RECYCLED WATER MASTER PLAN

DODSON

CITY OF PETALUMA

JUNE, 2004

INNOVATIVE DESIGN FOR WATER

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

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EXECUTIVE SUMMARY

SECTION I
EXECUTIVE SUMMARY

The City of Petaluma's Recycled Water Master Plan has been prepared by *Dodson Engineers* to identify a phased program to implement the use of recycled water throughout the City of Petaluma and southern Sonoma County. The goal of the Master Plan is to determine the least costly, most reliable phased project that will distribute all effluent from the City's Water Recycling Facility (WRF) during the period of restricted discharge to the Petaluma River and provide potable offset to augment the City's water supply.

Urban reuse of recycled water for irrigation of large urban customers, such as golf courses, parks, and open spaces that currently use potable water for irrigation, will reduce the City's demand on its potable water system. The Sonoma County Water Agency's (SCWA) Draft Water Conservation Program, prepared in 1998, identified 600 AF/year as a target for potable offset by recycled water for the City of Petaluma. When the City of Petaluma's Year 2000 Urban Water Management Plan was prepared, it included this value as potable water supply to be provided through potable offset by recycled water. The City of Petaluma's City Council adopted this plan in early 2001.

The City of Petaluma is restricted from releasing discharge to the Petaluma River between May 1st and October 20th by the San Francisco Bay Area Regional Water Quality Control Board. The City currently operates an extensive water recycling program that pays agricultural users to take the wastewater treatment plant's disinfected secondary effluent during the irrigation season. The majority of recycled water is currently used for irrigation of local agricultural and vineyard lands, and the remainder is used to irrigate a portion of Adobe Creek Golf Course.

The City of Petaluma is currently in the design phase for a new WRF that will produce disinfected tertiary recycled water meeting Title 22 requirements for unrestricted use. When the new WRF goes online in Year 2007, tertiary recycled water will be available and potable offset can be accomplished.

In 2001, a recycled water study was undertaken to identify potential customers and demands within the northeast portion of the City. This study identified potential future tertiary water customers, a future tertiary water reservoir, and sized the backbone pipeline system to convey recycled water into the Petaluma city limits. Since the Rooster Run Golf Course, which uses 422 acre-feet per year of potable water for irrigation, can currently be supplied with disinfected secondary effluent, the backbone pipeline was designed, bid, and will be completed by the summer of 2004. The pipeline will supply disinfected secondary effluent to Rooster Run Golf Course until tertiary water is available.

POTENTIAL RECYCLED WATER USERS AND DEMANDS

Potential customers for both the tertiary and secondary recycled water systems were identified and placed in either the secondary effluent system or the tertiary effluent system. Potential tertiary recycled water customers and potential secondary effluent recycled water customers identified are shown in Figures I-1 and I-2, respectively. Secondary effluent customers include existing customers, as well as additional customers identified along Lakeville Highway.

Potential customers are classified as turf, golf course, industrial, vineyard, or agricultural. All potential customer identified within the secondary effluent system are either agricultural or vineyard customers.

A total potential irrigation season demand of 2,595 million gallons (MG) was identified when including all potential tertiary and secondary effluent recycled water users. Of the 2,595 MG, 1,212 MG correspond to potential tertiary users and 1,383 MG correspond to potential secondary effluent users. Based on the water balance analysis for the WRF, approximately 790 MG of total recycled water will be available during the irrigation season in Year 2007, which will increase to approximately 1,000 MG of total recycled water in Year 2025 (buildout).

SYSTEM REQUIREMENTS AND EVALUATION CRITERIA

General requirements were developed to establish the framework for overall goals and objectives of the recycled water program. Design requirements were established to ensure that scenarios were developed and modeled to meet the requirements of the City and cost evaluation criteria were established to develop an 80 year present worth cost model for comparison purposes.

General Requirements

The four general requirements for the City of Petaluma's recycled water program include:

- Ability to offset 600 acre-feet per year of existing potable water use with recycled water to meet the City's Water Conservation Program requirements.

- Ability to manage recycled water to ensure no discharge to the Petaluma River during the period of restricted discharge, while providing sufficient water to recycled water customers to meet their demands.

- Ability to provide operational flexibility in the recycled water system by using 20 percent of all recycled water on city-owned agricultural land.

- Ability to phase the recycled water program to adjust to increasing recycled water production between Year 2007 and buildout.

Design Requirements

Design requirements for the tertiary and secondary effluent recycled water systems were developed and include requirements for delivery pressure, storage tanks/reservoirs, pumping stations, pipelines, and valves. These requirements are

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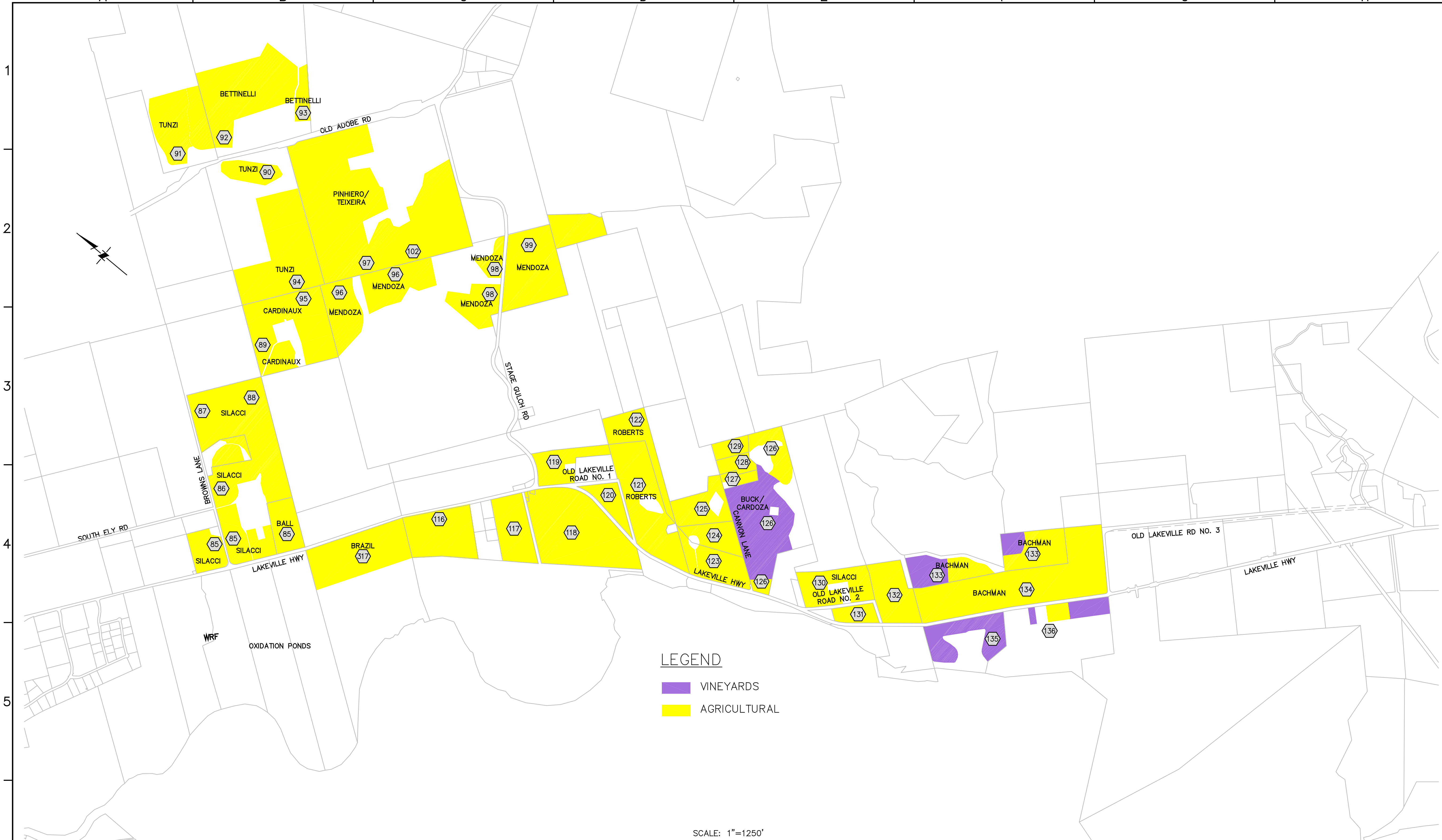
POTENTIAL TERTIARY WATER CUSTOMERS

Figure No. I-1

Sheet No. of



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POTENTIAL SECONDARY WATER CUSTOMERS

Figure No.
I-2

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of

outlined in Table I-1. All recycled water scenarios identified were modeled to ensure that these design requirements were met.

Table I-1
Design Criteria

DESCRIPTION	TERTIARY SYSTEM	SECONDARY EFFLUENT SYSTEM
Delivery Pressure (min)	50 psi	60 psi
In-System Storage type capacity	 Above Ground Welded Steel Tank Distribution Storage Only	 Open Reservoir Distribution Storage Only
Pumping Stations capacity (min) standby pumping unit emergency power	 100% Max Day Yes No, except Main Tertiary Pump Station at WRF	 100% Max Day Yes No
Velocity (max)	10 ft/sec	10 ft/sec
Pressure (max)	150 psi	250 psi[A]
Diameter (min)	6 inches	6 inches
Depth of Cover (min)	4 feet	4 feet
Hazen-Williams "C" Value	125	125
Minor Loss Coefficient "K"	K=1 per 1,000 ft of pipe	K=1 per 1,000 ft of pipe
Pipe Material >12 inches diameter ≤ 12 inches diameter	 DIP PVC C900	 DIP DIP
Valve Type > 12 inch diameter ≤ 12 inches diameter	 Butterfly Valve Gate Valve	 Butterfly Valve Gate Valve

[A] Existing agricultural system exceeds 200 psi.

Cost Evaluation Criteria

Cost evaluation criteria were developed in Section IV—System Requirements and Evaluation Criteria to establish an 80 year present worth life cycle cost. Cost evaluation criteria include capital costs, operation and maintenance (O&M) costs, and income. Capital costs include initial capital costs and cost of upgrades in a later year. O&M costs associated with the recycled water system are annual costs and include operation and maintenance costs associated with tertiary treatment facilities, pump stations, reservoirs, pipelines, valves, hydrants, irrigation systems, monitoring programs, and program administration. Annual income generated from estimated water rates was also included to obtain the overall annual cost for each scenario and to establish a true 80 year present worth cost for each scenario evaluated.

SCENARIO DEVELOPMENT AND METHODOLOGY

Scenarios were developed to serve various potential customer groupings or model areas for analysis to determine the most cost effective recycled water system. Various scenarios were developed for both the tertiary and secondary effluent recycled water systems.

Tertiary System Model Areas

Each potential tertiary customer was grouped into one of seven model areas. These model areas are identified by letters A through G and are shown in Figure I-3. A summary of total irrigation season demand, maximum day demand, total acreage, and total potable offset accomplished by each tertiary model area is shown in Table I -2.

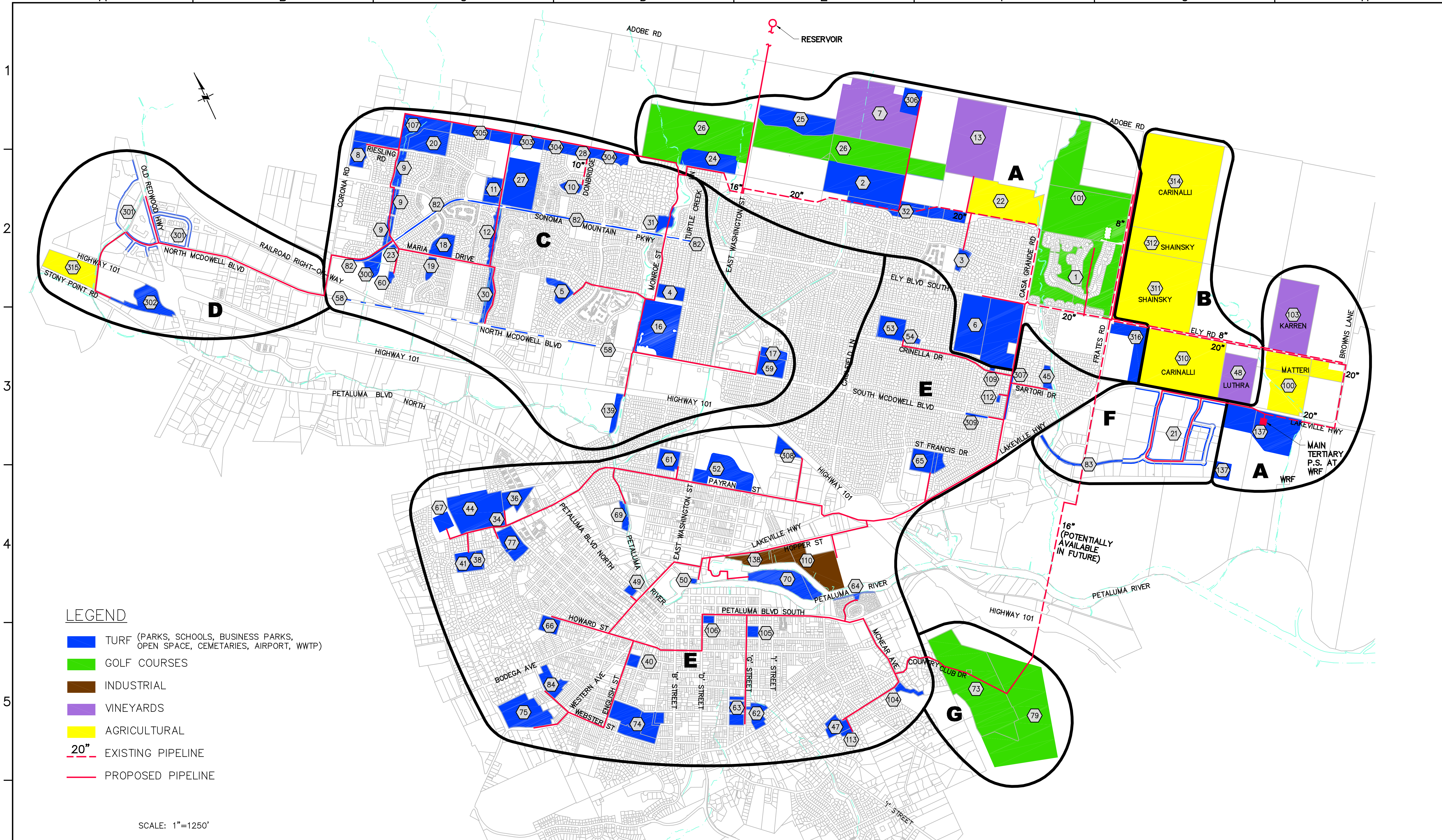
Table I-2
Tertiary Model Areas

Model Area	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)	Potable Offset (MG)
A	485	5.2	635	204
B	308	3.4	342	0
C	133	1.4	142	70
D	36	0.4	37	18
E	174	1.8	165	134
F	10	0.1	12	10
G	67	0.5	86	34

Model area A includes all customers adjacent to the tertiary recycled water Phase 1 recycled water backbone pipeline currently under construction. The potable offset requirement of 600 acre-ft or 196 million gallons is accomplished by current potable water customers identified in model area A. The other model areas identified are located throughout the tertiary water system and customers are grouped into model areas based on their physical location and pipeline routing. Pipeline routing was developed utilizing roads and routes that would be best suited for pipeline installation, as well as for crossing the Petaluma River and Highway 101.

Secondary Effluent System Model Areas

Each potential secondary effluent customer identified was grouped into one of five model areas. These model areas are identified by letters H through L, as shown in Figure I-4. A summary of total irrigation season demand, maximum day demand, and total acreage for each secondary effluent model area is provided in Table I-3. Although no potable offset is accomplished by providing customers in the secondary effluent system with recycled water, operational flexibility is accomplished through the ability to adjust irrigation rates on city-owned agricultural land to balance recycled water supply with storage.



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MODEL AREAS
POTENTIAL TERTIARY WATER CUSTOMERS

Figure No. I-3

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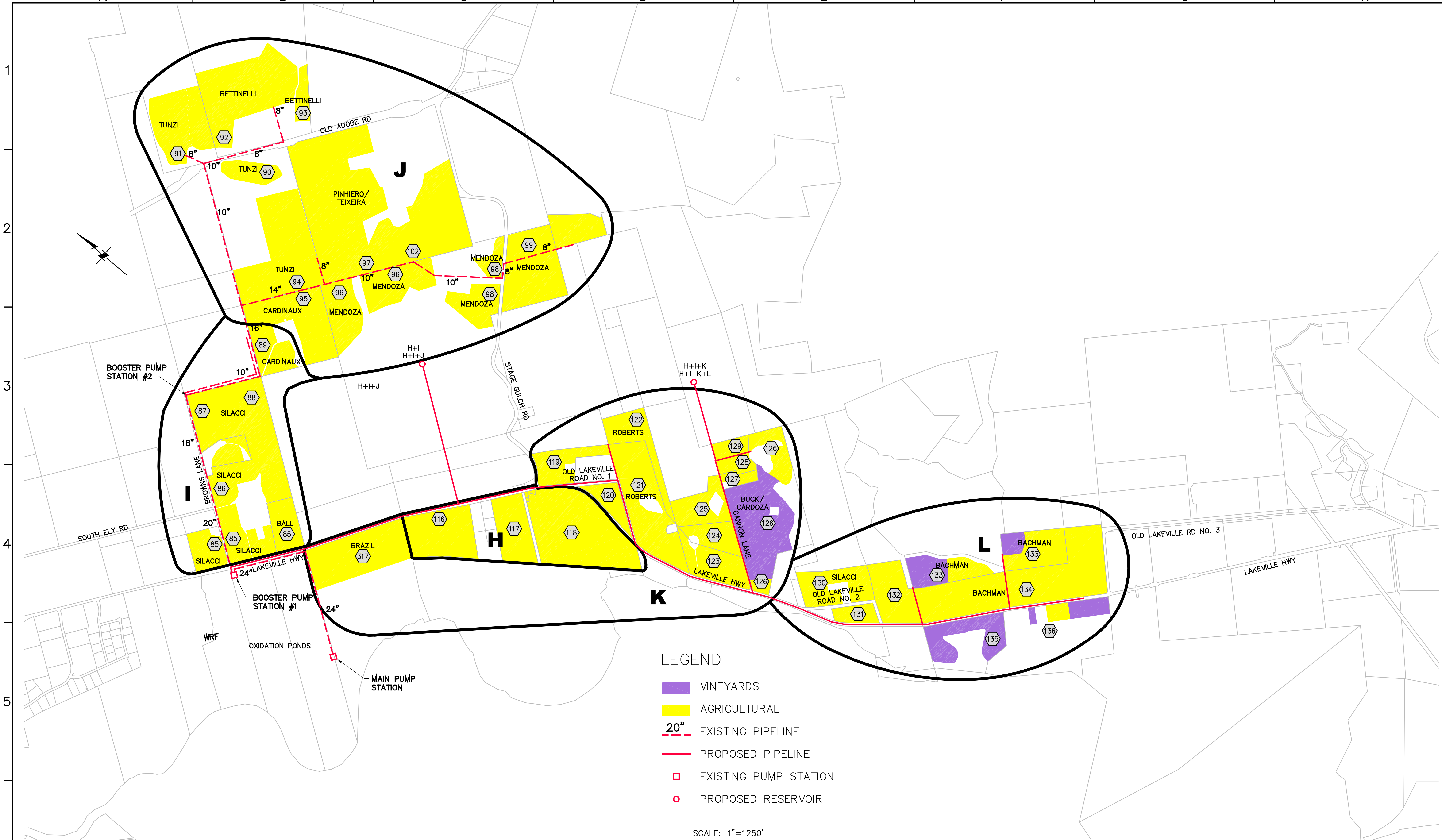

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MODEL AREAS
POTENTIAL SECONDARY WATER CUSTOMERS

Figure No. I-4

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Table I-3
Secondary Effluent Model Areas

Model Area	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)
H	195	2.1	205
I	149	1.5	156
J	420	4.1	519
K	347	3.8	438
L	274	3.0	359

Model area H has been identified as potential city-owned agricultural land for purposes of this master planning document; however, several areas within the secondary effluent system could be utilized to meet the city-owned agricultural land requirement.

Tertiary System Scenario Development

Model areas identified for the tertiary recycled water system were combined to develop recycled water system scenarios for modeling and analysis. Areas D and F were not included in any scenarios, due to the substantial infrastructure required to serve such small demands. Scenarios were developed based on the location of the WRF, existing and proposed pipeline routing, and the total amount of recycled water available. Since approximately 1,000 million gallons of recycled water will be available at buildout for distribution to all recycled water customers and a minimum of 195 million gallons is required for irrigation of city-owned agricultural land in the secondary effluent system, only 805 million gallons is available for use in any tertiary scenario. Table I-4 outlines the scenarios developed for the tertiary system and provides their total irrigation season demand, maximum daily demand, total acreage, and total potable offset.

Table I-4
Tertiary Scenarios

Scenario	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)	Potable Offset (MG)
A	485	5.2	635	204
A + B	793	8.6	977	204
A + G [A]	552	5.7	721	238
A + C	618	6.6	777	274
A + E + G	726	7.5	886	372
A + C + G [A]	685	7.1	863	307

[A] Scenarios A + G and A + C + G rely on using an existing 16-inch potable water pipeline. This pipeline is currently unavailable and its availability is dependent upon SCWA's new aqueduct alignment.

Secondary Effluent System Scenario Development

Model areas identified for the secondary effluent system were combined to develop various secondary effluent recycled water system scenarios for modeling and analysis.

Three scenarios were developed, based on the location of the WRF, existing and proposed pipeline routing, and the total amount of recycled water available. Since approximately 1,000 million gallons of recycled water will be available at buildout for distribution to recycled water customers and a minimum of 196 million gallons (600 acre-ft) is required for potable offset in the tertiary system, a maximum of 804 million gallons is available for use in any secondary effluent system scenario. Table I-5 outlines scenarios developed for the secondary effluent system and provides their total irrigation season demand, maximum daily demand, and total acreage.

Table I-5
Secondary Effluent Scenarios

Scenario	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)
H + I	344	3.6	361
H + I + J	764	7.7	880
H + I + K	691	7.4	799

Scenarios for H + I + J + K and H + I + K + L were not identified, since the total irrigation season demand would exceed the amount of recycled water available.

EVALUATION OF SCENARIOS

All scenarios developed for the tertiary and secondary effluent recycled water systems were modeled. A 24-hour simulation was run for each scenario using maximum day and average day demands. Scenario modeling was used to establish pump station size, reservoir size and elevation, pipeline diameters, and to confirm that each scenario met the design criteria established.

An 80 year present worth analysis was established for each scenario, based on the cost criteria and system requirements established. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. These costs, as well as total capital cost required in Years 2007 and 2047 and the annual cost associated with each scenario, are included in Section VI—Evaluation of Scenarios.

RECOMMENDED SCENARIOS/IMPLEMENTATION

The recommended recycled water program must consist of a combination of tertiary and secondary effluent scenarios that, in combination, meet the requirements established. The recommended recycled water program shall include a minimum potable water offset of 196 MG (600 acre-ft) per year and a minimum of 205 acres of city-owned agricultural land to achieve system flexibility. The total amount of recycled water available for distribution during an irrigation season is approximately 790 MG at startup of the WRF in Year 2007. This amount will increase with increased flow into the WRF to approximately 1,000 MG at buildout. Buildout is estimated to occur in Year 2025 and recycled water production is expected to increase linearly between Year 2007 and buildout. Total recycled water production includes both tertiary and secondary effluent recycled water.

A summary of the annualized present worth cost for each scenario evaluated is included in Table I-6.

Table I-6
Scenario Present Worth Comparison

Scenario	Total Irrigation Season Use (MG)	Meets Potable Offset Requirement (Potable Offset Amount)	Meets City-Owned Agricultural Land Requirement (City-Owned Acreage)	Annualized 80 Year Present Worth ($/MG)	Ranking PW, Lowest to Highest Cost	Not Feasible [B]
A	485	yes (204 MG)	no (30 acres)	$1,106/MG	2	
A + B	793	yes (204 MG)	no (30 acres)	$1,326/MG	3	
A + C	618	Yes (274 MG)	no (30 acres)	$1,738/MG	8	
A + G	552	yes (238 MG)	no (30 acres)	$1,096/MG	1	X
A + E + G	726	yes (372 MG)	no (30 acres)	$1,765/MG	9	
A + C + G	685	yes (307 MG)	no (30 acres)	$1,534/MG	6	X
H + I	344	no (0 MG)	Yes (205 acres)	$1,619/MG	7	
H + I + J	764	no (0 MG)	Yes (205 acres)	$1,379/MG	4	
H + I + K	691	no (0 MG)	Yes (205 acres)	$1,398/MG	5	
H (only) [A]	195	no (0 MG)	Yes (205 acres)	$2,537/MG [A]	10	
H + I + Partial J [A]	515	no (0 MG)	Yes (205 acres)	$1,639/MG [A]	7/8	
H + I + Partial K [A]	515	no (0 MG)	Yes (205 acres)	$1,498/MG [A]	5/6	

[A] Present Worth Analysis Cost included in Appendix C—Cost Evaluation Data. These scenarios were not modeled.

[B] Not feasible at this time due to unavailability of 16" potable water pipeline.

Figure I-5 outlines the methodology used to determine the least cost scenario combination, while meeting the potable offset requirement, city-owned agricultural land requirement, and balancing recycled water demand with recycled water supply.

The least cost recycled water program, which meets all requirements outlined in Section IV, includes scenario A in the tertiary system and scenario H + I + K (partial) in the secondary effluent system. Scenario H + I + K (partial) includes only a portion of the potential users identified in model area K. It is recommended to add customers closest to the WRF.

If additional potable offset is required by the City beyond that accomplished by scenario A, potable offset by recycled water should be further implemented. The cost of obtaining new potable water supply is estimated at approximately $2,155/acre-ft[(1)] or $6,611/MG[(1)]. This cost exceeds that of all recycled water scenarios evaluated. Potable water offset should be accomplished by adding potable customers in model area G through use of the existing 16-inch waterline, if available, and/or customers in model area C. Secondary effluent customers in model areas K and I would be removed from the secondary system to obtain the additional recycled water supply required. Table I-7 shows the available offset in each scenario. Potable offset varies between 204 MG and 307 MG for the four scenarios outlined.

Table I-7
Potable Water Offset Scenario Requirements

Scenario	Total Irrigation Season Demand (MG)	Maximum Day Demand (mgd)	Available Potable Offset (MG)	Reservoir		Main Tertiary Pump Station	
				Size (MG)	Elevation (ft)	Flow (mgd)	TDH (ft)
A	485	5.2	204	0.9	250	5.2	290
A + C	618	6.6	274	1.71	272	6.6	350
A + G	552	5.7	238	0.9	265	5.7	300
A + C + G	685	7.1	307	1.71	280	7.1	350

Recommended Project

Table I-8 outlines the parameters for the most cost effective recommended recycled water system, which consists of serving customers identified in tertiary system scenario A, as modified for possible future potable offset, and secondary effluent system scenario H + I + K (partial).

(1) Estimated cost of additional potable water supply based on SCWA's alternative to construct a pipeline around Dry Creek and build a treatment plant.

FIGURE I – 5

SCENARIO PRESENT WORTH ANALYSIS METHODOLOGY

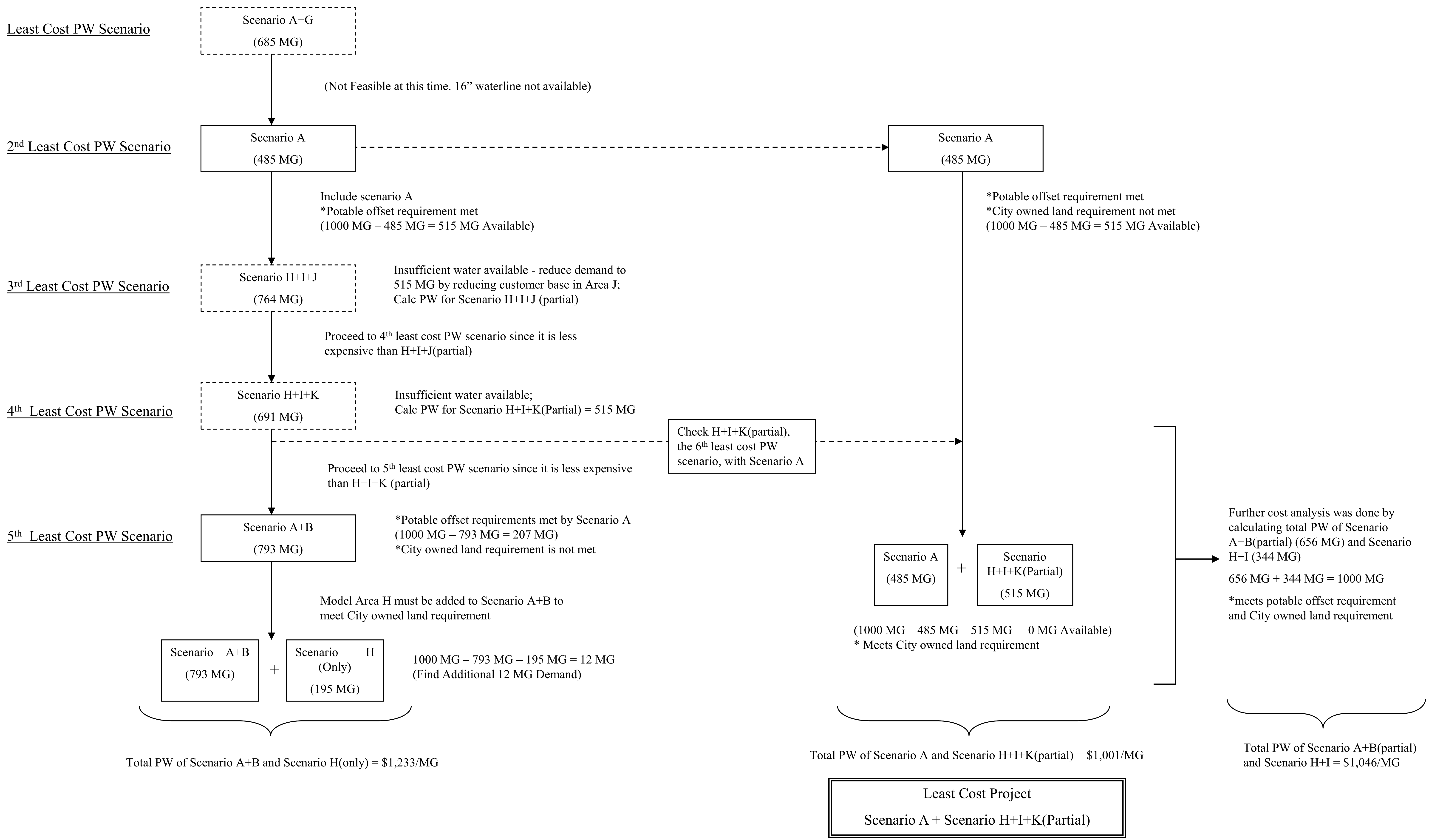

Table I-8
Recommended Project

Item	Tertiary Effluent System	Secondary Effluent System	Total (Both Systems)
Irrigation Season Demand (MG/year)	485	515	1,000
Maximum Day Demand (mgd)	5.2	5.2	N/A
Total Irrigated Acres (acres)	635	634	1,269
Potable Offset (MG/year)	204	0	204
City-Owned Agricultural Land (acres)	30	205	235
Tertiary System			
Pump Station	1		
Location	WRF		
Size	5.2 mgd @ 350' TDH [B]		
Reservoir	1		
Location	Northeast on E. Washington		
Size	1.71 MG [A]		
Elevation	280		
Secondary Effluent System			
Pump Stations		2	
Main Pump Station		Yes	
Booster Pump Station No. 1		Yes	
Booster Pump Station No. 2		No	
Reservoir			
Location		County	
Size		0.56 MG	
Elevation		360	

[A] A 0.9 MG reservoir may be constructed initially and a second reservoir added at the same site at a later date, if additional potable offset is required.

[B] Pump station may be designed for 5.2 mgd at 320 feet TDH initially, but sufficient horsepower and the addition of required stages must be provided for possible future requirement of 350 feet TDH. Tertiary system pump station shall be expandable to 8.0 mgd at 350 feet TDH.

The recommended tertiary and secondary recycled water systems are shown in Figures I-6 and I-7, respectively. Costs for the recommended tertiary and secondary effluent systems are provided in Tables I-9 and I-10, respectively. Costs include capital costs in Years 2007 and 2047, as well as annual costs associated with the system.

Recycled Water Project Implementation

Once tertiary water is available in Year 2007, customers in model areas A and H should be added and existing customers in model area J removed to achieve a total irrigation

Table I - 9
RECOMMENDED TERTIARY SYSTEM COSTS
Scenario A[7]

Cost	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs				
Tertiary Facilities - Initial	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000			
Tertiary Facilities - Additional[6]	1,480,000			
Tertiary Facilities - Upgrade		5,682,000		
Tertiary Facilities - Add .8		698,000		
Tertiary Facilities - Additional		809,000		
Reservoir	3,450,000			
New Pipes	2,540,000			
New Valves	82,000			
New Hydrants	27,000			
Hydrants -all (Upgrade)		46,000		
Irrigation - Initial	78,000			
Irrigation - Upgrade		78,000		
Land[4]	100,000			
O&M Costs				
Tertiary Facilities (4 mgd)			272,000	
Tertiary Facilities - Additional			78,000	
Pump Station Power			216,000	
Reservoirs				300,000
Pipelines - New			42,000	
Pipelines - Old			0	
Valves			5,000	
Hydrants			3,000	
Irrigation System			10,000	
Monitoring			16,000	
Program Administration[1]			38,000	
Income				
Reduction of Potable Income			25,000	
Recycled Water Income:				
Standard Rate Customer			-274,000	
Special Rate Customers			-68,000	
Well Customers			-47,000	
Vineyard Customers			-40,000	
Agricultural Customers[3]			7,000	
Rental Land Income			-3,000	
TOTAL	**$9,037,000**	**$7,313,000**	**$280,000** **per year**	**$300,000** **every 10th year**

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary). Half of total cost has been applied to each system.
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $7,000 to $21,000 if current payment rate was used
[4] Land cost is for tertiary reservoir site
[5] Reservoirs require a $300,000 per year maintainence once every ten years
[6] Additional costs of $1,280,000 and $1,480,000 for tertiary facilities may not be required per Corollo Engineers
[7] Includes increased cost due to recommendation to size facilities for addition of future potable offset customers.

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RECOMMENDED TERTIARY WATER SYSTEM SCENARIO A

Figure No. I-6

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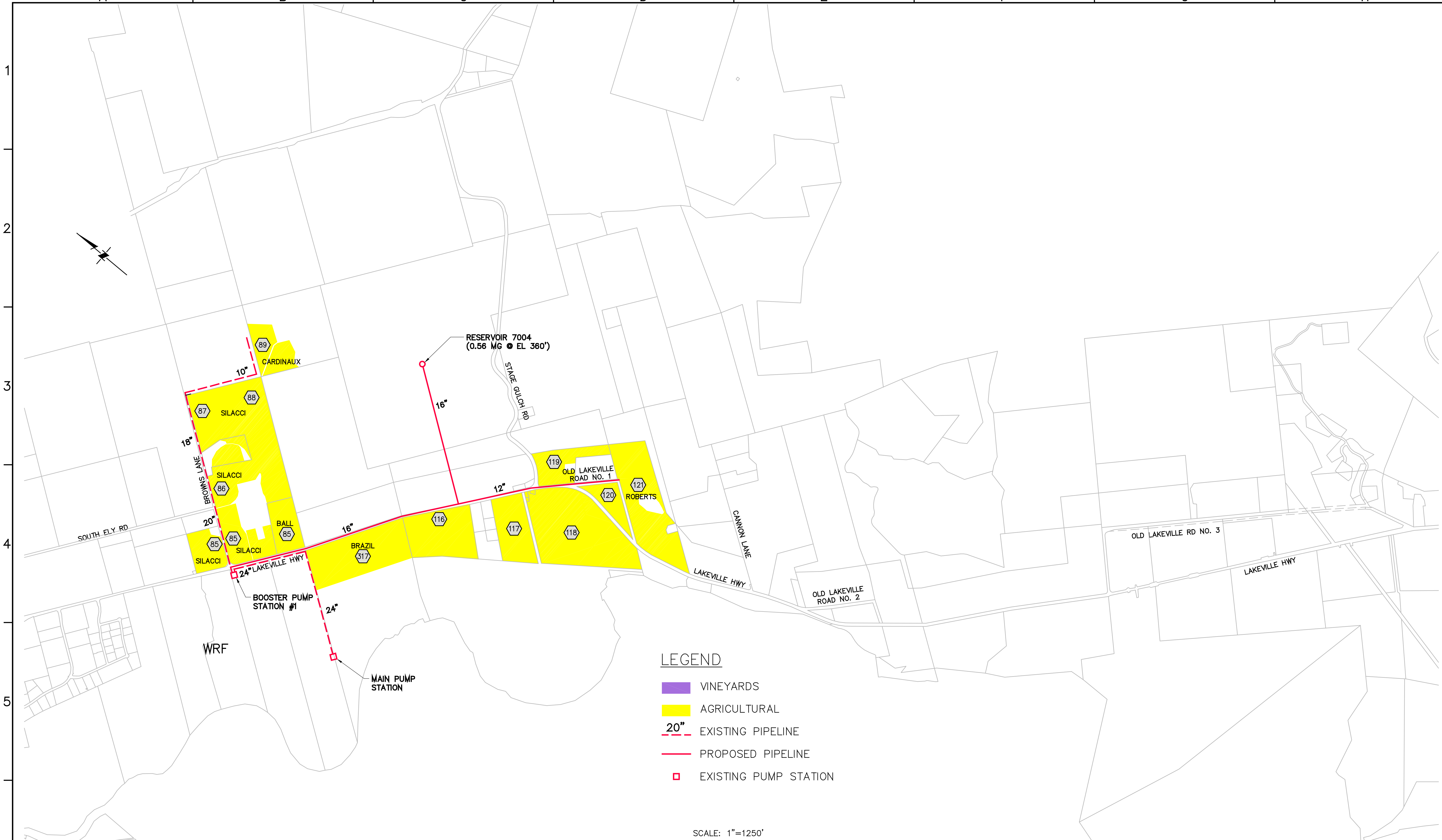

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RECYCLED WATER MASTER PLAN

RECOMMENDED SECONDARY WATER SYSTEM SCENARIO H+I+K (PARTIAL)

Figure No. I-7

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Table I-10
RECOMMENDED SECONDARY EFFLUENT SYSTEM COSTS
Scenario H+I+K(Partial)

Cost	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]
Capital Costs			
Pump Station Initial - Main	525,000		
Pump Station Initial - BPS#1	688,000		
Pump Station Initial - BPS#2	0		
Pump Station Upgrade - Main		525,000	
Pump Station Upgrade - BPS#1		688,000	
Pump Station Upgrade - BPS#2		0	
Reservoir	1,400,000		
New Pipes	4,325,000		
New Valves	162,000		
New Hydrants	85,000		
Hydrants (Upgrade)		121,000	
Irrigation - Initial	533,000		
Irrigation - Upgrade		532,000	
Land[4]	4,200,000		
O&M Costs			
Pump Stations			72,000
Pump Station Power			205,000
Reservoirs			5,000
Pipelines - New			17,000
Pipelines - Old			21,000
Valves			3,000
Hydrants			7,000
Irrigation System			72,000
Monitoring			56,000
Program Administration[1]			37,000
Income			
Recycled Water Income[3]			63,000
Rental Land Income			-20,000
TOTAL	**$11,918,000**	**$1,866,000**	**$538,000 per year**

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary). Half of total cost has been applied to each system.

[2] All Costs are in Year 2007 Dollars

[3] Agricultural payments would increase from $63,000 to $192,000 if current payment rate was used

[4] Land cost is for secondary effluent reservoir site and purchase of City owned agricultural land. City may elect to enter into a long term (40 year minimum) lease rather than purchasing land for City-owned agricultural land.

season demand of 790 MG. Not all customers in model areas A, H, and I can be served in Year 2007, since water demand from these three model areas will exceed the available recycled water supply of 790 MG. As flow into the WRF increases and additional recycled water supply becomes available, the remainder of customers in these areas can be added. Once recycled water production exceeds 829 MG, customers in model area K should be phased into the program, unless additional potable offset becomes necessary. Under that condition, customers in area G if possible, and/or area C, should be added rather than customers in area K. Customers must be added to the recycled water program so that customer demand matches supply.

The recommended recycled water program outlined herein requires numerous facilities that must be planned, designed, and constructed prior to startup of the WRF in Year 2007. A list of projects include:

<u>Tertiary Facilities</u>

- WRF with tertiary facility capacity of 5.2 mgd (minimum). (Currently under design.)
- Main tertiary pump station, rated for 5.2 mgd @ 320 to 350 feet TDH, expandable to 8.0 mgd @ 350 feet TDH. (Currently under design.)
- Phase 1 Recycled Water Pipeline conversion from existing secondary effluent system to tertiary effluent system.
- In-system 1.71 MG welded steel tank located at elevation 280, northeast of East Washington Street beyond Adobe Road. (The City may elect to construct a 0.9 MG reservoir and allow space at the site to add additional reservoir capacity at a later date.)
- New pipeline system, as shown in Figure I -6.
- Irrigation system on 30 acres of city-owned agricultural land.
- <u>Secondary Effluent Facilities</u>
- In-system 0.56 MG open reservoir, located at invert elevation 360 within the County, northeast of Lakeville Highway and southeast of Browns Lane.
- Main pump station and Booster pump station No. 1 upgrades.
- Purchase or obtain long-term (40 years minimum) lease for 205 irrigatable acres (minimum) of city-owned agricultural land and install irrigation system.
- Pipeline system, as shown in Figure I-7 (infrastructure to model area K customers, may be deferred).

Figure I-8 combines the items listed above into four projects and outlines a recommended project schedule for their implementation prior to the WRF's completion in Year 2007.

Figure I-8
Project Schedule

Project	2004	2005	2006	2007 (WRF Completion)
DHS REPORT				
PIPELINES AND RESERVOIRS				
System Environmental Work (EIR)				
Site Environmental Work, Land Acquisition, Predesign				
Design				
Bid and Construction				
CITY-OWNED AGRICULTURAL LAND				
Analyze Land				
Land Acquisition				
Irrigation System				
Design				
Bid and Construction				
Secure Lease				
SECONDARY PUMP STATION UPGRADE				
Study				
Design				
Bid and Construction				

II

BACKGROUND

SECTION II
BACKGROUND

The City of Petaluma currently operates a wastewater treatment facility located at 950 Hopper Street within the Petaluma city limits. Treated wastewater from the wastewater facility is then pumped through a 36-inch forcemain from the treatment plant's pond influent pump station to the City's oxidation ponds, located adjacent to Lakeville Highway. Disinfected secondary effluent from the oxidation ponds is currently discharged into the Petaluma River or distributed to recycled water irrigation customers. The amount of disinfected secondary effluent that is distributed for recycled water use is approximately 37 percent of the wastewater treatment facility's total effluent.

The City of Petaluma is restricted from releasing any discharge into the Petaluma River between May 1st and October 20th by the San Francisco Bay Area Regional Water Quality Control Board. The City currently operates an extensive water recycling program that recycles all of the wastewater treatment plant's disinfected secondary effluent during the irrigation season.

The majority of recycled water is currently used for irrigation of local agricultural and vineyard lands, and the remainder is used to irrigate a portion of Adobe Creek Golf Course. The City currently pays agricultural customers $210 for every acre foot of recycled water used. The City is interested in diversifying its water recycling program to include urban reuse. Urban reuse of recycled water for irrigation of large urban customers, such as golf courses, parks and open spaces that currently use potable water for irrigation, will reduce the City's demands on its potable water system, similar to that of water conservation. The Sonoma County Water Agency's (SCWA) Draft Water Conservation Program, prepared in 1998, identified 600 AF/year as a target for potable offset by recycled water for the City of Petaluma. When the City of Petaluma's Year 2000 Urban Water Management Plan was prepared, it included this value as potable water supply to be provided through potable offset by recycled water. The City of Petaluma's City Council adopted this plan in early 2001. The current program does not offset any potable water through the use of recycled water.

The City of Petaluma is currently in the design phase for a new Water Recycling Facility (WRF) that will produce disinfected tertiary recycled water meeting Title 22 requirements for unrestricted use. Allowable irrigation uses for disinfected tertiary effluent include parks and playgrounds, schoolyards, residential landscaping, unrestricted access golf courses, food crops, and other uses not prohibited by the Department of Health Services through the California Code of Regulations. Once the new WRF goes online in Year 2007, water meeting Title 22 requirements for disinfected tertiary recycled water will be available for use.

The City of Petaluma currently delivers disinfected secondary effluent through eighteen (18) hydrants to ten (10) recycled water customers in southern Sonoma County. The majority of recycled water is currently used for irrigation of local agricultural and vineyard lands, and the remainder is used to irrigate a portion of Adobe Creek Golf Course. These customers do not require tertiary effluent for their irrigation needs. A list of current customers is provided in Table II-1.

Table II-1
Existing Secondary Effluent Recycled Water Customers

Customer Name	Hydrant No.	Use
Silacci/Ball	1	Agricultural/Irrigation
Silacci	2	Agricultural/Irrigation
Silacci	3	Agricultural/Irrigation
Silacci	4	Agricultural/Irrigation
Cardinaux	5	Agricultural/Irrigation
Tunzi	6	Agricultural/Irrigation
Tunzi	7	Agricultural/Irrigation
Bettinelli	8	Agricultural/Irrigation
Bettinelli	9	Agricultural/Irrigation
Tunzi	10	Agricultural/Irrigation
Cardinaux	11	Agricultural/Irrigation
Mendoza	12 (M)	Agricultural/Irrigation
Teixeria/Pinhiero	12 (T)	Agricultural/Irrigation
Mendoza	13	Agricultural/Irrigation
Mendoza	14	Agricultural/Irrigation
Matteri	15	Agricultural/Irrigation
Adobe Creek Golf Course (Northeast)	16	Golf Course/Irrigation
Teixeria/Pinhiero	17	Agricultural/Irrigation
Karren	18	Vineyard/Drip Irrigation

The existing disinfected secondary effluent recycled water system was constructed in 1981 and expanded in 1989 and 1994. The existing secondary recycled water system has three pump stations. All water is pumped from the existing wastewater pond system by the Main Pump Station and then repumped by Booster Pump Station No. 1. Booster Pump Station No. 1 serves several customers as well as Booster Pump Station No. 2. Booster Pump Station No. 2 repumps recycled water to customers at higher elevations. Much of the land within these higher elevations is difficult and dangerous to access. The current secondary effluent recycled water system does not have in-system storage. Due to the small number of customers, variable speed driven pumps, and complex control, these stations are difficult to operate and maintain.

In 2001, a recycled water study was undertaken to identify potential customers and demands within the northeast portion of the City. This study identified potential future tertiary water customers, a future tertiary water reservoir site, and sized the backbone pipeline system to convey recycled water from the existing oxidation pond site and future site of the WRF to the northeast portion of Petaluma. The main focus of this study was to serve the Rooster Run Golf Course with recycled water to free up potable water supply. The Rooster Run Golf Course uses approximately 138 MG/year of water for irrigation of 126 acres. Since the Rooster Run Golf Course can be supplied with disinfected secondary effluent by the existing recycled water system, the backbone pipeline was designed, bid, and is currently under construction. The pipeline will be completed by the summer of 2004 and will temporarily connect to the existing disinfected secondary effluent recycled water system to serve Rooster Run Golf Course until the tertiary system goes online in Year 2007.

Once the WRF is completed and recycled water meeting the State of California Department of Health Services Title 22 requirements for disinfected tertiary recycled water is available, the City of Petaluma will be able to produce both disinfected secondary effluent and disinfected tertiary effluent. Since both systems provide advantages, it is envisioned that the City’s recycled water program will include the operation of two independent recycled water systems: a disinfected secondary effluent system and a disinfected tertiary effluent system. Disinfected tertiary water meeting the requirements of Title 22 for unrestricted use will provide the City with the ability to serve numerous customers, such as parks and schools, within the City limits and provides enormous potential for offsetting the use of the City’s potable water supply. Advantages for continued use of the disinfected secondary effluent system includes a lower production cost than tertiary recycled water, numerous customers who can use disinfected secondary effluent within close proximity to the WRF, and existing infrastructure for distribution of disinfected secondary effluent, including pumping stations and pipelines.

The City of Petaluma's Recycled Water Master Plan will identify a phased program to further implement the use of recycled water throughout the City of Petaluma and southern Sonoma County through buildout. The goal of the Master Plan is to determine the least costly, most reliable phased recycled water project that will distribute all effluent from the City's WRF during the period of restricted discharge into the Petaluma River. The City of Petaluma will continue to discharge to the Petaluma River between October 20th and May 1st in accordance with their discharge permit issued by the San Francisco Bay Area Regional Water Quality Control Board. This discharge equates to approximately 63 percent of all effluent produced.

III

POTENTIAL RECYCLED WATER USERS AND DEMANDS

SECTION III
POTENTIAL RECYCLED WATER USERS AND DEMANDS

Dodson Engineers worked closely with the City of Petaluma to identify potential disinfected secondary effluent and disinfected tertiary effluent recycled water users and their associated irrigated acreage and demands.

As discussed in Section II—Background, the City of Petaluma currently operates an extensive disinfected secondary effluent program that recycles all of the wastewater treatment plant's effluent during the period when the City is not allowed to discharge into the Petaluma River. The existing disinfected secondary effluent recycled water system was constructed in 1981 and expanded in 1989 and 1994. It consists of three variable speed pumping stations and a network of distribution pipelines. The system currently has no in-system storage. The current system serves eight agricultural customers, one vineyard, and one golf course through eighteen hydrants. Due to the small number of customers, no in-system storage, variable speed pumping, and complex controls, the system is difficult to operate and maintain. All current recycled water customers were identified as potential recycled water customers in this master plan. Historical recycled water use records, dating from 1986, as well as the amount of irrigated acreage for current recycled water customers, are included in Appendix E—Existing Secondary Water User/Facility Information.

POTENTIAL USERS

Dodson Engineers worked closely with the City of Petaluma's staff to identify potential customers for both the tertiary and secondary recycled water systems. Based on the physical location of the tertiary recycled water system's backbone pipeline, currently under construction, all customers northwest of Browns Lane would receive tertiary recycled water, regardless of whether secondary effluent would be suitable for their use. Potential tertiary users identified include three current secondary effluent system customers, as well as Rooster Run Golf Course, which would be added in the summer of 2004. Upon availability of tertiary recycled water, these four customers would be converted to tertiary effluent. Potential tertiary recycled water customers identified are shown in Figure III-1. A total of ninety-four (94) potential tertiary customers were identified. They include customers outside the City limits, within southern Sonoma County, as well as customers throughout the City of Petaluma. Potential secondary effluent recycled water customers are shown in Figure III-2. Secondary effluent customers include existing customers, as well as additional customers identified along Lakeville Highway. All secondary effluent customers are located within the County outside of the Petaluma city limits. Forty-one (41) potential secondary effluent system customers were identified. Potential customers along Lakeville Highway were not contacted during the master planning effort. These customers were included due to their proximity to the WRF, low elevation, and interest in recycled water as previously expressed to the City.

Each potential customer shown in Figures III-1 and III-2 are identified by a specific number. Each potential customer is also color coded in accordance with their associated use. Potential customers are classified as turf, golf course, industrial, vineyard, or agricultural. All potential customer identified within the secondary effluent system are either agricultural or vineyard customers.

POTENTIAL USER ACREAGE

The irrigated acreage for potential tertiary recycled water customers identified on Figure III-1 were provided by the City from previous work. Upon reviewing the information, it was determined that several of the areas seemed incorrect. The inaccuracy stemmed from differences between actual acres and irrigated acres. The City then provided aerial maps outlining the irrigated areas and the total calculated irrigated acreage for land that was in question. This information is included in Appendix F—Potential Recycled Water User Irrigated Acreage. The irrigated acreage for existing secondary effluent system users was obtained from historical records. This information is included in Appendix E—Existing Secondary Water User/Facility Information. Irrigated acreage for potential agricultural and vineyard users outside of the city limits was estimated through the use of aerial photographs and Sonoma County Assessor's parcel maps. Irrigated acreage for all future users was estimated using City planning documents.

Table III-1 and III-2 include total irrigated acres for all potential recycled water users identified in Figures III-1 and III-2, respectively.

POTENTIAL USER DEMANDS

A total irrigation season demand of 2,595 million gallons (MG) was identified when including all potential tertiary and secondary effluent recycled water users. Of the 2,595 MG, 1,212 MG corresponds to potential tertiary users and 1,383 MG corresponds to potential secondary effluent users. Based on the water balance analysis, approximately 790 MG of total recycled water will be available during the irrigation season in Year 2007, which will increase to approximately 1,000 MG of total recycled water in Year 2025 (Buildout). This information is included for reference in Appendix D.

Recycled water customers are classified into six different user type classifications. Demands for each customer were developed based on their classification, since different types of users use different amounts of water, have varying irrigation season lengths, and use water at different times throughout the day. The six user type classifications include: turf, golf course, industrial, vineyard, agricultural, and WRF No. 3 water. No. 3 water is tertiary recycled water that will be used within the new WRF in lieu of potable water. Development of associated demands is outlined below.

Turf Users

Users identified as turf users include parks, schools, business parks, open space, cemeteries, airports, and irrigation needs at the new WRF. All turf users will receive

Rev.	Date	By	Description

Designed VG
Drawn MJF
Checked DRH
Job No. 5311

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Approved:

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File Info. 5311-III-1 MJF 2/25/04

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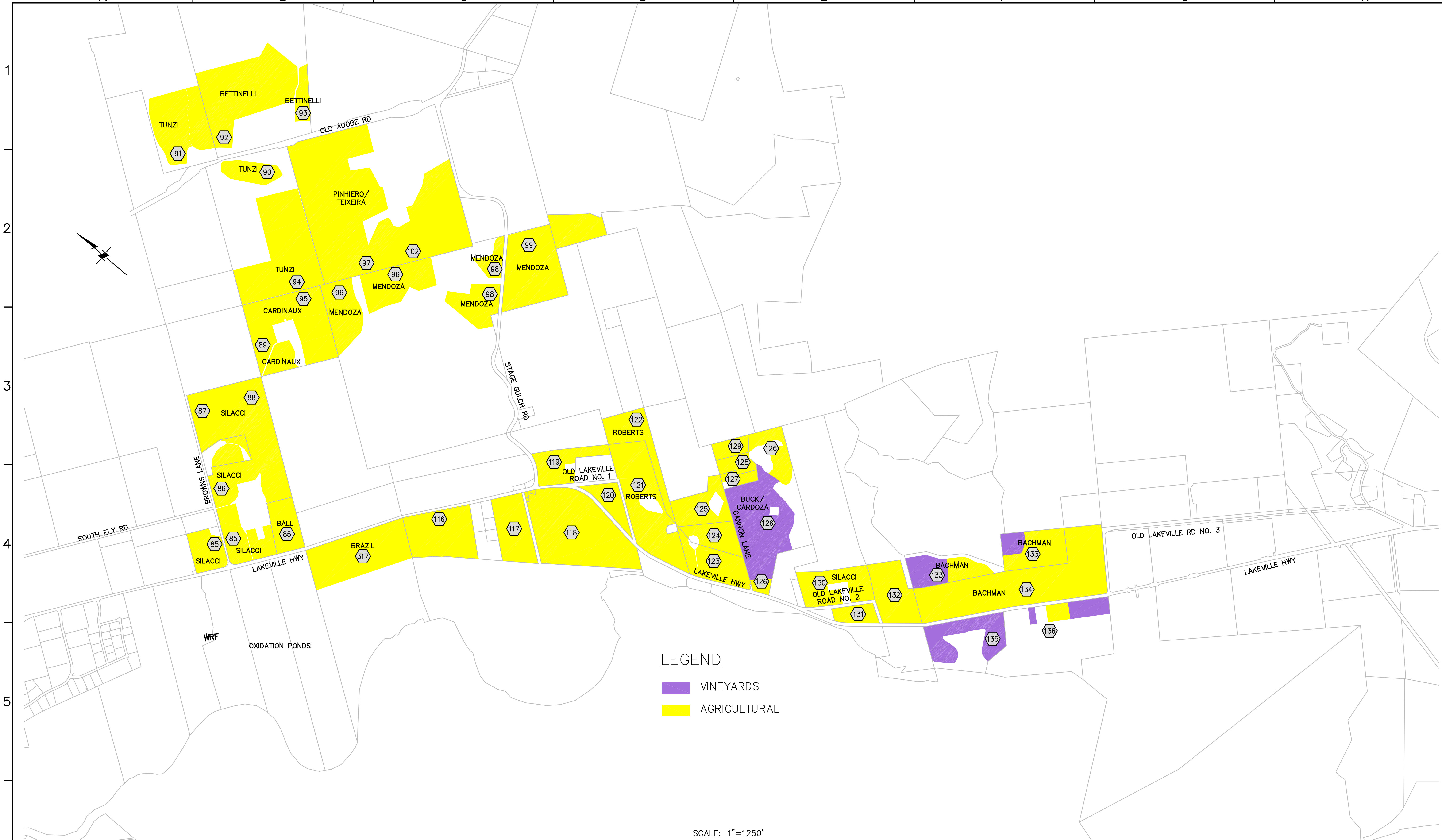
CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

POTENTIAL TERTIARY WATER CUSTOMERS

Figure No. III-1

Sheet No. of



Rev.	Date	By	Description

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Drawn MJF
Checked DRH
Job No. 5311

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Approved:

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CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

POTENTIAL SECONDARY WATER CUSTOMERS

Figure No.
III–2

Sheet No.
of

TABLE III - 1
Potential Tertiary Recycled Water System Users

							Current Source of Water (2003)				Potential Source of Water (2007)									
Model Area	Customer	Map #	Map Location	Description	Total Irrigated Acres	User Type	City Water (Potable Offset)	Secondary Effluent	Private Well	Not Irrigated	Secondary Effluent	Tertiary Recycled Water	Total Irrigation Season Use (MG/yr)	Avg. Irrigation Daily Use (mgd)	Max. Monthly Demand (MG/month)	Max. Daily Demand (mgd)	Max. Hour (gpm)	Factor (MG/acre)	Factor (acre-ft /acre)	High Risk Users
A	A15 (Matteri)	100	H-3	Ag User	37	A		X				X	**34.68**	0.16	**8.57**	0.33	228	**0.937**	**2.876**	
A	A16 (Adobe Creek) (NE)	101	F,G-2	Golf Course	**96.9**	G		X				X	**89.39**	0.42	**17.49**	0.67	466	**0.922**	**2.831**	
A	A18 (Karren)	103	H-2,3	Vineyard	30	V		X				X	**3.96**	0.03	0.99	0.04	70	**0.132**	**0.405**	
A	Adobe Creek (SW)	1	F,G-2	Golf Course	**40.8**	G			X			X	37.66	0.18	7.53	0.29	201	0.923	2.831	
A	Airport (Current Irrigation)	2	E-2	Open Space	**2.3**	T	X		X			X	2.30	0.01	0.62	0.02	44	1.000	3.069	
A	Arroyo Park	3	F-2	Park	**3**	T	X					X	3.00	0.01	0.81	0.03	58	1.000	3.069	
A	Casa Grande High School	6	F-3	School	**23.5**	T	X					X	23.50	0.11	6.38	0.24	453	1.000	3.069	
A	Ceja Vineyards (#3)	7	E-1	Vineyard	65	V			X			X	6.50	0.05	1.63	0.06	115	0.100	0.307	X
A	Greenway (Future)	316	G-3	Turf	15.5	T				X		X	15.50	0.07	4.21	0.16	299	1.000	3.069	X
A	Herrerias Vineyards (#4)	13	F-1,2	Vineyard	69	V			X			X	6.90	0.06	1.73	0.07	122	0.100	0.307	X
A	Old Adobe School	306	E-1	School	**6.6**	T	X					X	6.60	0.03	1.79	0.07	127	1.000	3.069	
A	Open Space (City Owned)	22	F-2	Ag User	30	A				X		X	28.47	0.13	8.15	0.31	578	0.949	2.912	
A	Prince Park	24	D-1,2	Park	**11.1**	T	X					X	11.10	0.05	3.01	0.12	214	1.000	3.069	
A	RESA (Redwood Estate Sports Plex)	25	E-1	Park	**18**	T			X	X		X	18.00	0.08	4.89	0.19	347	1.000	3.069	
A	Rooster Run	26	E-1,2	Golf Course	**126.4**	G	X					X	**138.34**	0.65	**25.20**	0.97	671	**1.094**	**3.359**	
A	Treatment Plant Irr (none returning)	137B	H-3	WWTP	40	T				X		X	40.00	0.19	10.86	0.42	771	1.000	3.069	
A	Treatment Plant 3W (returning)	137A	H-3	WWTP	N/A	P				X		X	N/A	**0.60**	N/A	**1.01**	**689**	N/A	N/A	
A	Wiseman Park (Extended)	32	E-2	Park	**19.4**	T	X					X	19.40	0.09	5.27	0.20	374	1.000	3.069	
B	Carinalli	310	G-3	Ag User	79.1	A			X			X	75.07	0.35	21.48	0.82	572	0.949	2.912	X
B	Carinalli	314	G-2	Ag User	116.1	A			X			X	110.18	0.51	31.53	1.21	839	0.949	2.912	X
B	Gurmeet Luthra	48	G-3	Vineyard	20	V			X			X	2.00	0.02	0.50	0.02	35	0.100	0.307	X
B	Shainsky	311	G-2,3	Ag User	96	A			X			X	91.10	0.43	26.07	1.00	694	0.949	2.912	X
B	Shainsky	312	G-2	Ag User	31	A			X			X	29.42	0.14	8.42	0.32	224	0.949	2.912	X
C	Bernard Eldridge School	4	D-2	School	2	T	X					X	2.00	0.01	0.54	0.02	39	1.000	3.069	
C	Bond Park	5	C,D-2	Park	6	T	X					X	6.00	0.03	1.63	0.06	116	1.000	3.069	
C	City Right-Of-Way (Maria & Sonoma Mtn)	23	B,C-2	Park	3	T				X		X	3.00	0.01	0.81	0.03	58	1.000	3.069	
C	Corona Creek Elementary	8	B-1,2	School	3	T	X					X	3.00	0.01	0.81	0.03	58	1.000	3.069	
C	Corona Creek LAD	9	C-2	Park	2.5	T	X					X	2.50	0.01	0.68	0.03	48	1.000	3.069	
C	Eagle Park	10	C,D-2	Park	**2.9**	T	X					X	2.90	0.01	0.79	0.03	56	1.000	3.069	
C	Gatti Park	11	C-2	Park	**7.3**	T				X		X	7.30	0.03	1.98	0.08	141	1.000	3.069	
C	Glenbrook Park	12	C-2	Park	2.6	T	X					X	2.60	0.01	0.71	0.03	50	1.000	3.069	
C	Kenilworth Jr. High (Relocated)	20	C-1	School	20	T				X		X	20.00	0.09	5.43	0.21	386	1.000	3.069	
C	Lucchesi Park	16	D-3	Park	**13.1**	T	X					X	13.10	0.06	3.56	0.14	253	1.000	3.069	
C	Lynch Creek Park (Future)	139	D-3	Park	7	T				X		X	7.00	0.03	1.90	0.07	135	1.000	3.069	X
C	McDowell Blvd North Streetscapes	58	D-3	Park	2	T	X					X	0.00	0.00	0.00	0.00	0	0.000	0.000	**Not feasible**
C	McDowell Elementary	59	E-3	School	3.7	T	X					X	3.70	0.02	1.00	0.04	71	1.000	3.069	
C	McDowell Meadow Park	60	C-2	Park	**0.8**	T	X					X	0.80	0.00	0.22	0.01	15	1.000	3.069	
C	McDowell Park	17	E-3	Park	**5.3**	T	X					X	5.30	0.02	1.44	0.06	102	1.000	3.069	
C	Meadow Elementary	18	C-2	School	2.2	T	X					X	2.20	0.01	0.60	0.02	42	1.000	3.069	
C	Meadow Park	19	C-2	Park	**2.7**	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
C	Open Space (by new Jr. High)	107	C-1	Open Space	3	T				X		X	3.00	0.01	0.81	0.03	58	1.000	3.069	
C	Santa Rosa J.C. Phase 2	303	C-1	Open Space	**5.4**	T	X					X	5.40	0.03	1.47	0.06	104	1.000	3.069	
C	Santa Rosa Junior College	27	C-2	School	5	T	X					X	5.00	0.02	1.36	0.05	96	1.000	3.069	
C	Sonoma Mountain Elementary Turf	28	D-2	School	**2.7**	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
C	Sonoma Mtn Parkway Streetscapes	82	B,C,D-2	Park	7.5	T	X					X	0.00	0.00	0.00	0.00	0	0.000	0.000	**Not feasible**
C	Sunrise Park	30	C-2	Park	**2.1**	T	X					X	2.10	0.01	0.57	0.02	40	1.000	3.069	
C	Trun Bridge Park	300	B-2	Park	**2.3**	T	X					X	2.30	0.01	0.62	0.02	44	1.000	3.069	
C	Turtle Creek Park	31	D-2	Park	5	T	X					X	5.00	0.02	1.36	0.05	96	1.000	3.069	
C	Urban Separator N	305	C-1	Open Space	**11.9**	T				X		X	11.90	0.06	3.23	0.12	229	1.000	3.069	
C	Urban Separator S	304	C,D-1	Open Space	**11.4**	T				X		X	11.40	0.05	3.10	0.12	220	1.000	3.069	
D	Driving Range	302	A-2,3	Driving Range	**11.8**	T						X	11.80	0.06	3.20	0.12	227	1.000	3.069	
D	Pumpkin Patch (Potential City Owned)	315	A-2	Ag User	19	A	X					X	18.03	0.08	5.16	0.20	366	0.949	2.912	
D	Redwood Business Park	301	A-2	Business Park	**5.9**	T						X	5.90	0.03	1.60	0.06	114	1.000	3.069	

							Current Source of Water (2003)				Potential Source of Water (2007)									
Model Area	Customer	Map #	Map Location	Description	Total Irrigated Acres	User Type	City Water (Potable Offset)	Secondary Effluent	Private Well	Not Irrigated	Secondary Effluent	Tertiary Recycled Water	Total Irrigation Season Use (MG/yr)	Avg. Irrigation Daily Use (mgd)	Max. Monthly Demand (MG/month)	Max. Daily Demand (mgd)	Max. Hour (gpm)	Factor (MG/acre)	Factor (acre-ft /acre)	High Risk Users
E	Anna Meadows Park	112	F-3	Park	0.37	T	X					X	0.37	0.00	0.10	0.00	7	1.000	3.069	
E	Casa Grande Streetscape	307	F-3	Park	**0.5**	T	X					X	0.50	0.00	0.14	0.01	10	1.000	3.069	
E	Crinella Mini Park	109	F-3	Park	0.4	T	X					X	0.40	0.00	0.11	0.00	8	1.000	3.069	
E	Del Oro Park	45	F-3	Park	3.5	T	X					X	3.50	0.02	0.95	0.04	67	1.000	3.069	
E	La Tercera Elementary	53	E-3	School	5	T	X					X	5.00	0.02	1.36	0.05	96	1.000	3.069	
E	La Tercera Park	54	E,F-3	Park	2.8	T	X					X	2.80	0.01	0.76	0.03	54	1.000	3.069	
E	Miwok Valley Elementary and Park	65	F-3,4	School	6.9	T	X					X	6.90	0.03	1.87	0.07	133	1.000	3.069	
E	S. McDowell Streetscape	309	F-3	Park	**0.08**	T	X					X	0.08	0.00	0.02	0.00	2	1.000	3.069	
E	Calvary Cemetary	36A	C-4	Cemetary	5.5	T	X					X	5.50	0.03	1.49	0.06	106	1.000	3.069	
E	Calvary Cemetary (Future)	36B	C-4	Cemetary	12	T				X		X	12.00	0.06	3.26	0.12	231	1.000	3.069	X
E	Cherry Valley Park	38	C-4	Park	0.75	T	X					X	0.75	0.00	0.20	0.01	14	1.000	3.069	
E	City Hall	40	D-5	Park	0.7	T	X					X	0.70	0.00	0.19	0.01	13	1.000	3.069	
E	Collins, Mary Elementary	41	C-4	School	1.4	T	X					X	1.40	0.01	0.38	0.01	27	1.000	3.069	
E	Country Club Open Space	104	E-5	Open Space	**2.4**	T	X					X	2.40	0.01	0.65	0.02	46	1.000	3.069	
E	Cypress Hill Cemetary	44	C-4	Cemetary	30	T	X		X			X	30.00	0.14	8.15	0.31	578	1.000	3.069	
E	Fairgrounds & Library	52	D-3,4	Park	**8.8**	T	X					X	8.80	0.04	2.39	0.09	170	1.000	3.069	
E	Grant Elementary	47	E-5	School	3.4	T	X					X	3.40	0.02	0.92	0.04	66	1.000	3.069	
E	Grant Park	113	E-5	Park	0.98	T	X					X	0.98	0.00	0.27	0.01	19	1.000	3.069	
E	Holmburg Park (Future)	69	D-4	Park	6	T				X		X	6.00	0.03	1.63	0.06	116	1.000	3.069	X
E	Jack Cavanaugh Park	50	D-4	Park	**0.04**	T	X					X	0.04	0.00	0.01	0.00	1	1.000	3.069	
E	Kenilworth Fields	308	E-3	Park	**11.4**	T	X					X	11.40	0.05	3.10	0.12	220	1.000	3.069	
E	Magnolia Park (Future)	67	C-4	Park	4	T				X		X	4.00	0.02	1.09	0.04	77	1.000	3.069	X
E	McKinley Elementary	61	D-3,4	School	2.7	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
E	McNear Elementary	62	E-5	School	1.7	T	X					X	1.70	0.01	0.46	0.02	33	1.000	3.069	
E	McNear Landing	64	E-4	Park	**0.15**	T	X					X	0.15	0.00	0.04	0.00	3	1.000	3.069	
E	McNear Park	63	D-5	Park	**4.8**	T	X		X			X	4.80	0.02	1.30	0.05	93	1.000	3.069	
E	McNear Peninsula Park (Future)	70	E-4	Park	**17.5**	T				X		X	17.50	0.08	4.75	0.18	337	1.000	3.069	X
E	Oak Hill Park	66	C,D-4	Park	**2.7**	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
E	Penry Park	49	D-4	Park	1.8	T	X					X	1.80	0.01	0.49	0.02	35	1.000	3.069	
E	Petaluma High	74	D-5	School	10.6	T	X					X	10.60	0.05	2.88	0.11	204	1.000	3.069	
E	Petaluma Junior High	75	C-5	School	**6.6**	T	X					X	6.60	0.03	1.79	0.07	127	1.000	3.069	
E	Pomeroy Corp	110	E-4	Industrial	N/A	I	X					X	**7.45**	**0.05**	**1.63**	**0.08**	**91**	N/A	N/A	X
E	Saint Vincent's High School	77	C-4	School	2.8	T	X					X	2.80	0.01	0.76	0.03	54	1.000	3.069	
E	Shamrock	138	E-4	Industrial	N/A	S	X					X	**1.02**	**0.01**	**0.21**	**0.01**	**16**	N/A	N/A	X
E	Valley Vista Elementary	84	C,D-5	School	**3.5**	T	X					X	3.50	0.02	0.95	0.04	67	1.000	3.069	
E	Walnut Park	106	D-4,5	Park	1.4	T	X					X	1.40	0.01	0.38	0.01	27	1.000	3.069	
E	Wickersham Park	105	E-4,5	Park	2	T	X					X	2.00	0.01	0.54	0.02	39	1.000	3.069	
F	Oakmead Business Park	21	G-3	Business Park	10	T	X					X	10.00	0.05	2.72	0.10	193	1.000	3.069	
F	South McDowell Blvd Streetscape	83	F-3,4	Park	1.8	T	X					X	0.00	0.00	0.00	0.00	0	0.000	0.000	**Not feasible**
G	Petaluma Golf Course (9 hole)	73	F-5	Golf Course	**43.1**	G	X					X	**33.43**	0.16	**6.00**	0.23	160	**0.776**	**2.380**	
G	Petaluma Golf Course (Future 9 holes)	79	F-5	Golf Course	43.1	G				X		X	33.43	0.16	6.00	0.23	160	0.776	2.380	X
	SUBTOTAL (Tertiary Recycled Water)												1212	6	305	13	N/A	N/A	N/A	N/A

***Bold faced numbers represent measured data**

TABLE III - 2
Potential Secondary Recycled Water System Users

Model Area	Customer	Map #	Map Location	Description	Total Irrigated Acres	User Type	Current Source of Water (2003)				Potential Source of Water (2007)		Total Irrigation Season Use (MG/yr)	Avg. Irrigation Daily Use (mgd)	Max. Monthly Demand (MG/month)	Max. Daily Demand (mgd)	Max. Hour (gpm)	Factor (MG/acre)	Factor (acre-ft /acre)	High Risk Users
							City Water	Secondary Effluent	Private Well	Not Irrigated	Secondary Effluent	Tertiary Recycled Water								
H	(Potential City Owned)	116	C-4	Ag User	55.1	A					X		52.29	0.24	14.90	0.57	397	0.949	2.912	X
H	(Potential City Owned)	117	C-4	Ag User	38.3	A					X		36.35	0.17	10.36	0.40	276	0.949	2.912	X
H	(Potential City Owned)	118	D-4	Ag User	111.9	A					X		106.19	0.50	30.27	1.16	806	0.949	2.912	X
I	A1 (Silacci & Ball)	85	B-4	Ag User	**41**	A		X			X		**38.84**	0.18	**11.16**	0.43	297	**0.947**	**2.907**	
I	A2 (Silacci)	86	B-4	Ag User	**20.5**	A		X			X		**19.43**	0.09	**6.13**	0.23	163	**0.948**	**2.909**	
I	A3 (Silacci)	87	B-3	Ag User	**30**	A		X			X		**28.23**	0.13	**7.26**	0.28	193	**0.941**	**2.888**	
I	A4 (Silacci)**	88	B-3	Ag User	**43**	A		X			X		**40.54**	0.19	**9.79**	0.38	261	**0.943**	**2.893**	
I	A5 (Cardinaux)	89	B-3	Ag User	**21**	A		X			X		**21.97**	0.10	**5.43**	0.21	145	**1.046**	**3.211**	
J	A6 (Tunzi)	90	B-2	Ag User	**11.3**	A		X			X		**5.87**	0.03	**1.59**	0.06	42	**0.519**	**1.594**	
J	A7 (Tunzi)**	91	A-2	Ag User	**0**	A		X			X		0.00	0.00	0.00	0.00	0	**0.519**	**1.593**	X
J	A8 (Bettinelli)	92	B-1	Ag User	**32.3**	A		X			X		**33.06**	0.15	**7.62**	0.29	203	**1.024**	**3.141**	
J	A9 (Bettinelli)	93	B-1	Ag User	**50.7**	A		X			X		**52.14**	0.24	**13.54**	0.52	360	**1.028**	**3.156**	
J	A10 (Tunzi)	94	B-2	Ag User	**127.5**	A		X			X		**66.58**	0.31	**15.56**	0.60	414	**0.522**	**1.603**	
J	A11 (Cardinaux)**	95	B-2	Ag User	**20**	A		X			X		**21.09**	0.10	**5.15**	0.20	137	**1.055**	**3.236**	
J	M12 (Mendoza)	96	B,C-2	Ag User	**30.6**	A		X			X		**28.53**	0.13	**11.80**	0.45	314	**0.932**	**2.861**	
J	T12 (Teixeira/Pinhiero)	97	B-2	Ag User	**67.3**	A		X			X		**54.20**	0.25	**15.44**	0.59	411	**0.805**	**2.472**	
J	A13 (Mendoza)**	98	C-2	Ag User	**37.7**	A		X			X		**35.14**	0.16	**7.81**	0.30	208	**0.932**	**2.860**	
J	A14 (Mendoza)	99	C-2	Ag User	**72.7**	A		X			X		**67.78**	0.32	**15.76**	0.60	420	**0.932**	**2.861**	
J	A17 (Teixeira/Pinhiero)**	102	C-2	Ag User	**68.7**	A		X			X		**55.30**	0.26	**13.61**	0.52	362	**0.805**	**2.470**	
K		119	C,D-4	Ag User	27.3	A					X		25.91	0.12	7.38	0.28	197	0.949	2.912	X
K		120	D-4	Ag User	16.8	A					X		15.94	0.07	4.54	0.17	121	0.949	2.912	X
K		121	D-4	Ag User	75.3	A					X		71.46	0.33	20.37	0.78	542	0.949	2.912	X
K		122	D-3	Ag User	30.9	A					X		29.32	0.14	8.36	0.32	222	0.949	2.912	X
K		123	D-4	Ag User	33.9	A					X		32.17	0.15	9.17	0.35	244	0.949	2.912	X
K		124	D-4	Ag User	21.2	A					X		20.12	0.09	5.73	0.22	153	0.949	2.912	X
K		125	D-4	Ag User	28.2	A					X		26.76	0.13	7.63	0.29	203	0.949	2.912	X
K	Buck	126A	E-4	Ag User	23.7	A					X		22.49	0.11	6.41	0.25	171	0.949	2.912	X
K	Buck	126B	E-4	Vineyard	80.9	V			X		X		8.09	0.07	2.02	0.08	144	0.100	0.307	X
K		127	D,E-4	Ag User	5.8	A					X		5.50	0.03	1.57	0.06	42	0.949	2.912	X
K		128	E-3	Ag User	10	A					X		9.49	0.04	2.70	0.10	72	0.949	2.912	X
K		129	D,E-3	Ag User	10.1	A					X		9.58	0.04	2.73	0.10	73	0.949	2.912	X
K	Brazil	317	B-4	Ag User	74	A					X		70.23	0.33	20.01	0.77	533	0.949	2.912	X
L		130	E-4	Ag User	37.8	A					X		35.87	0.17	10.22	0.39	272	0.949	2.912	X
L		131	E-4	Ag User	12.4	A					X		11.77	0.05	3.35	0.13	89	0.949	2.912	X
L		132	E-4	Ag User	39.6	A					X		37.58	0.18	10.71	0.41	285	0.949	2.912	X
L	Bachman	133A	F-4	Ag User	44.6	A					X		42.33	0.20	12.06	0.46	321	0.949	2.912	X
L	Bachman	133B	F-4	Vineyard	27.7	V			X		X		2.77	0.02	0.69	0.03	49	0.100	0.307	X
L	Bachman	134	F-4	Ag User	139.8	A					X		132.67	0.62	37.81	1.45	1007	0.949	2.912	X
L		135	F-5	Vineyard	37.7	V			X		X		3.77	0.03	0.94	0.04	67	0.100	0.307	X
L		136A	F-4	Ag User	6.3	A					X		5.98	0.03	1.70	0.07	45	0.949	2.912	X
L		136B	F-4	Vineyard	13.1	V			X		X		1.31	0.01	0.33	0.01	23	0.100	0.307	X
	SUBTOTAL (Secondary Effluent)												1383.34	6.52	379.31	14.54	N/A	N/A	N/A	N/A
	SUBTOTAL (Tertiary Recycled Water + Secondary Effluent)												2595.53	12.87	683.89	27.25	N/A	N/A	N/A	N/A

*Bold faced numbers represent measured data

**Irrigated acreage and demands for existing customers #88, #91, #95, #98, and #102 have been reduced within this table from current actual irrigation demands and irrigated acreage due to lack of interest in recycled water in the future or due to difficult and dangerous areas to access by US Filter staff. The total reduction in total irrigation season use due to these changes equates to 72.75 MG/yr [#88 (4 acres), #91 (5.2 acres), #95 (5 acres), #98 (5 acres), and #102 (70 acres)].

disinfected tertiary effluent meeting the requirements of Title 22 for unrestricted use. Turf users will use recycled water for irrigation of turf grass. All potential turf users are included in Table III-1 and Figure III-1.

Total Irrigation Season Use

Turf was estimated to require 1.0 million gallons (MG)/acre or 3.069 acre-ft/acre of water during the irrigation season. This is a typical value for irrigation over an irrigation season. Actual data for many potential recycled water turf users was obtained from potable water meter reading records. This data is included in Appendix G—Potential Recycled Water User Water Usage Data. In many cases, this data supported the estimated value listed above.

Total irrigation season use for all potential turf users was obtained by multiplying the turf factor of 1.0 MG/acre by each user's number of irrigated acres. Total irrigation season use (MG/year) for all potential turf users is provided in Table III-1.

Average Irrigation Daily Use

An irrigation season of April through October, 214 days, was used to determine the average irrigation daily use for turf users. The total irrigation season use (MG/year) was divided by 214 days to obtain the average irrigation daily use in million gallons per day (mgd). The average irrigation daily use for all potential turf users is provided in Table III-1.

Maximum Monthly Demand

A maximum monthly irrigation demand of 10.0 inches per month was used for turf users. This equates to 0.833 acre-ft/acre or 0.27 MG/acre for the maximum month. This maximum month factor of 0.27 MG/acre was multiplied by the number of irrigated acres for each turf user to obtain the demand for the maximum month (MG/month). The maximum monthly demand for all potential turf users is provided in Table III-1.

The irrigation demand for turf grass was used to arrive at the estimate of 10.0 inches per month for the maximum month demand. The irrigation demand formula is based on the evapotranspiration rate, precipitation for the month, root leaching rate factor, crop coefficient, and irrigation efficiency. The California Landscape Contractors Association recommends a root-leaching factor of 1.0. However, to account for potential salt accumulation at the root zone, a root leaching rate factor of 1.1 was used. This yields a more conservative value. The monthly irrigation demand for the month of July in Year 2000 in the City of Petaluma was 6.69 in/month. Since this does not take into consideration the water loss due to other factors, such as wind, runoff, or the soil's inability to efficiently transport water to the roots due to salt accumulation, a maximum monthly demand of 10.0 inches/month was used for all turf users.

Maximum Daily Demand

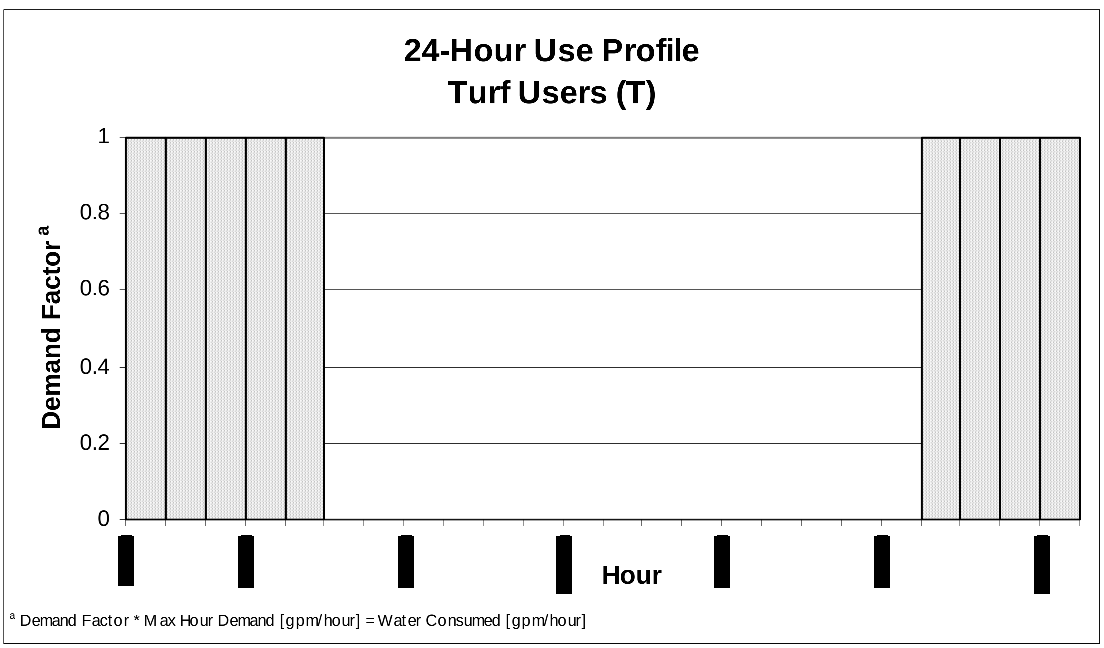
The maximum daily demand for turf users was calculated as a water demand fifteen percent greater than the average daily demand in the maximum month. The maximum monthly demand in MG/month was divided by 30 days to get the average daily demand for the maximum month. Thirty (30) days was used since it would yield a more conservative value than if thirty-one (31) days was used in the calculation. The average daily demand for the maximum month was then multiplied by 1.15 to increase it by 15 percent to yield the maximum daily demand. The maximum daily demand in million gallons/day (mgd) for all potential turf users is provided in Table III-1.

Maximum Hourly Demand

The maximum hourly demand for turf users was developed using the maximum daily demand and the 24-hour use profile for turf users.

A 24-hour use profile was developed based on the operation of a turf irrigation system. Turf users generally irrigated during night hours when people are not using facilities such as parks, schools, cemeteries, and open space. The 24-hour use profile was developed using an irrigation duration of 9 hours from 9 pm to 6 am.

This 24-hour use profile is illustrated below. The maximum hourly demand in gallons/minute (gpm) was calculated by converting the maximum daily demand in mgd to gpm and then distributing the demand into the 9 hours of irrigation. The maximum hourly demand for each potential turf user is provided in Table III-1. The demand for each hour of irrigation can be obtained by multiplying the maximum hourly demand by the associated demand factor in the 24-hour use profile.



Golf Course Users

Users identified as golf course customers include Adobe Creek Golf Course, Rooster Run Golf Course, and the Petaluma Country Club. The northeast half of the Adobe Creek Golf Course is currently served by the existing secondary effluent recycled water system. The southwest half of the Adobe Creek Golf Course is currently irrigated by a private well, since it cannot be served with disinfected secondary effluent due to the proximity of homes aligning the golf course. Rooster Run Golf Course is currently irrigated with potable water, but will be added to the existing secondary effluent recycled water system once the backbone recycled water pipeline, currently under construction, is completed. It is estimated that Rooster Run Golf Course will be irrigated with disinfected secondary effluent by the summer of 2004. The Petaluma Country Club is currently a 9-hole golf course irrigated with potable water. The country club has expressed an interest in both recycled water and expanding the golf course to an 18-hole facility. The additional nine holes have been included as a potential future recycled water user in the master plan. All potential recycled water golf course users would receive tertiary recycled water once the WRF is completed and are included in Table III-1 and Figure III-1. Their use will be limited to the irrigation of turf grass and supply to water elements of the course.

<u>Total Irrigation Season Use</u>

Total irrigation season use for Adobe Creek Golf Course (NE) was obtained from the secondary effluent recycled water system water meter readings from 2001 and 2002. These records are included in Appendix E—Existing Secondary Water User/Facility Information. The total water use data obtained for Adobe Creek (NE) was used to estimate total water use for the associated acreage at Adobe Creek (SW).

Total irrigation season use for Rooster Run Golf Course and the existing nine holes of the Petaluma Country Club were obtained from potable water meter readings from 2001 and 2002. This data is included in Appendix G—Potential Recycled Water User Water Usage Data. The data for the existing nine holes of the Petaluma Country Club was used to estimate the acreage and demand for the proposed future nine holes.

Actual irrigated acreage for all the golf courses was provided by the City and is included in Appendix F—Potential Recycled Water User Irrigated Acreage. Total irrigation season use (MG/y) for all golf courses is included in Table III-1.

<u>Average Irrigation Daily Use</u>

An irrigation season of April through October, 214 days, was used to determine the average irrigation daily use for golf course users. The total irrigation season use in MG was divided by 214 days to obtain the average irrigation daily use in mgd. Average irrigation daily use for the potential golf course users is provided in Table III-1.

Maximum Monthly Demand

A maximum monthly irrigation demand for Adobe Creek Golf Course (NE) was obtained from 2001 and 2002 secondary effluent recycled water system water meter readings. This data is included in Appendix E—Existing Secondary Water User/Facility Information. The maximum monthly irrigation demand for Adobe Creek Golf Course (NE) was used to estimate the maximum monthly irrigation demand for Adobe Creek Golf Course (SW).

The maximum monthly irrigation demands for Rooster Run Golf Course and the Petaluma Country Club were obtained from potable water meter reading records from 2001 and 2002. This data is included in Appendix G—Potential Recycled Water User Water Usage Data. The maximum monthly irrigation demand for the future nine holes at the Petaluma Country Club was based on the demand for the existing nine holes. Maximum monthly demand for potential golf course users is provided in Table III-1.

Maximum Daily Demand

The maximum daily demand for golf course users was calculated as a water demand fifteen percent greater than the average daily demand within the maximum month. The maximum monthly demand in MG/month was divided by 30 days to get the average daily demand for the maximum month. Thirty (30) days was used, since it would yield a more conservative value than if thirty-one (31) days was used in the calculation. The average daily demand for the maximum month was then multiplied by 1.15 to increase it by 15 percent to obtain the maximum daily demand. The maximum daily demand in mgd for all potential golf course users is provided in Table III-1.

Maximum Hourly Demand

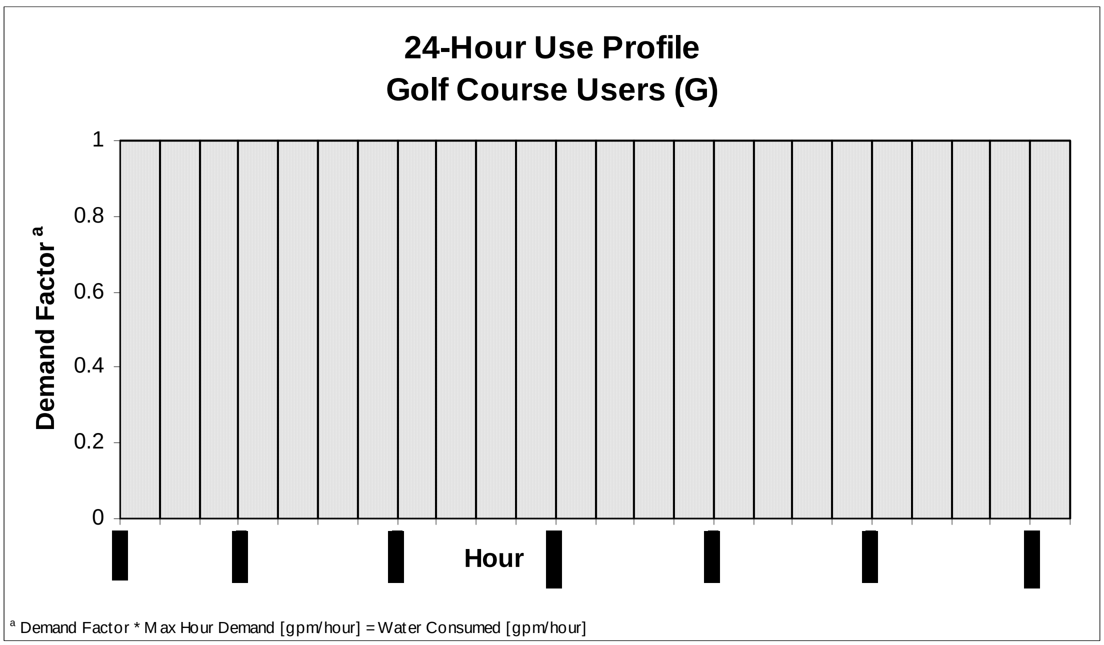
The maximum hourly demand for golf course users was developed assuming that all golf course users will continuously take an even amount of water over a 24-hour period. Although golf courses are irrigated during night hours when they are closed for business, they have the ability to take recycled water continuously into on-site water storage elements integrated as part of the course.

Currently, Rooster Run Golf Course and Adobe Creek Golf Course continuously supply their irrigation lakes with recycled water throughout the day and night. During actual irrigation, they use an on-site pump station to pump water from the lake for their irrigation activities. This irrigation activity will continue when tertiary effluent is supplied.

This continuous demand from golf courses is essential for the proper operation and cost effectiveness of the recycled water system. This constant demand allows the recycled water facilities, including pump station (SW), pipelines, and in-system reservoir (SW) to be sized much smaller than if these large demand customers were to take water over a shorter duration.

The Petaluma Country Club is currently supplied potable water from the City's potable water system and uses the water and system pressure for irrigation. For purposes of this master plan, it was determined that it would not be feasible to supply recycled water in that same manner to the Petaluma Country Club. If recycled water is provided to the Petaluma Country Club, water would be supplied at a constant rate over a 24-hour period and the golf course would have to store the water on-site and re-pump for irrigation. The costs associated with storage and re-pumping would be incurred by the country club.

A 24-hour use profile for golf courses is shown below. The maximum hourly demand in gpm is calculated by converting the maximum daily demand in mgd to gpm. The maximum hourly demand for each potential golf course user can be obtained from Table III-1.



Industrial Users

Although most customers identified include agricultural customers, vineyards, golf courses, and turf customers, two potential industrial customers were identified. These customers included Pomeroy Corporation and Shamrock Materials, Inc. Both companies manufacture concrete construction materials and are located within the city limits on Hopper Street west of highway 101. Their location can be seen on Figure III-1. They both currently use potable water in their manufacturing process. Prior to providing these customers with tertiary water, an analysis of the tertiary water would be required to verify that the water would not degrade the quality of their product.

Unlike other users identified, the water usage by these industries is not based on irrigation use and is required year round. The reliability of the water supply is also more critical since interruptions in water supply would result in production issues. Due to these differences between the industrial users and other users identified, a survey was conducted with both users to better understand their water use schedule, demands, and specific requirements. Upon review of the information gathered, it was determined that it would be feasible to serve these two customers and thus, they were included in the master planning study as potential customers. Completed potential industrial customer forms for Pomeroy Corporation and Shamrock Materials, Inc. are included in Appendix I—Potential Industrial Customer Survey. The information gathered from these potential customers was used to determine total irrigation season use, average irrigation daily use, maximum monthly demand, maximum daily demand, and specific 24-hour use profiles. Demand information is included in Table III-1.

Total Irrigation Season Use

Since Pomeroy Corporation and Shamrock Materials, Inc. use water year round, their water demands must be based on the same time frame as analyzed for other customers. The total irrigation season use is based on the total water used during the seven month irrigation period from April through October. Therefore, the total irrigation season use for these customers only includes their water use during these seven (7) months. It should be noted that recycled water will be required and supplied during the other months to these customers. Total irrigation season use for potential industrial users is included in Table III-1.

Average Daily Use

The average daily use for these customers is obtained by dividing their total irrigation season use by 146 days, rather than 214 days, since they are closed for business on weekends and holidays and do not use water on those days, unlike an irrigation customer. Average daily use for potential industrial users is included in Table III-1.

Maximum Monthly Demand

The maximum monthly demand for industrial customers is based on information obtained on the potential industrial customer survey forms. Maximum monthly demand for potential industrial users is included in Table III-1.

Maximum Daily Demand

The maximum daily demand for potential industrial customers was not available from the industrial customers and was calculated as a water demand fifteen percent greater than the average daily demand within the maximum month. The maximum monthly demand in MG/month was divided by 23 days to get the average daily demand for the maximum month. Twenty-three (23) days was used, since that was the estimated days that the facility would be open and use water during the maximum irrigation month of July. The average daily demand for the maximum month was then multiplied by 1.15 to increase it by 15 percent to obtain the maximum daily demand. The maximum daily demand in mgd for potential industrial users is provided in Table III-1.

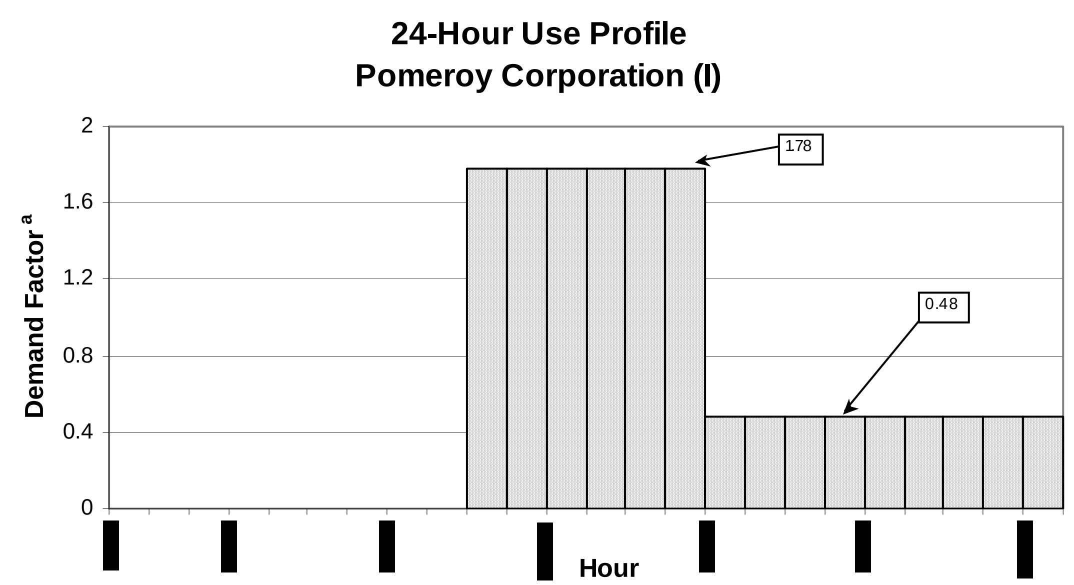
Maximum Hourly Demand

A specific 24-hour use profile was developed for each industrial user and is provided below.

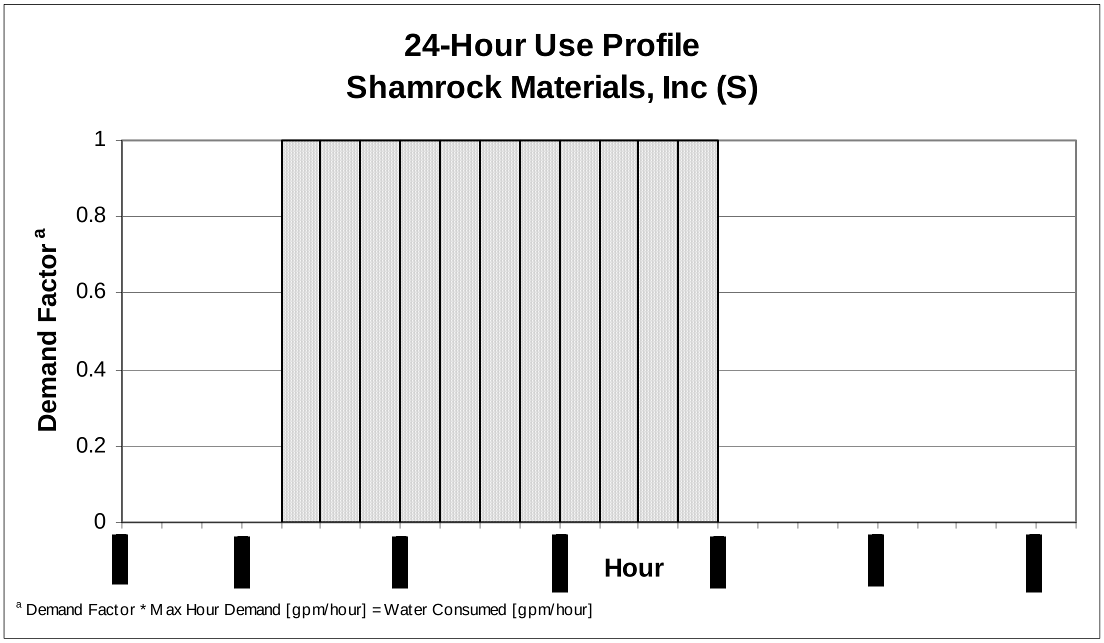
Pomeroy Corporation uses water in varying amounts for six hours between 10 am and 4 pm and for nine hours between 4 pm and 1 am. The 24-hour use profile provides demand factors of 1.78 and 0.48, respectively. The maximum hourly demand in gpm is calculated by converting the maximum daily demand in mgd to gpm and then distributing the demand into the fifteen (15) hours of demand. The maximum daily demand is the average hourly demand over the hours that demand occurs. In order to obtain the hourly demand for a specific hour, the maximum hourly demand must be multiplied by the demand factor from the 24-hour use profile for the hour in question.

Shamrock Materials, Inc. uses a constant supply of water over an 11-hour period from 5 am to 4 pm. The maximum hourly demand in gpm is calculated by converting the maximum daily demand in mgd to gpm and then distributing the demand into eleven (11) hours.

The average maximum hourly demand for these potential customers is provided in Table III-1.



[a] Demand Factor * Max Hour Demand [gpm/hour] = Water Consumed [gpm/hour]



Vineyard Users

Users identified as vineyard users are included in both the tertiary system and the secondary effluent system. The quality of water that is provided is dependent upon their physical location. Since vineyards root irrigate through drip irrigation, either secondary or tertiary recycled water can be used. Vineyard users can be found in both Figures III-1 and III-2 and corresponding Tables III-1 and III-2. It should be noted that vineyards use much less water per acre than the other irrigation customers identified in this master plan.

<u>Total Irrigation Season Use</u>

The existing secondary effluent recycled water system currently serves one vineyard. Although historical records are available for the water use of the existing recycled water customers in Appendix E—Existing Secondary Water User/Facility Information, insufficient data was available for Karren Vineyards, since they are a relatively new customer. An independent survey was conducted with Karren Vineyards during the initial recycled water study in 2001. Based on the data gathered at that time, the total irrigation season use was developed. For all other potential vineyard customers identified, the total irrigation season use was estimated at 0.10 MG/acre or 0.307 acre-ft/acre. This is a typical value for irrigation use by a vineyard over an irrigation season. The Sonoma County Grape Growers Association was contacted to verify data about vineyard water use within the Petaluma area. Total irrigation season use for potential vineyard customers was obtained by multiplying the factor of 0.10 MG/acre by the number of irrigated acres for each user. Information for total irrigation season use for all potential vineyard customers is included in Tables III-1 and III-2.

Average Irrigation Daily Use

An irrigation season of 120 days was used to determine average irrigation daily use for potential vineyards. This data was obtained from the Sonoma County Grape Growers Association. Average irrigation daily use (mgd) was determined by dividing the total irrigation season use (MG) by 120 days. Average irrigation daily use for each potential user is included in Tables III-1 and III-2.

Maximum Monthly Demand

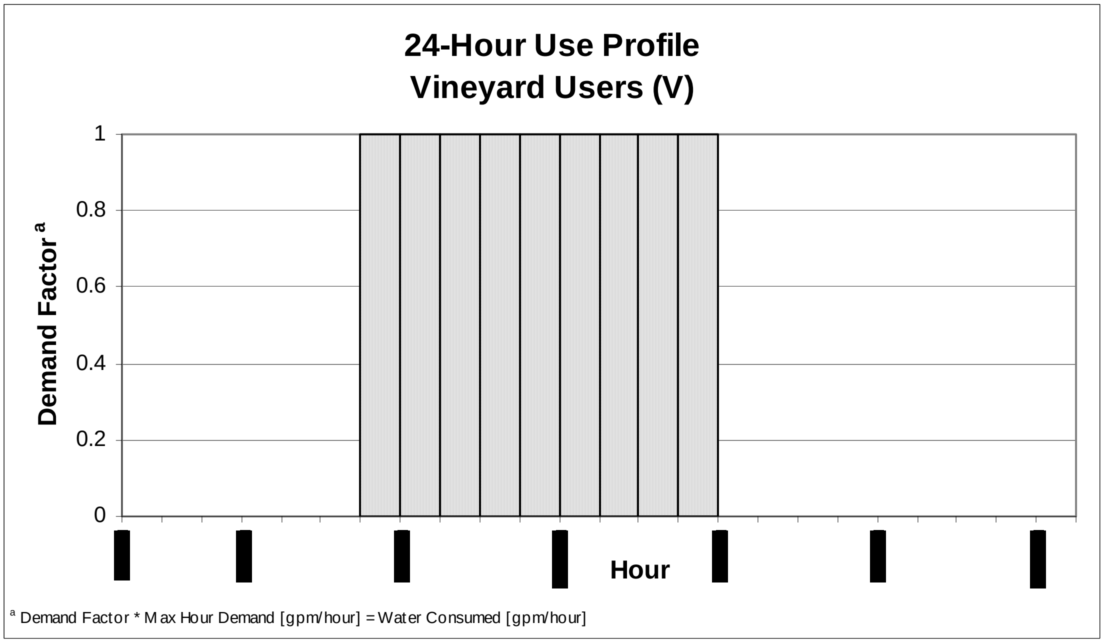
According to the Sonoma County Grape Growers Association, the monthly demand for vineyard users is approximately equal for each month throughout their four-month irrigation season. Maximum month demand was then determined by dividing the total irrigation season use by four. The maximum monthly demand for all potential vineyard customers is included in Tables III-1 and III-2.

Maximum Daily Demand

Maximum daily demand for potential vineyard users was calculated as a water demand fifteen percent greater than the average daily demand in the maximum month. The maximum monthly demand in MG/month was divided by 30 days to obtain the average daily demand for the maximum month. Thirty (30) days was used, since it would yield a more conservative value than if thirty-one (31) days was used in the calculation. The average daily demand for the maximum month was then multiplied by 1.15 to increase the value by 15 percent to yield the maximum daily demand. The maximum daily demand in mgd for potential vineyard users is provided in Tables III-1 and III-2.

Maximum Hourly Demand

The maximum hourly demand for vineyard users was developed using the maximum daily demand and a 24-hour use profile for vineyard users. A 24-hour use profile was developed based on how vineyard users irrigate throughout the day. Vineyards are irrigated during the daytime. The 24-hour profile for vineyard users was developed based on a 9-hour irrigation duration from 7 am to 4 pm. This 24-hour use profile is shown below. The maximum hourly demand in gpm is calculated by converting the maximum daily demand in mgd to gpm and then distributing the demand into the 9-hour irrigation period. The maximum hourly demand for each potential vineyard user is provided in Tables III-1 and III-2.



Agricultural Users

Users identified as agricultural users include current secondary effluent system customers, as well as potential customers identified along Lakeville Highway, Ely Road, Frates Road, and a parcel of land owned by the City of Petaluma along Casa Grande Road. These customers are shown in Figures III-1 and III-2. Agricultural customers will either receive tertiary recycled water or secondary effluent recycled water based upon their physical location. Demands for each potential agricultural user is provided in Tables III-1 and III-2.

<u>Total Irrigation Season Use</u>

Total irrigation season use and number of irrigated acres for all current secondary effluent system recycled water customers was obtained from 2001 and 2002 historical meter reading records. This data is summarized and included in Appendix E—Existing Secondary Water User/Facility Information. All factors for MG/acre and acre-ft/acre were created using these records. The factors obtained seemed reasonable for irrigation of agricultural land. The factors obtained for current customers were then averaged to obtain an average factor, which could be applied to potential agricultural lands identified that are currently irrigated with recycled water. An average factor of 0.949 MG/acre or 2.912 acre-ft/acre was applied to estimated irrigated acreage for potential agricultural customers to obtain their total irrigation season use. Total irrigation season use is provided in Tables III-1 and III-2 for all agricultural users.

<u>Average Irrigation Daily Use</u>

An irrigation season of April through October, 214 days, was used to determine the average irrigation daily use for agricultural users. The total irrigation season use in million gallons was divided by 214 days to obtain the average irrigation daily use in mgd. Average irrigation daily use for all potential agricultural users is provided in Tables III-1 and III-2.

Maximum Monthly Demand

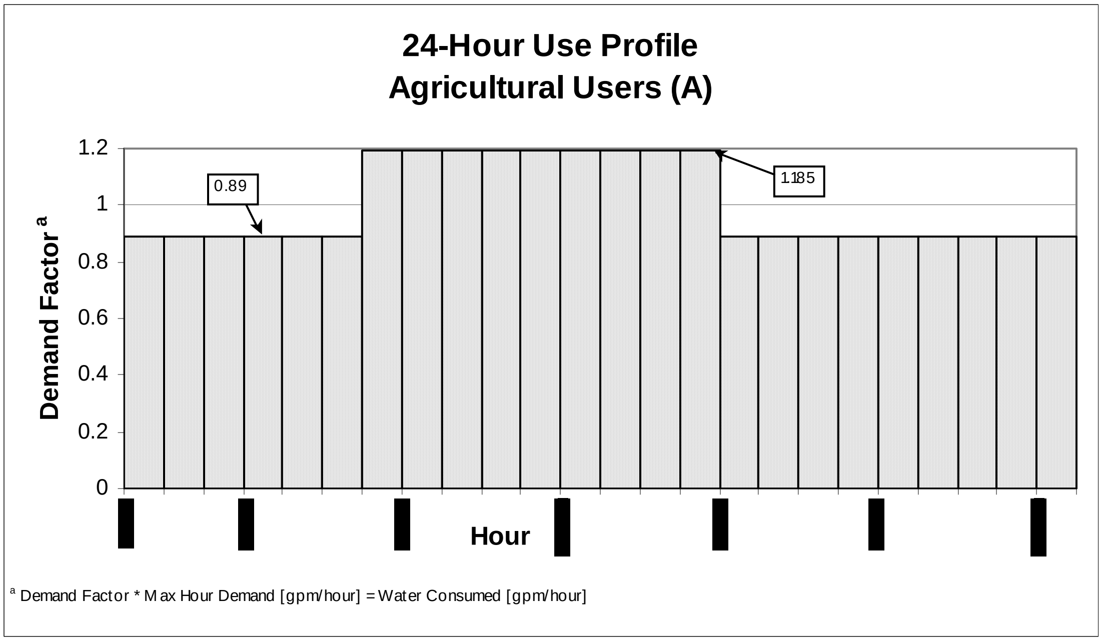
The maximum monthly demand for all current secondary effluent system agricultural customers was obtained from historical 2001 and 2002 meter reading records. This data is provided in Appendix E—Existing Secondary Water User/Facility Information. The percentage of recycled water used by the current agricultural customers in the maximum month was averaged to obtain a value of 28.5 percent. This percentage was applied to the total irrigation season use for all other agricultural users identified to obtain their maximum monthly demand. The maximum monthly demand for all potential agricultural users is included in Tables III-1 and III-2.

Maximum Daily Demand

The maximum daily demand for all potential agricultural customer is included in Tables III-1 and III-2. It was calculated as a demand fifteen percent greater than the average daily demand in the maximum month. The maximum month demand in MG/month was divided by 30 days to get the average daily demand for the maximum month. Thirty (30) days was used, since it would yield a more conservative value than if thirty-one (31) days was used in the calculation. The average daily demand in the maximum month was then multiplied by 1.15 to increase it by 15 percent to yield the maximum daily demand.

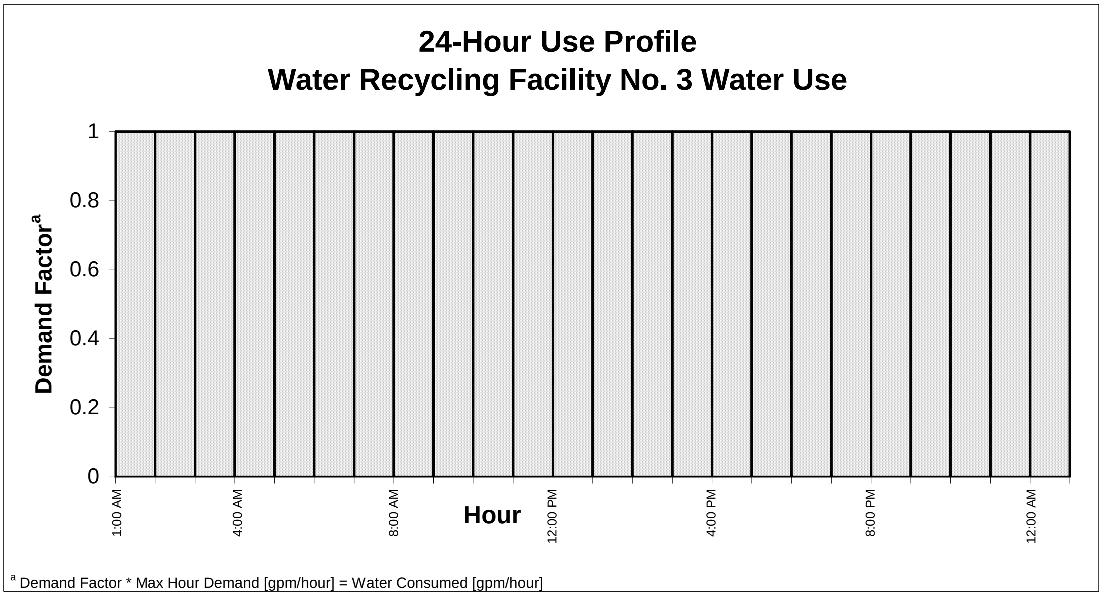
Maximum Hourly Demand

A specific 24-hour use profile was developed for agricultural users and is provided below. This use profile is based on the irrigation pattern of current agricultural customers in the secondary effluent recycled water system. Appendix E—Existing Secondary Water User/Facility Information includes 24-hour flow charts, dated 4/23/2002, 8/03/2002, and 9/08/2002, for all three pumping stations in the secondary effluent system. Since no storage is provided in the current secondary effluent distribution system, these charts show real time use by the customers. These flow charts were used to establish a 24-hour use profile. Although agricultural customers irrigate 24 hours/day, they irrigate at a higher rate during the 9-hour period between 7 am and 4 pm than the 13-hour period between 4 pm and 7 am. The 24-hour use profile provides demand factors of 1.185 and 0.89, respectively, for these two periods of varying use. The maximum hourly demand in gpm is calculated by converting the maximum daily demand in mgd to gpm and then distributing it among the 24 hours of irrigation. The maximum hourly demand is the average hourly demand over the hours that maximum daily demand occurs. In order to obtain the hourly demand for a specific hour, the maximum hourly demand should be multiplied by the demand factor from the 24-hour use profile for the hour in question. The 24-hour use profile was used in the modeling analysis of scenarios in Section VI—Evaluation of Scenarios. The average maximum hourly demand for each agricultural customer is provided in Tables III-1 and III-2.



Water Recycling Facility No. 3 Water Use

The tertiary recycled water distribution system will supply the Water Recycling Facility (WRF) with No. 3 water for in-plant use. This use is important for sizing the tertiary facilities in the plant, the tertiary recycled water pump station, and the tertiary in-system reservoir. However, this use will not expel water from the system. All No. 3 water will simply re-enter the WRF for recirculation. An average irrigation daily use of 0.60 mgd and a maximum daily demand of 1.01 mgd was provided by the WRF design consultant for use in the analysis. The 24-hour use at the WRF for No. 3 water was assumed to be constant. The 24-hour use profile for No. 3 water use at the WRF is provided below. The maximum hourly demand in gpm was calculated by converting the maximum daily demand in mgd to gpm and then distributing over a 24-hour period. The location of the WRF is shown in Figure III-1 and demand data for No. 3 water use at the WRF is shown in Table III-1.


24-Hour Use Profile
Water Recycling Facility No. 3 Water Use
Demand Factor[a]
1
0.8
0.6
0.4
0.2
0
1:00 AM
4:00 AM
8:00 AM
12:00 PM
4:00 PM
8:00 PM
12:00 AM
Hour
[a] Demand Factor * Max Hour Demand [gpm/hour] = Water Consumed [gpm/hour]

IV

SYSTEM REQUIREMENTS AND EVALUATION CRITERIA

SECTION IV
SYSTEM REQUIREMENTS AND EVALUATION CRITERIA

System requirements and evaluation criteria were created to ensure that recycled water scenarios are developed and evaluated in accordance with the City's requirements for recycled water systems. General requirements create the framework for overall goals and objectives for the system. Design requirements will allow various scenarios to be developed and modeled to meet the specific requirements of the City and cost evaluation criteria will allow the development of an 80 year present worth cost for each scenario for cost comparison purposes. These system requirements and evaluation criteria are outlined below.

GENERAL REQUIREMENTS

General Requirements for the City of Petaluma's recycled water program were identified and include the following items.

Potable Water Offset

A potable water offset requirement of 600 acre-ft or 196 million gallons by recycled water was identified for this master plan. The Sonoma County Water Agency's (SCWA) Draft Water Conservation Program, prepared in 1998, identified 600 AF/year as a target for potable offset by recycled water for the City of Petaluma. When the City of Petaluma's Year 2000 Urban Water Management Plan was prepared, it included this value as potable water supply to be provided through potable offset by recycled water. The City of Petaluma's City Council adopted this plan in early 2001. The recycled water program to be implemented shall, at a minimum, offset 600 acre-ft or 196 MG of potable water. The offset of potable water to the Rooster Run Golf Course, estimated to occur in the summer of 2004, will contribute 422 acre-ft or 138 million gallons to this requirement. All potable offset following the WRF coming online in Year 2007 will be accomplished by the tertiary system. No potable offset can be established by secondary effluent based on the potential customers identified in Figure III-2. All potential tertiary recycled water customers identified who currently use potable water and would contribute to additional potable offset are identified in Table III-2. The recycled water program shall provide flexibility to add additional potable water customers to the recycled system if additional potable offset beyond 600 AF/year is required at a later date.

Ability to Manage Recycled Water Between May 1st and October 20th.

The City of Petaluma must not discharge to the Petaluma River between May 1st and October 20th of each year, as imposed by the San Francisco Bay Area Regional Water Quality Control Board. Therefore, water within the storage system at the WRF must be balanced to ensure no discharge to the Petaluma River between this period and delivery of sufficient water to recycled water customers. The balance is a function of incoming wastewater flows to the WRF, recycled water demands, and storage within the WRF. A water balance was performed for use in this master plan.

The water balance information is included in Appendix D. The total recommended amount of recycled water for distribution during the irrigation season was estimated to be 790 million gallons at startup of the WRF in Year 2007 and approximately 1,000 million gallons at buildout. This includes all recycled water, namely, tertiary and secondary effluent.

The average dry weather flow (ADWF) entering the WRF at startup is estimated to be 5.2 mgd. Buildout is estimated to occur in Year 2025 with an ADWF of 6.7 mgd. It is anticipated that ADWF and the recommended amount of total recycled water available each irrigation season will increase linearly from Year 2007 through buildout. Distribution of recycled water greater than or less than the recommended amount increases the risk of discharge into the Petaluma River during the none discharge periods in May and October, namely the transition period between irrigation and non-irrigation seasons. The risk of not having sufficient recycled water available to meet the recycled water customers' demands also increases if distribution of recycled water is greater than or less than the recommended amount.

Operational Flexibility

Operational flexibility within the recycled water system is desired to ensure that effluent is not discharged into the Petaluma River during restricted months and sufficient water is available to meet customer demands.

In addition to fluctuations in incoming ADWF and the number of recycled water customers, other factors, such as weather, impact customer water use. Since almost all customers identified are irrigation customers, the air temperature and precipitation amounts prior to and during the irrigation season will impact the amount of recycled water used.

During the master planning process, the City of Petaluma and *Dodson Engineers* visited several agencies that provide recycled water. Recycled water provider surveys were conducted and supplemental data was collected for each of the agencies. This information is included in Appendix H—Recycled Water Provider Survey. During this survey process, it was found that operational flexibility in a recycled water system is essential and that other agencies obtain this flexibility through irrigation of agency owned lands.

Based on our discussions with these other agencies, it is recommended to obtain this flexibility by using 20 percent of all recycled water on city-owned agricultural land. Irrigation of city-owned agricultural land will allow the City to provide less or more irrigation than optimal to better balance the water supply with the demands on the recycled water system. It is recommended that city-owned agricultural land be agricultural land and irrigated with secondary effluent. This would provide the City with the most flexible system at the least cost. Since the City does not own sufficient land at this time for such use, it is unclear which parcels of land will be acquired for use as city-owned agricultural land. This master plan identified 205 acres that could be used for such purposes in the secondary effluent system. 205 acres of agricultural land equates to 195 million gallons of irrigation season use and equals approximately 20 percent of all estimated recycled water use at buildout. In addition, 30 acres of agricultural land in the tertiary system was identified for use as city-owned agricultural land. This land is currently owned by the City of Petaluma.

It is recommended that city-owned agricultural land be owned by the City, as well as the irrigation system installed on the land. The City of Petaluma may elect to enter into a long term (40 year minimum) lease to obtain this land rather than purchase the land. It is also recommended that the land be rented for agricultural purposes and that the City operate the irrigation system and maintain the ability to over or under irrigate to balance recycled water supply with storage.

This irrigation flexibility must be maintained through rental contracts written with language that allows the City to control the irrigation operation. Sample contracts from other agencies are included in Appendix H - Recycled Water Provider Survey. Prior to purchasing any land or entering into a long-term lease agreement and installing an irrigation system, the City shall evaluate the land to ensure that the soil is suitable for irrigation.

Ability to Phase Program to Adjust to Increasing Recycled Water Production Between Year 2007 and Buildout.

As total recycled water for irrigation season use increases from 790 million gallons in Year 2007 to 1,000 million gallons at buildout, customers must be added to the recycled water system to balance recycled water supply with system demand.

Impacts of Zero Discharge

This master planning document does not include a requirement for the recommended recycling program to meet a zero discharge requirement; namely, a requirement to recycle all effluent and eliminate any discharge to the Petaluma River regardless of the time of year. The City of Petaluma is not prohibited by the San Francisco Bay Area Regional Water Quality Control Board from discharging disinfected secondary effluent to the Petaluma River between October 20th and May 1st. The City meets all requirements of its NPDES permit.

Since all but two potential recycled water customers identified within the master plan are irrigation customers, all effluent, which is currently discharged to the river, would have to be stored until the irrigation season, under a zero discharge requirement. This quantity of water equates to approximately 63 percent of the City's total effluent or approximately 1,700 MG at buildout. A restriction to meet zero discharge would result in the need for a recycling program that could distribute approximately 2,135 MG/year in 2007 and 2,700 MG/year at buildout. If recycling of this magnitude was implemented, additional customers would be required beyond all those identified in Section III- Potential Recycled Water Users and Demands. A zero discharge program would require extensive facilities at the new WRF to store the estimated 1,700 MG of effluent until the irrigation season. Additional tertiary treatment facilities would also be required at the new WRF based on the amount of recycled water that would be required to meet tertiary standards.

In addition, the recycled water system would require additional pumping facilities, in-system storage, and distribution pipelines. If zero discharge were imposed, it is estimated that the recommended least cost recycled water program would increase by 6 to 7 times in capital cost and by 2 to 3 times in annual operating and maintenance cost.

Since a major focus of this master plan was to determine the least cost project for the City of Petaluma, alternatives to distribute recycled water beyond the city limits and southern Sonoma County were not considered.

DESIGN REQUIREMENTS

Basic design requirements for the tertiary and secondary effluent recycled water systems have been developed. *Dodson Engineers* has worked closely with the City of Petaluma's staff to establish criteria that will meet the operational requirements of the City and provide facilities with low operational and maintenance costs. All recycled water scenarios identified in Section V—Scenario Development and Methodology will be modeled to ensure that design requirements identified will be met.

Design requirements for the recycled water systems include requirements for delivery pressure, storage tanks/reservoirs, pumping stations, and pipelines and valves.

Delivery Pressure

A minimum delivery pressure at each customer's delivery point has been established. The minimum delivery pressure to any tertiary recycled water system customer will be 50 psi. This will allow adequate pressure for the operation of irrigation systems and meet the industrial customers' needs. Current secondary effluent system customers who will be converted to the tertiary system will have a minimum pressure requirement of 60 psi, as established below for the secondary effluent system.

The minimum delivery pressure established for secondary effluent system customers is 60 psi. This requirement is based on the minimum requested pressure from current secondary effluent customers. The higher pressure is requested, since large areas are served by a single hydrant. A maximum pressure at customer water meters or hydrants has not been established. If delivery pressures exceed customers maximum desired pressure, then pressure reducing valves (PRV) must be provided at customer water meters and hydrants. All current agricultural customers have PRVs at their hydrants.

Storage Tanks/Reservoirs

In-system storage reservoir(s) are required for both the tertiary and secondary effluent recycled water system. Reservoir(s) will allow the pump station(s) to be sized for maximum daily demands rather than maximum hourly demands and still allow the system to meet maximum hourly demands without complex controls at the pumping station(s).

Tertiary System

In-system above ground welded steel storage tanks shall be provided in the tertiary system. The tank(s) shall be sized for distribution storage only. During maximum day demands, with all duty pumps at the associated pump station operating, the tank shall not end at a lower level than at the start of the maximum day. No emergency storage will be provided in the distribution system, since it has been determined that recycled water is not essential. Tertiary water will be used for fire protection at the new WRF. A one MG storage reservoir will be located at the WRF for fire water storage.

Secondary Effluent System

The current secondary effluent recycled water system does not have in-system storage. These stations are difficult to operate and maintain due to the small number of customers in the system, variable speed driven pumps, and their complex controls. It is recommended that these stations be provided with in-system storage to eliminate the variable speed drives and complex controls and lower pump station operations and maintenance costs. Storage will be accomplished through the use of open reservoir(s). The reservoir(s) will be sized for distribution storage only. During maximum day demands, the reservoir shall not end at a lower level than at the beginning of the day. No emergency storage will be provided.

Pumping Stations

Tertiary System

Pumping stations in the tertiary system, including the main pump station at the WRF, shall be sized for 100 percent of the maximum day demand. Maximum hourly demand fluctuations will be handled by in-system storage. All pump stations will be provided with a standby pumping unit. Emergency power will not be provided for pumping stations except that the main tertiary pump station at the WRF will be provided with standby power as part of the WRF's standby power system. This pump station is essential to the WRF, since it will supply water to the No. 3 Water System and will serve to pump fire flows for fire protection at the WRF.

Secondary Effluent System

The existing pumping stations that serve the current secondary effluent system will be used to serve the future secondary effluent system, except the pumps will operate as constant speed and in-system storage will be provided. This will allow for less complex controls at the pump stations and lower operations and maintenance costs. If maximum day demands exceed the station's duty pump capacity, then additional pumps will be added at the existing stations. If required, additional pump station(s) will also be added to the system. Appendix E—Existing Secondary Water User/Facility Information includes pump curves for the three existing secondary effluent pump stations, namely, the main pump station, booster pump station No. 1, and booster pump station No. 2. Data for these existing pump stations is provided in Table IV-1.

Each secondary effluent pump station will be provided with a standby pumping unit. No standby power is currently provided, nor will be provided in the future.

Table IV-1
Existing Secondary Effluent System Pump Stations

Pump Station Name	# Duty Pumps	# Standby Pumps	Design Point	Standby Power
Main Pump Station	4	1	1,500 gpm @ 150 feet TDH	No
Booster Pump Station No. 1	4	1	1,250 gpm @ 365 feet TDH	No
Booster Pump Station No. 2	2	1	1,350 gpm @ 170 feet TDH	No

Pipelines and Valves

Design criteria for pipelines and valves have been established. This criteria sets requirements for maximum pipeline velocities, maximum pipeline pressures, minimum pipeline diameters, minimum pipeline cover, pipeline materials, valve type, Hazen-Williams "C" values, and minor loss coefficients "K" for modeling of scenarios in Section VI—Evaluation of Scenarios. The design criteria established are outlined in Table IV-2 for the tertiary and secondary effluent recycled water systems.

Table IV-2
Pipeline and Valve Design Criteria

Description	Tertiary System	Secondary Effluent System
Velocity (max)	10 ft/sec	10 ft/sec
Pressure (max)	150 psi	250 psi[A]
Diameter (min)	6 inches	6 inches
Depth of Cover (min)	4 feet	4 feet
Hazen-Williams "C" Value	125	125
Minor Loss Coefficient "K"	K=1 per 1,000 ft of pipe	K=1 per 1,000 ft of pipe
Pipe Material >12 inches diameter ≤ 12 inches diameter	 DIP PVC C900	 DIP DIP
Valve Type > 12 inch diameter	 Butterfly Valve	 Butterfly Valve

≤ 12 inches diameter	Gate Valve	Gate Valve

[A] Existing agricultural system exceeds 200 psi.

COST EVALUATION CRITERIA

Scenarios developed in Section V—Scenario Development and Methodology will be evaluated in Section VI—Evaluation of Scenarios based on general requirements and design requirements established herein and an 80 year present worth life cycle cost in 2007 dollars. Cost evaluation criteria are developed in this section and include both capital and operation and maintenance (O&M) costs. Table IV-3 outlines all costs used and indicates to which system(s) the costs are to be applied.

Capital Costs

Capital costs include initial capital costs and cost of upgrades in a later year. These costs are converted to present worth over an 80 year life. Capital costs include the cost for tertiary facilities, pump stations, reservoirs, pipelines, valves, hydrants, irrigation systems, and land.

<u>Tertiary Facilities</u>

Capital costs for tertiary facilities include costs for treatment facilities and the main tertiary pump station located at the new WRF. Capital costs include initial capital cost in Year 2007 and the additional cost required in 40 years (Year 2047) to upgrade the facilities. The initial cost for tertiary facilities, currently under design to produce the first 4 mgd of tertiary recycled water, have not been included in this analysis, since these costs have already been allocated. Initial capital costs for tertiary facilities to produce tertiary recycled water in excess of 4 mgd have been included. Costs for additional capacity in excess of 4 mgd shall be added to the tertiary facilities for each additional 0.8 mgd tertiary module required.

Capital costs for upgrade of all tertiary facilities, which will occur in 40 years (Year 2047), including upgrades to the initial tertiary facilities for production of the first 4 mgd of tertiary water, have been included. Cost data for tertiary facilities at the WRF is included in Appendix D. All capital costs for tertiary facilities are included in Table IV-3.

<u>Pump Stations</u>

As discussed previously, the current secondary effluent recycled water system has three existing pump stations. Since these pump stations are old and in need of upgrade work, the cost evaluation criteria includes capital cost to upgrade these facilities in Year 2007 and again 40 years later in Year 2047. Upgrade costs for pump stations are obtained by using 50 percent of the value obtained from the pump station capital cost graph in Figure IV-1.

If additional pumping capacity is required, the cost for additional pumps at these existing pump stations must also be added. Additional pumping capacity shall be estimated at 50 percent of the value obtained from the pump station capital cost graph in Figure IV-1.

Capital cost for the main tertiary pump station, located at the WRF, is included under capital cost for tertiary facilities. If additional secondary effluent or tertiary pump stations are required, other than those outlined above, or a pump station that would exclusively serve the Petaluma Country Club, the cost for such pump stations should be obtained from Figure IV-1. Upgrade to such pump stations in 40 years (Year 2047) should be estimated as 50 percent of the value obtained from the pump station capital cost graph in Figure IV-1. It is the intention of the City to require the Petaluma Country Club to own and operate any pump station solely used to serve the country club.

Reservoirs

Initial capital costs for reservoirs can be obtained from Figures IV-2 and IV-3. Figure IV-2 provides capital costs for welded steel reservoirs to be used in the tertiary recycled water system and Figure IV-3 provides capital costs for open reservoirs, which will be used for storage in the secondary effluent system. Detention time in the secondary system reservoirs is anticipated to be short and the growth of algae will be minimized.

Pipelines

Capital cost for all new pipelines is included in the cost evaluation criteria. Pipelines installed prior to Year 2007 are not considered new for this evaluation. This includes all current pipelines, the Phase 1 recycled water pipeline currently under construction, and the tertiary recycled water pipeline to be constructed with the WRF. The cost evaluation also does not include any pipeline that will solely serve the Petaluma Country Club. It has been determined that such a pipeline would be constructed, owned, and maintained by the country club. Pipeline capital costs per linear foot for pipelines ranging from 6-inches to 24-inches in diameter have been established and are included in Table IV-3.

Valves

Capital costs for new valves are included in the cost evaluation criteria. Valves installed prior to Year 2007 shall be considered existing for purposes of this evaluation. This includes all valves within the Phase 1 recycled water pipeline, currently under construction, and the valves to be installed in the tertiary recycled water pipeline to be constructed with the WRF. This pipeline will be constructed under the WRF project. Since it has been determined that any pipeline associated with providing water solely to the Petaluma Country Club will not be included in the cost analysis, its associated valves will not be included either. The cost for valves has been included in Table IV-3 and is provided in dollars per 500 feet of pipeline length for pipeline diameters 6-inches through 24-inches. The cost is based on an estimated valve spacing and the cost of the valve and its associated installation.

Hydrants

Hydrants are to be provided for all agricultural and vineyard users. Capital cost for hydrants for all proposed agricultural and vineyard users is included in the cost evaluation in Year 2007. Hydrants consist of exposed piping, isolation valves, water meter, and pressure reducing valve. All hydrant materials for new and existing customers shall be replaced in 40 years (Year 2047). Table IV-3 includes initial and replacement costs for hydrants.

Irrigation System

Capital cost to install an irrigation system on agricultural lands to be owned by the City of Petaluma is included in the cost evaluation. The irrigation system will be owned, operated, and maintained by the City. This will provide the City with the flexibility required for water balance of recycled water supply and demand. The land shall be rented to agricultural customer(s) with agreements allowing flexibility in irrigation rates. Examples of such agreements are provided in Appendix H—Recycled Water Provider Survey for agencies that operate similar systems. The capital cost for the irrigation system was obtained from suppliers of such systems. It is recommended that design of the irrigation system(s) for city-owned agricultural land be performed by an agricultural engineer.

Land

The purchase price of city-owned agricultural land for recycled water flexibility purposes, as well as land required for pump station and reservoir sites, is not included in the costs analysis for comparison of scenarios. No present worth cost has been established for the purchase of land since it is expected that the land will appreciate with time and will have an associated salvage value. In general, the sale of land in a future year should negate its original cost. The City should estimate the cost of land at $20,000 per acre. This includes a land cost of $15,000 per acre in Year 2007 dollars, plus contingency.

Operation and Maintenance Costs

In general, operation and maintenance (O&M) costs associated with the recycled water systems are annual costs. These costs have been converted to a present worth cost over an 80 year life. Operation and maintenance costs are included in the analysis for tertiary facilities, pump stations, reservoirs, pipelines, valves, hydrants, irrigation system, and monitoring program.

Tertiary Facilities

Annual operation and maintenance costs for tertiary facilities at the WRF include the facilities required to treat secondary effluent to tertiary standards and the main pump station for distribution of tertiary recycled water. Costs are included in Table IV-3. The costs do not include power costs for the main tertiary pump station, which are included below under pump station power costs.

Pump Stations

Annual operation and maintenance costs for pump stations have been developed. Pump station power costs are not included in the pump station operation and maintenance costs, but rather below, under pump station power costs. All pump stations should be included, except the main tertiary pump station located at the WRF, which is included under tertiary facilities above, and any pump station used solely for serving the Petaluma Country Club. Such a pump station would be constructed, owned, and operated by the country club. O&M costs for pump stations are included in Table IV-3.

Pump Station Power Costs

Annual power costs for pump stations, other than any pump station used solely to supply recycled water to the Petaluma Country Club, are included under this line item in Table IV-3. Power costs associated with a pump station to serve the Petaluma Country Club exclusively would be paid for by the country club. A cost of 16 cents per kilowatt-hour and average horsepower used at each pump station over the irrigation season was used to determine annual pump station power costs. Average horsepower was determined through hydraulic modeling for each pump station in each scenario evaluated.

Reservoirs

Welded steel reservoirs are provided to meet storage requirements in the tertiary recycled water system. Maintenance activities at welded steel reservoirs include tank re-coating and replacement of miscellaneous items, which are estimated to occur every ten (10) years. The O&M cost for these activities is included in Table IV-3.

Open reservoirs in the secondary effluent system have been provided with an annual operations and maintenance cost. The O&M cost is provided in Table IV-3.

Pipelines

Annual operation and maintenance costs for pipelines include repairs and replacement. Pipelines are categorized as pipelines installed prior to 2003 and those installed in or after 2003. Pipelines installed prior to 2003 are constructed of asbestos-cement transmission pipe, class T-70 (AWWA C402-77), with fiberglass-reinforced plastic couplings with internal rubber gasket joints. These pipelines were installed in 1981, 1989, and 1994 and, in many cases, the internal operating pressure exceeds the pipeline design pressure.

The City has completed emergency repair work on these pipelines and the associated cost data was used to determine their associated annual operation and maintenance costs. Pipelines installed in 2003 and after include all proposed pipelines in the master plan, as well as the Phase 1 recycled water pipeline currently under construction, and the tertiary recycled water pipeline to be installed with the WRF. Pipelines installed during and after 2003 have been, and will be, constructed to the proper pressure class. All pipelines in the tertiary system 12-inches in diameter and less will be PVC and all pipelines 14-inches in diameter and larger will be constructed of ductile iron. All pipelines in the secondary effluent system shall be constructed of ductile iron. An annual operation and maintenance cost per linear foot of pipe has been developed for pipelines installed prior to 2003 and in or after 2003 and is outlined in Table IV-3.

Valves

An operation and maintenance cost for valves in the recycled water system has been developed. The cost corresponds to an annual valve exercise program. An annual cost per linear foot of pipeline has been estimated for use in the cost evaluation and is included in Table IV-3.

Hydrants

An annual operation and maintenance cost for hydrants has been provided in Table VI-3. It includes replacement and maintenance of hydrant items. Hydrants are provided for all agricultural and vineyard users.

Irrigation System

An annual cost per acre of city-owned agricultural land for the operation and maintenance of the irrigation system has been determined. The O&M cost is based on the O&M costs experienced by other agencies, as obtained during Recycled Water Provider surveys. It includes the cost to operate the irrigation system and replace broken items, including sprinkler heads.

Monitoring Program

A monitoring program is required for inspection of land irrigated with recycled water. This cost includes monitoring of agricultural and vineyard land. These lands require more monitoring due to their size and proximity to roads for visual inspection. Monitoring is required to verify the proper use of recycled water and to ensure that runoff does not occur. An annual cost per acre for a monitoring program is included in Table IV-3 and is estimated based on the current secondary effluent recycled water program.

Administration of Program

The cost to administer the entire recycled water program, including both the tertiary and recycled water systems, is estimated at $75,000 per year, which equates to 0.5 full-time employees. A present worth of this cost is not included, since the cost does not vary by scenario or with use of tertiary versus secondary effluent.

Potable Offset Savings

The annual savings to offset potable water with recycled water is not included in present worth analysis for comparison of scenarios. The cost to obtain new potable water, including purchase of water, cost of distribution, and O&M cost to the system, is estimated at $2,155 per acre-ft/year or $6,611 per million gallons/year in 2007 dollars. This estimate was provided by the City and data used to arrive at this value is included in Appendix K—Cost to Obtain Additional Potable Water Supply. When additional potable offset is required, the cost for new potable water supply should be compared to the cost of recycled water to determine if potable offset through additional recycled water is cost effective.

Income

Income from the recycled water program must be considered when determining the total present worth of each scenario. Income is considered to be negative when determining cost.

Reduction in Income From Potable Water

An annual cost associated with reduction of revenue from potable water sales is included in the cost analysis. Since a requirement of 600 acre-ft or 196 million gallons of potable offset through the use of recycled water is required, that amount of potable water will be used by other customers. For potable water offset above 600 acre-ft or 196 million gallons in each scenario, a reduction of income from potable water sales has been included. Additional information is included in Table IV-3.

Income From Recycled Water

Annual income will be generated by the sale of recycled water. The amount of income generated from recycled water sales is based on several parameters, including user classification, recycled water quality to be provided, current customer water rates, and current water source. The current recycled water secondary effluent system pays agricultural customers $210 per acre-ft to use recycled water, which equates to approximately $611 per acre. Present worth for scenarios will be performed based on the proposed payment rate of $200 per acre of irrigated area, which equates to approximately $190 per million gallons. The proposed payment rate was established based on the City of Santa Rosa's payment plan of approximately $100/acre (includes average costs of all cash and non-cash incentives) and the City of Petaluma's current payment plan. Agricultural customers who lease city-owned agricultural land will neither be charged nor pay for recycled water. This is based on current practices at the Novato Sanitary District and the City of Santa Rosa. Both agencies operate lease programs that lease agency owned land under very similar circumstances. Information from the site visits to the Novato Sanitary District and the City of Santa Rosa and is included in Appendix H—Recycled Water Provider Survey. A detailed list of rates used in the cost analysis for various proposed users is provided in Table IV-3.

Income From Rental of City-Owned Agricultural Land

City-owned agricultural land will be rented to agricultural customer(s). The rental revenue per acre has been based on information obtained from the Novato Sanitary District and the City of Santa Rosa. Both agencies rent agency owned land under similar circumstances to that proposed for the City of Petaluma. Information from site visits to Novato Sanitary District and the City of Santa Rosa is included in Appendix H—Recycled Water Provider Survey.

TABLE IV-3
SCENARIO EVALUATION COST CRITERIA TABLE (20)

					Applicable to:				
					Tertiary System			Secondary System	
Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	All	Potable Offset Only	City-Owned Agricultural Land Only	All	City-Owned Agricultural Land Only
CAPITAL COSTS									
TERTIARY FACILITIES (TREATMENT FACILITIES + TERTIARY PUMP STATION)					X				
Initial Facilities (Year 2007)									
$ 0 (for 4 mgd facility)	$0	2007	1	40	X				
* Cost of initial facility not included. Project already a given.									
$1,280,000 for additional 0.8 mgd (from 4 mgd to 4.8 mgd max day demand)	$1,280,000	2007	1	40	X				
* ($6,400,000 for 4 mgd=$1,280,000/0.8 mgd module)									
$1,480,000 for each 0.8 mgd above 4.8 mgd max day demand (see Table below)	TABLE	2007	1	40	X				
Add $1,480,000 if max day demand between 4.8 mgd-5.6 mgd									
Add $2,960,000 if max day demand between 5.6 mgd-6.4 mgd									
Add $4,440,000 if max day demand between 6.4 mgd-7.2 mgd									
Add $5,920,000 if max day demand between 7.2 mgd-8.0 mgd									
Add $7,400,000 if max day demand between 8.0 mgd-8.8 mgd									
* ($1,000,000 additional to treat 4 mgd of pond water. Pond water must be treated when max day demand exceeds ADWF. Therefore, additional $200,000/0.8 mgd module)									
Upgrade Facilities (Year 2047)									
$5,684,000 (for 4 mgd facility)	(3)	2007	40	40	X				
$698,000 for additional 0.8 mgd (from 4 mgd to 4.8 mgd max day demand)	(3)	2007	40	40	X				
* ($3,494,000 for additional 4 mgd=$698,000 per 0.8 mgd module)									
$807,988 for each 0.8 mgd above 4.8 mgd max day demand (see Table below)	(3)	2007	40	40	X				
Add $ 807,988 if max day demand between 4.8 mgd-5.6 mgd									
Add $1,615,976 if max day demand between 5.6 mgd-6.4 mgd									
Add $2,423,964 if max day demand between 6.4 mgd-7.2 mgd									
Add $3,231,952 if max day demand between 7.2 mgd-8.0 mgd									
Add $4,039,940 if max day demand between 8.0 mgd-8.8 mgd									
* ($4,039,938 additional to upgrade to treat 4 mgd of pond water. Pond water must be treated when max day demand exceeds ADWF. Therefore, $807,988 per 0.8 mgd module)									

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System – All	Tertiary System – Potable Offset Only	Tertiary System – City-Owned Agricultural Land Only	Secondary System – All	Secondary System – City-Owned Agricultural Land Only
<u>PUMP STATIONS</u>									
SECONDARY PUMP STATIONS - EXISTING									
Capital cost to add pump(s).	50% (4)	2007	1	40				X	
$ 50% * (4) for Hp of additional pump(s).									
Upgrade Facilities (Year 2007)									
$ (2) (for Main Pump Station)	(2)	2007	1	40				X	
$ (2) (for Booster Pump Station #1)	(2)	2007	1	40				X	
$ (2) (for Booster Pump Station #2)	(2)	2007	1	40				X	
Upgrade Facilities (Year 2047)									
$ (2) (for Main Pump Station)	(3)	2007	40	40				X	
$ (2) (for Booster Pump Station #1)	(3)	2007	40	40				X	
$ (2) (for Booster Pump Station #2)	(3)	2007	40	40				X	
PUMP STATIONS - NEW (NOT INCLUDING TERTIARY PUMP STATION AT WWTP OR PUMP STATION TO PETALUMA COUNTRY CLUB)									
Initial Facilities (Year 2007)									
$ (4)	(4)	2007	1	40	X			X	
Upgrade Facilities (Year 2047)									
$ (2)	(3)	2007	40	40	X			X	
<u>RESERVOIRS</u>									
Initial Facilities (Year 2007)									
$ (5)	(5)	2007	1	80	X			X	

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System – All	Tertiary System – Potable Offset Only	Tertiary System – City-Owned Agricultural Land Only	Secondary System – All	Secondary System – City-Owned Agricultural Land Only
PIPELINES - NEW									
Initial Facilities (Year 2007)									
$ See Table Below (Sum all new pipes in system)	Table	2007	1	80	X			X	

Pipe Ø	Material	Unit Cost / LF
6	PVC C900	$108
8	PVC C900	$125
10	PVC C900	$137
12	PVC C900	$160
14	DIP	$174
16	DIP	$199
18	DIP	$222
20	DIP	$255
24	DIP	$302

* Do not include cost for facilities on Petaluma Country Club.

** Does not include cost of pipes installed prior to 2007.

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Tertiary System – All	Tertiary System – Potable Offset Only	Tertiary System – City-Owned Agricultural Land Only	Secondary System – All	Secondary System – City-Owned Agricultural Land Only
VALVES - NEW									
Initial Facilities (Year 2007)									
$ See Table Below (Sum all new pipes in system)	Table	2007	1	80	X			X	

Valve Ø	Type	Unit Cost / 500 LF of Pipe
6	Gate	$820
8	Gate	$1,175
10	Gate	$1,650
12	Gate	$1,915
14	Butterfly	$2,820
16	Butterfly	$3,625
18	Butterfly	$4,480
20	Butterfly	$5,150
24	Butterfly	$9,490

* Do not include cost for facilities on Petaluma Country Club.

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System: All	Tertiary System: Potable Offset Only	Tertiary System: City-Owned Agricultural Land Only	Secondary System: All	Secondary System: City-Owned Agricultural Land Only
HYDRANTS									
Initial Facilities - New Vineyard and New Agricultural Customers (Year 2007)	Formula	2007	1	40	X (6)			X (new only)	
$ Calculate from formula below									
Upgrade Facilities - All Vineyard and Agricultural Customers (Year 2047)	(3)	2007	40	40	X (6)			X (all)	
$Calculate from formula below									
COST = $9,000 / Hydrant * # hydrants									
IRRIGATION SYSTEM - CITY-OWNED AGRICULTURAL LAND ONLY (YEAR 2007)									
Initial Facilities (Year 2007)									
$ Calculate from formula below	Formula	2007	1	40			X		X
Upgrade Facilities (Year 2047)									
$Calculate from formula below	(3)	2007	40	40			X		X
COST = # Acres of city-owned agricultural land * $2,600 / Acre									
PURCHASE OF LAND - CITY-OWNED AGRICULTURAL LAND AND RESERVOIR AND PUMP STATION LAND (YEAR 2007)	N / A								X (21)
* The cost to purchase land is estimated at $20,000 / acre ($15,000 / Acre + contingency). No Present Worth cost has been assigned to the purchase of land since it is expected to appreciate with time and have a salvage value. In general, the sale of the land in a future Year should negate the original cost. This is true for a present worth analysis.									

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System – All	Applicable to: Tertiary System – Potable Offset Only	Applicable to: Tertiary System – City-Owned Agricultural Land Only	Applicable to: Secondary System – All	Applicable to: Secondary System – City-Owned Agricultural Land Only
OPERATIONS AND MAINTENANCE COSTS (7)									
TERTIARY FACILITIES (TREATMENT FACILITIES + TERTIARY PUMP STATION) (9)									
$272,000 / Year (for 4 mgd facility) (7)	$8,214,608	2007	-	-	X				
Add $73,000/year if max day 4.0 mgd-4.8 mgd => $2,204,656 present worth (7)	TABLE	2007	-	-	X				
Add $78,000/year if max day 4.8 mgd-5.6 mgd => $2,355,660 present worth (7)									
Add $103,000/year if max day 5.6 mgd-8.4 mgd => $3,110,679 present worth (7)									
Add $128,000/year if max day 6.4 mgd-7.2 mgd => $3,865,698 present worth (7)									
Add $162,000/year if max day 7.2 mgd-8.0 mgd => $4,892,524 present worth (7)									
Add $193,000/year if max day 8.0 mgd-8.8 mgd => $5,828,747 present worth (7)									
* Based on $108,000/year additional O&M for 4-8 mgd additional facility, and $108,000/year * 150% additional O&M for 4-8 additional for treating pond water. Use pond water if max day > ADWF.									
PUMP STATIONS - (NOT INCLUDING TERTIARY PUMP STATION OR PETALUMA COUNTRY CLUB PUMP STATION) (9)									
$ / Year = [($36,000 / Year / pump station) * # pump stations] (8)	(7)	2007	-	-	X(8)			X	
PUMP STATIONS POWER COSTS									
* $ / Year = sum for all pump stations [($0.16 / KWH) * (avg Hp used at station) * (0.7457) * (214 days/year) * (24 hours/day)]	(7)	2007	-	-	X			X	
(Do not include power costs for Petaluma Country Club Pump Station)									
RESERVOIRS									
Steel Reservoirs (Tertiary System Reservoirs)									
$ / Every 10 Years = $300,000 * # Reservoirs in system (10) = PW of $762,135 per reservoir (11) [$ in Year 10, 20, 30, 40, 50, 60, and 70 (Year 2017, 2027, 2037, 2047, 2057, 2067, and 2077)] =	formula	2007	10, 20, 30, 40, 50, 60, 70	10	X (10)				
$ = $762,135 * Reservoirs in system									
* includes recoating and replacement of misc items every 10 years.									
Open Reservoirs (Secondary System Reservoirs)									
$ / Year = $5,000 * (# of reservoirs)	(7)	2007	-	-				X (10)	

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System: All	Tertiary System: Potable Offset Only	Tertiary System: City-Owned Agricultural Land Only	Secondary System: All	Secondary System: City-Owned Agricultural Land Only
PIPELINES									
Pipelines installed after 2003.									
$ / Year = $0.85 * LF of pipe in system	(7)	2007	-	-	X			X (12)	
Pipelines installed prior to 2003. (Existing Secondary Effluent System and existing 16" pipe to Petaluma Country Club.)									
$ / Year = $1.70 * LF of pipe in system	(7)	2007	-	-				X (13)	
* Based on current budget of $30,000 / Year maintenance cost									
* Not include pipelines beyond Petaluma Country Club Pump Station.									
VALVES									
$ / Year = $0.10 * LF of Pipe in System	(7)	2007	-	-	X			X	
* Annual exercise program for valves.									
HYDRANTS									
$ / Year = $500 * # hydrants in system	(7)	2007	-	-	X (6)			X	
IRRIGATION SYSTEM (CITY-OWNED AGRICULTURAL LAND ONLY)									
$ / Year = $350 * # acres of irrigated city-owned agricultural land	(7)	2007	-	-			X		X
MONITORING PROGRAM									
$ / Year = $100 * # acres of irrigated Agricultural and Vineyard land, including city-owned agricultural land.	(7)	2007	-	-	X (22)			X (22)	

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System: All	Tertiary System: Potable Offset Only	Tertiary System: City-Owned Agricultural Land Only	Secondary System: All	Secondary System: City-Owned Agricultural Land Only
ADMINISTRATION OF PROGRAM									
* The cost to administer the entire recycled water system is estimated at $75,000 / Year. This cost equates to 0.5 full-time employees. Present Worth for comparing scenarios will not be included since the cost does not vary per system.	N / A				X			X	
POTABLE OFFSET SAVINGS									
Annual savings to offset potable water with recycled water is not included in cost for scenarios. The cost to obtain new potable water is $2,155 / AF = $6,611 / MG (inflated to 2007 $s). This data, provided by the City, shall be used for cost comparison purposes when determining if additional recycled water for potable offset is cost effective. Includes cost to purchase potable water, cost of distribution, and O&M cost to system.									
See Appendix K.	N/A								
INCOME									
<u>REDUCTION IN INCOME FROM POTABLE WATER</u>									
Reduction in income from potable water sales is included for recycled water use offsetting potable water >600 acre-ft/year or 196 MG/year.									
Customers with Standard Rates									
$ / Year = ($3,069 / MG) * # MG of potable offset >196 MG	(7)	2007	-	-		X			
* used $1,000 / Acre-ft (inflated to 2007 $s) = $3,069 / MG									
Customers with Special Rates (N/A since in first 196 MG/year of offset)									
Rooster Run Golf Course									
$ / Year = ($255 / MG) * # MG of potable offset	(7)	2007	-	-		X			
* used $74 / Acre-ft = $227 / MG = $255 / MG inflated to 2007 $s									
<u>INCOME FROM RECYCLED WATER</u>									
Current Potable Customers with Standard Rates (Potable + Future)									
$ / Year = ($2,302 / MG) * # MG of water demand / year	-(7)	2007	-	-		X (14)			
* used 75% of Potable Rate									

Cost Items	Present Worth n=80 (1)	Cost Basis (Year)	Year of Improvement (1-80)	Life (# Years)	Applicable to: Tertiary System: All	Tertiary System: Potable Offset Only	Tertiary System: City-Owned Agricultural Land Only	Secondary System: All	Secondary System: City-Owned Agricultural Land Only
Current Potable Customers with Special Rates									
Rooster Run Golf Course									
$ / Year = ($255 / MG) * # MG of water demand / year	-(7)	2007	-	-		X (15)			
* used $74 / Acre-ft = $227 / MG = $255 / MG inflated to 2007 $s									
Adobe Creek Golf Course (S and N)									
$ / Year = ($255 / MG) * MG of water demand / year	-(7)	2007	-	-		X (15)			
* used $74 / Acre-ft = $227 / MG = $255 / MG inflated to 2007 $s									
Current Well Customers (Urban)									
$ / Year = ($2,302 / MG) * # MG of water demand / year	-(7)	2007	-	-	X (16)				
* used 75% of Potable Rate									
Vineyard Customers (Tertiary)									
$ / Year = ($2,302 / MG) * # MG of water demand / year	-(7)	2007	-	-	X (17)				
* used 75% of Potable Rate									
Vineyard Customers (Secondary)									
$ / Year = ($1,534 / MG) * # MG of water demand / year	-(7)	2007	-	-				X (23)	
* used 50% of Potable Rate									
Agricultural Customers									
$ / Year = ($190 / MG) * # MG of water demand / year	(7)	2007	-	-	X (18)			X (18)	
* pay $200 / Acre = $190 / MG									
Payment of $200 / Acre was used for cost analysis within this master plan. Payment was derived based on the City of Santa Rosa's payment of $100 / acre and current City of Petaluma payment of $210 / acre-ft = $611 / acre.									
* Do not include city-owned agricultural land AG customers									
City-Owned Agricultural Land Agricultural Customers									
$ / Year = ($0 / MG) * # MG of water demand / year	$0	2007	-	-			X (19)		X (19)
INCOME FROM RENTAL OF CITY-OWNED AGRICULTURAL LAND									
$ / Year = ($100 / Acre) * # Acres of city-owned agricultural land	-(7)	2007	-	-			X (19)		X (19)

(1) All costs will be presented in Present Worth over an 80-year period.

(2) Upgrades for Pump Stations will cost 50% of new station. See pump station Capital Cost Graph (Figure IV-1), use HP required.

(3) Use Formula for Present Worth of Capital cost in Future Year; PW = (Future Cost in 2007 $s) / (l +i)^{n} ; i = 0.03 and n= year of improvement (i.e., n= 40 if improvement done in year 40). ∴ PW = (Future Cost in 2007 $s) / 3.262 if n=40.

(4) Use Pump Station Capital Cost Graph, use HP required (Figure IV-1).

(5) Use Reservoir Capital Cost Graph, use MG capacity. Use Steel Reservoir Graph for Tertiary System Reservoirs (Figure IV-2) and Open Reservoir Graph (Figure IV-3) for Secondary Effluent System Reservoirs.

(6) Hydrants are only for Agricultural and Vineyard Users.

(7) Use Formula for Present Worth of Annual Cost; PW = (Annual Cost in 2007 $s) * [((l + i) ^{n} -1) / (i * (l + i) ^{n})]; i = 0.03 and n = 80. ∴ PW = (Annual Cost in 2007 $s) * 30.2 if n=80.

(8) For all Pump Stations except Main Tertiary Pump Station and pump station to Petaluma Country Club. Count Secondary effluent pump stations separately.

(9) Power cost for Tertiary Facilities at Plant, excluding the tertiary pump station, is included in O&M annual costs for Tertiary Facilities. Power costs for all Pump Stations, including the main tertiary pump station, are included in Pump Station Power Costs, except pump station to Petaluma Country Club.

(10) Do not include storage ponds or tanks at treatment plant.

(11) Sum all Present Worths for each year of costs. Use Formula for Present Worth of Capital Cost in Future Year; PW = (Future cost in 2007 $) / (l + i) ^{n}); i = 0.03 and n = year of improvement (i.e., n=40 if improvement done in year 40).

(12) Do not include pipe installed prior to Year 2003.

(13) Include only piping installed prior to Year 2003. Namely, existing piping in Secondary Effluent System.

(14) Includes all current potable (non-well) customers except Rooster Run Golf Course.

(15) Includes only Rooster Run and Adobe Creek Golf Courses.

(16) Includes all customers within the tertiary system currently on well water except Adobe Creek (S).

(17) Includes only vineyards with tertiary water.

(18) Includes only agricultural customers, excluding city-owned agricultural land.

(19) Includes only city-owned agricultural land.

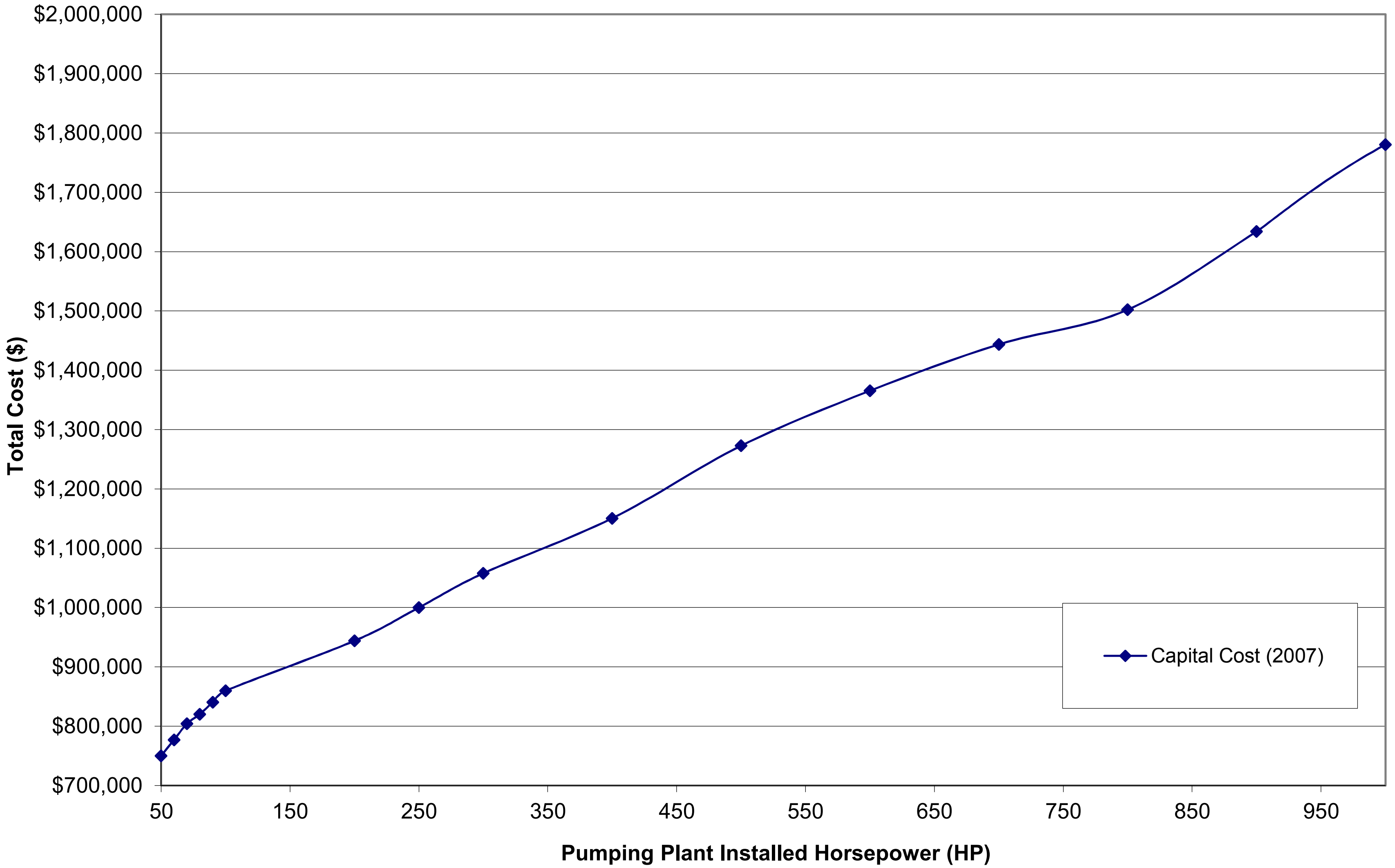
(20) Present Worth analysis is performed on basis of 3% value of money.

(21) Also includes land for reservoirs and pump stations.

(22) Also includes all Agricultural and Vineyard Users on tertiary system.

(23) Includes only vineyards with secondary effluent water.

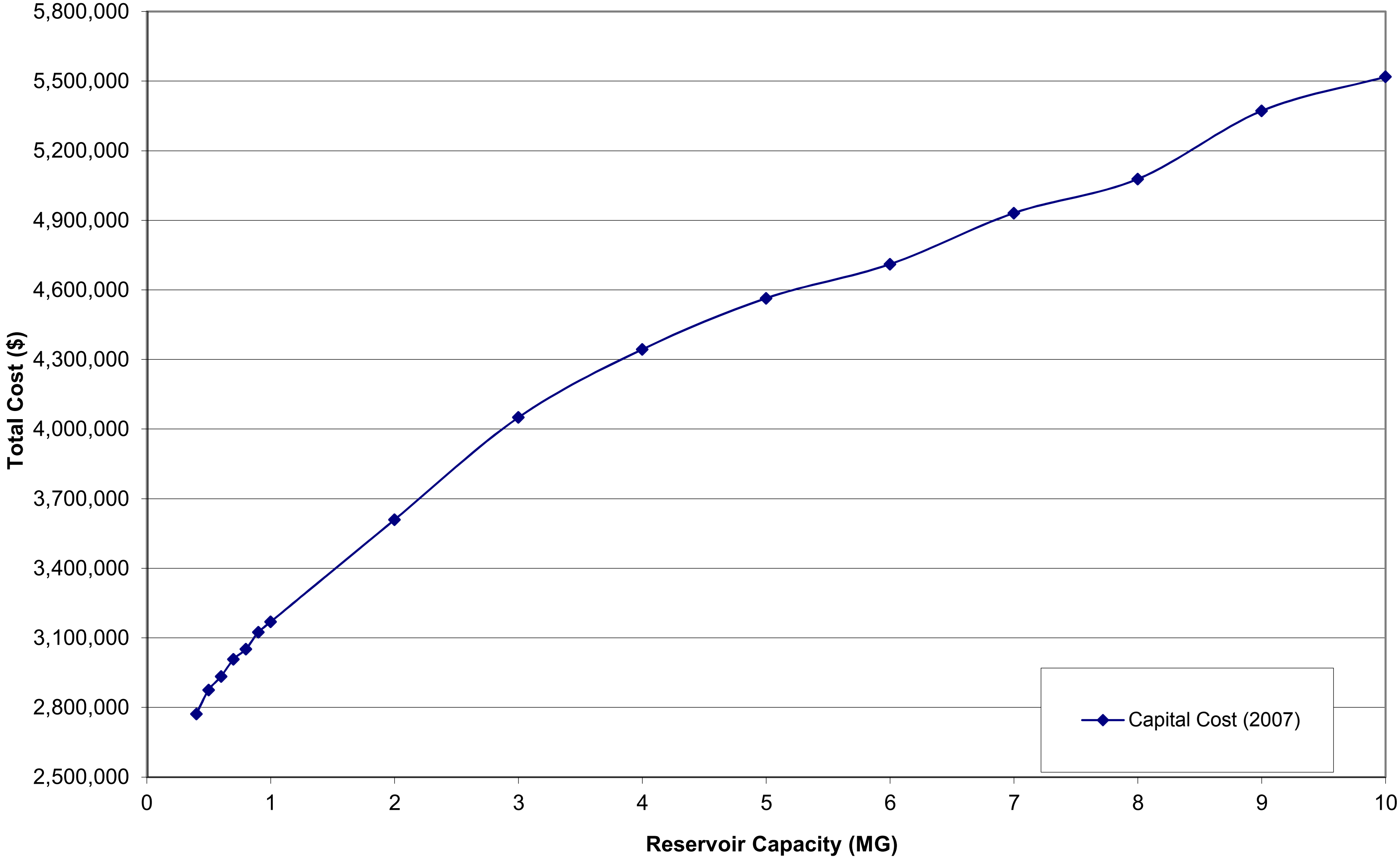
Figure IV - 1
Pump Station Capital Cost



Cost were produced using EBMUD data and adjusted per GSDA projects. All cost have been increased to 2007 dollars.

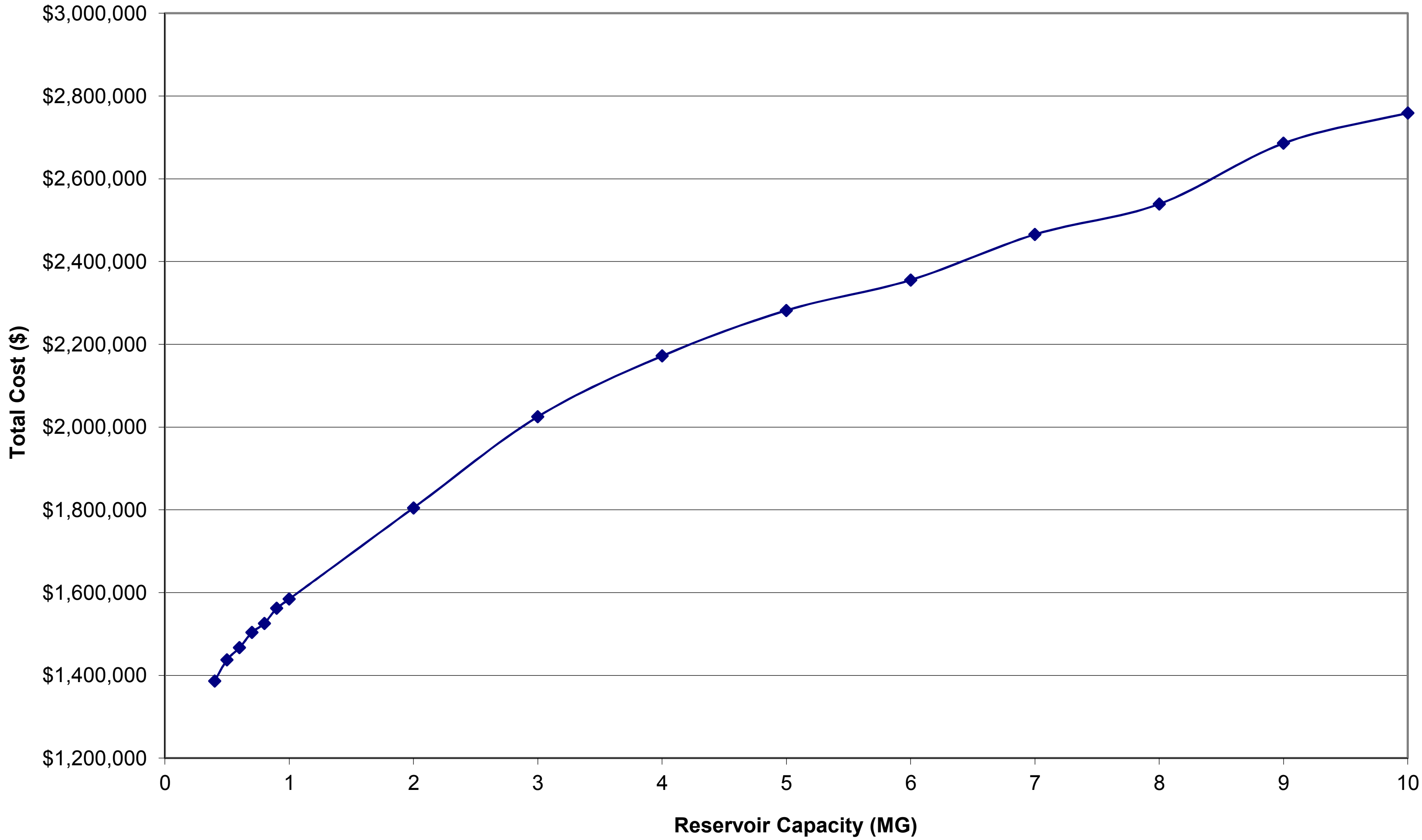
9/27/2011

Figure IV -2
Steel Reservoir Capital Cost



Cost were produced using EBMUD data and adjusted per GSDA projects. All cost have been increased to 2007 dollars. 9/27/2011

Figure IV -3
Open Reservoir Capital Cost



Open reservoir cost are assumed at 50% of steel reservoir. All cost are provided in 2007 dollars. Open reservoirs are assumed to be lined. 9/27/2011

V

SCENARIO DEVELOPMENT AND METHODOLOGY

SECTION V
SCENARIO DEVELOPMENT AND METHODOLOGY

Scenarios were developed to serve various potential customer groupings or model areas for analysis to determine the most cost effective recycled water system that meets the requirements outlined in Section IV—System Requirements and Evaluation Criteria. Various scenarios were developed for both the tertiary and secondary effluent recycled water systems. Each system's scenarios will be evaluated independently in Section VI—Evaluation of Scenarios and then a recommendation for implementation of scenarios will be presented in Section VII—Recommended Scenarios/Implementation. The recommendation will include a combination of scenarios from both the tertiary and secondary effluent systems, since requirements for potable offset must be met by the tertiary system and city-owned agricultural land requirements must be met by the secondary effluent system to provide system flexibility to account for variable irrigation use due to weather impacts from year to year.

A pipeline network to serve all potential recycled water customers in the tertiary and secondary effluent recycled water systems identified in Section III in Figures III-1 and III-2, respectively, was developed per discussions with City staff. Potential roads/routes that would be best suited for pipeline installation, as well as the best route(s) for crossing the Petaluma River and Highway 101 for serving potential tertiary customers on the west side of Petaluma were identified. These routings are shown in Figures V-1 and V-2, respectively, for serving all customers in the tertiary and secondary effluent systems. All pipelines currently installed or to be installed prior to 2007 are shown as existing for purposes of this master plan. It should be noted that it is not feasible to serve all customers in either system, since sufficient recycled water is not available. However, this routing will be used to create pipeline routing for each scenario developed.

MODEL AREAS

All customers identified in Section III were grouped together into areas based upon their physical location in either the tertiary or secondary effluent recycled water system.

Tertiary System Model Areas

Each potential tertiary customer shown in Figure V-1 was grouped into one of seven groups or model areas. These model areas are identified by letters A through G and are shown in Figure V-3. Table V-1 groups all potential tertiary customers by model area. A summary of total irrigation season demands, maximum day demand, total acreage, and total potable offset accomplished by each tertiary model area is shown in Table V-2.

Table V-2
Tertiary Model Areas

Model Area	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)	Potable Offset (MG)
A	485	5.2	635	204
B	308	3.4	342	0
C	133	1.4	142	70
D	36	0.4	37	18
E	174	1.8	165	134
F	10	0.1	12	10
G	67	0.5	86	34

Model area A includes all customers adjacent to the Phase 1 Recycled Water Pipeline currently under construction. This pipeline will serve as the backbone to convey tertiary water into the Petaluma city limits. The potable offset requirement of 600 acre-ft or 196 million gallons identified in Section IV—System Requirements and Evaluation Criteria is accomplished by current potable water customers identified in model area A. Model area B includes potential agricultural land and vineyard customers along the backbone pipeline. These customers were excluded from model area A since they are not current customers. Both the short-term and long-term interest in recycled water by these potential customers is unknown, which makes them a higher risk than customers included in model area A. The other model areas identified are located throughout the tertiary water system and customers are grouped into model areas based on their physical location and pipeline routing shown in Figure V-1.

Table V-1 includes a column that identifies certain potential users as high risk. This column includes all agricultural and vineyard customers who are currently not served by the secondary recycled water system. These customers have been identified as high risk since, at this time, it is unknown if these customers are interested in using recycled water for their irrigation needs. The majority of these customers are included in model area B, with a few customers in model area A. In addition to these customers, potential customers who do not exist at this time, and are classified as future, have also been identified as high risk. These users are identified as future per the City's General Plan. Such customers are included in model areas A, C, E, and G. Model area G includes nine future holes at the Petaluma Country Club. All potential industrial users identified in model area E have also been identified as high risk, since their commitment to recycled water use at this time is dependent on the actual water quality provided and reliability of the supply. The only high risk users identified who currently use potable water are the two industrial users. Turf customers were not classified as high risk.

Rev.	Date	By	Description

Designed VG
Drawn MJF
Checked DRH
Job No. 5311

Submitted: Date

Approved:

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DODSON

File Info. 5311-V-1 MJF 1/21/04

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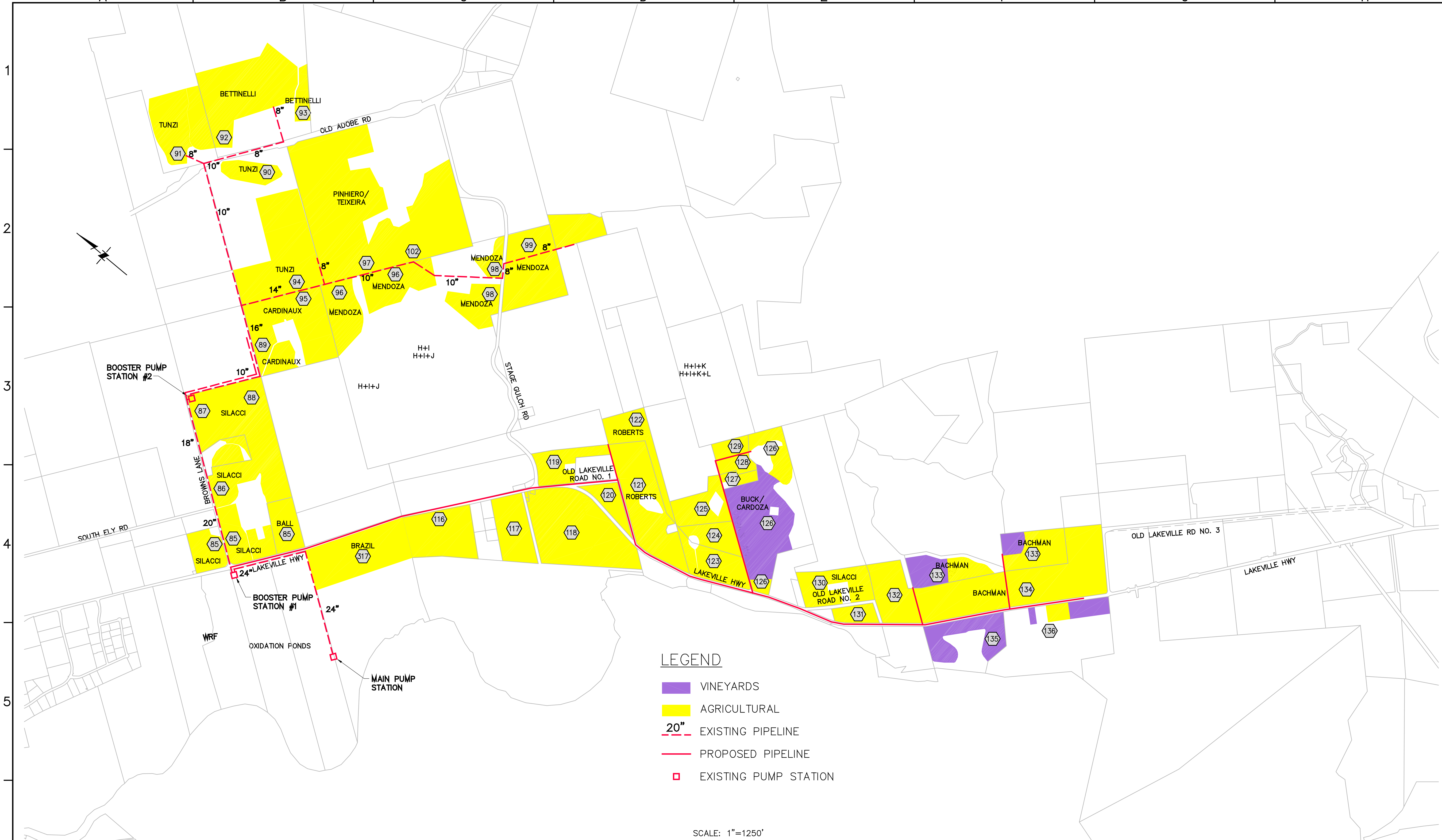
CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

POTENTIAL TERTIARY WATER CUSTOMERS

Figure No. V-1

Sheet No. of



Rev.	Date	By	Description

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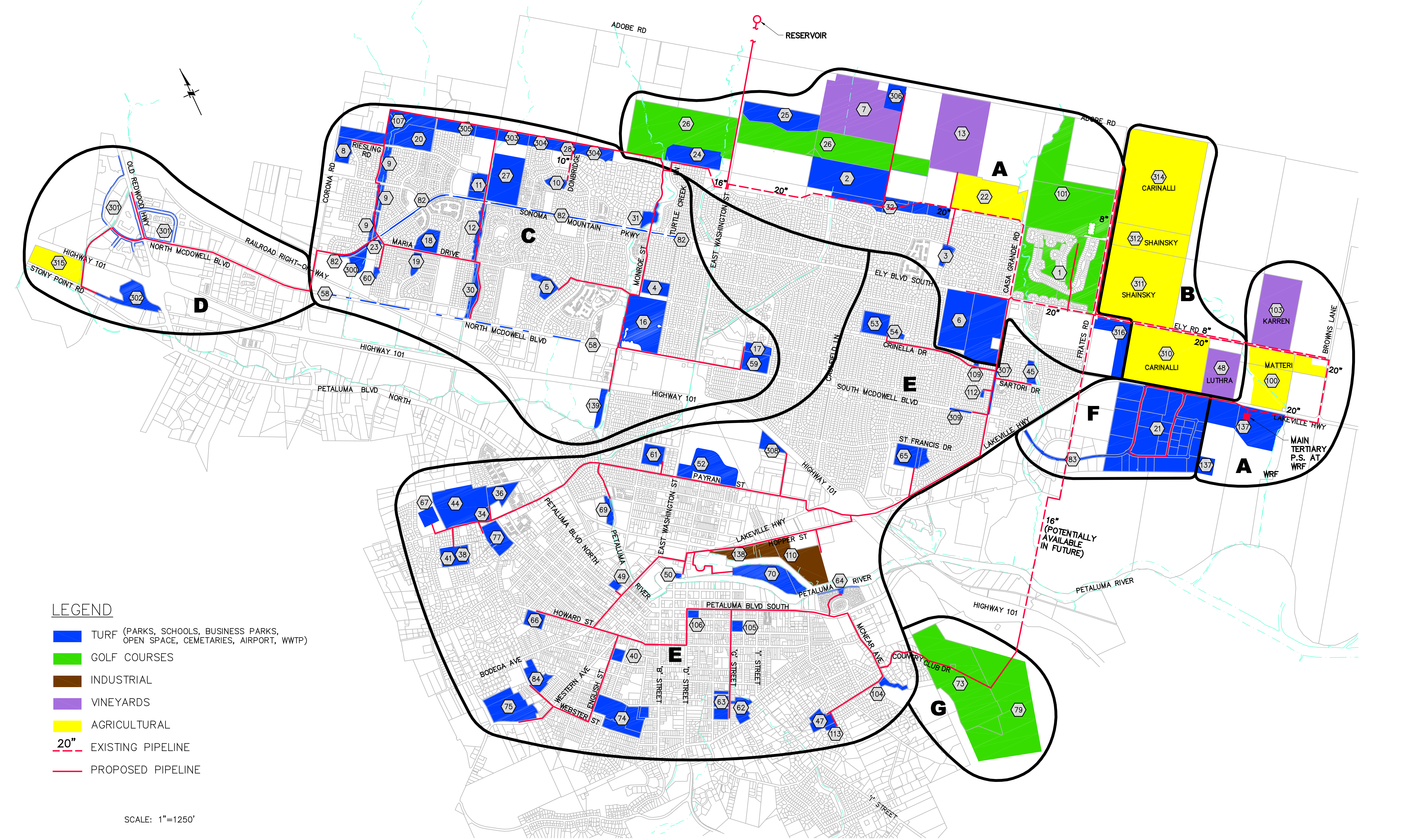
CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

POTENTIAL SECONDARY WATER CUSTOMERS

Figure No. V-2

Sheet No. of



Rev.	Date	By	Description

Designed VG
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Job No. 5311

Submitted: Date

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CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

MODEL AREAS
POTENTIAL TERTIARY WATER CUSTOMERS

Figure No. V-3

Sheet No. of

TABLE V - 1

Potential Tertiary Recycled Water System Users

Model Area	Customer	Map #	Map Location	Description	Total Irrigated Acres	User Type	Current Source of Water (2003): City Water (Potable Offset)	Current Source of Water (2003): Secondary Effluent	Current Source of Water (2003): Private Well	Current Source of Water (2003): Not Irrigated	Potential Source of Water (2007): Secondary Effluent	Potential Source of Water (2007): Tertiary Recycled Water	Total Irrigation Season Use (MG/yr)	Avg. Irrigation Daily Use (mgd)	Max. Monthly Demand (MG/month)	Max. Daily Demand (mgd)	Max. Hour (gpm)	Factor (MG/acre)	Factor (acre-ft /acre)	High Risk Users
A	A15 (Matteri)	100	H-3	Ag User	37	A		X				X	34.68	0.16	8.57	0.33	228	0.937	2.876	
A	A16 (Adobe Creek) (NE)	101	F,G-2	Golf Course	96.9	G		X				X	89.39	0.42	17.49	0.67	466	0.922	2.831	
A	A18 (Karren)	103	H-2,3	Vineyard	30	V		X				X	3.96	0.03	0.99	0.04	70	0.132	0.405	
A	Adobe Creek (SW)	1	F,G-2	Golf Course	40.8	G			X			X	37.66	0.18	7.53	0.29	201	0.923	2.831	
A	Airport (Current Irrigation)	2	E-2	Open Space	2.3	T	X		X			X	2.30	0.01	0.62	0.02	44	1.000	3.069	
A	Arroyo Park	3	F-2	Park	3	T	X					X	3.00	0.01	0.81	0.03	58	1.000	3.069	
A	Casa Grande High School	6	F-3	School	23.5	T	X					X	23.50	0.11	6.38	0.24	453	1.000	3.069	
A	Ceja Vineyards (#3)	7	E-1	Vineyard	65	V			X			X	6.50	0.05	1.63	0.06	115	0.100	0.307	X
A	Greenway (Future)	316	G-3	Turf	15.5	T				X		X	15.50	0.07	4.21	0.16	299	1.000	3.069	X
A	Herrerias Vineyards (#4)	13	F-1,2	Vineyard	69	V			X			X	6.90	0.06	1.73	0.07	122	0.100	0.307	X
A	Old Adobe School	306	E-1	School	6.6	T	X					X	6.60	0.03	1.79	0.07	127	1.000	3.069	
A	Open Space (City Owned)	22	F-2	Ag User	30	A				X		X	28.47	0.13	8.15	0.31	578	0.949	2.912	
A	Prince Park	24	D-1,2	Park	11.1	T	X					X	11.10	0.05	3.01	0.12	214	1.000	3.069	
A	RESA (Redwood Estate Sports Plex)	25	E-1	Park	18	T			X	X		X	18.00	0.08	4.89	0.19	347	1.000	3.069	
A	Rooster Run	26	E-1,2	Golf Course	126.4	G	X					X	138.34	0.65	25.20	0.97	671	1.094	3.359	
A	Treatment Plant Irr (none returning)	137B	H-3	WWTP	40	T				X		X	40.00	0.19	10.86	0.42	771	1.000	3.069	
A	Treatment Plant 3W (returning)	137A	H-3	WWTP	N/A	P				X		X	N/A	0.60	N/A	1.01	689	N/A	N/A	
A	Wiseman Park (Extended)	32	E-2	Park	19.4	T	X					X	19.40	0.09	5.27	0.20	374	1.000	3.069	
B	Carinalli	310	G-3	Ag User	79.1	A			X			X	75.07	0.35	21.48	0.82	572	0.949	2.912	X
B	Carinalli	314	G-2	Ag User	116.1	A			X			X	110.18	0.51	31.53	1.21	839	0.949	2.912	X
B	Gurmeet Luthra	48	G-3	Vineyard	20	V			X			X	2.00	0.02	0.50	0.02	35	0.100	0.307	X
B	Shainsky	311	G-2,3	Ag User	96	A			X			X	91.10	0.43	26.07	1.00	694	0.949	2.912	X
B	Shainsky	312	G-2	Ag User	31	A			X			X	29.42	0.14	8.42	0.32	224	0.949	2.912	X
C	Bernard Eldridge School	4	D-2	School	2	T	X					X	2.00	0.01	0.54	0.02	39	1.000	3.069	
C	Bond Park	5	C,D-2	Park	6	T	X					X	6.00	0.03	1.63	0.06	116	1.000	3.069	
C	City Right-Of-Way (Maria & Sonoma Mtn)	23	B,C-2	Park	3	T				X		X	3.00	0.01	0.81	0.03	58	1.000	3.069	
C	Corona Creek Elementary	8	B-1,2	School	3	T	X					X	3.00	0.01	0.81	0.03	58	1.000	3.069	
C	Corona Creek LAD	9	C-2	Park	2.5	T	X					X	2.50	0.01	0.68	0.03	48	1.000	3.069	
C	Eagle Park	10	C,D-2	Park	2.9	T	X					X	2.90	0.01	0.79	0.03	56	1.000	3.069	
C	Gatti Park	11	C-2	Park	7.3	T				X		X	7.30	0.03	1.98	0.08	141	1.000	3.069	
C	Glenbrook Park	12	C-2	Park	2.6	T	X					X	2.60	0.01	0.71	0.03	50	1.000	3.069	
C	Kenilworth Jr. High (Relocated)	20	C-1	School	20	T				X		X	20.00	0.09	5.43	0.21	386	1.000	3.069	
C	Lucchesi Park	16	D-3	Park	13.1	T	X					X	13.10	0.06	3.56	0.14	253	1.000	3.069	
C	Lynch Creek Park (Future)	139	D-3	Park	7	T				X		X	7.00	0.03	1.90	0.07	135	1.000	3.069	X
C	McDowell Blvd North Streetscapes	58	D-3	Park	2	T	X					X	0.00	0.00	0.00	0.00	0	0.000	0.000	Not feasible
C	McDowell Elementary	59	E-3	School	3.7	T	X					X	3.70	0.02	1.00	0.04	71	1.000	3.069	
C	McDowell Meadow Park	60	C-2	Park	0.8	T	X					X	0.80	0.00	0.22	0.01	15	1.000	3.069	
C	McDowell Park	17	E-3	Park	5.3	T	X					X	5.30	0.02	1.44	0.06	102	1.000	3.069	
C	Meadow Elementary	18	C-2	School	2.2	T	X					X	2.20	0.01	0.60	0.02	42	1.000	3.069	
C	Meadow Park	19	C-2	Park	2.7	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
C	Open Space (by new Jr. High)	107	C-1	Open Space	3	T				X		X	3.00	0.01	0.81	0.03	58	1.000	3.069	
C	Santa Rosa J.C. Phase 2	303	C-1	Open Space	5.4	T	X					X	5.40	0.03	1.47	0.06	104	1.000	3.069	
C	Santa Rosa Junior College	27	C-2	School	5	T	X					X	5.00	0.02	1.36	0.05	96	1.000	3.069	
C	Sonoma Mountain Elementary Turf	28	D-2	School	2.7	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
C	Sonoma Mtn Parkway Streetscapes	82	B,C,D-2	Park	7.5	T	X					X	0.00	0.00	0.00	0.00	0	0.000	0.000	Not feasible
C	Sunrise Park	30	C-2	Park	2.1	T	X					X	2.10	0.01	0.57	0.02	40	1.000	3.069	
C	Trun Bridge Park	300	B-2	Park	2.3	T	X					X	2.30	0.01	0.62	0.02	44	1.000	3.069	
C	Turtle Creek Park	31	D-2	Park	5	T	X					X	5.00	0.02	1.36	0.05	96	1.000	3.069	
C	Urban Separator N	305	C-1	Open Space	11.9	T				X		X	11.90	0.06	3.23	0.12	229	1.000	3.069	
C	Urban Separator S	304	C,D-1	Open Space	11.4	T				X		X	11.40	0.05	3.10	0.12	220	1.000	3.069	
D	Driving Range	302	A-2,3	Driving Range	11.8	T						X	11.80	0.06	3.20	0.12	227	1.000	3.069	
D	Pumpkin Patch (Potential City Owned)	315	A-2	Ag User	19	A	X					X	18.03	0.08	5.16	0.20	366	0.949	2.912	
D	Redwood Business Park	301	A-2	Business Park	5.9	T						X	5.90	0.03	1.60	0.06	114	1.000	3.069	

							Current Source of Water (2003)				Potential Source of Water (2007)									
Model Area	**Customer**	**Map #**	**Map Location**	**Description**	**Total Irrigated Acres**	**User Type**	**City Water (Potable Offset)**	**Secondary Effluent**	**Private Well**	**Not Irrigated**	**Secondary Effluent**	**Tertiary Recycled Water**	**Total Irrigation Season Use (MG/yr)**	**Avg. Irrigation Daily Use (mgd)**	**Max. Monthly Demand (MG/month)**	**Max. Daily Demand (mgd)**	**Max. Hour (gpm)**	**Factor (MG/acre)**	**Factor (acre-ft /acre)**	**High Risk Users**
E	Anna Meadows Park	112	F-3	Park	0.37	T	X					X	0.37	0.00	0.10	0.00	7	1.000	3.069	
E	Casa Grande Streetscape	307	F-3	Park	**0.5**	T	X					X	0.50	0.00	0.14	0.01	10	1.000	3.069	
E	Crinella Mini Park	109	F-3	Park	0.4	T	X					X	0.40	0.00	0.11	0.00	8	1.000	3.069	
E	Del Oro Park	45	F-3	Park	3.5	T	X					X	3.50	0.02	0.95	0.04	67	1.000	3.069	
E	La Tercera Elementary	53	E-3	School	5	T	X					X	5.00	0.02	1.36	0.05	96	1.000	3.069	
E	La Tercera Park	54	E,F-3	Park	2.8	T	X					X	2.80	0.01	0.76	0.03	54	1.000	3.069	
E	Miwok Valley Elementary and Park	65	F-3,4	School	6.9	T	X					X	6.90	0.03	1.87	0.07	133	1.000	3.069	
E	S. McDowell Streetscape	309	F-3	Park	**0.08**	T	X					X	0.08	0.00	0.02	0.00	2	1.000	3.069	
E	Calvary Cemetary	36A	C-4	Cemetary	5.5	T	X					X	5.50	0.03	1.49	0.06	106	1.000	3.069	
E	Calvary Cemetary (Future)	36B	C-4	Cemetary	12	T				X		X	12.00	0.06	3.26	0.12	231	1.000	3.069	X
E	Cherry Valley Park	38	C-4	Park	0.75	T	X					X	0.75	0.00	0.20	0.01	14	1.000	3.069	
E	City Hall	40	D-5	Park	0.7	T	X					X	0.70	0.00	0.19	0.01	13	1.000	3.069	
E	Collins, Mary Elementary	41	C-4	School	1.4	T	X					X	1.40	0.01	0.38	0.01	27	1.000	3.069	
E	Country Club Open Space	104	E-5	Open Space	**2.4**	T	X					X	2.40	0.01	0.65	0.02	46	1.000	3.069	
E	Cypress Hill Cemetary	44	C-4	Cemetary	30	T	X		X			X	30.00	0.14	8.15	0.31	578	1.000	3.069	
E	Fairgrounds & Library	52	D-3,4	Park	**8.8**	T	X					X	8.80	0.04	2.39	0.09	170	1.000	3.069	
E	Grant Elementary	47	E-5	School	3.4	T	X					X	3.40	0.02	0.92	0.04	66	1.000	3.069	
E	Grant Park	113	E-5	Park	0.98	T	X					X	0.98	0.00	0.27	0.01	19	1.000	3.069	
E	Holmburg Park (Future)	69	D-4	Park	6	T				X		X	6.00	0.03	1.63	0.06	116	1.000	3.069	X
E	Jack Cavanaugh Park	50	D-4	Park	**0.04**	T	X					X	0.04	0.00	0.01	0.00	1	1.000	3.069	
E	Kenilworth Fields	308	E-3	Park	**11.4**	T	X					X	11.40	0.05	3.10	0.12	220	1.000	3.069	
E	Magnolia Park (Future)	67	C-4	Park	4	T				X		X	4.00	0.02	1.09	0.04	77	1.000	3.069	X
E	McKinley Elementary	61	D-3,4	School	2.7	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
E	McNear Elementary	62	E-5	School	1.7	T	X					X	1.70	0.01	0.46	0.02	33	1.000	3.069	
E	McNear Landing	64	E-4	Park	**0.15**	T	X					X	0.15	0.00	0.04	0.00	3	1.000	3.069	
E	McNear Park	63	D-5	Park	**4.8**	T	X		X			X	4.80	0.02	1.30	0.05	93	1.000	3.069	
E	McNear Peninsula Park (Future)	70	E-4	Park	**17.5**	T				X		X	17.50	0.08	4.75	0.18	337	1.000	3.069	X
E	Oak Hill Park	66	C,D-4	Park	**2.7**	T	X					X	2.70	0.01	0.73	0.03	52	1.000	3.069	
E	Penry Park	49	D-4	Park	1.8	T	X					X	1.80	0.01	0.49	0.02	35	1.000	3.069	
E	Petaluma High	74	D-5	School	10.6	T	X					X	10.60	0.05	2.88	0.11	204	1.000	3.069	
E	Petaluma Junior High	75	C-5	School	**6.6**	T	X					X	6.60	0.03	1.79	0.07	127	1.000	3.069	
E	Pomeroy Corp	110	E-4	Industrial	N/A	I	X					X	**7.45**	**0.05**	**1.63**	**0.08**	**91**	N/A	N/A	X
E	Saint Vincent's High School	77	C-4	School	2.8	T	X					X	2.80	0.01	0.76	0.03	54	1.000	3.069	
E	Shamrock	138	E-4	Industrial	N/A	S	X					X	**1.02**	**0.01**	**0.21**	**0.01**	**16**	N/A	N/A	X
E	Valley Vista Elementary	84	C,D-5	School	**3.5**	T	X					X	3.50	0.02	0.95	0.04	67	1.000	3.069	
E	Walnut Park	106	D-4,5	Park	1.4	T	X					X	1.40	0.01	0.38	0.01	27	1.000	3.069	
E	Wickersham Park	105	E-4,5	Park	2	T	X					X	2.00	0.01	0.54	0.02	39	1.000	3.069	
F	Oakmead Business Park	21	G-3	Business Park	10	T	X					X	10.00	0.05	2.72	0.10	193	1.000	3.069	
F	South McDowell Blvd Streetscape	83	F-3,4	Park	1.8	T	X					X	0.00	0.00	0.00	0.00	0	0.000	0.000	**Not feasible**
G	Petaluma Golf Course (9 hole)	73	F-5	Golf Course	**43.1**	G	X					X	**33.43**	0.16	**6.00**	0.23	160	**0.776**	**2.380**	
G	Petaluma Golf Course (Future 9 holes)	79	F-5	Golf Course	43.1	G				X		X	33.43	0.16	6.00	0.23	160	0.776	2.380	X
	SUBTOTAL (Tertiary Recycled Water)												1212	6	305	13	N/A	N/A	N/A	N/A

***Bold faced numbers represent measured data**

Table V-3 identified the amount of recycled water use in each model area associated with potential customers identified as high risk.

Table V-3
High Risk Tertiary Users

Model Area	Total Irrigation Season Demand (MG/Year)	High Risk Irrigation Season Demand (MG/Year)	% of High Risk Demand
A	485	29	6%
B	308	308	100%
C	133	7	5%
D	36	18	50%
E	174	48	28%
F	10	0	0%
G	67	34	50%

In addition, a few potential customers identified in Table V-1 have not been included in any model area, since serving them was determined to be unfeasible.

Secondary Effluent System Model Areas

Each potential secondary effluent customer identified in Section III was grouped into one of five model areas. These model areas are identified by letters H through L, as shown in Figure V-4. Table V-4 groups all potential secondary effluent customers by model area. A summary of total irrigation season demand, maximum day demand, and total acreage for each secondary effluent model area is provided in Table V-5. No potable offset is accomplished by providing customers in the secondary effluent system with recycled water.

Table V-5
Secondary Effluent Model Areas

Model Area	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)
H	195	2.1	205
I	149	1.5	156
J	420	4.1	519
K	347	3.8	438
L	274	3.0	359

Model area H has been identified as potential city-owned agricultural land for purposes of this master plan. As outlined under general requirements in Section

IV—System Requirements and Evaluation Criteria, a requirement that a minimum of 20 percent of all recycled water shall be used to irrigate city-owned agricultural land. By owning the land, the City will obtain the flexibility required for balancing their recycled water supply and demand. Although specific parcels of land were identified in this master plan for city-owned agricultural land, it is not required that these particular parcels be purchased, but rather, that the City obtain a minimum of 205 acres of agricultural land that can be irrigated by the secondary effluent system. Model area I includes current secondary effluent customers who are served by Booster Pump Station No. 1. Model area J includes all current secondary effluent system customers who are currently served through Booster Pump Station No. 2. Other model areas in the secondary system were developed based on the physical location of potential customer and pipeline routing identified in Figure V-2.

Table V-4 includes a column that identifies certain potential users as high risk. This column includes all agricultural and vineyard customers who are currently not served by the secondary recycled water system. These customers have been identified as high risk since, at this time, it is unknown if these customers are interested in using recycled water for their irrigation needs. These customers are included in model areas K and L. In addition to these customers, city-owned agricultural land in model area H is classified as high risk, since this particular land is not owned by the City at this time.

Table V-6 identifies the amount of recycled water use in each model area associated with potential customers identified as high risk.

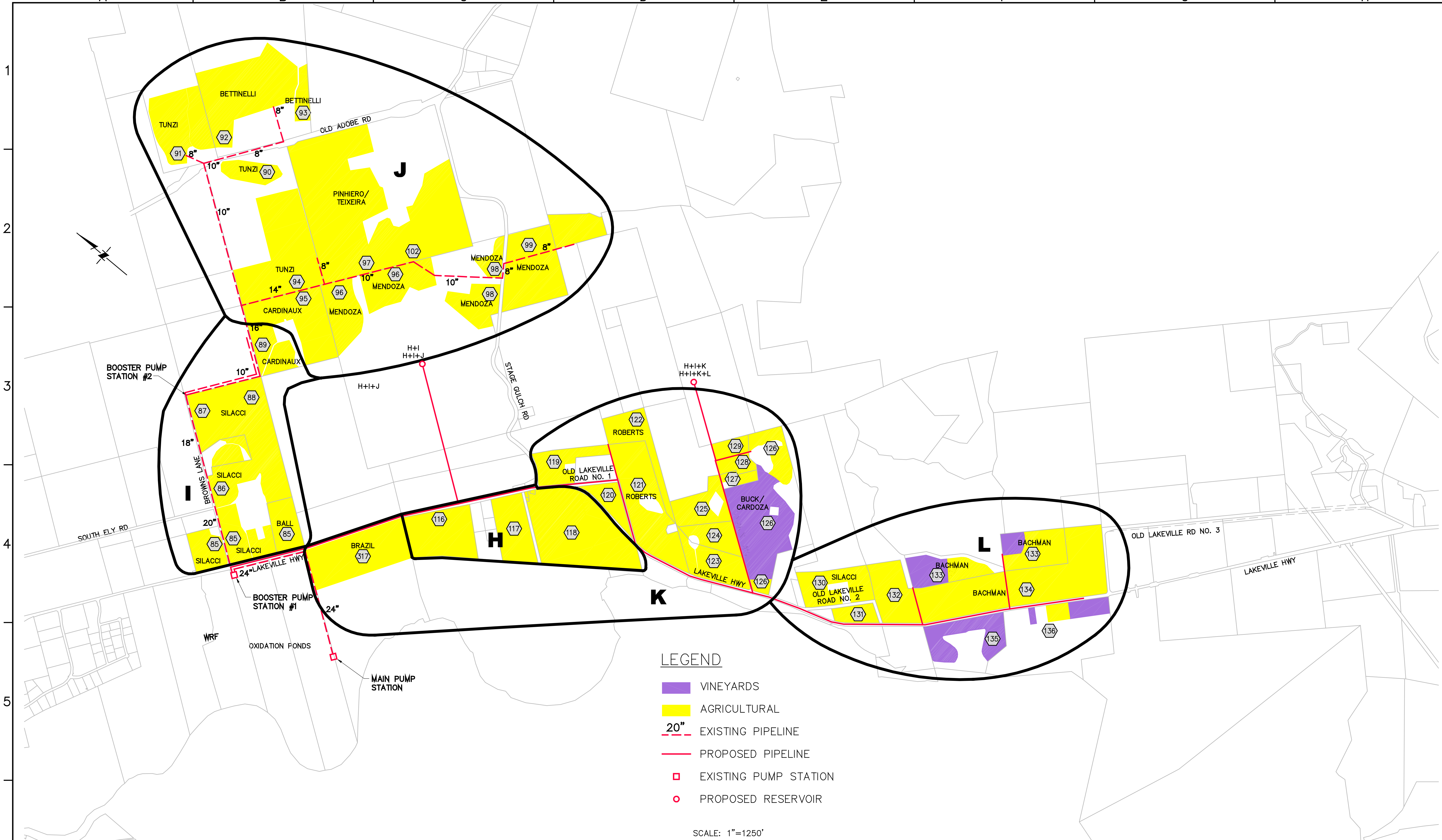
Table V-6
High Risk Secondary Effluent Users

Model Area	Total Irrigation Season Demand (MG/Year)	High risk Irrigation Season Demand (MG/Year)	% of High Risk Demand
H	195	195	100%
I	149	0	0%
J	420	0	0%
K	347	347	100%
L	274	274	100%

SCENARIO DEVELOPMENT

Tertiary System Scenario Development

Model areas identified for the tertiary recycled water system were combined to develop recycled water system scenarios for modeling and analysis. It was determined at Brainstorming/User Group Meeting III that model areas D and F would not be included in any scenarios, due to the substantial infrastructure required to serve such small demands. Scenarios were developed based on the



Rev.	Date	By	Description

Designed VG
Drawn MJF
Checked DRH
Job No. 5311

Submitted: Date
Approved:

REGISTERED PROFESSIONAL ENGINEER
GARY S. DODSON
NO. 16252
EXP. 6/30/05
CIVIL
STATE OF CALIFORNIA

DODSON

File Info. 5311-V-4 MJF 1/21/04

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CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

MODEL AREAS
POTENTIAL SECONDARY WATER CUSTOMERS

Figure No. V-4

Sheet No. of

location of the WRF, existing and proposed pipeline routing, and the total amount of recycled water available. Since approximately 1,000 million gallons of recycled water will be available at buildout for distribution to all recycled water customers and a minimum of 195 million gallons is required to be used to irrigate city-owned agricultural lands in the secondary effluent system, only 805 million gallons is available for use in any tertiary scenario. Table V-7 outlines the scenarios developed for the tertiary system and provides their total irrigation season demand, maximum daily demand, total acreage, and total potable offset.

Table V-7
Tertiary Scenarios

Scenario	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)	Potable Offset (MG)
A	485	5.2	635	204
A + B	793	8.6	977	204
A + G	552	5.7	721	238
A + C	618	6.6	777	274
A + E + G	726	7.5	886	372
A + C + G	685	7.1	863	307

All tertiary scenarios include model area A, due to its inclusion of the Phase 1 recycled water pipeline currently under construction, which is essential for transporting tertiary water from the WRF to the city limits and its ability to meet the potable offset requirements set forth in Section IV—System Requirements and Evaluation Criteria. Model area G includes the existing 9 holes of the Petaluma Country Club and 9 future holes. Three scenarios developed include model area G, due to its large concentrated demand and potential for potable offset. Scenarios A + G and A + C + G rely on using an existing 16-inch potable water pipeline, rather than serving model area G through model area E. These scenarios will only be feasible if the existing 16-inch potable water pipeline becomes available. Currently, this pipeline conveys potable water from the Sonoma County Water Agency (SCWA) aqueduct near Highway 101 to the City of Petaluma's potable water booster pump station located at the corner of Frates Road and Ely Road. If the new aqueduct, to be constructed by SCWA, takes the proposed east alignment, the existing 16-inch potable water line will no longer be required for potable water conveyance and could be converted for use on the tertiary recycled water system. At this time, the final alignment for the new SCWA aqueduct is not known.

Maximum day demands, as outlined in Table V-7 for each scenario, are critical for the tertiary system, since the maximum day demand is the value for which the tertiary facilities at the new WRF must be designed. The basis of design for the WRF, currently under construction, was to initially design the facilities for 4 mgd. This means that only a maximum day demand of 4 mgd of tertiary water could be produced. Based on scenarios developed herein and outlined in Table V-7, all scenarios exceed a maximum day demand of 4 mgd. The WRF is being designed for expansion of tertiary facilities in 0.8 mgd increments through the addition of 0.8 mgd tertiary modules. In addition, maximum day tertiary water production in excess of ADWF must be produced using pond water from storage ponds in the WRF, rather than through the treatment of influent flow. ADWF is estimated at 5.2 mgd at startup of the WRF in 2007 and 6.7 mgd at buildout.

Secondary Effluent System Scenario Development

Model areas identified for the secondary effluent system were combined to develop various recycled water system scenarios for modeling and analysis.

Three scenarios were developed, based on the location of the WRF, existing and proposed pipeline routing, and the total amount of recycled water available. Since approximately 1,000 million gallons of recycled water will be available at buildout for distribution to recycled water customers and a minimum of 196 million gallons (600 acre-ft) is required for potable offset in the tertiary system, only a maximum of 804 million gallons is available for use in any secondary effluent system scenario. Table V-8 outlines scenarios developed for the secondary effluent system and provides their total irrigation season demand, maximum daily demand, and total acreage.

Table V-8
Secondary Effluent Scenarios

Scenario	Total Irrigation Season Demand (MG/Year)	Maximum Day Demand (mgd)	Area (acres)
H + I	344	3.6	361
H + I + J	764	7.7	880
H + I + K	691	7.4	799

Scenarios for H + I + J + K and H + I + K + L were not identified, since the total irrigation season demand would exceed 804 million gallons per year. All secondary effluent scenarios include model area H, since it has been designated as city-owned agricultural land and irrigation of city-owned agricultural land is required per the general requirements for the recycled water system, as outlined in Section IV—System Requirements and Evaluation Criteria.

Model area I was also included in each scenario, since this land is in close proximity to the WRF and serves current secondary effluent customers with all infrastructure in place.

VI

EVALUATION OF SCENARIOS

SECTION VI
EVALUATION OF SCENARIOS

All scenarios developed for the tertiary and secondary effluent recycled water systems, in Section V—Scenario Development and Methodology, were modeled using MWH Soft Inc. H_2OMAP Water software. A detailed description of the modeling software and its capabilities is included in Appendix B—Model Run Input/Output Data. A 24-hour simulation was run for each scenario using maximum day and average day demands. Input and output data for each scenario is included in Appendix B. Development of models required constructing a scaled map for each scenario with node and pipe locations. Nodes were required at each user location, as well as pump stations, reservoirs, and locations where pipes connect. Input data included user demands, user elevations, and user type, along with the 24-hour use profile for each user type. For the secondary effluent system, existing pump curve data was input. The capacity for tertiary pump station(s) was input as the maximum day demand for each scenario. Input data for pipes included diameter, length, roughness coefficient or Hazen-Williams "C" value, and minor loss coefficient. During the modeling process, pipe diameters, reservoir height and size, and tertiary pump station total dynamic head were manipulated to achieve output meeting the design requirements established in Section IV—System Requirements and Evaluation Criteria. Output for each scenario included 24-hour tank level and node pressures.

TERTIARY SYSTEM SCENARIO EVALUATION

Evaluation for the tertiary system scenarios includes modeling and cost estimating for scenarios A, A + B, A + C, A + G, A + E + G, and A + C + G.

Scenario A

Scenario A is shown in Figure VI-1. It includes all customers, pipes, the pump station, and the reservoir required for implementation of scenario A. Table VI-1 outlines general information for scenario A.

Table VI-1
Scenario A

Total Irrigation Season Demand	485 MG/year
Maximum Day Demand	5.2 mgd
Total Irrigated Acres	635 acres
Potable Offset	204 MG/year
City-Owned Agricultural Land	30 acres
Pump Station Requirements Number Location Size	 1 WRF 5.2 mgd @ 290' TDH
Reservoir Requirements Number Location Size Elevation	 1 Northeast on East Washington 0.90 MG 250 feet

Scenario A meets all design requirements established in Section IV—System Requirements and Evaluation Criteria.

An 80 year present worth analysis was established for scenario A. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-2 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-2 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario A. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario A + B

Scenario A + B is shown in Figure VI-2. It includes all customers, pipes, the pump station, and the reservoir required for implementation of scenario A + B. Table VI-3 outlines general information for scenario A + B.

Table VI - 2
COST EVALUATION
Scenario A

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs					
Tertiary Facilities - Initial	0	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000	1,280,000			
Tertiary Facilities - Additional[6]	1,480,000	1,480,000			
Tertiary Facilities - Upgrade	1,742,000		5,682,000		
Tertiary Facilities - Add .8	214,000		698,000		
Tertiary Facilities - Additional	248,000		809,000		
Reservoir	3,150,000	3,150,000			
New Pipes	2,540,000	2,540,000			
New Valves	82,000	82,000			
New Hydrants	27,000	27,000			
Hydrants -all (Upgrade)	14,000		46,000		
Irrigation - Initial	78,000	78,000			
Irrigation - Upgrade	24,000		78,000		
Land[4]	N/A	100,000			
O&M Costs					
Tertiary Facilities (4 mgd)	8,215,000			272,000	
Tertiary Facilities - Additional	2,356,000			78,000	
Pump Station Power	3,838,000			127,000	
Reservoirs	762,000				300,000
Pipelines - New	1,268,000			42,000	
Pipelines - Old	0			0	
Valves	149,000			5,000	
Hydrants	76,000			3,000	
Irrigation System	317,000			10,000	
Monitoring	489,000			16,000	
Program Administration[1]	N/A				
Income					
Reduction of Potable Income	741,000			25,000	
Recycled Water Income:					
Standard Rate Customer	-8,280,000			-274,000	
Special Rate Customers	-2,044,000			-68,000	
Well Customers	-1,411,000			-47,000	
Vineyard Customers	-1,207,000			-40,000	
Agricultural Customers[3]	199,000			7,000	
Rental Land Income	-91,000			-3,000	
TOTAL ($)	$16,256,000	$8,737,000	$7,313,000	$153,000	$300,000
Annualized Cost ($/MG)	$1,106				
Annualized Cost ($/Acre-ft)	$360				

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $199,000 to $608,000 if current payment rate was used
[4] Land cost is for tertiary reservoir site
[5] Reservoirs require a $300,000 per year maintainence once every ten years
[6] Additional costs of $1,280,000 and $1,480,000 for tertiary facilities may not be required per Corollo Engineers

Table VI-3
Scenario A + B

Total Irrigation Season Demand	793 MG/year
Maximum Day Demand	8.6 mgd
Total Irrigated Acres	977 acres
Potable Offset	204 MG/year
City-Owned Agricultural Land	30 acres
Pump Station Requirements Number Location Size	 1 WRF 8.6 mgd @ 320' TDH
Reservoir Requirements Number Location Size Elevation	 1 Northeast on East Washington 0.94 MG 260 feet

All design requirements outlined in Section IV are met by scenario A + B with the following exception. When filling the reservoir with no system demands, the pressure at the main tertiary pump station at the WRF will exceed 150 psi. It is recommended to design the tertiary recycled water pipeline between the WRF and the Ely Road/Browns Lane intersection to a pressure class of 250 psi and to implement pressure relief at the pump station to protect piping downstream of the Ely Road/Browns Lane intersection.

An 80 year present worth analysis was established for scenario A + B. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-4 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-4 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario A + B. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario A + C

Scenario A + C is shown in Figure VI-3. It includes all customers, pipes, the pump station, and the reservoir required for implementation of scenario A + C. Table VI-5 outlines general information for scenario A + C.

Table VI - 4
COST EVALUATION
Scenario A+B

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs					
Tertiary Facilities - Initial	0	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000	1,280,000			
Tertiary Facilities - Additional[6]	7,400,000	7,400,000			
Tertiary Facilities - Upgrade	1,742,000		5,682,000		
Tertiary Facilities - Add .8	214,000		698,000		
Tertiary Facilities - Additional	1,238,000		4,038,000		
Reservoir	3,150,000	3,150,000			
New Pipes	3,104,000	3,104,000			
New Valves	95,000	95,000			
New Hydrants	72,000	72,000			
Hydrants -all (Upgrade)	28,000		91,000		
Irrigation - Initial	78,000	78,000			
Irrigation - Upgrade	24,000		78,000		
Land[4]	N/A	100,000			
O&M Costs					
Tertiary Facilities (4 mgd)	8,215,000			272,000	
Tertiary Facilities - Additional	5,829,000			193,000	
Pump Station Power	6,429,000			213,000	
Reservoirs	762,000				300,000
Pipelines - New	1,370,000			45,000	
Pipelines - Old	0			0	
Valves	161,000			5,000	
Hydrants	151,000			5,000	
Irrigation System	317,000			10,000	
Monitoring	1,522,000			50,000	
Program Administration[1]	N/A				
Income					
Reduction of Potable Income	741,000			25,000	
Recycled Water Income:					
Standard Rate Customer	-8,280,000			-274,000	
Special Rate Customers	-2,044,000			-68,000	
Well Customers	-1,411,000			-47,000	
Vineyard Customers	-1,346,000			-45,000	
Agricultural Customers[3]	1,118,000			37,000	
Rental Land Income	-91,000			-3,000	
TOTAL ($)	$31,868,000	$15,279,000	$10,587,000	$418,000	$300,000
Annualized Cost ($/MG)	$1,326				
Annualized Cost ($/Acre-ft)	$432				

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $1,118,000 to $3,413,000 if current payment rate was used
[4] Land cost is for tertiary reservoir site
[5] Reservoirs require a $300,000 per year maintainence once every ten years

Table VI-5
Scenario A + C

Total Irrigation Season Demand	618 MG/year
Maximum Day Demand	6.6 mgd
Total Irrigated Acres	777 acres
Potable Offset	274 MG/year
City-Owned Agricultural Land	30 acres
Pump Station Requirements Number Location Size	 1 WRF 6.6 mgd @ 350' TDH
Reservoir Requirements Number Location Size Elevation	 1 Northeast on East Washington 1.71 MG 272 feet

All design requirements outlined in Section IV are met by scenario A + C with the following exception. When filling the reservoir with no system demands, the pressure at the main tertiary pump station at the WRF will exceed 150 psi. It is recommended to design the tertiary recycled water pipeline between the WRF and the Ely Road/Browns Lane intersection to a pressure class of 250 psi and to implement pressure relief at the pump station to protect piping downstream of the Ely Road/Browns Lane intersection.

An 80 year present worth analysis was established for scenario A + C. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-6 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-6 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario A + C. Costs were developed using the cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario A + G

Scenario A + G is shown in Figure VI-4. This scenario utilizes the existing 16-inch pipeline currently used for potable water. This scenario is only feasible if that pipeline becomes available for recycled water use. Figure VI-4 includes all customers, pipes, pump stations, and the reservoir required for implementation of scenario A + G. Table VI-7 outlines general information for scenario A + G.

Table VI - 6
COST EVALUATION
Scenario A+C

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs					
Tertiary Facilities - Initial	0	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000	1,280,000			
Tertiary Facilities - Additional[6]	4,440,000	4,440,000			
Tertiary Facilities - Upgrade	1,742,000		5,682,000		
Tertiary Facilities - Add .8	214,000		698,000		
Tertiary Facilities - Additional	743,000		2,424,000		
Reservoir	3,450,000	3,450,000			
New Pipes	8,844,000	8,844,000			
New Valves	276,000	276,000			
New Hydrants	27,000	27,000			
Hydrants -all (Upgrade)	14,000		46,000		
Irrigation - Initial	78,000	78,000			
Irrigation - Upgrade	24,000		78,000		
Land[4]	N/A	100,000			
O&M Costs					
Tertiary Facilities (4 mgd)	8,215,000			272,000	
Tertiary Facilities - Additional	3,866,000			128,000	
Pump Station Power	5,696,000			189,000	
Reservoirs	762,000				300,000
Pipelines - New	2,228,000			74,000	
Pipelines - Old	0			0	
Valves	262,000			9,000	
Hydrants	76,000			3,000	
Irrigation System	317,000			10,000	
Monitoring	489,000			16,000	
Program Administration[1]	N/A				
Income					
Reduction of Potable Income	7,137,000			236,000	
Recycled Water Income:					
Standard Rate Customer	-13,070,000			-433,000	
Special Rate Customers	-2,044,000			-68,000	
Well Customers	-1,411,000			-47,000	
Vineyard Customers	-1,207,000			-40,000	
Agricultural Customers[3]	199,000			7,000	
Rental Land Income	-100,000			-3,000	
TOTAL ($)	$32,547,000	$18,495,000	$8,928,000	$353,000	$300,000
Annualized Cost ($/MG)	$1,738				
Annualized Cost ($/Acre-ft)	$566				

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $199,000 to $608,000 if current payment rate was used
[4] Land cost is for tertiary reservoir site
[5] Reservoirs require a $300,000 per year maintainence once every ten years

Table VI-7
Scenario A + G

Total Irrigation Season Demand	552 MG/year
Maximum Day Demand	5.7 mgd
Total Irrigated Acres	721 acres
Potable Offset	238 MG/year
City-Owned Agricultural Land	30 acres
Pump Station Requirements Number Location 1 Size 1 Location 2 Size 2	 2 WRF 5.7 mgd @ 300' TDH Petaluma Country Club 0.46 mgd @ 150' TDH
Reservoir Requirements Number Location Size Elevation	 1 Northeast on East Washington 0.90 MG 265 feet

All design requirements outlined in Section IV are met by scenario A + G with the following exceptions. The pump station to serve the Petaluma Country Club will be owned and operated by the country club. This pump station's discharge pressure will exceed 150 psi on maximum day and 200 psi on average day and the discharge pressure into a storage lake on the country club property will be less than 50 psi. This is a result of the elevation at the country club.

An 80 year present worth analysis was established for scenario A + G. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-8 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-8 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario A + G. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario A + E + G

Scenario A + E + G is shown in Figure VI-5. It includes all customers, pipes, pump stations, and the reservoir required for implementation of scenario A + E + G. Table VI-9 outlines general information for scenario A + E + G.

Table VI - 8
COST EVALUATION
Scenario A+G

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs					
Tertiary Facilities - Initial	0	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000	1,280,000			
Tertiary Facilities - Additional[6]	2,960,000	2,960,000			
Tertiary Facilities - Upgrade	1,742,000		5,682,000		
Tertiary Facilities - Add .8	214,000		698,000		
Tertiary Facilities - Additional	495,000		1,615,000		
Reservoir	3,150,000	3,150,000			
New Pipes	2,540,000	2,540,000			
New Valves	82,000	82,000			
New Hydrants	27,000	27,000			
Hydrants -all (Upgrade)	14,000		46,000		
Irrigation - Initial	78,000	78,000			
Irrigation - Upgrade	24,000		78,000		
Land[4]	N/A	100,000			
O&M Costs					
Tertiary Facilities (4 mgd)	8,215,000			272,000	
Tertiary Facilities - Additional	3,111,000			103,000	
Pump Station Power	4,467,000			148,000	
Reservoirs	762,000				300,000
Pipelines - New	1,268,000			42,000	
Pipelines - Old	453,000			15,000	
Valves	176,000			6,000	
Hydrants	76,000			3,000	
Irrigation System	317,000			10,000	
Monitoring	489,000			16,000	
Program Administration[1]	N/A				
Income					
Reduction of Potable Income	3,800,000			126,000	
Recycled Water Income:					
Standard Rate Customer	-12,861,000			-426,000	
Special Rate Customers	-2,044,000			-68,000	
Well Customers	-1,411,000			-47,000	
Vineyard Customers	-1,207,000			-40,000	
Agricultural Customers[3]	199,000			7,000	
Rental Land Income	-91,000			-3,000	
TOTAL ($)	$18,325,000	$10,217,000	$8,119,000	$164,000	$300,000
Annualized Cost ($/MG)	$1,096				
Annualized Cost ($/Acre-ft)	$357				

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $199,000 to $608,000 if current payment rate was used
[4] Land cost is for tertiary reservoir site
[5] Reservoirs require a $300,000 per year maintainence once every ten years

Table VI-9
Scenario A + E + G

Total Irrigation Season Demand	726 MG/year
Maximum Day Demand	7.5 mgd
Total Irrigated Acres	886 acres
Potable Offset	372 MG/year
City-Owned Agricultural Land	30 acres
Pump Station Requirements Number Location 1 Size 1 Location 2 Size 2	 2 WRF 7.5 mgd @ 330' TDH Petaluma Country Club 0.46 mgd @ 190' TDH
Reservoir Requirements Number Location Size Elevation	 1 Northeast on East Washington 1.71 MG 275 feet

All design requirements outlined in Section IV are met by scenario A + E + G with the following exceptions. When filling the reservoir with no system demand, the pressure at the main tertiary pump station at the WRF will exceed 150 psi. It is recommended to design the tertiary recycled water pipeline between the WRF and the Ely Road/Browns Lane intersection to a pressure class of 250 psi and to implement pressure relief at the pump station to protect piping downstream of the Ely Road/Browns Lane intersection.

The pump station to serve the Petaluma Country Club will be owned and operated by the country club. This pump station's discharge pressure will exceed 150 psi with maximum and average day demands. The discharge pressure into a storage lake on the country club site will be less than 50 psi. This is a result of the high elevation at the country club.

It should also be noted that under scenario A + E + G, customers #67, #41, #36B, #66, and #75 will receive pressure less than 50 psi, but greater than 40 psi, on the maximum day and customer #66 will receive pressure less than 50 psi, but greater than 40 psi, on average day. If scenario A + E + G is implemented, it is recommended to consult these customers to determine if a pressure of 40 psi at their irrigation meter is acceptable. If not, it is recommended to not include them in the recycled water system.

An 80 year present worth analysis was established for scenario A + E + G. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-10 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-10 also includes the total capital cost required in Years 2007

Table VI - 10
COST EVALUATION
Scenario A+E+G

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs					
Tertiary Facilities - Initial	0	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000	1,280,000			
Tertiary Facilities - Additional[6]	5,920,000	5,920,000			
Tertiary Facilities - Upgrade	1,742,000		5,682,000		
Tertiary Facilities - Add .8	214,000		698,000		
Tertiary Facilities - Additional	991,000		3,233,000		
Reservoir	3,450,000	3,450,000			
New Pipes	20,136,000	20,136,000			
New Valves	621,000	621,000			
New Hydrants	27,000	27,000			
Hydrants -all (Upgrade)	14,000		46,000		
Irrigation - Initial	78,000	78,000			
Irrigation - Upgrade	24,000		78,000		
Land[4]	N/A	100,000			
O&M Costs					
Tertiary Facilities (4 mgd)	8,215,000			272,000	
Tertiary Facilities - Additional	4,893,000			162,000	
Pump Station Power	5,232,000			173,000	
Reservoirs	762,000				300,000
Pipelines - New	2,959,000			98,000	
Pipelines - Old	0			0	
Valves	348,000			12,000	
Hydrants	76,000			3,000	
Irrigation System	317,000			10,000	
Monitoring	489,000			16,000	
Program Administration[1]	N/A				
Income					
Reduction of Potable Income	12,976,000			430,000	
Recycled Water Income:					
Standard Rate Customer	-24,958,000			-826,000	
Special Rate Customers	-2,044,000			-68,000	
Well Customers	-3,824,000			-127,000	
Vineyard Customers	-1,207,000			-40,000	
Agricultural Customers[3]	199,000			7,000	
Rental Land Income	-91,000			-3,000	
TOTAL ($)	$38,839,000	$31,612,000	$9,737,000	$119,000	$300,000
Annualized Cost ($/MG)	$1,765				
Annualized Cost ($/Acre-ft)	$575				

1 Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
2 All Costs are in Year 2007 Dollars
3 Agricultural payments would increase from $199,000 to $608,000 if current payment rate was used
4 Land cost is for tertiary reservoir site
5 Reservoirs require a $300,000 per year maintainence once every ten years

and 2047 and the annual cost associated with implementation of scenario A + E + G. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario A + C + G

Scenario A + C + G is shown in Figure VI-6. This scenario utilizes the existing 16-inch pipeline currently used for potable water. This scenario is only feasible if that pipeline becomes available for recycled water use. It includes all customers, pipes, pump stations, and the reservoir required for implementation of scenario A + C + G. Table VI-11 outlines general information for scenario A + C + G.

Table VI-11
Scenario A + C + G

Total Irrigation Season Demand	685 MG/year
Maximum Day Demand	7.1 mgd
Total Irrigated Acres	863 acres
Potable Offset	307 MG/year
City-Owned Agricultural Land	30 acres
Pump Station Requirements Number Location 1 Size 1 Location 2 Size 2	 2 WRF 7.1 mgd @ 350' TDH Petaluma Country Club 0.46 mgd @ 150' TDH
Reservoir Requirements Number Location Size Elevation	 1 Northeast on East Washington 1.71 MG 280 feet

All design requirements outlined in Section IV are met by scenario A + C + G with the following exceptions. When filling the reservoir with no system demand, and under maximum day conditions, the pressure at the main tertiary pump station at the WRF will exceed 150 psi. It is recommended to design the tertiary recycled water pipeline between the WRF and the Ely Road/Browns Lane intersection to a pressure class of 250 psi and to implement pressure relief at the pump station to protect piping downstream of the Ely Road/Browns Lane intersection. The pressure at the Ely Road/Browns Lane intersection will be less than 150 psi under maximum day conditions.

The pump station to serve the Petaluma Country Club will be owned and operated by the country club. This pump station's discharge pressure will exceed 150 psi with maximum and average day demands. The discharge pressure into a storage lake on the country club site will be less than 50 psi. This is a result of the high elevation at the country club.

An 80 year present worth analysis was established for scenario A + C + G. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-12 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-12 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario A + C + G. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

SECONDARY EFFLUENT SYSTEM SCENARIO EVALUATION

Evaluation for the secondary effluent system scenarios includes modeling and cost estimating for scenarios H + I, H + I + J, and H + I + K.

Scenario H + I

Scenario H + I is shown in Figure VI-7. It includes all customers, pipes, pump stations, and the reservoir required for implementation of scenario H + I. Table VI-13 outlines general information for scenario H + I.

Table VI-13
Scenario H + I

Total Irrigation Season Demand	344 MG/year
Maximum Day Demand	3.6 mgd
Total Irrigated Acres	361 acres
Potable Offset	None
City-Owned Agricultural Land	205 acres
Pump Station Requirements Main Booster Pump Station Booster Pump Station No. 1 Booster Pump Station No. 2	 Yes Yes No
Reservoir Requirements Number Location Size Elevation	 1 County 0.56 MG 350 feet

All design requirements outlined in Section IV are met by scenario H + I except customer #89 will receive pressure less than 50 psi, but greater than 40 psi, under maximum day and average day demands. If scenario H + I is implemented, it is recommended to consult this customer to determine if a pressure of 40 psi at their irrigation hydrant is acceptable. If not, it is recommended to not include them in the recycled water system.

An 80 year present worth analysis was established for scenario H + I. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established.

Table VI - 12
COST EVALUATION
Scenario A+C+G

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs					
Tertiary Facilities - Initial	0	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000	1,280,000			
Tertiary Facilities - Additional[6]	4,440,000	4,440,000			
Tertiary Facilities - Upgrade	1,742,000		5,682,000		
Tertiary Facilities - Add .8	214,000		698,000		
Tertiary Facilities - Additional	743,000		2,424,000		
Reservoir	3,450,000	3,450,000			
New Pipes	8,844,000	8,844,000			
New Valves	276,000	276,000			
New Hydrants	27,000	27,000			
Hydrants -all (Upgrade)	14,000		46,000		
Irrigation - Initial	78,000	78,000			
Irrigation - Upgrade	24,000		78,000		
Land[4]	N/A	100,000			
O&M Costs					
Tertiary Facilities (4 mgd)	8,215,000			272,000	
Tertiary Facilities - Additional	3,866,000			128,000	
Pump Station Power	6,105,000			202,000	
Reservoirs	762,000				300,000
Pipelines - New	2,228,000			74,000	
Pipelines - Old	453,000			15,000	
Valves	289,000			10,000	
Hydrants	76,000			3,000	
Irrigation System	317,000			10,000	
Monitoring	489,000			16,000	
Program Administration[1]	N/A				
Income					
Reduction of Potable Income	10,195,000			338,000	
Recycled Water Income:					
Standard Rate Customer	-17,728,000			-587,000	
Special Rate Customers	-2,044,000			-68,000	
Well Customers	-1,411,000			-47,000	
Vineyard Customers	-1,207,000			-40,000	
Agricultural Customers[3]	199,000			7,000	
Rental Land Income	-100,000			-3,000	
TOTAL ($)	$31,836,000	$18,495,000	$8,928,000	$330,000	$300,000
Annualized Cost ($/MG)	$1,534				
Annualized Cost ($/Acre-ft)	$500				

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $199,000 to $608,000 if current payment rate was used
[4] Land cost is for tertiary reservoir site
[5] Reservoirs require a $300,000 per year maintainence once every ten years

Table VI-14 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-14 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario H + I. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario H + I + J

Scenario H + I + J is shown in Figure VI-8. It includes all customers, pipes, pump stations, and reservoirs required for implementation of scenario H + I + J. Table VI-15 outlines general information for scenario H + I + J.

Table VI-15
Scenario H + I + J

Total Irrigation Season Demand	764 MG/year
Maximum Day Demand	7.7 mgd
Total Irrigated Acres	880 acres
Potable Offset	None
City-Owned Agricultural Land	205 acres
Pump Station Requirements Main Booster Pump Station Booster Pump Station No. 1 Booster Pump Station No. 2	 Yes Yes Yes
Reservoir Requirements Number Location (Lower Zone) Size (Lower Zone) Elevation (Lower Zone) Location (Upper Zone Size (Upper Zone) Elevation (Upper Zone)	 2 County 0.32 MG 410 feet County 0.18 MG 478 feet (highest land available)

All design requirements outlined in Section IV are met by scenario H + I + J with the following exceptions.

Customer #89 will receive pressure less than 50 psi, but greater than 40 psi, under average day demands and customers #96, #97, and #102 will receive pressure less than 50 psi, but greater than 40 psi, under maximum day demands. If scenario H + I + J is implemented, it is recommended to consult these customers to determine if a pressure of 40 psi at their irrigation hydrant is acceptable. If not, it is recommended to move customer #89 to model area J and not to include customers #96, #97, and #102 in the recycled water system. Low pressures for customers #96, #97, and #102 result from not having land sufficiently high for placement of the reservoir.

An 80 year present worth analysis was established for scenario H + I + J. For cost comparison to other scenarios evaluated, the total 80 year present worth was

Table VI - 14
COST EVALUATION
Scenario H+I

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]
Capital Costs				
Pump Station Initial - Main	525,000	525,000		
Pump Station Initial - BPS#1	688,000	688,000		
Pump Station Initial - BPS#2	0	0		
Pump Station Upgrade - Main	161,000		525,000	
Pump Station Upgrade - BPS#1	211,000		688,000	
Pump Station Upgrade - BPS#2	0		0	
Reservoir	1,400,000	1,400,000		
New Pipes	2,122,000	2,122,000		
New Valves	65,000	65,000		
New Hydrants	27,000	27,000		
Hydrants- All (Upgrade)	19,000		62,000	
Irrigation - Initial	533,000	533,000		
Irrigation - Upgrade	163,000		532,000	
Land[4]	N/A	4,200,000		
O&M Costs				
Pump Stations	2,174,000			72,000
Pump Station Power	4,181,000			138,000
Reservoirs	151,000			5,000
Pipelines - New	328,000			11,000
Pipelines - Old	643,000			21,000
Valves	76,000			3,000
Hydrants	106,000			4,000
Irrigation System	2,167,000			72,000
Monitoring	1,027,000			34,000
Program Administration[1]	N/A			
Income				
Recycled Water Income[3]	729,000			24,000
Rental Land Income	-619000			-20,000
TOTAL ($)	$16,877,000	$9,560,000	$1,807,000	$364,000
Annualized Cost ($/MG)	$1,619			
Annualized Cost ($/Acre-ft)	$528			

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)

[2] All Costs are in Year 2007 Dollars

[3] Agricultural payments would increase from $729,000 to $2,225,000 if current payment rate was used

[4] Land cost is for secondary effluent reservoir site and purchase of City owned agricultural land

annualized and a present worth cost per total irrigation season use was established. Table VI-16 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-16 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario H + I + J. Costs were developed based on cost criteria established in Section IV—System Requirements and Evaluation Criteria.

Scenario H + I + K

Scenario H + I + K is shown in Figure VI-9. It includes all customers, pipes, pump stations, and the reservoir required for implementation of scenario H + I + K. Table VI-17 outlines general information for scenario H + I + K.

Table VI-17
Scenario H + I + K

Total Irrigation Season Demand	691 MG/year
Maximum Day Demand	7.4 mgd
Total Irrigated Acres	799 acres
Potable Offset	None
City-Owned Agricultural Land	205 acres
Pump Station Requirements	
Main Booster Pump Station	Yes
Booster Pump Station No. 1	Yes
Booster Pump Station No. 2	No
Reservoir Requirements	
Number	1
Location	County
Size	0.26 MG
Elevation	360 feet

All design requirements outlined in Section IV will be met by scenario H + I + K except customer #89 will receive pressure less than 50 psi, but greater than 40 psi, under maximum day and average day demands. If scenario H + I + K is implemented, it is recommended to consult this customer to determine if a pressure of 40 psi at their irrigation hydrant is acceptable. If not, it is recommended to not include them in the recycled water system.

An 80 year present worth analysis was established for scenario H + I + K. For cost comparison to other scenarios evaluated, the total 80 year present worth was annualized and a present worth cost per total irrigation season use was established. Table VI-18 outlines the total 80 year present worth cost and annualized present worth cost per million gallons and per acre-ft. In addition to present worth information, Table VI-18 also includes the total capital cost required in Years 2007 and 2047 and the annual cost associated with implementation of scenario H + I + K.

Table VI - 16
COST EVALUATION
Scenario H+I+J

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]
Capital Costs				
Pump Station Initial - Main	525,000	525,000		
Pump Station Initial - BPS#1	688,000	688,000		
Pump Station Initial - BPS#2	450,000	450,000		
Pump Station Upgrade - Main	161,000		525,000	
Pump Station Upgrade - BPS#1	211,000		688,000	
Pump Station Upgrade - BPS#2	138,000		450,000	
Reservoir	2,800,000	2,800,000		
New Pipes	2,988,000	2,988,000		
New Valves	110,000	110,000		
New Hydrants	27,000	27,000		
Hydrants- All (Upgrade)	52,000		170,000	
Irrigation - Initial	533,000	533,000		
Irrigation - Upgrade	163,000		532,000	
Land[4]	N/A	4,200,000		
O&M Costs				
Pump Stations	3,262,000			108,000
Pump Station Power	9,493,000			314,000
Reservoirs	302,000			10,000
Pipelines - New	391,000			13,000
Pipelines - Old	1,710,000			57,000
Valves	147,000			5,000
Hydrants	287,000			10,000
Irrigation System	2,167,000			72,000
Monitoring	2,658,000			88,000
Program Administration[1]	N/A			
Income				
Recycled Water Income[3]	3,276,000			108,000
Rental Land Income	-619000			-20,000
TOTAL ($)	$31,920,000	$12,321,000	$2,365,000	$765,000
Annualized Cost ($/MG)	$1,379			
Annualized Cost ($/Acre-ft)	$449			

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $3,276,000 to $10,002,000 if current payment rate was used
[4] Land cost is for secondary effluent reservoir site(s) and purchase of City owned agricultural land

Table VI - 18
COST EVALUATION
Scenario H+I+K

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]
Capital Costs				
Pump Station Initial - Main	525,000	525,000		
Pump Station Initial - BPS#1	688,000	688,000		
Pump Station Initial - BPS#2	0	0		
Pump Station Upgrade - Main	161,000		525,000	
Pump Station Upgrade - BPS#1	211,000		688,000	
Pump Station Upgrade - BPS#2	0		0	
Reservoir	1,400,000	1,400,000		
New Pipes	6,591,000	6,591,000		
New Valves	260,000	260,000		
New Hydrants	144,000	144,000		
Hydrants- All (Upgrade)	55,000		179,000	
Irrigation - Initial	533,000	533,000		
Irrigation - Upgrade	163,000		532,000	
Land[4]	N/A	4,200,000		
O&M Costs				
Pump Stations	2,174,000			72,000
Pump Station Power	8,255,000			273,000
Reservoirs	151,000			5,000
Pipelines - New	695,000			23,000
Pipelines - Old	643,000			21,000
Valves	120,000			4,000
Hydrants	302,000			10,000
Irrigation System	2,167,000			72,000
Monitoring	2,350,000			78,000
Program Administration[1]	N/A			
Income				
Recycled Water Income[3]	2,303,000			76,000
Rental Land Income	-619000			-20,000
TOTAL ($)	$29,272,000	$14,341,000	$1,924,000	$614,000
Annualized Cost ($/MG)	$1,398			
Annualized Cost ($/Acre-ft)	$456			

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary)
[2] All Costs are in Year 2007 Dollars
[3] Agricultural payments would increase from $2,303,000 $7,030,000 if current payment rate was used
[4] Land cost is for secondary effluent reservoir site and purchase of City owned agricultural land

Rev.	Date	By	Description

Designed VG
Drawn MJF
Checked DRH
Job No. 5311

Submitted: Date

Approved:

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RECYCLED WATER MASTER PLAN

SCENARIO A

Figure No. VI-1

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SCENARIO A+B

Figure No. VI-2

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SCENARIO A+C

Figure No. VI-3

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SCENARIO A+G

Figure No. VI-4

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SCENARIO A+E+G

Figure No. VI-5

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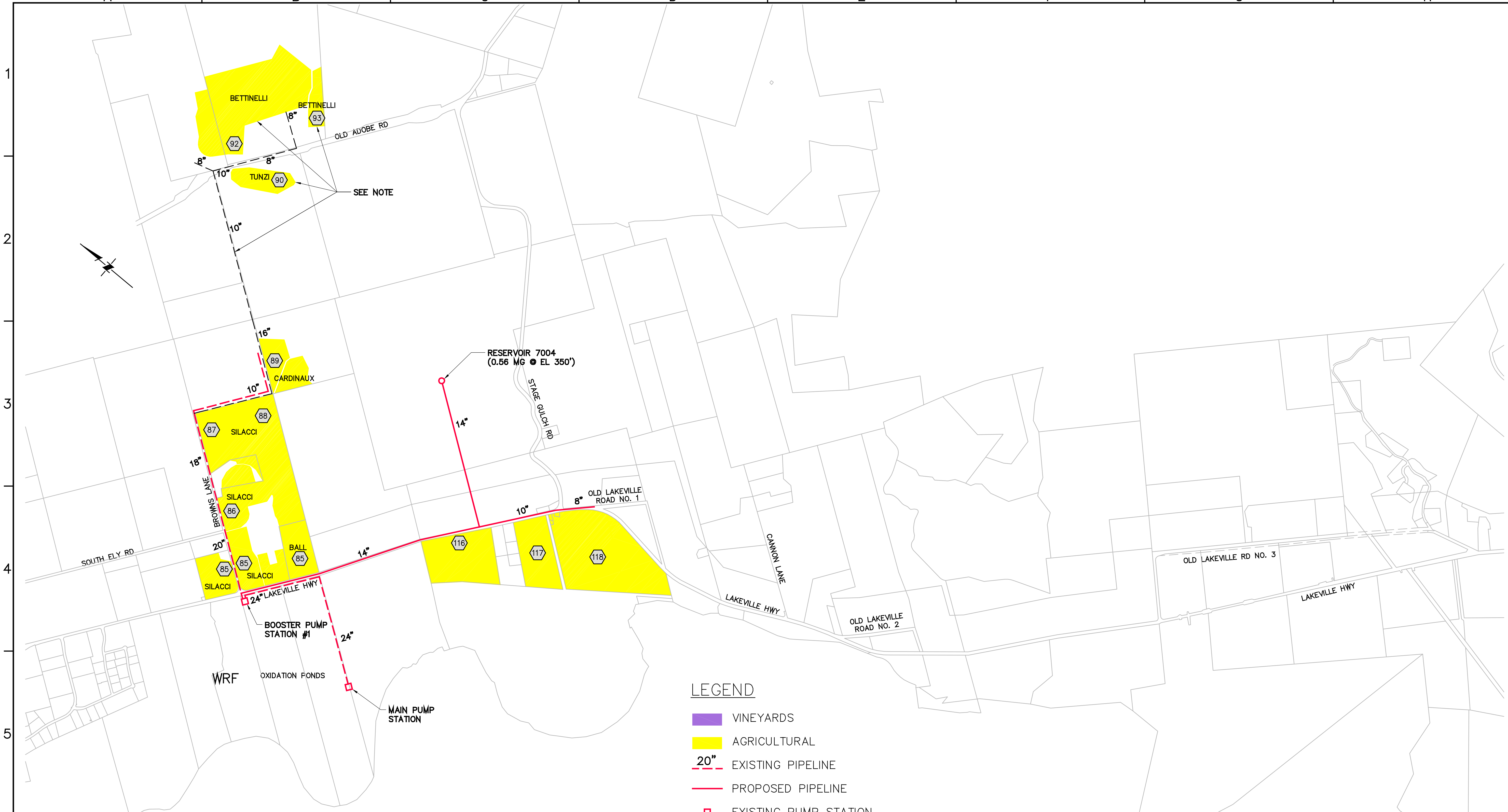
RECYCLED WATER MASTER PLAN

SCENARIO A+C+G

Figure No. VI-6

Sheet No. of



LEGEND

- VINEYARDS
- AGRICULTURAL
- 20" EXISTING PIPELINE
- PROPOSED PIPELINE
- EXISTING PUMP STATION

SCALE: 1"=1250'

NOTE:

CUSTOMERS 90, 92, AND 93 ARE LOCATED WITHIN MODEL AREA J, BUT CAN BE SERVED BY THE H+I SYSTEM WITHOUT THE USE OF BOOSTER PUMP STATION NO. 2.

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RECYCLED WATER MASTER PLAN

SCENARIO H+I

Figure No. VI-7

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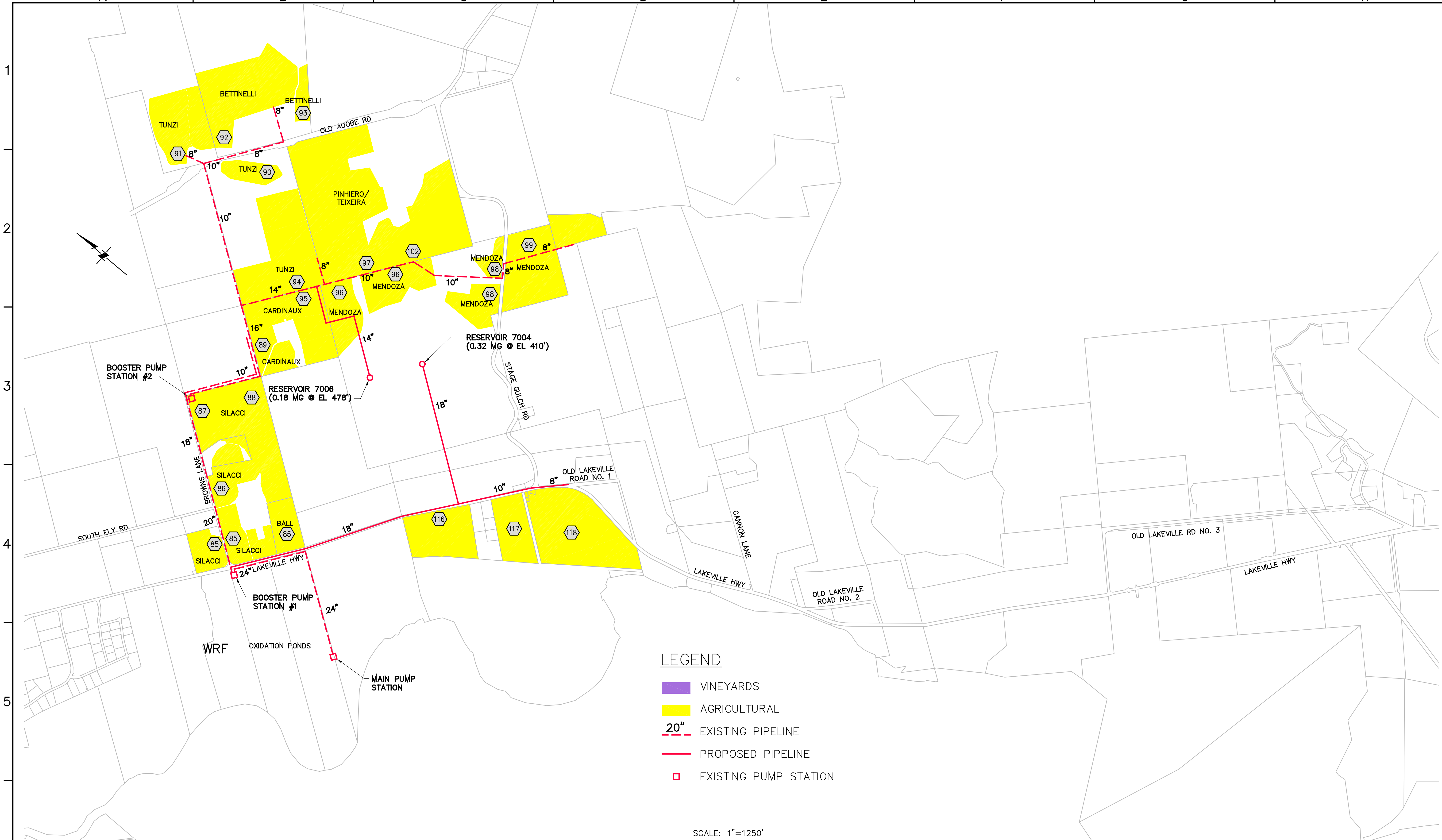

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RECYCLED WATER MASTER PLAN

SCENARIO H+I+J

Figure No. VI-8

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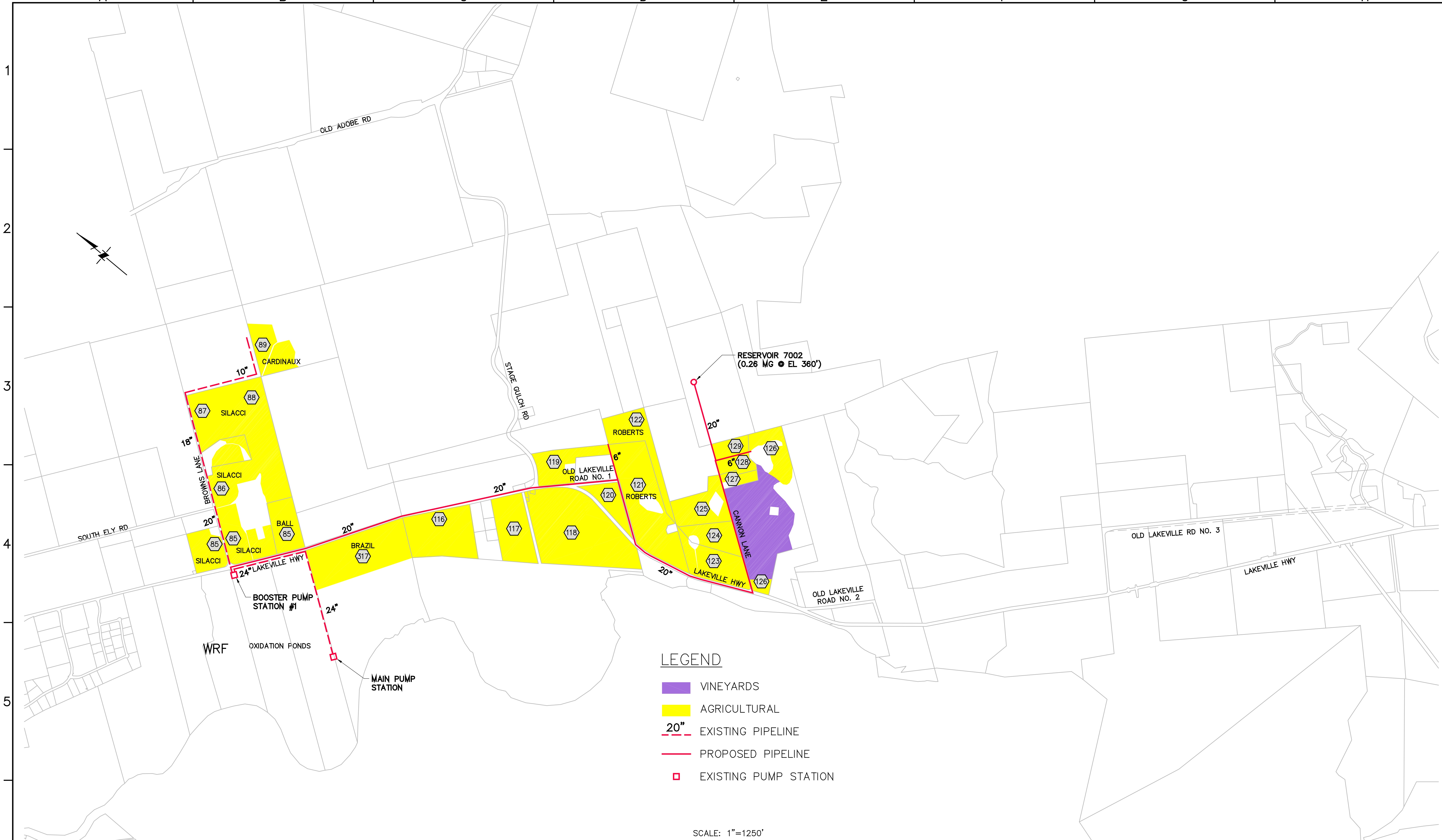

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RECYCLED WATER MASTER PLAN

SCENARIO H+I+K

Figure No. VI-9

Sheet No. of

VII

RECOMMENDED SCENARIOS / IMPLEMENTATION

SECTION VII
RECOMMENDED SCENARIOS/IMPLEMENTATION

The recommended recycled water program must consist of a combination of tertiary and secondary effluent scenarios that, in combination, meet the general requirements established in Section IV—System Requirements and Evaluation Criteria. The recommended recycled water program must include a minimum potable water offset of 196 MG (600 acre-ft) per year, include a minimum of 205 acres of city-owned agricultural land to provide system flexibility to account for variable irrigation use due to weather impacts, and the ability to manage recycled water between May 1st and October 20th.

The total target amount of recycled water available for distribution during an irrigation season was determined. At startup of the WRF in Year 2007, approximately 790 MG of recycled water will be available for distribution. This amount will increase with increased ADWF into the WRF to approximately 1,000 MG at buildout. Buildout is estimated to occur in Year 2025 and recycled water production is expected to increase linearly between Year 2007 and buildout. Total recycled water production includes both tertiary and secondary effluent recycled water.

A summary of the annualized present worth cost for each scenario evaluated in Section VI—Evaluation of Scenarios is included in Table VII-1. Each scenario is ranked from lowest to highest 80 year present worth cost.

Table VII-1
Scenario Present Worth Comparison

Scenario	Total Irrigation Season Use (MG)	Meets Potable Offset Requirement (Potable Offset Amount)	Meets City-Owned Agricultural Land Requirement (City-Owned Acreage)	Annualized 80 Year Present Worth ($/MG)	Ranking PW, Lowest to Highest Cost	Not Feasible [B]
A	485	yes (204 MG)	no (30 acres)	$1,106/MG	2	
A + B	793	yes (204 MG)	no (30 acres)	$1,326/MG	3	
A + C	618	yes (274 MG)	no (30 acres)	$1,738/MG	8	
A + G	552	yes (238 MG)	no (30 acres)	$1,096/MG	1	X
A + E + G	726	yes (372 MG)	no (30 acres)	$1,765/MG	9	
A + C + G	685	yes (307 MG)	no (30 acres)	$1,534/MG	6	X
H + I	344	N/A	yes (205 acres)	$1,619/MG	7	
H + I + J	764	N/A	yes (205 acres)	$1,379/MG	4	
H + I + K	691	N/A	yes (205 acres)	$1,398/MG	5	
H (only) [A]	195	N/A	yes (205 acres)	$2,537/MG [A]	10	
H + I + Partial J [A]	515	N/A	yes (205 acres)	$1,639/MG [A]	7/8	
H + I + Partial K [A]	515	N/A	yes (205 acres)	$1,498/MG [A]	5/6	

[A] Present Worth Analysis Cost included in Appendix C—Cost Evaluation Data. These scenarios were not modeled.

[B] Not feasible at this time due to unavailability of 16" potable water pipeline.

SCENARIO ANALYSIS METHODOLOGY

Figure VII-1 outlines the methodology used to determine the least cost scenario combination, while meeting the potable offset requirement, city-owned agricultural land requirement, balancing recycled water demand with recycled water supply, and managing recycled water between May 1st and October 20th.

RECOMMENDATION

The least cost recycled water program, which meets all requirements outlined in Section IV, includes scenario A in the tertiary system and scenario H + I + K (partial) in the secondary effluent system. Scenario H + I + K (partial) includes a portion of the potential users identified in model area K.

If the 16-inch potable water pipeline identified in scenario A + G becomes available for recycled water use, implementation of that scenario should be considered by the City at that time, since it has the lowest present worth cost of all scenarios evaluated. This pipeline's availability is based on the future alignment of SCWA's new aqueduct. It should be noted that scenario A + G is dependent upon expansion of the Petaluma Country Club from a nine hole to an eighteen hole golf course facility. The scenario also relies on the country club's ownership of its associated recycled water pump station and pipeline. If model area G is added to the tertiary recycled water system at a later date, customers in model area K should be removed from the secondary effluent system to balance recycled water demand with supply.

If additional potable offset is required by the City beyond that accomplished by scenario A, potable offset by recycled water should be further implemented. The cost of obtaining new potable water supply is estimated at approximately $2,155/acre-ft or $6,611/MG. This cost exceeds that of all recycled water scenarios evaluated. Potable water offset should be accomplished by adding potable customers in model area G through use of the existing 16-inch waterline, if available, and/or customers in model area C. Secondary effluent customers in model areas K and I would be removed from the secondary system to obtain the additional recycled water supply required. Since it is unknown at this time if additional potable water offset will be required at a future date, it is recommended to construct all facilities in the tertiary recycled water system for future expansion or to the size required to serve scenario A + C, A + G, or A + C + G. These scenarios represent the least cost present worth scenarios that provide additional potable offset. Table VII-2 outlines the tertiary facility requirements for these facilities.

FIGURE VII – 1
SCENARIO PRESENT WORTH ANALYSIS METHODOLOGY

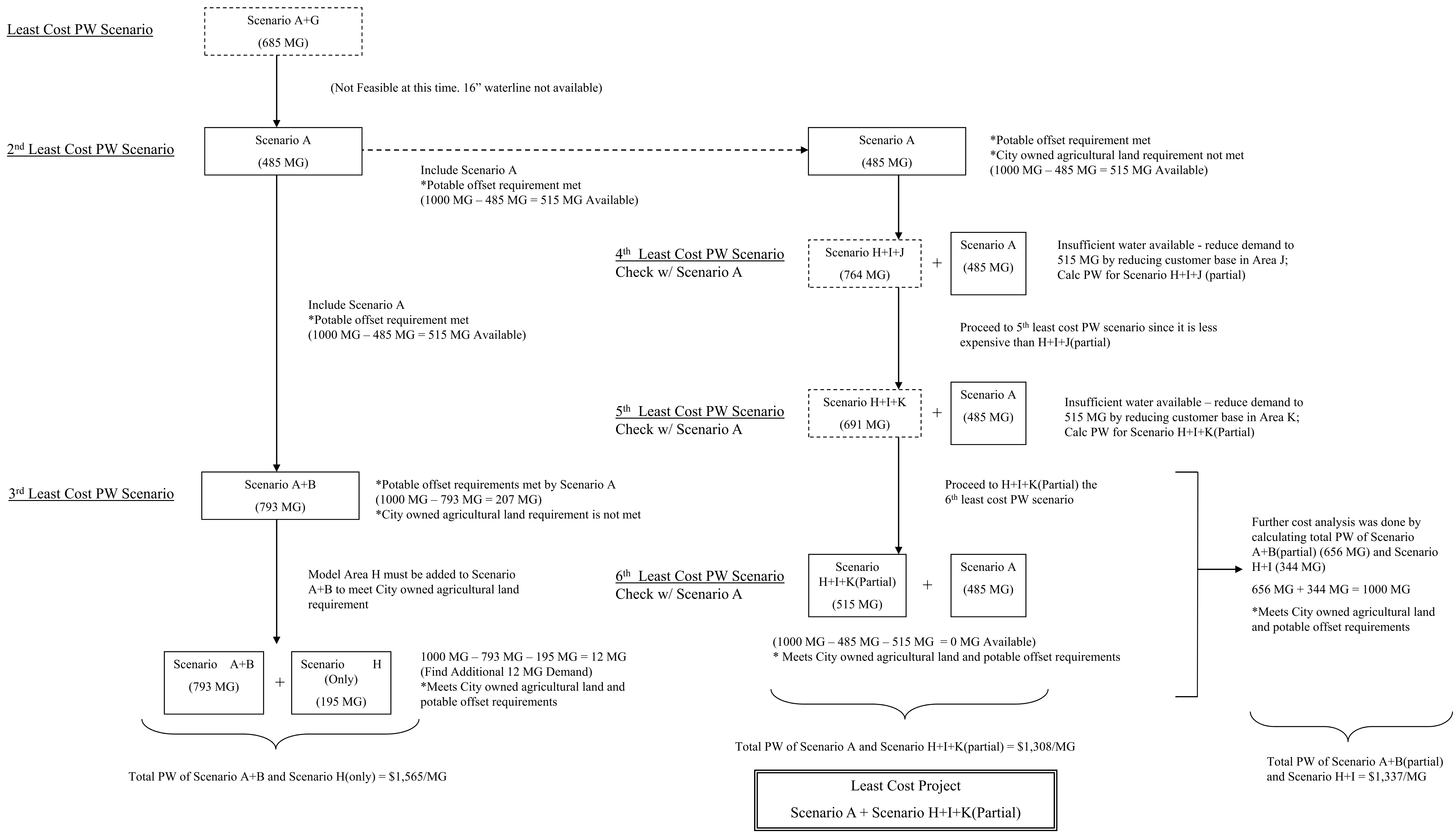

Table VII-2
Potable Water Offset Scenario Requirements

Scenario	Total Irrigation Season Demand (MG)	Maximum Day Demand (mgd)	Available Potable Offset (MG)	Reservoir		Main Tertiary Pump Station	
				Size (MG)	Elevation (ft)	Flow (mgd)	TDH (ft)
A	485	5.2	204	0.9	250	5.2	290
A + C	618	6.6	274	1.71	272	6.6	350
A + G	552	5.7	238	0.9	265	5.7	300
A + C + G	685	7.1	307	1.71	280	7.1	350

The tertiary facilities, including the main tertiary pump station, at the WRF are currently being designed to handle a maximum day demand of 5.2 mgd, as required by scenario A. In addition, all tertiary facilities are being designed for expansion to 8 mgd at a later date. Based on information contained in Table VII-2, it is recommended to design the in-system tertiary reservoir at elevation 280 and the main tertiary pump station at the WRF for 5.2 mgd at a total dynamic head (TDH) of 350 feet and expandable to a total capacity of 7.1 mgd at 350 feet TDH. The initial pumping facilities at the main tertiary pump station may be designed for 5.2 mgd at a total dynamic head as low as 320 feet, as long as sufficient motor horsepower is provided and additional pump stage(s) can be added, at a later date, to accomplish 7.1 mgd at 350 feet TDH. Model runs have been conducted for both 5.2 mgd at 320 feet and 350 feet TDH. Input and output data for these modified versions of scenario A are provided in Appendix B—Model Run Input/Output Data. All design requirements outlined in Section IV are met by scenario A (modified) with the following exception. When filling the reservoir with no system demands, the pressure at the main tertiary pump station at the WRF will exceed 150 psi. It is recommended to design the tertiary recycled water pipeline between the WRF and the Ely Road/Browns Lane intersection to a pressure class of 250 psi and to implement pressure relief set at 150 psi at the pump station to protect piping downstream of the Ely Road/Browns Lane intersection. Implementation of the items outlined above will provide the flexibility required to implement scenarios A + C, A + G, or A + C + G at a later date. Since scenarios A + C and A + C + G require a 1.71 MG reservoir, it is recommended to construct a 1.71 MG reservoir initially or to construct a 0.9 MG reservoir initially and allow space at the site for construction of a second reservoir at a later date.

The reservoir in the secondary effluent recycled water system should be sized for the maximum requirements of scenario H + I and scenario H + I + K. Therefore, it should be sized for 0.56 MG and located at elevation 360. A model run for scenario H + I + K (partial) was conducted and input and output data are included in Appendix B—Model Run Input/Output Data. All design requirements outlined in Section IV will be met by scenario H + I + K (partial) except customer #89 will receive pressure less than 50 psi, but greater than 40 psi, under maximum day and average day demands. Prior to implementation of scenario H + I + K (partial), it is recommended to consult this customer to determine if a pressure of 40 psi at their irrigation hydrant is acceptable. If not, it is recommended to not include them in the recycled water system.

Table VII-3 outlines the parameters for the recommended recycled water system, which consists of serving customers identified in tertiary system scenario A, as modified for possible future potable offset, and secondary effluent system scenario H + I + K (partial).

Table VII-3
Recommended Project

Item	Tertiary Effluent System	Secondary Effluent System	Total (Both Systems)
Irrigation Season Demand (MG/year)	485	515	1,000
Maximum Day Demand (mgd)	5.2	5.2	N/A
Total Irrigated Acres (acres)	635	634	1,269
Potable Offset (MG/year)	204	0	204
City-Owned Agricultural Land (acres)	30	205	235
Tertiary System			
Pump Station	1		
Location	WRF		
Size	5.2 mgd @ 350' TDH [B]		
Reservoir	1		
Location	Northeast on E. Washington		
Size	1.71 MG [A]		
Elevation	280		
Secondary Effluent System			
Pump Stations		2	
Main Pump Station		Yes	
Booster Pump Station No. 1		Yes	
Booster Pump Station No. 2		No	
Reservoir			
Location		County	
Size		0.56 MG	
Elevation		360	

[A] A 0.9 MG reservoir may be constructed initially and a second reservoir added at the same site at a later date.

[B] Pump station may be designed for 5.2 mgd at 320 feet TDH initially, but sufficient horsepower and the addition of required stages must be provided for possible future requirement of 350 feet TDH.

The recommended tertiary and secondary recycled water systems are shown in Figures VII-2 and VII-3, respectively. Costs for the recommended tertiary and secondary effluent systems are provided in Tables VII-4 and VII-5, respectively. Costs include capital costs in Years 2007 and 2047, as well as annual costs associated with the system.

Rev.	Date	By	Description

Designed VG
Drawn MJF
Checked DRH
Job No. 5311

Submitted: Date

Approved:

REGISTERED PROFESSIONAL ENGINEER GARY S. DODSON NO. 16252 EXP. 6/30/05 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER DANA R. HUNT NO. 53326 EXP. 6/30/03 CIVIL STATE OF CALIFORNIA

DODSON INNOVATIVE DESIGN FOR WATER

File Info. 5311-VII-2 MJF 1/26/04

BAR IS ONE INCH AT FULL SCALE
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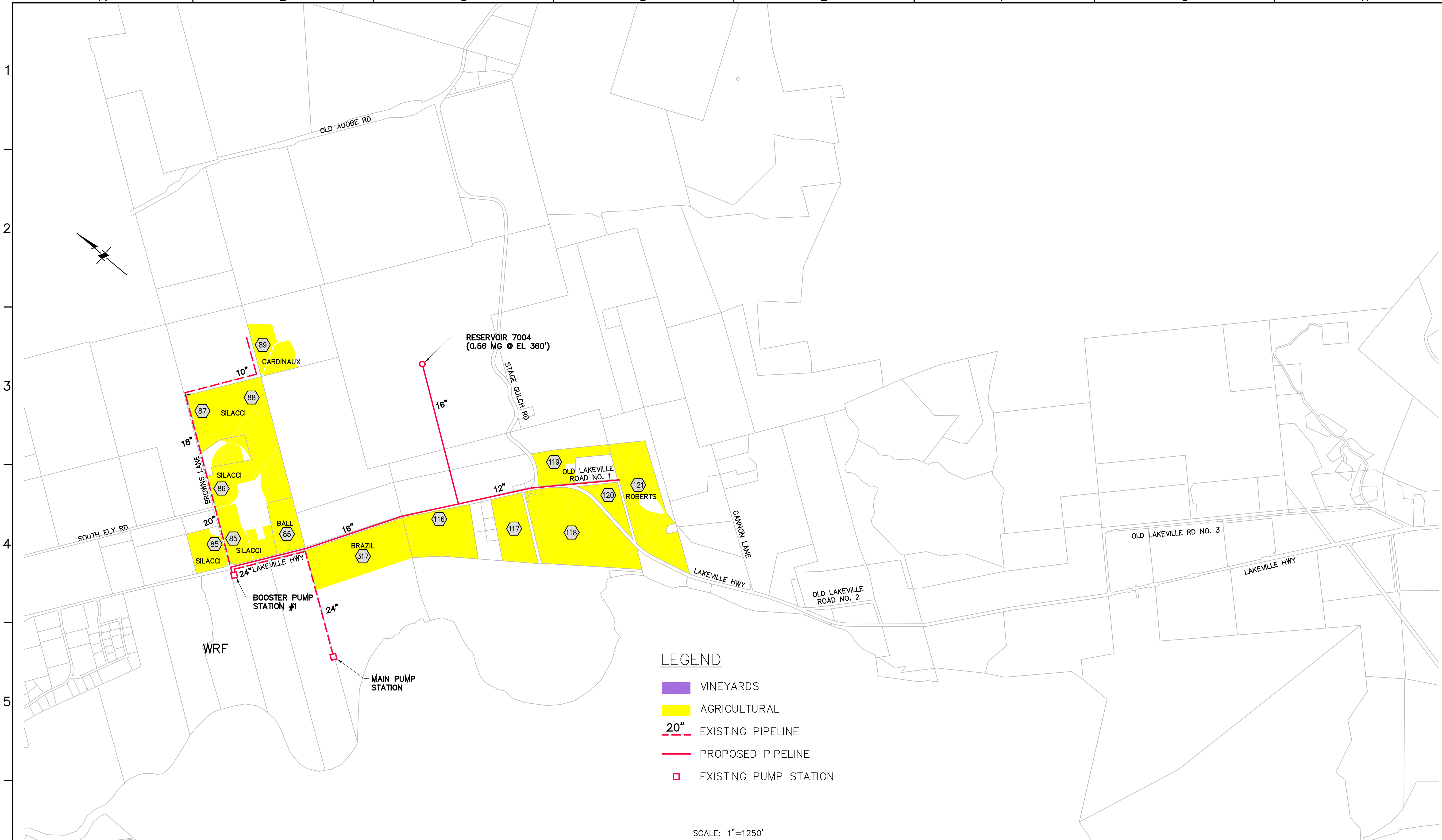
CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

SCENARIO A
RECOMMENDED TERTIARY WATER SYSTEM

Figure No. VII-2

Sheet No. of



Rev.	Date	By	Description

Designed VG
Drawn MJF
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REGISTERED PROFESSIONAL ENGINEER GARY S. DODSON NO. 16252 EXP. 6/30/05 CIVIL STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER DANA R. HUNT NO. 53326 EXP. 6/30/03 CIVIL STATE OF CALIFORNIA

DODSON INNOVATIVE DESIGN FOR WATER

File Info. 5311-VII-3 MJF 3/2/04

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CITY OF PETALUMA

RECYCLED WATER MASTER PLAN

SCENARIO H+I+K (PARTIAL)
RECOMMENDED SECONDARY WATER SYSTEM

Figure No. VII-3

Sheet No. of

Table VII - 4
RECOMMENDED TERTIARY SYSTEM COSTS
Scenario A[7]

Cost	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]	Ten Year Maintainence ($/Year)[5]
Capital Costs				
Tertiary Facilities - Initial	0			
Tertiary Facilities - Add .8 mgd[6]	1,280,000			
Tertiary Facilities - Additional[6]	1,480,000			
Tertiary Facilities - Upgrade		5,682,000		
Tertiary Facilities - Add .8		698,000		
Tertiary Facilities - Additional		809,000		
Reservoir	3,450,000			
New Pipes	2,540,000			
New Valves	82,000			
New Hydrants	27,000			
Hydrants -all (Upgrade)		46,000		
Irrigation - Initial	78,000			
Irrigation - Upgrade		78,000		
Land[4]	100,000			
O&M Costs				
Tertiary Facilities (4 mgd)			272,000	
Tertiary Facilities - Additional			78,000	
Pump Station Power			216,000	
Reservoirs				300,000
Pipelines - New			42,000	
Pipelines - Old			0	
Valves			5,000	
Hydrants			3,000	
Irrigation System			10,000	
Monitoring			16,000	
Program Administration[1]			38,000	
Income				
Reduction of Potable Income			25,000	
Recycled Water Income:				
Standard Rate Customer			-274,000	
Special Rate Customers			-68,000	
Well Customers			-47,000	
Vineyard Customers			-40,000	
Agricultural Customers[3]			7,000	
Rental Land Income			-3,000	
TOTAL	**$9,037,000**	**$7,313,000**	**$280,000 per year**	**$300,000 every 10th year**

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary). Half of total cost has been applied to each system.

[2] All Costs are in Year 2007 Dollars

[3] Agricultural payments would increase from $7,000 to $21,000 if current payment rate was used

[4] Land cost is for tertiary reservoir site

[5] Reservoirs require a $300,000 per year maintainence once every ten years

[6] Additional costs of $1,280,000 and $1,480,000 for tertiary facilities may not be required per Corollo Engineers

[7] Includes increased cost due to recommendation to size facilities for addition of future potable offset customers.

Table VII - 5
RECOMMENDED SECONDARY EFFLUENT SYSTEM COSTS
Scenario H+I+K(Partial)

Cost	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]
Capital Costs			
Pump Station Initial - Main	525,000		
Pump Station Initial - BPS#1	688,000		
Pump Station Initial - BPS#2	0		
Pump Station Upgrade - Main		525,000	
Pump Station Upgrade - BPS#1		688,000	
Pump Station Upgrade - BPS#2		0	
Reservoir	1,400,000		
New Pipes	4,325,000		
New Valves	162,000		
New Hydrants	85,000		
Hydrants (Upgrade)		121,000	
Irrigation - Initial	533,000		
Irrigation - Upgrade		532,000	
Land[4]	4,200,000		
O&M Costs			
Pump Stations			72,000
Pump Station Power			205,000
Reservoirs			5,000
Pipelines - New			17,000
Pipelines - Old			21,000
Valves			3,000
Hydrants			7,000
Irrigation System			72,000
Monitoring			56,000
Program Administration[1]			37,000
Income			
Recycled Water Income[3]			63,000
Rental Land Income			-20,000
TOTAL	**$11,918,000**	**$1,866,000**	**$538,000 per year**

[1] Program Administration is estimated at $75,000/year for total recycled water program (Tertiary + Secondary). Half of total cost has been applied to each system.

[2] All Costs are in Year 2007 Dollars

[3] Agricultural payments would increase from $63,000 to $192,000 if current payment rate was used

[4] Land cost is for secondary effluent reservoir site and purchase of City owned agricultural land. City may elect to enter into a long term (40 year minimum) lease rather than purchasing land for City-owned agricultural land.

RECYCLED WATER PROJECT IMPLEMENTATION

Once tertiary water is available in Year 2007, customers in model areas A and H should be added and customers in model area J removed to achieve a total irrigation season demand of 790 MG. Although customers in model area J were recommended to be removed from the secondary effluent recycled water system, it should be noted that customers #90, #92, and #93 can be served without Booster Pump Station No. 2 with some minor piping modifications to the system. Not all customers in model areas A, H, and I can be served in Year 2007, since water demand from these three model areas exceeds the available recycled water supply of 790 MG. As flow into the WRF increases and additional recycled water supply becomes available, the remainder of customers in these areas can be added. Once recycled water production exceeds 829 MG, customers in model area K should be phased into the program unless additional potable offset is required. In that case, customers in area G, if possible, and/or customers in area C should be added. Customers must be added to the recycled water program so that customer demand matches recycled water supply. Since not all customers in model area K can be added, it is recommended to add customers closest to the WRF, namely, users #317, #119, #120, and #121.

Prior to construction of any facilities for the recommended projects outlined in this master plan, the City should contact all potential users recommended for participation in the recycled water program to determine their interest in recycled water and to verify their demands. The systems identified for implementation include sufficient flexibility to make adjustments as required. Land in model area H was identified as potential city-owned agricultural land. It is not essential that these exact parcels be used for this purpose, but only that approximately 205 acres of land within the vicinity of the WRF be purchased for this purpose. Prior to the purchase of any land for city-owned agricultural land, the land should be analyzed to ensure it is suitable for irrigation. If changes are made to the customer base identified, it is recommended that a model run be performed prior to design and/or construction of the system's associated infrastructure.

Prior to production of tertiary recycled water and distribution to customers, the City of Petaluma must prepare a Title 22 Engineering Report to the California Department of Health Services. The guidelines for preparation of this report are included in Appendix L—California Department of Health Services Title 22 Engineering Report.

The recommended recycled water program outlined herein requires numerous facilities that must be planned, designed, and constructed prior to startup of the WRF in Year 2007. A list of projects include:

<u>Tertiary Facilities</u>

$ WRF with tertiary facility capacity of 5.2 mgd (minimum). (Currently under design.)

$ Main tertiary pump station, rated for 5.2 mgd @ 320 to 350 feet TDH, expandable to 7.1 mgd @ 350 TDH. (Currently under design.)

$ Phase 1 Recycled Water Pipeline conversion from existing secondary effluent system to tertiary effluent system.

$ In-system 1.71 MG welded steel tank located at elevation 280, northeast of East Washington Street beyond Adobe Road. (The City may elect to construct a 0.9 MG reservoir and allow space at the site for additional reservoir capacity at a later date.)

$ New pipeline system, as shown in Figure VII-2.

$ Irrigation system on 30 acres of city-owned agricultural land.

<u>Secondary Effluent Facilities</u>

$ In-system 0.56 MG open reservoir, located at invert elevation 360 within the County, northeast of Lakeville Highway and southeast of Browns Lane.

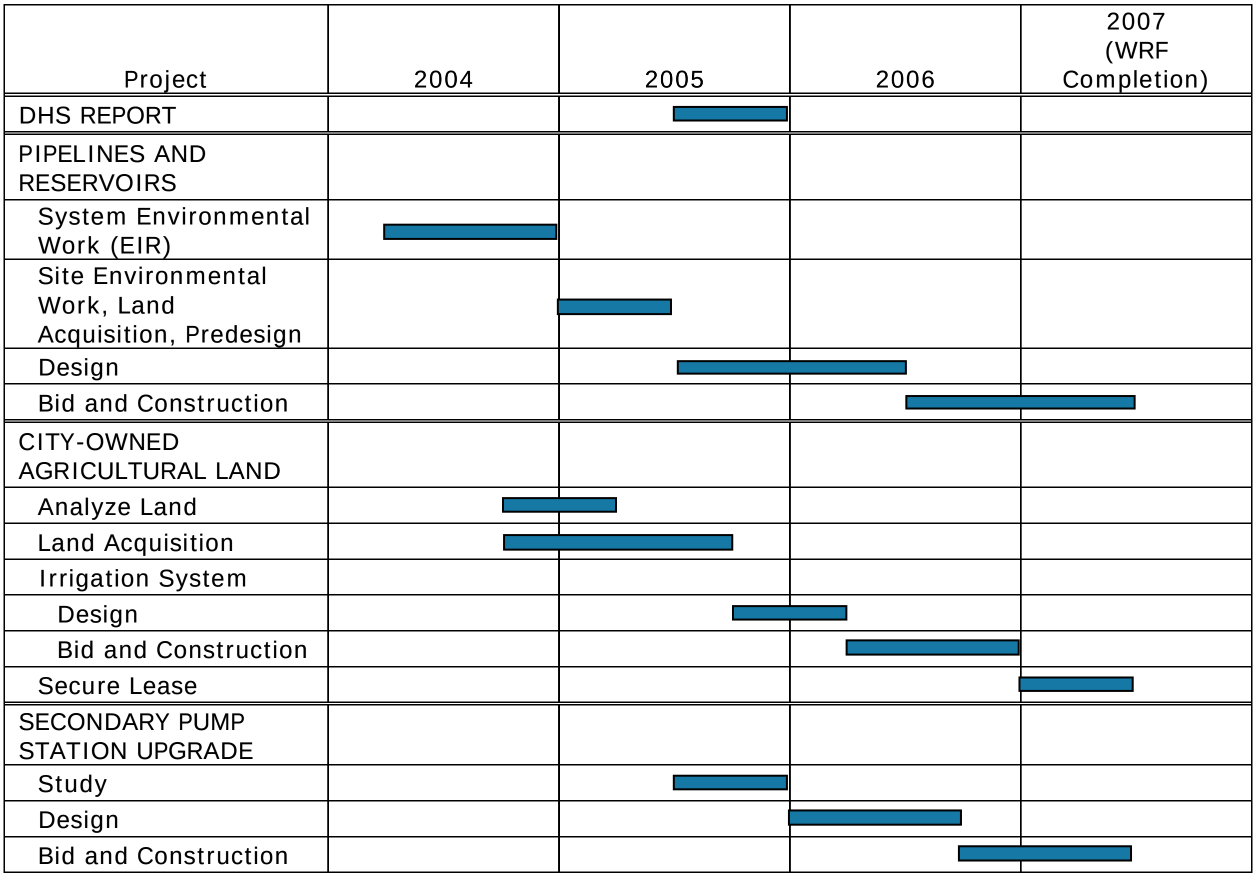
$ Main pump station and Booster pump station No. 1 upgrades.

$ Purchase or obtain long term (40 years minimum) lease for 205 irrigatable acres (minimum) of city-owned agricultural land and install irrigation system.

$ Pipeline system, as shown in Figure VII-3. Infrastructure to serve model area K customers may be deferred.

$ Figure VII-4 combines the items listed above into three projects, and outlines a recommended project schedule for their implementation.

Figure VII-4
Project Schedule



APPENDIX A

BRAINSTORMING/USER GROUP MEETING AGENDA AND MINUTES

APPENDIX A

BRAINSTORMING/USER GROUP MEETING AGENDA AND MINUTES

During the course of preparing the City of Petaluma's Recycled Water Master Plan, four (4) brainstorming/user group meetings were held at various stages of the project to gather City input. Participants of these meetings are listed below and include individuals from Dodson Engineers, City of Petaluma, and U.S. Filter.

Name	Agency/Title
Michael Ban	City of Petaluma/Director, Department of Water Resources and Conservation
Margaret Orr	City of Petaluma/Engineering Manager, Department of Water Resources and Conservation
Dean Eckerson	City of Petaluma/Engineering Manager, Department of Water Resources and Conservation
Pamela Tuft	City of Petaluma/Director of General Plan Administration
Steve Simmons	City of Petaluma/Utility Manager, Department of Water Resources and Conservation
Chris McAuliffe	U.S. Filter/WWTP Manager
Gary Dodson	Dodson Engineers/Technical Advisor
Dana Hunt	Dodson Engineers/Project Manager
Victor Gonzales	Dodson Engineers/Staff Engineer
Michael Albert	Dodson Engineers/Staff Engineer

The agenda and minutes from the four (4) brainstorming/user group meetings are attached.

Brainstorming/User Group Meeting	Title/Subject
I	Identify Potential Recycled Water Users and Demands
II	Develop Assumptions and Evaluation Criteria
III	Alternative Development
IV	Alternative Screening

BRAINSTORMING/USER GROUP MEETING I

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

BRAINSTORMING/USER GROUP MEETING I
"IDENTITY POTENTIAL RECYCLED WATER USERS AND DEMANDS"
JUNE 12, 2003
9:00 a.m. - NOON

AGENDA

I. IDENTITY POTENTIAL RECYCLED WATER USERS AND DEMANDS

A. Potential "Title 22 Unrestricted Use" Users
   1. Urban Users (includes current agricultural users: Matteri, Adobe Creek (N), and Karren Vineyard due to location). Users are Ag user, golf course, vineyard, turf, and industrial. Includes Luthra due to location.
   2. Additional parks identified
   3. Industrial users
   4. New Recycling Facility

B. Potential "Secondary Effluent" Users (Agricultural and Vineyard)
   1. Current secondary effluent customers (except Matteri, Adobe Creek (N), and Karren Vineyard)
   2. Potential agricultural users
      a) Cloudy Bend Ranch (potential City owned)
      b) Kendall Jackson (for sale)
   3. Potential vineyard users/locations
      a) Bachman
      b) Buck
      c) Schmidt
      d) Sangiacomo
   4. Survey form

C. Potential City Owned Land(s)/Flexible Users
   1. Santa Rosa Study

D. Demands
   1. Use by customers type: agricultural, vineyard, turf, golf course, industrial
   2. Total irrigation use
   3. Average irrigation daily use (irrigation season)
   4. Maximum monthly demand

5. Maximum daily demand
6. Maximum hour demand

II. SITE VISITS

A. MRWPCA - May 23, 2003

B. City of Santa Rosa and Novato Sanitary District - June 25, 2003

III. NEXT MEETING: JULY 17, 2003-DEVELOP ASSUMPTIONS AND EVALUATION CRITERIA

A. Information Requested by July 1, 2003

1. Potable water vs. recycled water offset cost (cost to be used to determine value of recycled water vs. potable water)
2. Revenue to be received from recycled water (charges to users for recycled water for both secondary effluent and Title 22 unrestricted use).
3. Land cost (per acre) for pumping and/or storage facilities and Potential City Owned Lands (FYI, land cost for Kendall Jackson property is $15,000/acre)
4. Cost associated with administration of a recycled water program.

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN
BRAINSTORMING/USER GROUP MEETING I
JUNE 12, 2003

MINUTES

ATTENDEES

Mike Ban	City of Petaluma
Dean Eckerson	City of Petaluma
Margaret Orr	City of Petaluma
Steve Simmons	City of Petaluma
Chris McAuliffe	U.S. Filter
Dana Hunt	GSDA
Victor Gonzales	GSDA

ACTION ITEMS

Mike Ban, Steve Simmons, Dean Eckerson, Margaret Orr

- Research possible land for City owned land and/or potential agricultural customers off Ely Road between Frates Road and Karren Vineyard.
- Supply GSDA with a copy of Central Petaluma Specific Plan.
- Review and mark up tertiary and secondary effluent user lists, including adding/deleting customers and current water source.

Margaret Orr

- Lucchesi Park: Determine if the park has well and what is irrigated. Is the soccer field artificial? Provide actual irrigation acreage for recycled water use.
- Depot Site: Check use. Possible demand of water? Currently not included on recycled customer list.
- Determine the beneficial cost ($/mg) to offset potable water with tertiary water. (Cost of potable water, facilities, operations and maintenance, etc.)
- Contact potential users on Lakeville Highway to determine their possible use of secondary effluent or tertiary and their demands/irrigated acreage. (Use forms by GSDA).
- Talk to City planners to verify that Future Park #69 will be Holmburg Park.
- Talk to City planners about future uses of Pomeroy Corp. and current treatment plant.
- Contact Pomeroy Corp. (Use form provided by GSDA).

Chris McAuliffe

- Compile any associated costs to provide secondary effluent to current users including maintenance, monitoring cost, power, etc.

I. MEETING – AGENDA ITEMS:

A. Potential "Title 22 Unrestricted Use" Users.

1. Urban Users (includes current agricultural users: Matteri, Adobe Creek (N), and Karren Vineyard due to location). Users are agricultural users, golf courses, vineyards, turf, and industrial. Any other potential customers or City owned lands identified west of Browns Lane along Ely Road will receive tertiary water due to location, including Luthra.
2. Sonoma Marin Fairgrounds (#80) removed. Future use will not need water.
3. Petaluma Golf Course may double its demand. The course possibly would expand to 18 holes from 9 holes if water is available. The additional 9 holes will be added as a potential tertiary customer.
4. Kenilworth Junior High (#51) is being replaced by a new junior high. The land will be sold and will not require recycled water. The user will be removed.
5. Little League Ball Field (#55) is being sold with Kenilworth Junior High. It will not require water. The user will be removed.
6. Petaluma High (#74) has a large water well not currently in use. It could be a source of water in the future.
7. Dairy Farmers of America could produce 60,000 gallons per day of recycled water.
8. Lucchesi Park (#16) has a well and uses it. Its soccer field is artificial turf and therefore does not need water. The park's demands need to be examined closer to determine its accuracy.
9. Sonoma Mountain High (#108) will be removed, it has essentially no irrigation water use.
10. Rocky Memorial Dog Park will be removed. It is not irrigated and will not require recycled water.
11. The following Future Parks were identified:
    a. Future Park #67 identified as Magnolia Park.
    b. Future Park #68, 71, and 72 removed from potential users list.
    c. Future Park #69 identified as Holmburg Park.
    d. Future Park #70 identified as McNear Peninsula Park.
12. The following parks were added.
    a. Country Club Park (#104)
    b. Wickersham Park (#105)
    c. Walnut Park (#106)
    d. Anna Meadows Park (#112)
    e. Grant Park
13. The following parks were not included.
    a. Putman Plaza (#114), no significant water uses.
    b. Westridge Park, no significant water use and too far away.
    c. Westridge Open Space, no water uses.
    d. Penry Park, too small.
    e. Fairway Meadow Park (#116), mainly a creek, no irrigation.

f. Sunset Park (#113), too small.

14. Sonoma Mountain Townhouse (#33), has a single water system and the use of recycled water, is not feasible.
15. Industrial users:
    a. Whether or not Pomeroy Corp. and the existing treatment plant will use water is unsure. The City will look into future use/demands and provide data to GSDA. At this time the existing WWTP (#79) will be removed as a potential user.
16. New Recycling Facility:
    a. Corollo will start working on the new treatment facility again soon. GSDA is waiting on Corollo to provide plant demands for tertiary water use (returning and non-returning) to determine potential use and requirements for tertiary recycled water pump station.
17. Information was provided that 600 AF of current potable water demand was determined to be offset by recycled water in planning study. This will become a requirement for the Recycled Water Master Plan.
18. Additional data on current potable water use and acreages was been provided to GSDA for use in refining the information presented.

B. Potential “Secondary Effluent” Users (Agricultural and Vineyard).
1. Current secondary effluent customers (except Matteri, Adobe Creek (N), and Karren Vineyard) have been identified as potential secondary effluent customers.
2. Kendell Jackson property is for sale and will be removed from potential user list. The City is not interested in this land for "City owned land" since it is hilly, has a stream, and a red-legged frog issue.
3. The City provided a map to GSDA, which located potential lands along Lakeville Highway for potential customers. The City will determine who owns the parcels and contact the landowners to discuss interest and need for recycled water. City will provide acreage to GSDA for all lands that they wish to include. It is possible that tertiary water rather than secondary effluent would be provided to these customers. These potential lands include both agricultural land and vineyards.
4. The City is interested in obtaining "City owned land" east of Cloudy Bend Ranch just west of Lakeville Highway.
5. Property south of the Bachman property will not be pursued, including Schmidt and Sangiacomo.

C. Survey Form:
1. City will review survey form provided by GSDA and use it to contact potential agricultural and vineyard users.

D. Potential City Owned Land(s)/Flexible Users.
1. City needs to have flexibility in the water system. This flexibility could be achieved by having City owned land that could be used for fluxuating water use to match supply.

E. Site Visits:
   1. MRWPCA – May 23, 2003.
      a. MRWPCA does a good job marketing their water. The demand for the water was high and users were well educated on the water. The district only supplies water at 10 psi to users. Users need to repump the water for their needs. The water situation in Monterey is impacted by salt intrusion in water wells.
   2. City of Santa Rosa and Novato Sanitary District – June 25, 2003.

F. Next Meeting: July 17, 2003 – Develop Assumptions and Evaluation Criteria.
   1. Information requested by July 1, 2003.
      a. Potable Water vs. Recycled water offset cost (cost to be used to determine value of recycled water vs potable water).
      b. Revenue to be received from recycled water (charges to users for recycled water for both secondary effluent and Title 22 unrestricted use).
      c. Land cost (per acre) for pumping and/or storage facilities and potential City owned lands (FYI, land cost for Kendall Jackson property is $15,000/acre).
      d. Cost associated with administration of a recycled water program.

BRAINSTORMING/USER GROUP MEETING II

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

BRAINSTORMING/USER GROUP MEETING II
"DEVELOP ASSUMPTIONS AND EVALUATION CRITERIA"
JULY 17, 2003
9:00 a.m. - NOON

AGENDA

I. ASSUMPTIONS AND EVALUATION CRITERIA

A. DESIGN CRITERIA (to be used in model)
   1. Table Attached
      a. Hydrant delivery pressure
      b. Storage
      c. Pumping stations
      d. Pipelines
      e. Pipe material
      f. Valve type

B. COST CRITERIA (to be used for alternative evaluation. Present worth over 80 years).
   1. Table Attached
      a. Capital Costs
         1) Tertiary facilities
         2) Pump stations
         3) Reservoirs
         4) Pipelines
         5) Valves
         6) Hydrants
         7) Irrigation system
         8) City owned land
      b. O&M Costs
         1) Tertiary facilities
         2) Pump stations
         3) Power costs - pump stations
         4) Reservoirs
         5) Pipelines
         6) Valves
         7) Hydrants
         8) Irrigation system
         9) Monitoring/administration programs

c. Potable offset savings
d. Income
1) Loss income from potable water
2) Income from recycled water
3) City owned land rental income
2. Information Needed
a. Potable vs. well customers - markup table
b. Outstanding cost information for Cost Criteria Table

II. POTENTIAL RECYCLED WATER USERS AND DEMAND

A. STATUS (handout)

B. INFORMATION NEEDED
1. Potential agricultural and vineyard customers/acreage/water type
2. City owned land location/acreage
3. Urban Acreages
4. Industrial User Demands

III. RECYCLED WATER PROVIDER SURVEY FORMS

A. NOVATO SANITARY DISTRICT

B. CITY OF SANTA ROSA

C. MRWPCA (not applicable)

IV. NAPA SALT MARSH/REGIONAL RECYCLING

V. NEXT MEETING: THURSDAY, AUGUST 7, 2003 - ALTERNATIVE DEVELOPMENT

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN
BRAINSTORMING/USER GROUP MEETING II
July 17,2003

MINUTES

ATTENDEES

Mike Ban	City of Petaluma
Dean Eckerson	City of Petaluma
Margaret Orr	City of Petaluma
Steve Simmons	City of Petaluma
Pamela Tuft	City of Petaluma
Chris McAuliffe	U.S. Filter
Dana Hunt	GSDA
Victor Gonzales	GSDA

ACTION ITEMS

Mike Ban

< Come up with a value to use as an annual savings of offset for potable water with recycled water including the cost to purchase new potable water (water not included in current contracts with water supplies).

Margaret Orr

< Meet with Pamela Tuft to review map of users that GSDA prepared.

< Obtain information from Santa Rosa about basis for payment of $100/acre/year to agricultural customers.

I. MEETING – AGENDA ITEMS:

A. Assumptions and evaluation criteria.

1. Design Criteria (to be used in model)
    a. All criteria provided by GSDA were reviewed and accepted by the City.
    b. City would like for secondary effluent system storage be an open reservoir.
    c. A criteria that a minimum potable water offset of 600 acre-ft/year shall be provided by the tertiary system will be added.
    d. A criteria that a minimum of 20% of all irrigated lands shall be City owned lands will be added as a criteria.

B. Cost Criteria (to be used for alternative evaluation. Present worth over 80 years)

1. Capital Cost – All capital cost criteria provided by GSDA were reviewed and accepted by the City.
    a. It was agreed that land costs would be set at $20,000/acre. ($15,000/acre + contingency). Land costs are required to purchase City owned land and pump station and reservoirs sites. These costs will not be used in the Present Worth analysis since the land would have a salvage value and thus be considered an asset in such an analysis.
2. O&M Costs – All O&M cost criteria provided by GSDA were reviewed and accepted by the City. The only exception was the Monitoring Program/Administration of Program Cost. After discussion it was agreed that a value of $100/acre would be used to estimate the cost of monitoring for agricultural, vineyard, and City owned lands. No cost would be included for Urban Customers. A cost of administering the recycled water program was estimated by the City to be $75,000/year. This cost will not be used in the present worth analysis since it is not dependant upon the type of system or customer.
3. Potable offset savings – Mike Ban is going to look into this and provide GSDA with a value to use.
4. Income:
    a. Loss income from potable water - $1,000/acre-ft for standard customers rate will be used in Year 2007 $s. Special rate customers (golf courses) pay $74/acre-ft. This cost will be increased to 2007 dollars.
    b. Income from recycled water – Current potable customers with standard rates will pay 75% of potable water prices for tertiary water. Golf course will still pay $74/acre-ft because of lease agreements. Could change at later date with contract negotiations. Vineyard customers will pay 75% of potable rates for tertiary water and 50% of potable rates for secondary water. Ag users will get paid $200/acre for taking secondary effluent. Currently ag users are paid $660/acre but the City will step them down to $200/acre between now and 2007. Water will be supplied to users on City owned land for free.
    c. City owned land rental income – The City will charge $100/acre.

2. Information Needed.
    a. Potable vs. well customers – markup table.
    b. Outstanding cost information on Cost Criteria Table.

II. POTENTIAL RECYCLED WATER USERS AND DEMANDS

A. Information needed
   1. Provide potential agricultural, vineyard, and urban customers not already included in tables and maps. – City will not approach potential ag users on Lakeville Highway during this study.
   2. Acreages for Agricultural and Vineyard customers along Lakeville Highway and any added customers.
   3. Determine water type to be provided to each customer.
   4. Determine City owned land location/acreage. Need approximately 200 acres.
   5. Provide requested urban acreages
   6. Provide industrial user demands – Shamrock shall be added as an industrial user.

B. Update Information Provided.
   1. GSDA will incorporate all acreage information provided from City into tables.
   2. GSDA will add Lynch Park (future) as a 7-acre user.
   3. GSDA will show all cemeteries and Cinnabar Elementary as current private well customers.
   4. Users 110 and 39's location will be adjusted on map.
   5. Street names will be edited as requested on maps.

III. RECYCLED WATER PROVIDER SURVEY FORMS.

A. Survey forms were distributed. Novato survey form will be edited to show that all recycled water provided is secondary effluent.

IV. NAPA SALT MARSH/REGIONAL RECYCLING.

A. The project would have a high capital cost but not much use for the City. The project was determined to be unfeasible. It is not part of the current study.

V. NEXT MEETING: AUGUST 7, 2003 - ALTERNATIVE DEVELOPMENT.

BRAINSTORMING/USER GROUP MEETING III

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

BRAINSTORMING/USER GROUP MEETING III
"ALTERNATIVE DEVELOPMENT"
SEPTEMBER 17, 2003
9:00 a.m. - NOON

AGENDA

I. NEXT STEP - SCREEN ALTERNATIVES FOR BEST PROJECT (MODELING)

A. TO PROCEED, NEED TO FINALIZE…
   1. Identify Potential Recycled Water Users and Demands.
   2. Develop Assumptions and Evaluation Criteria.
   3. Alternative Development.

II. IDENTIFY POTENTIAL RECYCLED WATER USERS AND DEMANDS

A. Potential customers:
   1. Everybody included?
      a. Small users non-feasible?

B. City owned land. Recommend 200 acres (min).
   1. Secondary system.
      a. #317 = 74 acres.
      b. #116 = 55.1 acres.
      c. #117 = 38.3 acres.
      d. #118 = 111.9 aces.
   2. Tertiary system.
      a. #313 = 41.1 acres.
      b. #318 = 73.1 acres.

C. Tertiary vs. secondary effluent service.

D. Industrial users.
   1. Require water year round.
   2. Dependent upon water.

E. Petaluma golf course irrigation operation.

F. Potable users vs. well water users (urban). Identify.

G. Higher risk customers for connection.

III. DEVELOP ASSUMPTIONS AND EVALUATION CRITERIA

A. $/MG to use as benefit of providing potable offset.

B. Minimum amount of potable offset = 600 AF (196 MG)

C. Amount of total recycled water available (700 MG - 1000 MG)

D. Max amount tertiary recycled water available without tertiary expansion 700 MG.

IV. ALTERNATIVE DEVELOPMENT

A. Methodology.
   1. Tertiary system.
   2. Secondary effluent system.

B. Pipeline routings.
   1. Existing Zone IV pipeline use.
   2. Pipeline routings.
   3. Existing pipelines for use.
   4. Elimination of customers.

C. Modeling run/groupings.

D. Reservoir locations.

E. Pumping station locations.

V. ALTERNATIVE SCREENING

A. Information/issues in Agenda Items II, III, and IV must be finalized prior to proceeding with Task 6 - Alternative Screening.

VI. BRAINSTORMING/USER GROUP MEETING I V - ALTERNATIVE SCREENING, DECEMBER 4, 2003.

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

BRAINSTORMING/USER GROUP MEETING III
"ALTERNATIVE DEVELOPMENT"
SEPTEMBER 17, 2003
9:00 a.m. - NOON

MINUTES

ATTENDEES

Mike Ban	City of Petaluma
Dean Eckerson	City of Petaluma
Margaret Orr	City of Petaluma
Pamela Tuft	City of Petaluma
Steve Simmons	City of Petaluma
Chris McAuliffe	U.S. Filter
Dana Hunt	Dodson Engineers
Gary Dodson	Dodson Engineers
Mike Albert	Dodson Engineers

I. NEXT STEP - SCREEN ALTERNATIVES FOR BEST PROJECT (MODELING)

A. DODSON ENGINEERS will proceed with modeling of alternatives (Task 6 - Alternative Screening). This task is dependent upon final information on: 1) Identification of Potential Recycled Water Users and Demands, 2) Development of Assumptions and Evaluation Criteria, and 3) Development of Alternatives to be screened. All of these subjects were reviewed and revised at the meeting, as required, into final format for Task 6 - Alternative Screening to proceed.

II. IDENTIFY POTENTIAL RECYCLED WATER USERS AND DEMANDS

A. Potential customers.
   1. The following customers were deleted, added or changed:
      a. Deleted:
         1) Airport N (#318) and Airport-S (#313) (City Owned) will not be irrigated due to airport potential issues such as birds, soft ground and sprinkler piping in emergency landing area.
         2) Oxfoot Associates (#315 and #318). Adobe Road will not be crossed for delivery of tertiary water.
         3) Cinnabar Elementary (#39). Deleted since not in City limits, on well water, and difficult to serve.
         4) Miwok Park (#115). Combined into Miwok Valley Elementary (#65). Acreage for #65 revised to 6.9 acres per actual aerial information.

b. Additions:
   1) Greenway (future). 300-foot wide strip added at corner of Frates Road and Ely Road.
   2) Pumpkin Patch. 19 acres added as Ag User. To also be designated as Potential City Owed Land.
c. Changes:
   1) Open Space (by Adobe Creek) #22 was changed to 30 acres and will be designated as Ag User (City Owned Land).
   2) Treatment Plant Irr (#137) will be revised from 9 to 40 acres.
   3) Streetscape Users (#58, #82, and #83) will have use revised to 0 since they will not be included due to infeasibility. Their location and acreage data will remain for reference.
   4) McNear Peninsula Park (#70) will be designated as (Future) and a High Risk User.
   5) Existing Ag Users #95 (Hydrant 11) and #102 (Hydrant 17) will be reduced in acreage since certain areas are difficult and dangerous for City to serve and monitor. Chris to provide revised acreage. #95 reduced from 25 acres to 20 acres. #102 reduced from 138.7 acres to 68.7 acres.
   6) Existing Ag User #91 (Hydrant 7) will have use revised to 0 since currently not interested in irrigating.
   7) After meeting, Existing Ag User #88 (Hydrant 4) was reduced by 4 acres per Chris and Margaret, from 47 to 43 acres.
   8) After meeting, Existing Ag User #98 (Hydrant 13) was reduced by 5 aces per Chris and Margaret, from 42.7 to 37.7 acres.
   9) Magnolia Park-Future (#67) will be revised to 4 acres.
   10) KOA will not be included due to irrigation size and difficult layout.

B. City Owned Land. Recommend 200 acres (min). Revised per meeting to include:
   1. Secondary system.
      a. #116 = 55.1 acres.
      b. #117 = 38.3 acres.
      c. #118 = 111.9 aces.
   2. Tertiary system.
      a. #22 = 30 acres.
      b. #315 = 19 acres.

C. Tertiary vs. secondary effluent service.
   1. Users will be grouped based on current maps. Both a tertiary and a secondary effluent system will be analyzed.

D. Industrial users.
   1. Require water year round.
   2. Dependent upon reliable water delivery and quality concerns.

E. Petaluma Golf Course irrigation operation.

1. Model assumptions will not include cost of additional pump station. That cost will be borne by Golf Course as well as on-site storage and pumping. Modeling will assume constant 24-hour delivery.

F. Potable users vs. well water users (urban). Identify.

1. Information provided and table updated.

G. Higher risk customers for connection were identified. This will not be included in modeling, but will be discussed in phasing and recommendations for Master Plan.

III. DEVELOP ASSUMPTIONS AND EVALUATION CRITERIA

A. $/MG to use as benefit of providing potable offset.

1. $2,300/AF will be used in cost analysis as benefit for potable offset. This number will be increased to 2007 $s. Mike Ban to provide supporting information for Master Plan.

B. Minimum amount of potable offset = 600 AF (196 MG)

C. Amount of total recycled water available (700 MG - 1000 MG). Additional clarification needed from City and Carollo on WWTP ADWFs for various years, as well as associated water balance information.

D. Max amount tertiary recycled water available without tertiary expansion 700 MG.

E. Cost analysis will also reflect current payment of $210/acre ft to AG users = $611/acre in addition to desired payment of $200/acre.

F. The initial tertiary facilities at the WWTP will not be included within analysis since project is already committed to regardless of Master Planning outcome. All upgrades and O&M costs will be included.

IV. ALTERNATIVE DEVELOPMENT

A. Methodology.

1. Tertiary and secondary effluent users have been grouped into model areas for analysis.

B. Pipeline routings.

1. Existing Zone IV pipeline use.
   a. Pipeline will show extension to S. Ely Boulevard. Steve to provide additional drawings. This pipe will only be included in one model run since it is only "potentially available in the future".
2. Pipeline routings.
   a. Pipeline routings were revised to reflect better locations.
3. Existing pipelines for use.
   a. Where existing unused pipelines of the correct size and location exist, they will be shown as existing.

C. Modeling run/groupings.

1. Model Run Groupings (based on groupings presented at meeting):
   a. I+L+M, A+C+D, A+E, and A+G were removed.
   b. Group E and Group F will be combined to form a single group since demand within Group E is very small.

c. Model areas with < 50 acres and < 1 MGD max day demand will not be modeled. This includes model areas D and G. These areas are deemed not cost effective due to the infrastructure required to serve small demands.

d. Nine combinations of model runs still exist with the potential for another if Grouping I will be required to be modeled alone. The scope only provides for 4 model runs so minimizing the number of model areas and model runs was desirable.

e. Model grouping numbers will be revised from (E+F) to E, G to F, H to G, I to H, J to I, K to J, L to K, and M to L. This and all other revisions are reflected in attached data.

D. Reservoir locations.

1. Reservoir within tertiary system will be located north on E. Washington.
2. Reservoirs within the Ag system will be provided in each zone on land of appropriate elevation.

E. Pumping station locations.

1. New pump stations will be located as required to meet design criteria for new system.

V. ALTERNATIVE SCREENING

A. Alternative screening, as identified herein, will proceed.

VI. BRAINSTORMING/USER GROUP MEETING I V - ALTERNATIVE SCREENING, DECEMBER 4, 2003.

A. The project timeline will be re-evaluated at December 4th meeting to determine required City time to confirm Master Plan direction prior to writing the Draft Master Plan.

MODEL SCENARIOS

I. TERTIARY SYSTEM

A. Model Areas:
A = 485 MG (456 MG)
B = 308 MG (0 MG)
C = 133 MG (126 MG)
D = 36 MG (18 MG)
E = 174 MG (126 MG)
F = 10 MG (10 MG)
G = 67 MG (33 MG)

B. Model Runs:
A = 485 MG (456 MG)
A + B = 793 MG (456 MG)
A + G = 552 MG (489 MG)
A + C = 618 MG (582 MG)
A + E + G = 726 MG (615 MG)

Note: Tertiary System (min) = 196 MG (potable offset). Accomplished by A.

II. SECONDARY EFFLUENT SYSTEM

A. Model Area:
H = 195 MG (City owned land = 205 acres)
I = 127 MG
J = 442 MG
K = 347 MG
L = 274 MG

B. Model Runs:
H + I = 322 MG
H + I +J = 764 MG
H + I + K = 669 MG
H + I + K+ L = 943 MG

Note: Tertiary system (min) = 196 MG (potable offset)

( ) = low risk users

BRAINSTORMING/USER GROUP MEETING IV

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

BRAINSTORMING/USER GROUP MEETING IV
"ALTERNATIVE SCREENING"
DECEMBER 4, 2003
9:00 a.m. - NOON

AGENDA

I. POTENTIAL RECYCLED WATER USERS AND DEMANDS

A. Table
   1. No changes since last meeting, except #89.

II. ASSUMPTIONS AND EVALUATION CRITERIA

A. Design Criteria Table
   1. No changes since last meeting.

B. Cost Criteria Table
   1. Cost changes to tertiary facilities (per Carollo). Add tertiary facilities above 4.0 mgd facilities in 0.8 mgd modules. Must treat pond water above ADWF plant values.

III. ALTERNATIVE SCREENING

A. Modeling/Model Scenarios
   1. Tertiary scenarios
      a. A
      b. A + B
      c. A + C
      d. A + G
      e. A + E + G
   2. Secondary scenarios
      a. H + I
      b. H + I + J
      c. H + I + K
      d. H + I + K + L

B. Screening
   1. Water balance
      a. Startup: Total Recycled Water = 790 MG
      b. Buildout: Total Recycled Water = 1000 MG

YEAR	2007	BUILDOUT
Total MG Required	790	1000
Total MG Required (potable offset)	196 (600 acre-ft)	196 (600 acre-ft)
Total MG Required (City owned)	133 (20% of land)	190 (20% of land)
Max Tertiary (MG)	657	810
Max Secondary (MG)	594	804

2. Cost Analysis of Scenarios
    a. Cost (80 year life cycle)
    b. Sensitivity
    c. Potable offset (600 acre-ft or 196 MG min)
    d. Operational flexibility (City owned land 133 (Year 2007) - 190 (Year buildout) Acres Min)

IV. NEXT STEP

A. Next meeting/additional work

B. Schedule

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

BRAINSTORMING/USER GROUP MEETING IV
"ALTERNATIVE SCREENING"
DECEMBER 4, 2003
9: 00 a.m. - NOON

MINUTES

ATTENDEES

Mike Ban	City of Petaluma
Dean Eckerson	City of Petaluma
Margaret Orr	City of Petaluma
Pamela Tuft	City of Petaluma
Steve Simmons	City of Petaluma
Chris McAuliffe	U.S. Filter
Dana Hunt	Dodson Engineers
Gary Dodson	Dodson Engineers
Mike Albert	Dodson Engineers

I. POTENTIAL RECYCLED WATER USERS AND DEMANDS

A. Table.
   1. Customer #89 was modeled in Area J rather than Area I since Booster Pump Station No. 2 is not needed due to current piping.
   2. Chris has requested that the customers in Area J be included in Model Run H + I just to see if any customers in Area J could be served without Booster Pump Station No. 2. The findings will be conveyed to the City.

II. ASSUMPTIONS AND EVALUATION CRITERIA

A. Design Criteria Table.
   1. No changes since last meeting.

B. Cost Criteria Table.
   1. Cost changes to tertiary facilities were updated prior to the evaluation work per Carollo. Tertiary facilities above 4.0 mgd facilities were added in 0.8 mgd modules. Pond water must be treated above ADWF in to plant.
   2. Loss of income on current potable water sales for potable customers above the required potable offset requirement of 600 acre-ft or 196 MG has been included in cost evaluation for the various recycled water scenarios.
   3. The cost to obtain new potable water has been determined by the City to be approximately $2,300/AF or $7,944/MG. This cost shall be used for cost comparison when determining if additional recycled water for potable offset is cost effective. Based on all scenarios evaluated, it is less costly to offset potable water with recycled water than to pursue obtaining additional potable water at a cost of $2,300/AF or $7,944/MG. This cost has not been included in the development of costs for comparing the various recycled water scenarios, but it

shall be noted that if additional potable water is required, then recycled water should be used to offset potable water.

III. ALTERNATIVE SCREENING

A. Modeling/Model Scenarios.

1. Tertiary scenarios.

a. Model Run A:
   1) Total demand = 485 MG/YR
   2) Max day demand = 5.2 mgd
   3) Total acres = 635 Acres
   4) Meets potable offset Criteria. Potable offset = 204 MG
   5) Does not meet City Owned Land Requirement.
   6) Pump station requirements
      a) Number: 1
      b) Location: Tertiary Plant
      c) Size: 5.2 mgd @ 290' TDH
   7) Reservoir requirements:
      a) Number: 1
      b) Location: North on East Washington
      c) Size: 0.90 MG
      d) Elevation: 250 Feet
   8) Issues:
      a) No issues exist with this model run

b. Model Run A + B:
   1) Total demand = 793 MG/YR
   2) Max day demand = 8.6 mgd
   3) Total acres = 977 Acres
   4) Meets potable offset criteria. Potable offset = 204 MG
   5) Does not meet City Owned Land Requirement.
   6) Pump station requirements:
      a) Number: 1
      b) Location: Tertiary Plant
      c) Size: 8.6 mgd @ 320' TDH
   7) Reservoir requirements:
      a) Number: 1
      b) Location: North on East Washington
      c) Size: 0.94 MG
      d) Elevation: 260 Feet
   8) Issues:
      a) Pressure at Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand (Design Pipe for 250 psi).

c. Model Run A + C:
   1) Total demand=618 MG/YR
   2) Max day demand=6.6 mgd
   3) Total acres=777 Acres
   4) Meets potable offset criteria. Potable offset = 274 MG
   5) Does not meet City Owned Land Requirement.
   6) Pump Station Requirements:
      a) Number: 1
      b) Location: Tertiary Plant

c) Size: 6.6 mgd @ 350' TDH
7) Reservoir Requirements:
a) Number: 1
b) Location: North on East Washington
c) Size: 1.71 MG
d) Elevation: 272 Feet
8) Issues:
a) Pressure at Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand (Design Pipe for 250 psi).

d. Model Run A + G:
1) Total demand = 552 MG/YR
2) Max day demand = 5.7 mgd
3) Total acres = 721 Acres
4) Meets potable offset Criteria. Potable offset = 238 MG
5) Does not meet City Owned Land Requirement.
6) Pump station requirements:
a) Number: 2
b) Location A: Tertiary Plant
c) Size A: 5.7 mgd @ 300' TDH
d) Location B: Petaluma Country Club (Bottom of Hill)
e) Size B: 0.46 mgd @ 150' TDH
7) Reservoir requirements:
a) Number: 1
b) Location: North on East Washington
c) Size: 0.90 MG
d) Elevation: 265 Feet
8) Issues:
a) Pressure at Petaluma Country Club Pump Station exceeds 150 psi for Max day and 200 psi for Avg day.
b) Discharge pressure at Petaluma Country Club < 50 psi.

e. Model Run A + E + G:
1) Total demand = 726 MG/YR
2) Max day demand = 7.5 mgd
3) Total acres = 886 Acres
4) Meets potable offset criteria. Potable offset = 372 MG.
5) Does not meet City Owned Land Requirement.
6) Pump station requirements:
a) Number: 2
b) Location A: Tertiary Plant
c) Size A: 7.5 mgd @ 330' TDH
d) Location B: Petaluma Country Club (Bottom of Hill)
e) Size B: 0.46 mgd @ 190' TDH
7) Reservoir requirements:
a) Number: 1
b) Location: North on East Washington
c) Size: 1.71 MG
d) Elevation: 275 Feet
8) Issues:
a) Max day Customers #67, 41, 36B, 81, 66, 75 < 50 psi, but > 40 psi.
b) Avg day Customers #66, 81 < 50 psi, but > 40 psi.
c) Pressure at Petaluma Country Club Pump Station exceeds 150 psi

at Avg day and Max day demands.

d) Discharge Pressure at Petaluma Country Club < 50 psi.

e) Pressure at Tertiary Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand.

f. Model Run A+C+G (using existing 16" pipeline).
   1) Total demand = 685
   2) Max day demand = 7.1 mgd
   3) Total acres = 863 Acres
   4) Meets potable offset criteria. Potable offset = 307
   5) Does not meet City Owned Land Requirement.
   6) Pump station requirements:
      a) Number: 2
      b) Location A: Tertiary Plant
      c) Size A: 7.1 mgd @ 350' TDH
      d) Location B: Petaluma Country Club (Bottom of Hill)
      e) Size B: 0.46 mgd @ 150'
   7) Reservoir requirements:
      a) Number: 1
      b) Location North on East Washington
      c) Size: 1.71 MG
      d) Elevation: 280 Feet
   8) Issues:
      a) Pressure at Petaluma Country Club Pump Station exceeds 150 psi at Avg day and max day demands.
      b) Discharge Pressure at Petaluma Country Club <50 psi.
      c) Pressure at Tertiary Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand.
      d) Pressure at Tertiary Pump Station exceeds 150 psi on max and Avg day. Pressure at Browns Lane and Ely Road is below 150 psi.

2. Secondary scenarios.

a. Model Run H + I:
   1) Total demand = 344 MG/YR
   2) Max day demand = 3.6 mgd
   3) Total acres = 361 Acres
   4) Does not meet potable offset criteria.
   5) Meets City Owned Land Requirement.
   6) Pump station required:
      a) Main P.S.
      b) Booster P.S. #1
      c) No additional pump stations
   7) Reservoir requirements:
      a) Number: 1
      b) Location: County
      c) Size: 0.56 MG
      d) Elevation: 350 Feet
   8) Issues:
      a) Pressure at Customer #89 ≅ 40 psi (max day and Avg day)

b. Model Run H + I + J:
   1) Total demand = 764 MG/YR

2) Max day demand = 7.7 mgd
3) Total acres = 880 Acres
4) Does not meet potable offset criteria.
5) Meets City Owned Land Requirement.
6) Pump station requirements:
   a) Main P.S.
   b) Booster P.S. #1
   c) Booster P.S. #2
   d) No additional pump stations
7) Reservoir requirements:
   a) Number: 2
   b) Location: County
   c) Size A: 0.32 MG
   d) Elevation A: 410 Feet
   e) Size B: 0.18 MG
   f) Elevation B: 478 Feet (highest land available)
8) Issues:
   a) Pressure at Customer #89 ≅ 40 psi Avg day.
   b) Low pressure at nodes #96, 97, 102, and 30 max day (≅ 40 psi) due to high elevation along ridge. Reservoir serving this area is at maximum elevation.

c. Model Run H + I + K:
1) Total demand = 691 MG/YR
2) Max day demand = 7.4 mgd
3) Total acres = 799 Acres
4) Does not meet potable offset criteria.
5) Meets City Owned Land Requirement.
6) Pump Stations Required:
   a) Main P.S.
   b) Booster P.S. #1
   c) No additional pump stations
7) Reservoir requirements:
   a) Number: 1
   b) Location: County
   c) Size: 0.26 MG
   d) Elevation: 360 Feet
8) Issues:
   a) Pressure at Customer #89 ≅ 40 psi (max day and Avg day)

d. Model Run H + I + K + L:
1) Total demand = 965 MG/YR
2) Max day demand = 10.4 mgd
3) Total acres = 1158 Acres
4) Does not meet potable offset criteria.
5) Meets City Owned Land Requirement.
6) Pump station requirements:
   a) Main P.S.*
   b) Booster P.S. #1*
   c) No additional pump stations.
      Additional pump must be added at pump station.
7) Reservoir requirements:
   a) Number: 1
   b) Location: County

c) Size: 1.27 MG
d) Elevation: 360 Feet

8) Issues:
a) Not sufficient water available for this alternative.
b) Pressure at Customer #89 ≅ 40 psi (Avg day)

B. Screening.
1. Water balance.
a. Startup (2007): Total Recycled Water = 790 MG
b. Buildout: Total Recycled Water = 1000 MG

YEAR	2007	BUILDOUT
Total MG Required	790	1000
Total MG Required (potable offset)	196 (600 acre-ft)	196 (600 acre-ft)
Total MG Required (City owned)	133 (20% of land)	190 (20% of land)
Max Tertiary (MG)	657	810
Max Secondary (MG)	594	804

2. Cost Analysis of Scenarios
a. Model run scenarios were evaluated based on present worth of annualized 80-year life cycle cost.
b. Potable offset requirement (600 acre-ft or 196 MG min).
c. Operational flexibility requirement (City owned land 133 acres (Year 2007) - 190 acres (Year buildout) Min).
d. Findings/recommendations
1) Tertiary System
a) Tertiary system with current Ag payment of ($210/Acre-ft = $580/MG)

Model Run	A	A+B	A+C	A+G	A+E+G	A+C+G
Total Demand (MG/Year)	485	793	618	552	726	685
Max Day (mgd)	5.2	8.6	6.6	5.7	7.5	7.1
Total Acres	635	977	777	721	886	863
Total Present Worth ($)	17,972,728	37,767,685	33,604,445	20,001,990	40,917,356	32,510,798
Annualized PW Cost ($/MG)	1223	1572	1794	1196	1860	1478
Annualized PW Cost ($/acre-ft)	398	512	585	390	600	482
Tertiary Ranking (least to highest cost)	2	4	5	1	6	3
Overall Ranking (least to highest cost)	2	5	8	1	9	4

b) Tertiary System with proposed lower Ag payments of ($200/Acre = $190/MG)

Model Run	A	A+B	A+C	A+G	A+E+G	A+C+G
Total Demand (MG/Year)	485	793	618	552	726	685
Max Day (mgd)	5.2	8.6	6.6	5.7	7.5	7.1
Total Acres	635	977	777	721	886	863
Total Present Worth ($)	17,563,923	32,935,724	33,195,640	19,593,194	40,508,551	32,101,993
Annualized PW Cost ($/MG)	1195	1371	1773	1171	1841	1459
Annualized PW Cost ($/acre-ft)	389	447	578	382	606	475
Tertiary Ranking (least to highest cost)	2	3	5	1	6	4
Overall Ranking (least to highest cost)	2	5	8	1	9	7

2) Secondary System

a) Secondary system with current Ag payment of ($210/Acre-ft = $580/MG)

Model Run	H+I	H+I+J	H+I+J (partial J)	H+I+K	H+I+K (partial K)	H+I+K+L	H+I+K+L (partial L)
Total Demand (MG/Year)	344	764	515***	691	515***	965	804
Max Day (mgd)	3.6	7.7	5.2	7.4	5.2	10.4	8.7
Total Acres	361	880	634	799	634	1158	970
Total Present Worth ($)	14,596,732	30,010,528	25,649,043	27,236,330	25,226,343	37,788,204	35,486,096
Annualized PW Cost ($/MG)	1400	1296	1644	1301	1616	1292	1457
Annualized PW Cost ($/acre-ft)	456	422	536	424	527	421	475
Secondary Ranking (least to highest cost)	1	N/A*	3	N/A*	2	N/A*	N/A**
Overall Ranking (least to highest cost)	3	N/A*	7	N/A	6	N/A*	N/A**

* Scenario not feasible due to requirement to provide minimum 600 acre-ft of potable offset, namely Area A.
** Scenario not feasible due to amount of recycled water available.
*** Maximum available recycled water (1,000 MG) – Area A = 515 MG.

b) Secondary system with proposed lower Ag payment of ($200/Acre = $190/MG)

Model Run	H+I	H+I+J	H+I+J (partial J)	H+I+K	H+I+K (partial K)	H+I+K+L	H+I+K+L (partial L)
Total Demand (MG/Year)	344	764	515***	691	515***	965	804
Max Day (mgd)	3.6	7.7	5.2	7.4	5.2	10.4	8.7
Total Acres	361	880	634	799	634	1158	970
Total Present Worth ($)	13,100,926	23,285,290	21,856,528	21,747,782	21,338,544	29,166,708	28,477,363
Annualized PW Cost ($/MG)	1257	1006	1401	1039	1367	997	1169
Annualized PW Cost ($/acre-ft)	410	328	456	338	446	325	381
Secondary Ranking (least to highest cost)	1	N/A*	3	N/A*	2	N/A*	N/A**
Overall Ranking (least to highest cost)	3	N/A*	6	N/A*	4	N/A*	N/A**

* Scenario not feasible due to requirement to provide minimum 600 acre-ft of potable offset, namely Area A.
** Scenario not feasible due to amount of recycled water available.
*** Maximum available recycled water (1,000 MG) – Area A = 515 MG.

3) Tertiary Systems vs. Secondary System

a) Current Ag Payment ($210/Acre-ft = $580/MG)

Overall Ranking	Scenario	MG	Total MG	Comment
1	A+G	552	N/A	Least cost option if existing pipeline to Area G can be used. Currently not feasible. Add Area G if existing pipeline becomes available.
2	A	485	485	Satisfies requirements for 600 acre-ft potable offset.
3	H+I	344	829	Satisfies requirement for 20% City-owned land.
4	A+C+G	C+G=200	1000 + (N/A)	Add customers in areas C and G. Currently not feasible since area G can only be added if existing pipeline becomes available. If area G not feasible do not add area C. Area A +C is ranked below.
5	A+B	B=308	1000+	Add customers in Area B when additional customers are required in later years until buildout if area G cannot be added above.
6	H+I+K (Partial K)	—	—	Add customers in Area K if customers in Areas listed above become unavailable.
7	H+I+J (Partial J)	—	—	Add customers in Area J if customers in Areas listed above become unavailable.
8	A+C	—	—	Add customers in Area C if additional potable offset customers are required.
9	A+E+G	—	—	Add customers in Areas E and G if additional potable offset customers are required beyond Areas A and C.

b) Proposed lower Ag Payment ($200/Acre = $190/MG)

Overall Ranking	Scenario	MG	Total MG	Comment
1	A+G	552	N/A	Least cost option if existing pipeline to Area G can be used. Currently not feasible. Add Area G if existing pipeline becomes available.
2	A	485	485	Satisfies requirements for 600 acre-ft potable offset.
3	H+I	344	829	Satisfies requirement for 20% City-owned land.
4	H+I+K (Partial K)	K=347	1000+	Add customers in Area K when additional customers are needed in later years until buildout.
5	A+B	-	—	Add customers in Area B if customers in Areas listed above become unavailable.
6	H+I+J (Partial J)	—	—	Add customers in Area J if customers in Areas listed above become unavailable.
7	A+C+G	-	N/A	Add customers in Areas C and G if additional potable offset customers are required. Currently not feasible since Area G can only be added if existing pipeline becomes available.
8	A+C	—	—	Add customers in Area C if additional potable offset customers are required.
9	A+E+G	—	—	Add customers in Areas E and G if additional potable offset customers are required beyond Areas A and C.

4) Recommendations:

a) It is recommended to serve customers as outlined above due to the cost analysis. Since the cost to obtain new potable water supply is considerably more expensive than any of the scenarios evaluated, it is recommended to serve customers in Areas C, E, and G with recycled water prior to obtaining potable water at a cost of $2,300/acre-ft. In addition, it should be noted that customers within Areas C, E, and G have a much lower risk than customers in I, J, K, and L, since their ability to use recycled water is purely at the landowner's discretion.

b) At startup of the Tertiary Treatment Facility (2007), approximately 790 MG of recycled water will be available to tertiary and secondary customers during an irrigation season (MG/YR). It is recommended to serve customers in Area A with tertiary water and customers in Areas H and I with secondary water. Phasing current customers in Area J away from recycled water and customers in Areas A and H onto recycled water will be required.

c) In addition, the tertiary reservoir and the pipeline to the tertiary reservoir need to be constructed prior to serving customers in Area A with tertiary water. The secondary system reservoir and upgrades to the existing Main and Booster Pump Station No. 1 in the secondary recycled water system should also be constructed around the time of startup of the tertiary treatment plant to minimize the complexity of the secondary system. As the total available recycled water increases from 790 MG at startup to 1,000 MG at buildout, it is recommended to add customers as required in Area B or Area K, depending upon the payment amount to agricultural customers. It should be noted that if current Ag payment is continued, and the existing 16 inch pipeline to Petaluma Country Club becomes available, then areas G and C should be added prior to Areas B or K

d) If additional potable offset becomes required, customers in Area B or K, and then I, should be removed from the system and customers in Area C or G should be added.

e) It is important that facilities are constructed to account for potential changes in customers in the future. The following items should be considered.

f) Tertiary Pump Station at Plant:
   (1) Initially designed for Area A (5.2 mgd). Only requires 290' TDH.
   (2) Ability to phase for Area A + B (8.6 mgd @ 320' TDH)
   (3) Ability to phase for Area A + C + G (7.1 mgd @ 350' TDH)
   (4) Design initial facilities for 5.2 mgd @ 350' TDH

g) Tertiary Facilities at Plant:
   (1) Initially designed for Area A (5.2 mgd)
   (2) Ability to phase for Area A + B (8.6 mgd)
   (3) Ability to phase for Area A + C + G (7.1 mgd)

h) Tertiary Reservoir at Plant:
   (1) Initially designed for Area A (5.2 mgd)
   (2) Ability to phase for Area A + B (8.6 mgd)
   (3) Ability to phase for Area A + C + G (7.1 mgd)

i) Tertiary Reservoir in System:
   (1) Initially sized for A + B (0.94 MG) or A + C + G (1.71 MG) or ability to add another reservoir at same site if sized for A only (0.9MG)
   (2) Elevation required for A + B (260 feet) or A + C + G (280 ft), whichever is higher. Note that A only requires a reservoir at elev 250 feet. A+C would require a reservoir of 1.71 MG at elev 272 feet. The pump station would have the same TDH requirement as A+C+G.

j) Secondary Reservoir in System:
   (1) Initially sized for H + I plus K (0.56 MG)
   (2) Elevation required for H + I + K = 360 feet.

IV. ADDITIONAL WORK

A. Model A + C + G (using existing 16-inch pipeline) to determine reservoir size and elevation and tertiary pump station TDH requirement.
   1. Work has been performed and information is included above.

B. Determine cost impact to owning H + I as all City owned land versus having Area I be owned by others as it is currently evaluated.
   1. Per cost analysis performed, it is least costly for both H and I to be City owned land if current Ag payment of ($580/MG) is continued.

2. Per cost analysis performed, it is least costly if Area I is owned by others and Area H is City owned land (per Initial Analysis) if a lower AG payment of ($190/MG) is implemented.
3. The costs are relatively close, so the City should also evaluate the options based on the following Advantages vs. Disadvantages.
    a. H (City Owned) + I (Owned by Others)
        1) Advantages - City is not required to purchase land in Area I. The purchase of land cost is not included in cost analysis since land can be sold and, therefore, has a salvage value. The City would have to come up with Capital cost for land. It should be noted also that if it becomes necessary to obtain more potable offset, the City would have no need for the land and would then have to sell it.
        2) Disadvantages - City has less flexibility and control with Area I since it will be owned by others.
    b. H + I (All City Owned)
        1) Advantages - City has more flexibility and control over Area I if it is owned by the City.
        2) Disadvantages - City would need to provide capital cost to purchase Area I. The purchase of land is not included in cost analysis since it can be sold and, therefore, has a salvage value. Another Disadvantage is that if it becomes necessary to obtain more potable offset, the City would have no need for the land and would then have to sell it.

C. Determine if pressure requirements of any customers in Area J can be met if included in Model Run H + I.
    1. Customers #90, #92, and #93 can be served within Area J without Booster Pump Station #2 and some piping modifications. Pressure requirements will be met. This is based on using reservoir sized under Scenario H & I.

V. PROVIDE DIRECTION TO CAROLLO

A. Dana and Margaret will meet with Carollo on December 19th to provide direction and any additional information to Carollo for completion of their design.

B. Discuss:
    1. Tertiary pump station design/pressure relief.
    2. Reservoir (at plant).
    3. Reservoir (in system).
    4. Max day tertiary water requirements/phasing.

VI. DRAFT MASTER PLAN

A. Draft Master Plan shall be submitted on January 29, 2004. A meeting will be held from 9 a.m. to 1 p.m. to discuss content. The City will then have time to review the document and provide comments to Dodson for inclusion into the final master.

MODEL SCENARIOS

TERTIARY SYSTEM

	Demand (MG/Year)	Max Day (mgd)	Area (Acres)	Potable Offset (MG)
Model Areas:				
A =	485 MG (456 MG)	5.2	635	204
B =	308 MG (0 MG)	3.4	342	0
C =	133 MG (126 MG)	1.4	142	70
D =	36 MG (18 MG)	0.4	37	18
E =	174 MG (126 MG)	1.8	165	134
F =	10 MG (10 MG)	0.1	12	10
G =	67 MG (33 MG)	0.5	86	34
Model Runs:				
A =	485 MG (428 MG)	5.2	635	204
A + B =	793 MG (456 MG)	8.6	977	204
A + G =	552 MG (489 MG)	5.7	721	238
A + C =	618 MG (582 MG)	6.6	777	274
A + E + G =	726 MG (615 MG)	7.5	866	372
A + C + G =	685 MG (615 MG)	7.1	863	307

Note: Tertiary System (min) = 196 MG (potable offset). Accomplished by A.
( ) = low risk user's demands

SECONDARY EFFLUENT SYSTEM

	Demand (MG/Year)	Max Day (mgd)	Area (Acres)
Model Areas:			
H =	195 MG (City owned land = 205 acres)	2.1	205
I =	149 MG	1.5	156
J =	420 MG	4.1	519
K =	347 MG	3.8	438
L =	274 MG	3.0	359
Model Runs:			
H + I =	344 MG	3.6	361
H + I + J =	764 MG	7.7	880
H + I + K =	691 MG	7.4	799
H + I + K + L =	965 MG	10.4	1158

Note: Secondary system (min) = 190 MG (City owned land). Accomplished by H.

APPENDIX B

MODEL RUN INPUT/OUTPUT DATA

APPENDIX B

MODEL RUN INPUT/OUTPUT DATA

During the evaluation phase of the master planning, each scenario was computer modeled to size facilities and confirm that the evaluation/design criteria could be met. MWH Soft Inc., H_2OMAP Water software was used to perform the analysis. The results were used to prepare that cost comparison between scenarios. The following scenarios were modeled and a summary of their results, as well as model input and output data, are included.

Tertiary Scenarios

A

A + B

A + C

A + G

A + E + G

A + C + G

Secondary Effluent Scenarios

H + I

H + I + J

H + I + K

In addition to the scenarios listed above, the recommended scenarios were remodeled to include their proposed modifications. A summary of the results, as well as model input and output data, are included.

Recommended Scenarios

Tertiary Scenario—A (modified)

Secondary Effluent Scenario—H + I + K (partial)

MODEL DESCRIPTION

H2OMAP Water is a hydraulic modeling software for water distribution systems developed by MWH Soft, Inc. This software is capable of providing steady-state or real time simulations of water distribution systems of any size and can perform such functions as fire flow analysis, water quality assessment, energy consumption/cost evaluation and the software provides a SCADA interface for on-line calibration. Programmed in Visual C++, H2OMAP has integrated their hydraulic model with a GIS interface for easier management and analysis of spatial data. H2OMAP's GIS interface and spreadsheet management provides a compatible environment for importing or exporting information to excel spreadsheets, CAD, Arcview/ArcInfo or numerous other spreadsheet and GIS programs.

H2OMAP is a stand-alone program in which the user utilizes any number or combination of network components to build the distribution system. Some of the network components available are pipes, demand nodes, fixed or variable-head reservoirs, cylindrical or variable area tanks, hydropneumatic tanks, pressure reducing/sustaining valves, custom valves (any headloss vs. flow relationship), fixed or variable speed pumps, turbines, and disinfection stations. Components are placed into a GIS framework as objects and are assigned attributes such as geographic location, connectivity to other components, elevation and other component specific attributes. Some of the component-specific attributes are described below for the more commonly used components of the Petaluma Recycled Water Model:

- **Pipes** are assigned a length (or length can calculated based on the geographic location), diameter, minor loss coefficient and a friction coefficient (the user can choose from either Hazen-Williams, Darcy Weisbach or Chezy friction headloss formula).

- **Nodes** are used to connect pipes or to represent a customer demand, reservoir or tank. Customer demand nodes are assigned a water consumption rate (volume per time) and a demand pattern that describes how a specific user's consumption varies with time. Reservoirs represent an infinite external source of water such as a lake, river, or water treatment facility, and are assigned as either a fixed or variable head reservoir. Tanks are nodes with storage capacity and can be either a cylindrical or variable area shape.

- **Pumps** can either be set to a certain design point and a pump curve is extrapolated using a program-defined function or a user input pump curve can be assigned. Pumps can be shut on or off according to time, level at a certain node (for instance water level at a reservoir), or a user defined pattern.

Once the system components have been placed within a spatial database and attributes are assigned, a system of "scenarios" can be built to analyze any number of alternative system designs. A Scenario Manager within the software provides a tree-type structure in which each project "child" inherits the information from its "parent" scenario. For instance scenario's can be altered from a "parent" scenario to delete or add certain pipe sections or demand nodes, change pump design heads, raise and lower tank elevation or change customer demands from a max day to an average day demand. After the scenarios have been created each scenario can be run to produce the required output. H2OMAP's hydraulic model solves a system of equations expressing the conservation of water and energy loss/gain. For the purposes of creating and evaluating the Petaluma Recycled Water Master Plan the main outputs analyzed were customer's water pressure, tank levels, pump flow rates, pump head, and pipe headloss. Each scenario is adjusted as needed to provide an efficient system meeting all the requirements outlined in the design criteria. While the model presented in this report provides sufficient information to evaluate alternatives at the Master Planning level, further modeling and design may be necessary to optimize the system once a design alternative has been selected.

MODEL SCENARIO

A

MODEL SCENARIO
A

PARAMETERS

TOTAL DEMAND	485 MG/YR
MAX DAY DEMAND	5.2 mgd
TOTAL ACRES	635 Acres
Meets Potable Offset Criteria	YES (204 MG)
Meets City-Owned Agricultural Land Requirement	NO

SYSTEM REQUIREMENTS

Pump Station

Number:	1
Location:	Tertiary Plant
Size:	5.2 mgd @ 290' TDH

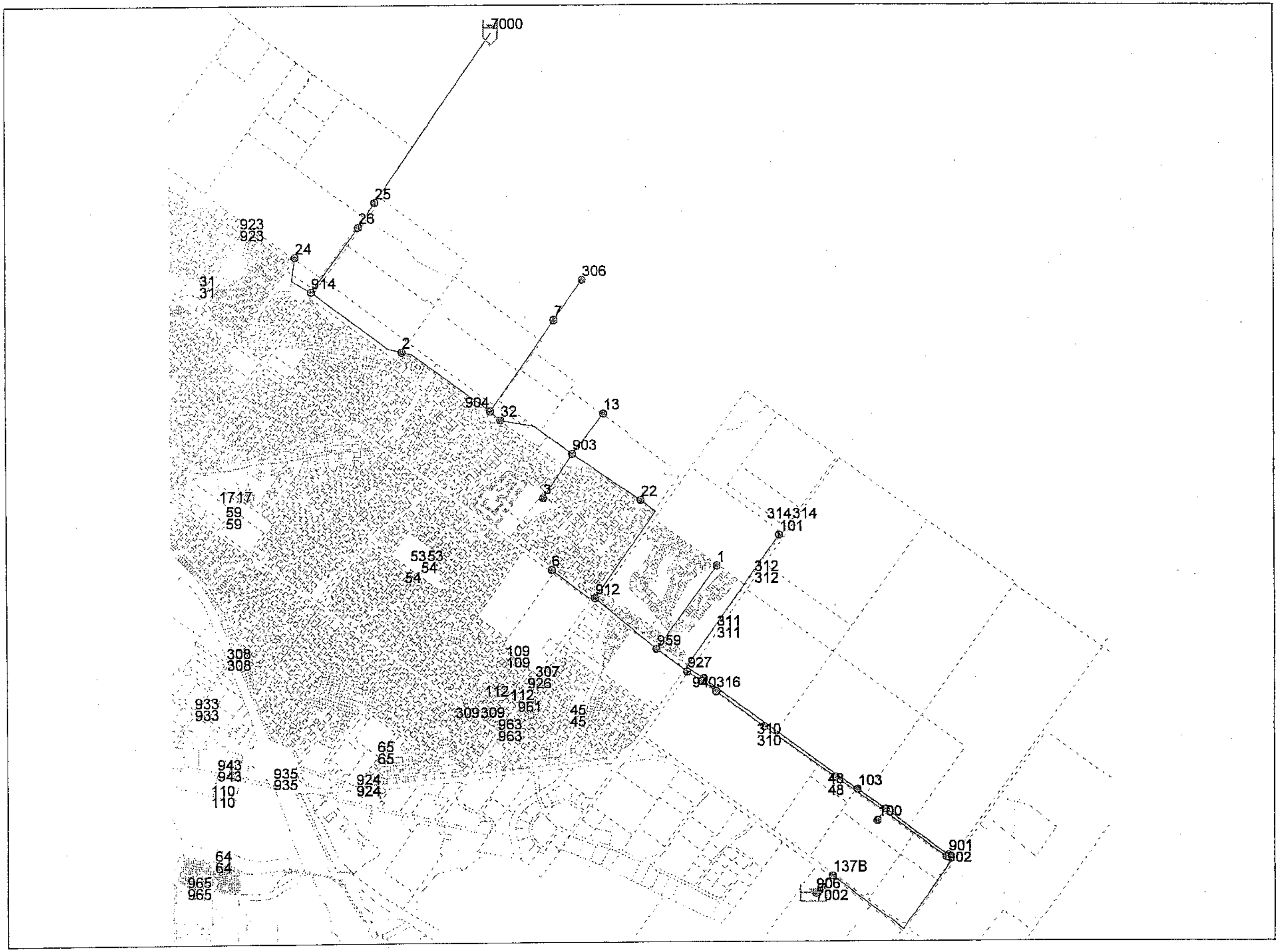
Reservoir

Number:	1
Location:	Northeast on East Washington
Size:	0.90 MG
Elevation:	250 Feet

ISSUES

-NONE

TERTIARY RECYCLED WATER SYSTEM - Scenario A



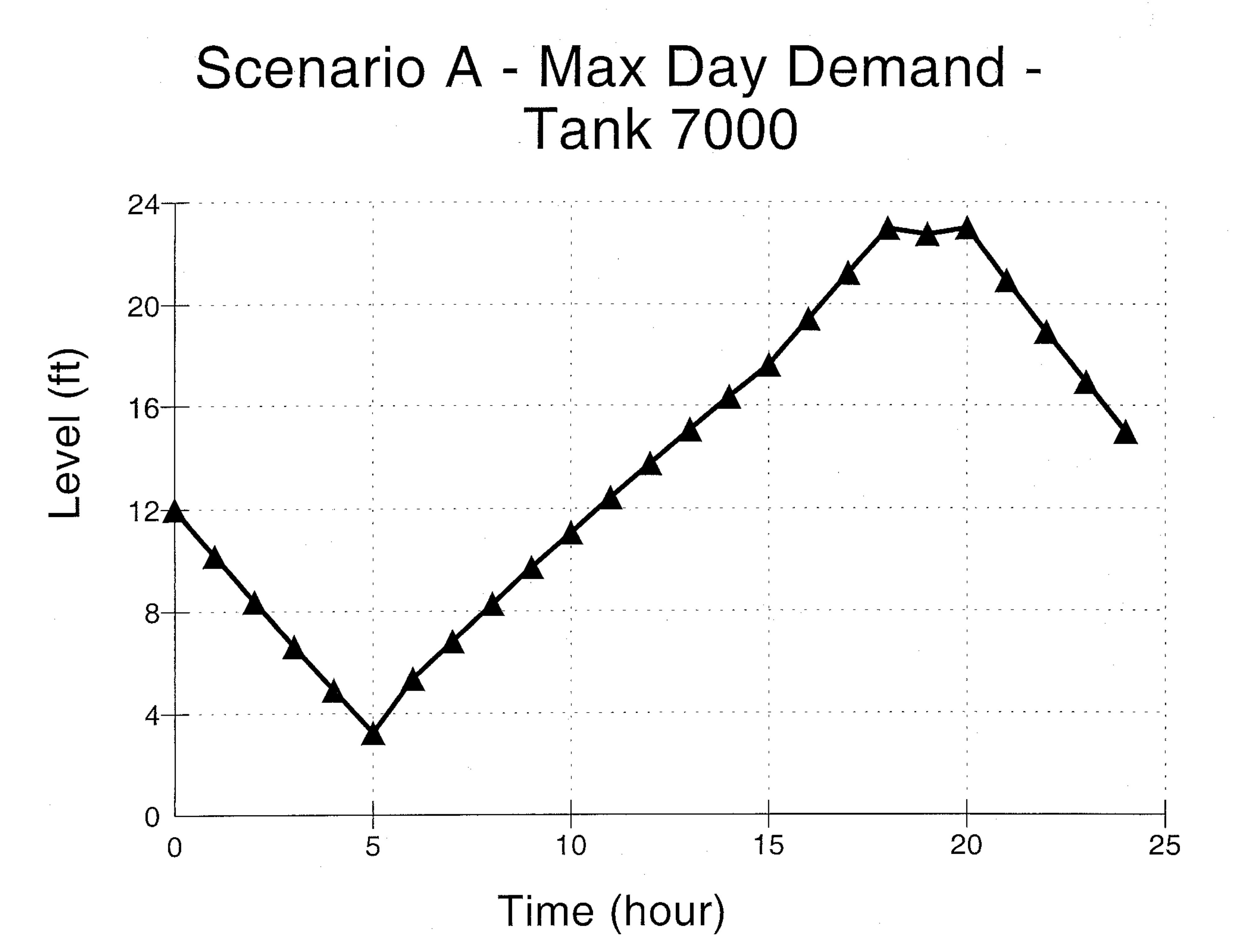
Date: Sunday, November 02, 2003

NODE INPUT DATA FOR SCENARIO A

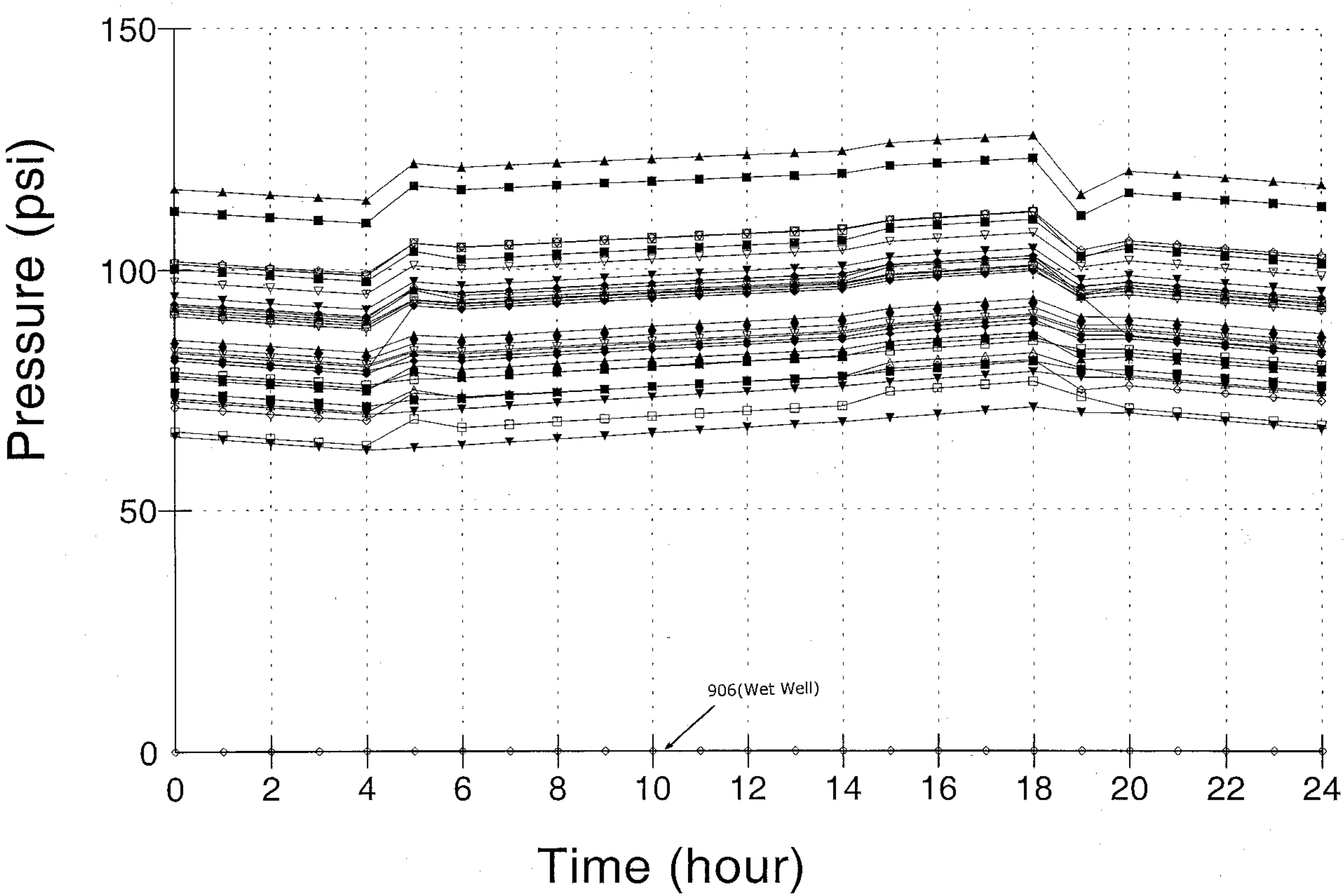
Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
A	Adobe Creek (S)	1	201	132	G	75
A	Airport (Current Irrigation)	2	44	18	T	72
A	Arroyo Park	3	58	23	T	63
A	Casa Grande High School	6	453	181	T	53
A	Ceja Vineyards (#3)	7	115	99	V	88
A	Herrerias Vineyards (#4)	13	122	105	V	81
A	Open Space (City Owned)	22	217	93	A	74
A	Prince Park	24	214	86	T	89
A	RESA (Redwood Estate Sports Plex)	25	347	139	T	110
A	Rooster Run	26	671	440	G	93
A	Wiseman Park (Extended)	32	374	150	T	70
A	A15 (Matteri)	100	228	98	A	51
A	A16 (Adobe Creek N)	101	466	305	G	80
A	A18 (Karren)	103	70	60	V	33
A	Old Adobe School	306	127	51	T	102
A	Greenway (Future)	316	299	120	T	45
A	8-inch bend	901				35
A	8-inch lateral	902				35
A	Service line to 3 and 13	903				67
A	Service line	904				69
A	Junction	906				5
A	New Junction	912				50
A	Reduce to 16-inch	914				79
A	Zone G	927				54
A	Existing 8 Tee	940				48
A	Existing 20 to 8 Connection	942				48
A	Service line Matteri	953				51
A	Service to Adobe Creek S	959				52
A	Service to Carinalli (310)	966				39
A	Service to Gurmeet Luthra	968				31
A	Treatment Plant Irr (none returning)	137A	771	308	T	5
A	Treatment Plant 3W (returning)	137B	689	451	G	15

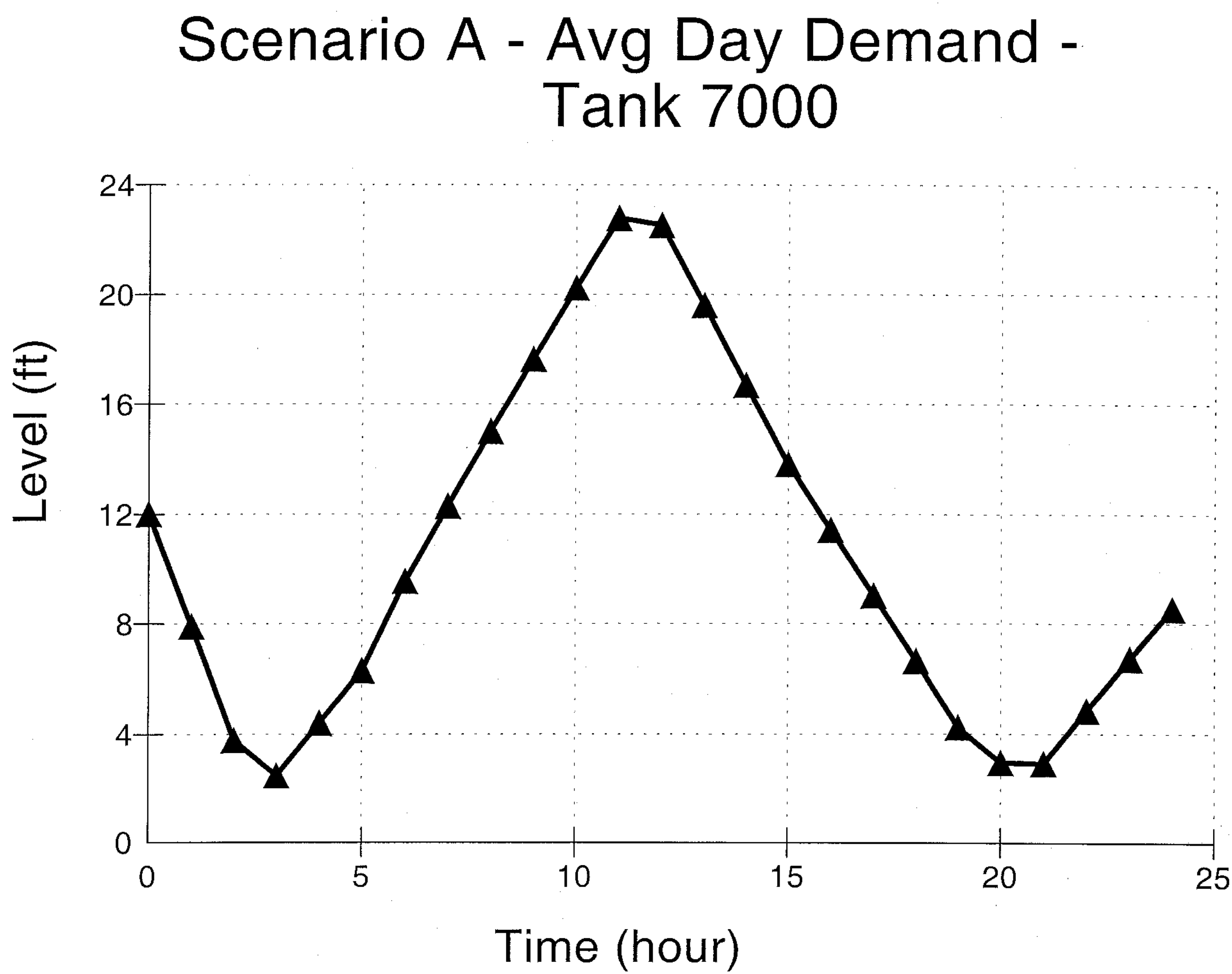
LINK INPUT DATA FOR SCENARIO A

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2,203	20	125	2.2
A	Service to Arroyo Park	3	903	1,077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1,660	20	125	1.66
A	To Reservoir	25	7000	4,140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.6
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3,854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2,790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1,041	6	125	1.04
A	Existing 20	903	32	1,664	20	125	1.66
A	Service to 7 and 306	904	7	2,239	6	125	2.24
A	Existing 20 at Airport	904	2	2,185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1,629	20	125	1.63
A	Existing 8 - Casa Grande High	912	6	1,069	6	125	1.07
A	Existing 20 Casa Grande Rd	912	22	2,523	20	125	2.52
A	New East Wahington St	914	26	1,625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3,717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1,581	8	125	1.58
A	Service to Matteri	953	100	284	6	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.7
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2,095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1,210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1,700	20	125	1.7
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3,655	20	125	3.66

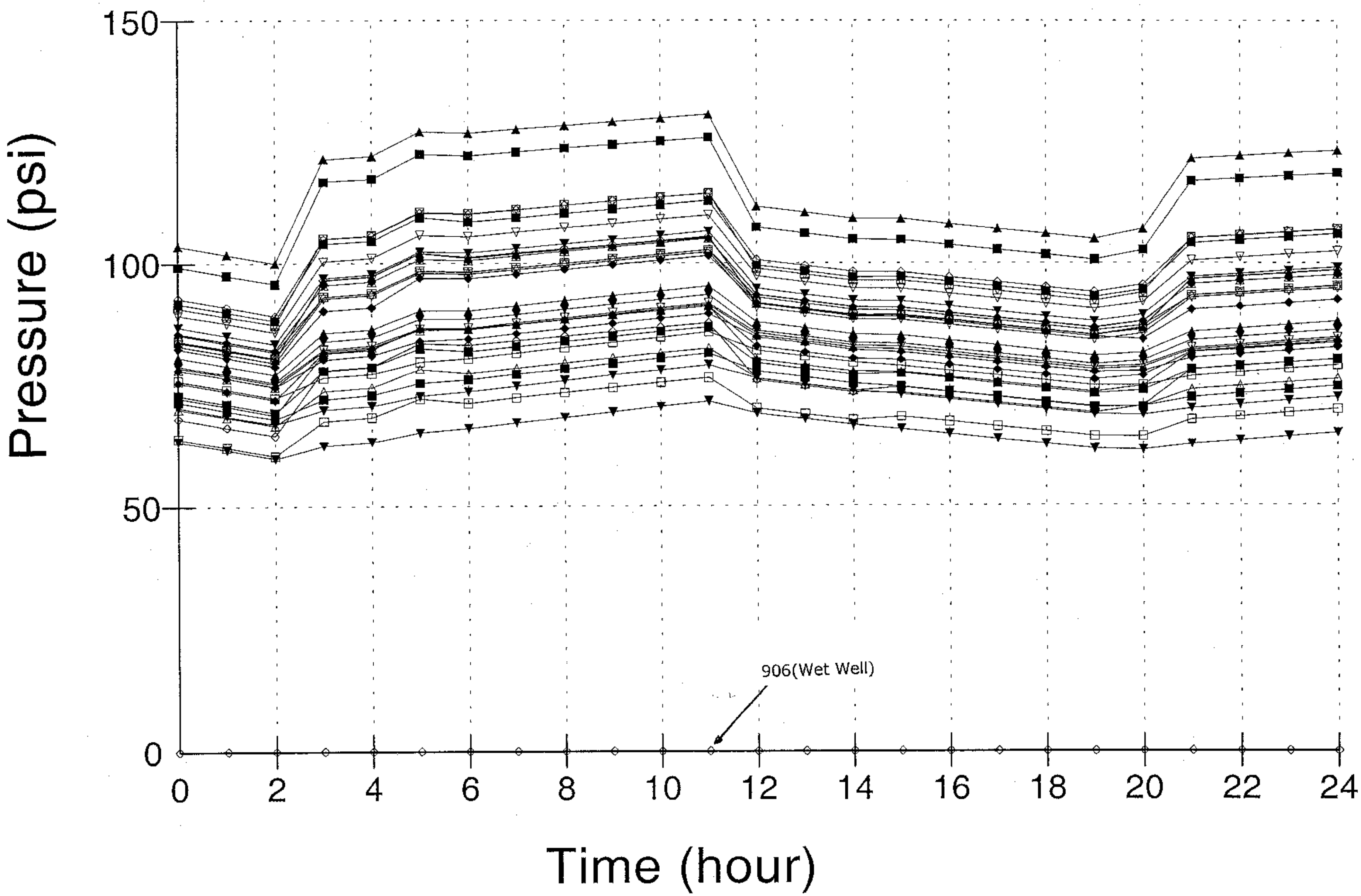

Scenario A - Max Day Demand - Tank 7000
Level (ft)
0
4
8
12
16
20
24
0
5
10
15
20
25
Time (hour)

Scenario A - Max Day Demand - Pressure at All Nodes




Scenario A - Avg Day Demand - Tank 7000
Level (ft)
0
4
8
12
16
20
24
0
5
10
15
20
25
Time (hour)

Scenario A - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

A + B

MODEL SCENARIO
A + B

PARAMETERS

TOTAL DEMAND	793 MG/YR
MAX DAY DEMAND	8.6 mgd
TOTAL ACRES	977 Acres
Meets Potable Offset Criteria	YES (204 MG)
Meets City-Owned Agricultural Land Requirement	NO

SYSTEM REQUIREMENTS

Pump Station

Number:	1
Location:	Tertiary Plant
Size:	8.6 mgd @ 320' TDH

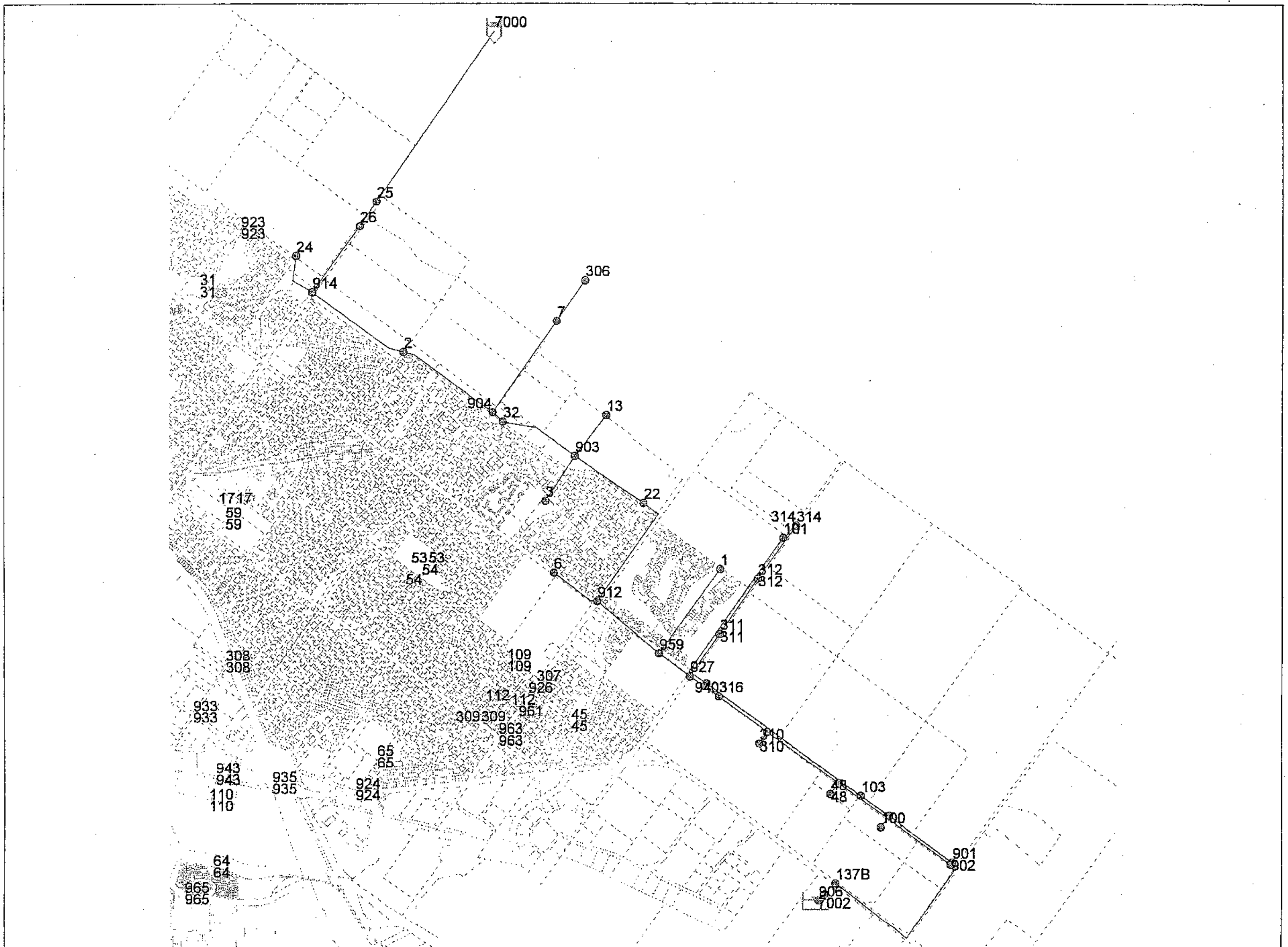
Reservoir

Number:	1
Location:	Northeast on East Washington
Size:	0.94 MG
Elevation:	260 Feet

ISSUES

-Pressure at Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand (Design Pipe for 250 psi) and design pressure relief at tertiary pump station.

TERTIARY RECYCLED WATER SYSTEM - Scenario A&B



Date: Sunday, November 02, 2003

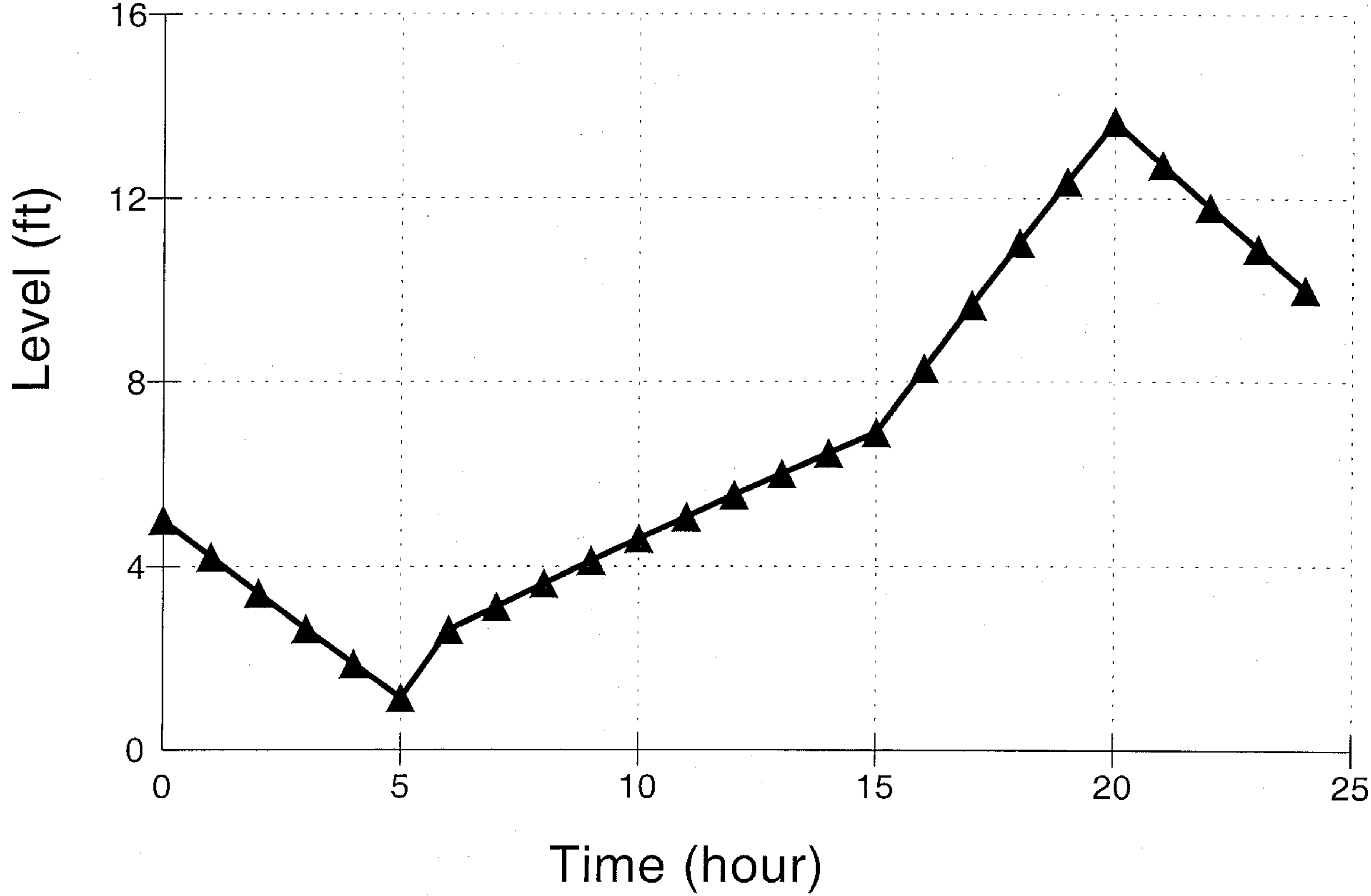
NODE INPUT DATA FOR SCENARIO A + B

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
A	Adobe Creek (S)	1	201	132	G	75
A	Airport (Current Irrigation)	2	44	18	T	72
A	Arroyo Park	3	58	23	T	63
A	Casa Grande High School	6	453	181	T	53
A	Ceja Vineyards (#3)	7	115	99	V	88
A	Herrerias Vineyards (#4)	13	122	105	V	81
A	Open Space (City Owned)	22	217	93	A	74
A	Prince Park	24	214	86	T	89
A	RESA (Redwood Estate Sports Plex)	25	347	139	T	110
A	Rooster Run	26	671	440	G	93
A	Wiseman Park (Extended)	32	374	150	T	70
A	A15 (Matteri)	100	228	98	A	51
A	A16 (Adobe Creek N)	101	466	305	G	80
A	A18 (Karren)	103	70	60	V	33
A	Old Adobe School	306	127	51	T	102
A	Greenway (Future)	316	299	120	T	45
A	8-inch bend	901				35
A	8-inch lateral	902				35
A	Service line to 3 and 13	903				67
A	Service line	904				69
A	Junction	906				5
A	New Junction	912				50
A	Reduce to 16-inch	914				79
A	Zone G	927				54
A	Existing 8 Tee	940				48
A	Existing 20 to 8 Connection	942				48
A	Service line Matteri	953				51
A	Service to Adobe Creek S	959				52
A	Service to Carinalli (310)	966				39
A	Service to Gurmeet Luthra	968				31
A	Treatment Plant Irr (none returning)	137A	771	308	T	5
A	Treatment Plant 3W (returning)	137B	689	451	G	15
B	Gurmeet Luthra	48	35	30	V	31
B	Carinalli	310	572	246	A	39
B	Shainsky	311	694	298	A	64
B	Shainsky	312	224	96	A	73
B	Carinalli	314	839	361	A	90

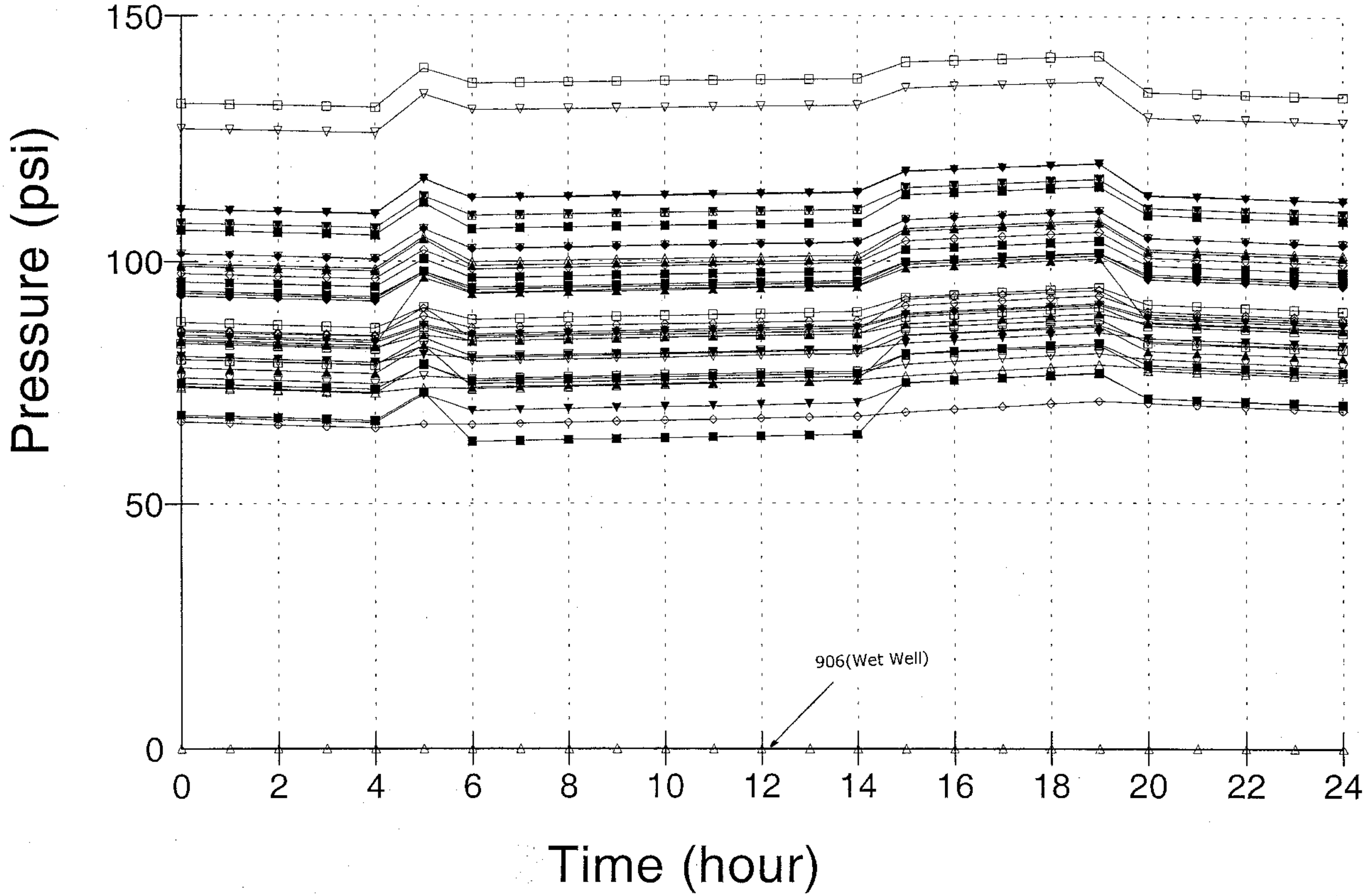
LINK INPUT DATA FOR SCENARIO A + B

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2,203	20	125	2.2
A	Service to Arroyo Park	3	903	1,077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1,660	20	125	1.66
A	To Reservoir	25	7000	4,140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.6
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3,854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2,790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1,041	6	125	1.04
A	Existing 20	903	32	1,664	20	125	1.66
A	Service to 7 and 306	904	7	2,239	6	125	2.24
A	Existing 20 at Airport	904	2	2,185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1,629	20	125	1.63
A	Existing 8 - Casa Grande High	912	6	1,069	6	125	1.07
A	Existing 20 Casa Grande Rd	912	22	2,523	20	125	2.52
A	New East Wahington St	914	26	1,625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3,717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1,581	8	125	1.58
A	Service to Matteri	953	100	284	6	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.7
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2,095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1,210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1,700	20	125	1.7
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3,655	20	125	3.66
B	Service to Carinalli (310)	310	966	15	8	100	0
B	New Frates Rd	311	312	1,356	10	125	1.36
B	New Frates Rd	312	314	1,319	10	125	1.32
B	New Frates Rd	927	311	1,037	12	125	1.04
B	Service to Gurmeet Luthra	968	48	277	6	100	0

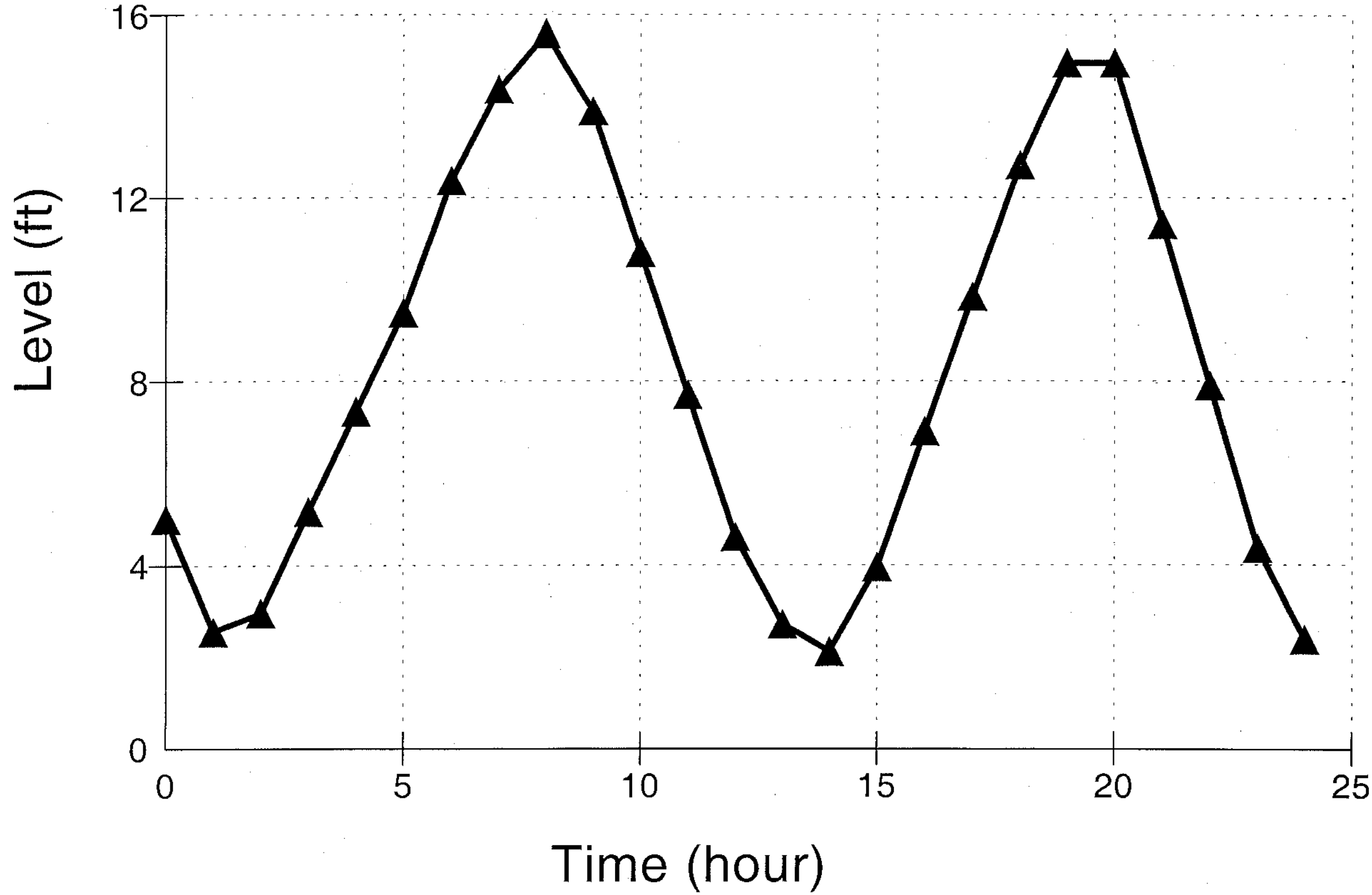
Scenario A + B - Max Day Demand - Tank 7000



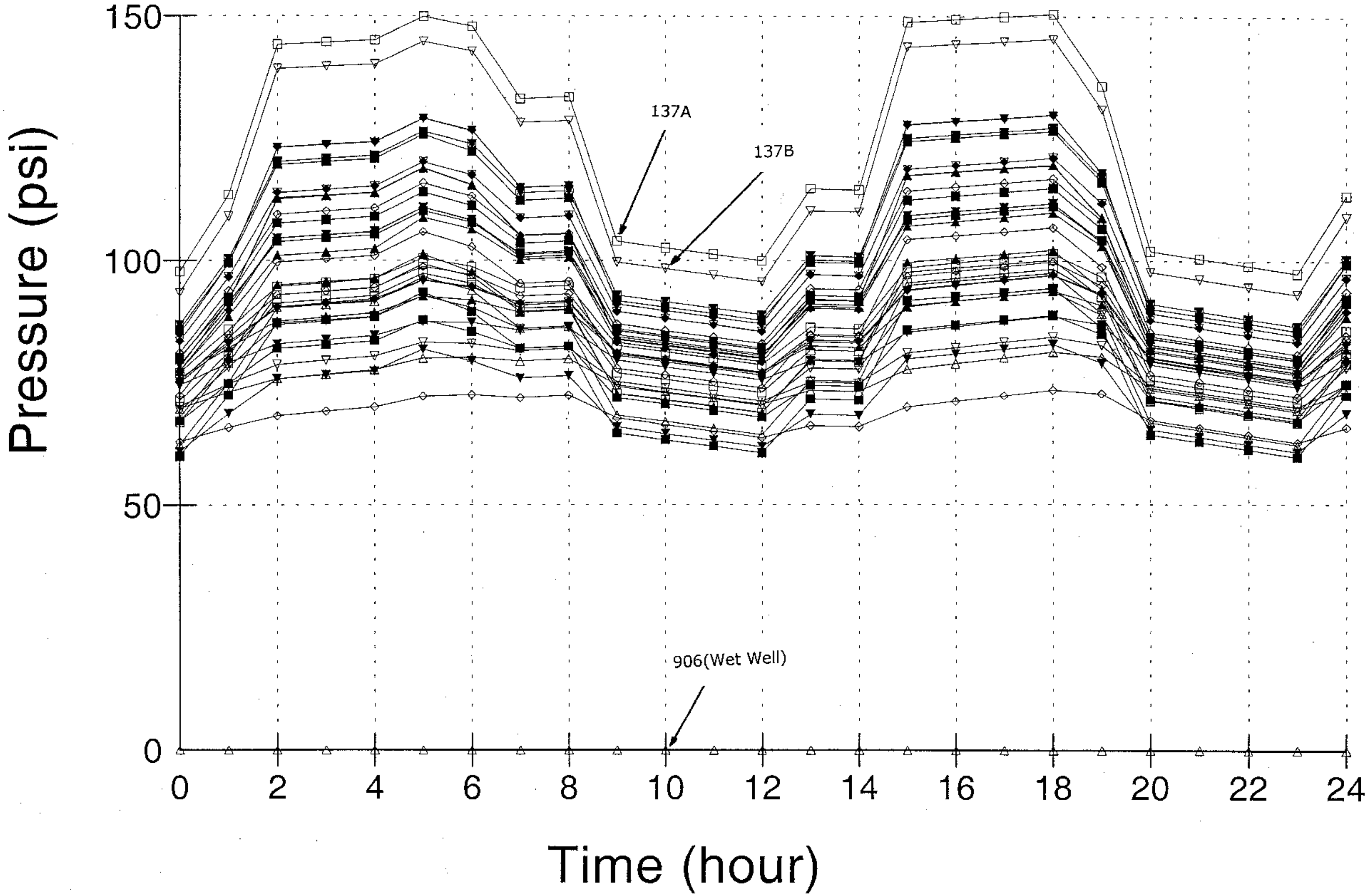
Scenario A + B - Max Day Demand - Pressure at All Nodes



Scenario A + B - Avg Day Demand - Tank 7000



Scenario A + B - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

A + C

MODEL SCENARIO
A + C

PARAMETERS

TOTAL DEMAND	618 MG/YR
MAX DAY DEMAND	6.6 mgd
TOTAL ACRES	777 Acres
Meets Potable Offset Criteria	YES (274 MG)
Meets City-Owned Agricultural Land Requirement	NO

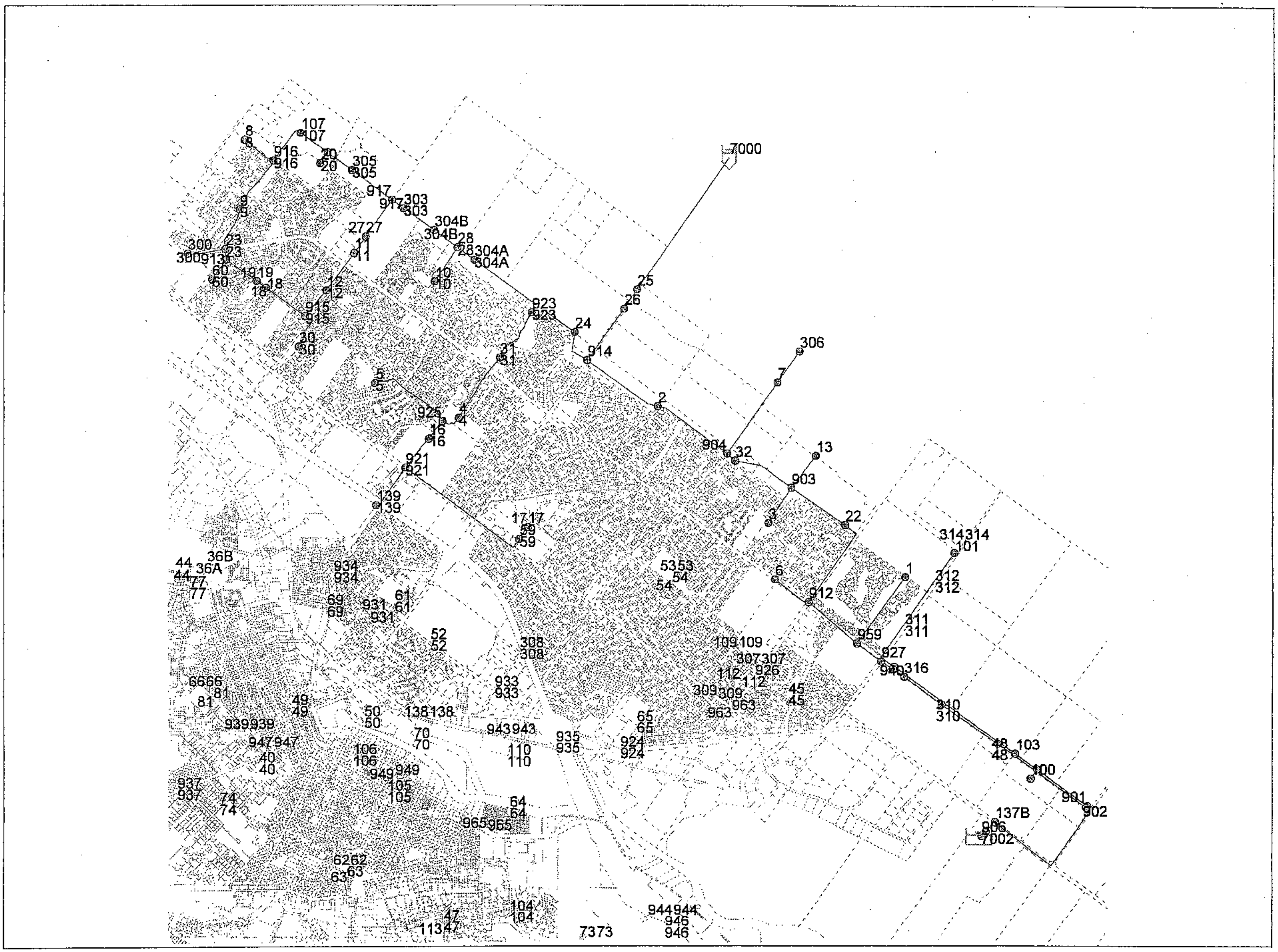
SYSTEM REQUIREMENTS

Pump Station	
Number:	1
Location:	Tertiary Plant
Size:	6.6 mgd @ 350' TDH
Reservoir	
Number:	1
Location:	Northeast on East Washington
Size:	1.71 MG
Elevation:	272 Feet

ISSUES

-Pressure at Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand (Design Pipe for 250 psi) and design pressure relief at tertiary pump station.

TERTIARY RECYCLED WATER SYSTEM - Scenario A&C



Date: Sunday, November 02, 2003

NODE INPUT DATA FOR SCENARIO A + C

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
A	Adobe Creek (S)	1	201	132	G	75
A	Airport (Current Irrigation)	2	44	18	T	72
A	Arroyo Park	3	58	23	T	63
A	Casa Grande High School	6	453	181	T	53
A	Ceja Vineyards (#3)	7	115	99	V	88
A	Herrerias Vineyards (#4)	13	122	105	V	81
A	Open Space (City Owned)	22	217	93	A	74
A	Prince Park	24	214	86	T	89
A	RESA (Redwood Estate Sports Plex)	25	347	139	T	110
A	Rooster Run	26	671	440	G	93
A	Wiseman Park (Extended)	32	374	150	T	70
A	A15 (Matteri)	100	228	98	A	51
A	A16 (Adobe Creek N)	101	466	305	G	80
A	A18 (Karren)	103	70	60	V	33
A	Old Adobe School	306	127	51	T	102
A	Greenway (Future)	316	299	120	T	45
A	8-inch bend	901				35
A	8-inch lateral	902				35
A	Service line to 3 and 13	903				67
A	Service line	904				69
A	Junction	906				5
A	New Junction	912				50
A	Reduce to 16-inch	914				79
A	Zone G	927				54
A	Existing 8 Tee	940				48
A	Existing 20 to 8 Connection	942				48
A	Service line Matteri	953				51
A	Service to Adobe Creek S	959				52
A	Service to Carinalli (310)	966				39
A	Service to Gurmeet Luthra	968				31
A	Treatment Plant Irr (none returning)	137A	771	308	T	5
A	Treatment Plant 3W (returning)	137B	689	451	G	15
C	Bernard Eldrige School	4	39	16	T	46
C	Bond Park	5	116	46	T	45
C	Corona Creek Elementary	8	58	23	T	55
C	Corona Creek LAD	9	48	19	T	43
C	Eagle Park	10	56	22	T	76
C	Gatti Park	11	141	56	T	59
C	Glenbrook Park	12	50	20	T	49

NODE INPUT DATA FOR SCENARIO A + C

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
C	Lucchesi Park	16	253	101	T	35
C	McDowell Park	17	102	41	T	36
C	Meadow Elementary	18	42	17	T	37
C	Meadow Park	19	52	21	T	37
C	Kenilworth Jr High (Relocated)	20	386	154	T	59
C	City Right-of-Way (Maria & Sonoma Mtn)	23	58	23	T	42
C	Santa Rosa Junior College	27	96	38	T	69
C	Sonoma Mountain ElementaryTurf	28	52	21	T	95
C	Sunrise Park	30	40	16	T	38
C	Turtle Creek Park	31	96	38	T	76
C	McDowell Elementary	59	71	28	T	32
C	McDowell Meadow Park	60	15	6	T	35
C	Open Space (by new Jr High)	107	58	23	T	56
C	Lynch Creek Park	139	135	54	T	27
C	Trun Bridge Park	300	44	18	T	40
C	Santa Rosa JC Phase 2	303	104	42	T	81
C	Urban Separator N	305	229	92	T	79
C	Service to Meadow Park	913				38
C	Service to Sunrise Park	915				43
C	Service to Corona Creek Elementary	916				53
C	New Junction	917				92
C	Service to Kenilworth Jr High	919				64
C	Service to Lynch Creek Park	921				35
C	New Junction	923				76
C	New Junction	925				47
C	Urban Separator S	304A	110	44	T	95
C	Urban Separator S	304B	110	44	T	97

LINK INPUT DATA FOR SCENARIO A + C

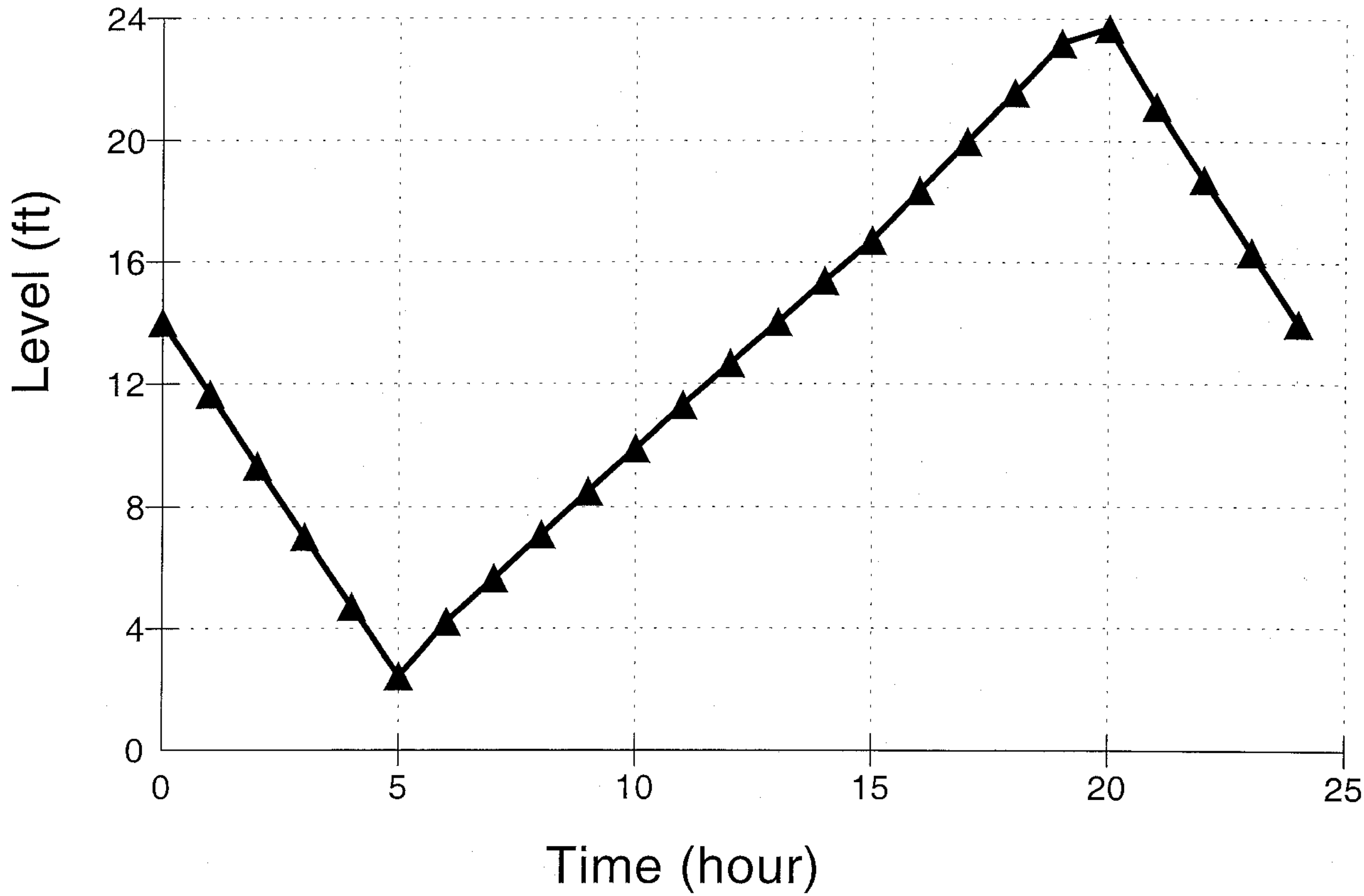
Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2203	20	125	2.2
A	Service to Arroyo Park	3	903	1077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1660	20	125	1.66
A	To Reservoir	25	7000	4140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.6
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1041	6	125	1.04
A	Existing 20	903	32	1664	20	125	1.66
A	Service to 7 and 306	904	7	2239	6	125	2.24
A	Existing 20 at Airport	904	2	2185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1629	20	125	1.63
A	Existing 8 - Casa Grande High	912	6	1069	6	125	1.07
A	Existing 20 Casa Grande Rd	912	22	2523	20	125	2.52
A	New East Wahington St	914	26	1625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1581	8	125	1.58
A	Service to Matteri	953	100	284	6	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.7
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1700	20	125	1.7
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3655	20	125	3.66
C	Monroe St	4	925	551	10	125	0.55
C	Maria Dr	9	23	1117	10	125	1.12
C	Sunrise Pkwy	11	12	1206	12	125	1.21
C	Sunrise Pkwy	12	915	855	12	125	0.85
C	Luchesi Park	16	921	968	8	125	0.97
C	Maria Dr	18	915	1239	10	125	1.24
C	Maria Dr	19	18	302	10	125	0.3

1/8/04

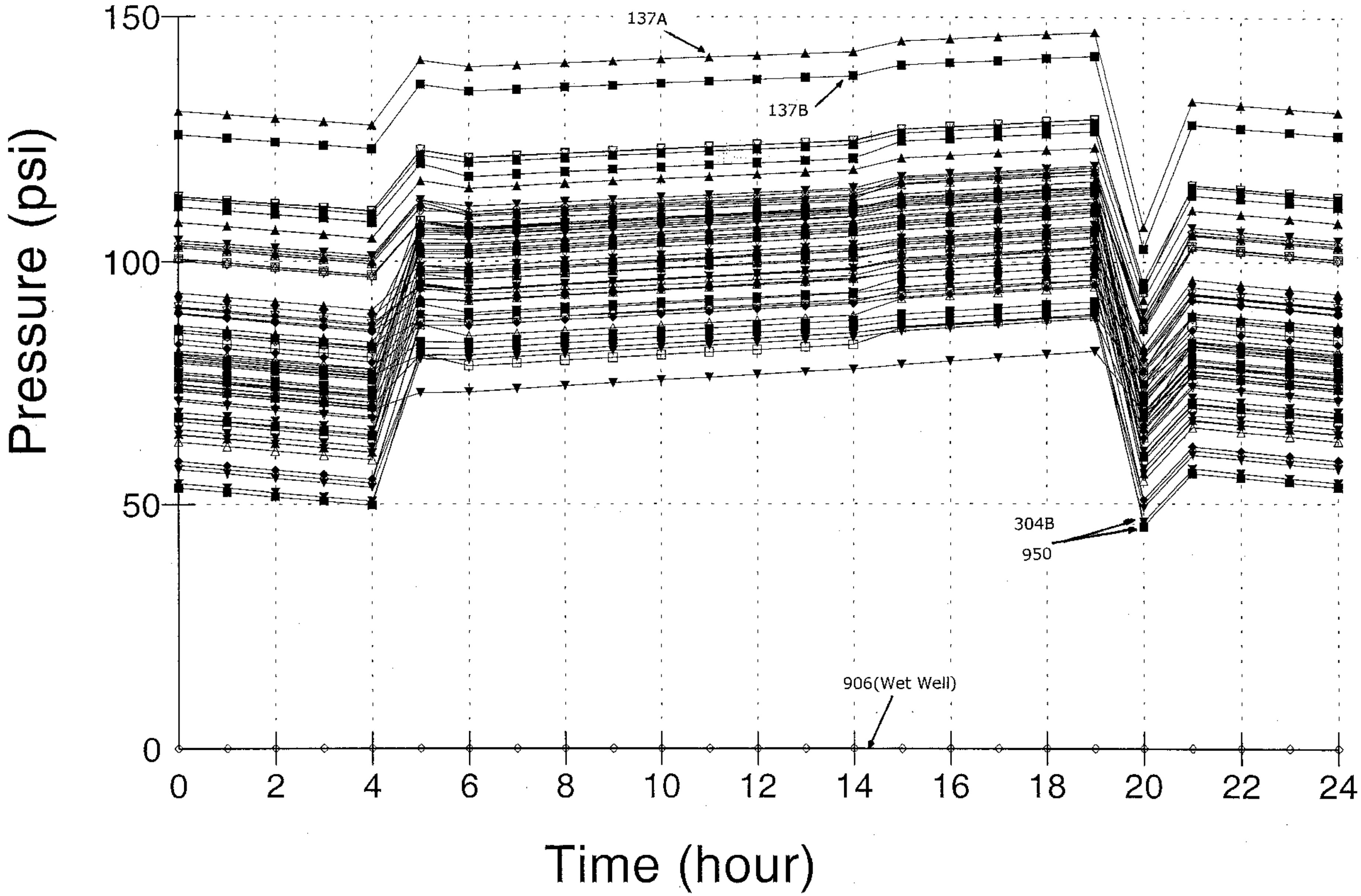
LINK INPUT DATA FOR SCENARIO A + C

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
C	Service to Kenilworth Jr High	20	919	339	6	125	0.34
C	Service to Trun Bridge Park	23	300	986	6	125	0.99
C	Maria Dr	23	913	268	10	125	0.27
C	New pipe (C)	24	923	1486	12	125	1.49
C	Campus Cir	27	11	512	12	125	0.51
C	Existing 10 - Turtle Creek Park	28	10	1061	10	125	1.06
C	New Pipe (C)	28	304B	746	12	125	0.75
C	Monroe St	31	4	1905	10	125	1.9
C	Service to McDowell Park	59	17	387	6	125	0.39
C	New Pipe (C)	107	916	1123	12	125	1.12
C	New Pipe (C)	303	917	370	12	125	0.37
C	New Pipe (C)	305	919	771	12	125	0.77
C	Service to McDowell Meadow Park	913	60	628	6	125	0.63
C	Maria Dr	913	19	972	10	125	0.97
C	Service to Sunrise Park	915	30	961	6	125	0.96
C	Service to Corona Creek Elementary	916	8	914	6	125	0.91
C	Maria Dr	916	9	1537	10	125	1.54
C	New Pipe (C)	917	305	1278	12	125	1.28
C	New Pipe (C)	917	27	1158	12	125	1.16
C	New Pipe (C)	919	107	854	12	125	0.85
C	Service to Lynch Creek Park	921	139	1271	6	125	1.27
C	South McDowell Blvd	921	59	3755	6	125	3.75
C	Sleepy Hollow Ln	923	31	1471	10	125	1.47
C	Service to Bond Park	925	5	2190	6	125	2.19
C	Luchesi Park	925	16	565	8	125	0.56
C	New Pipe (C)	304A	923	2162	12	125	2.16
C	New Pipe (C)	304A	28	545	12	125	0.54
C	New Pipe (C)	304B	303	975	12	125	0.97

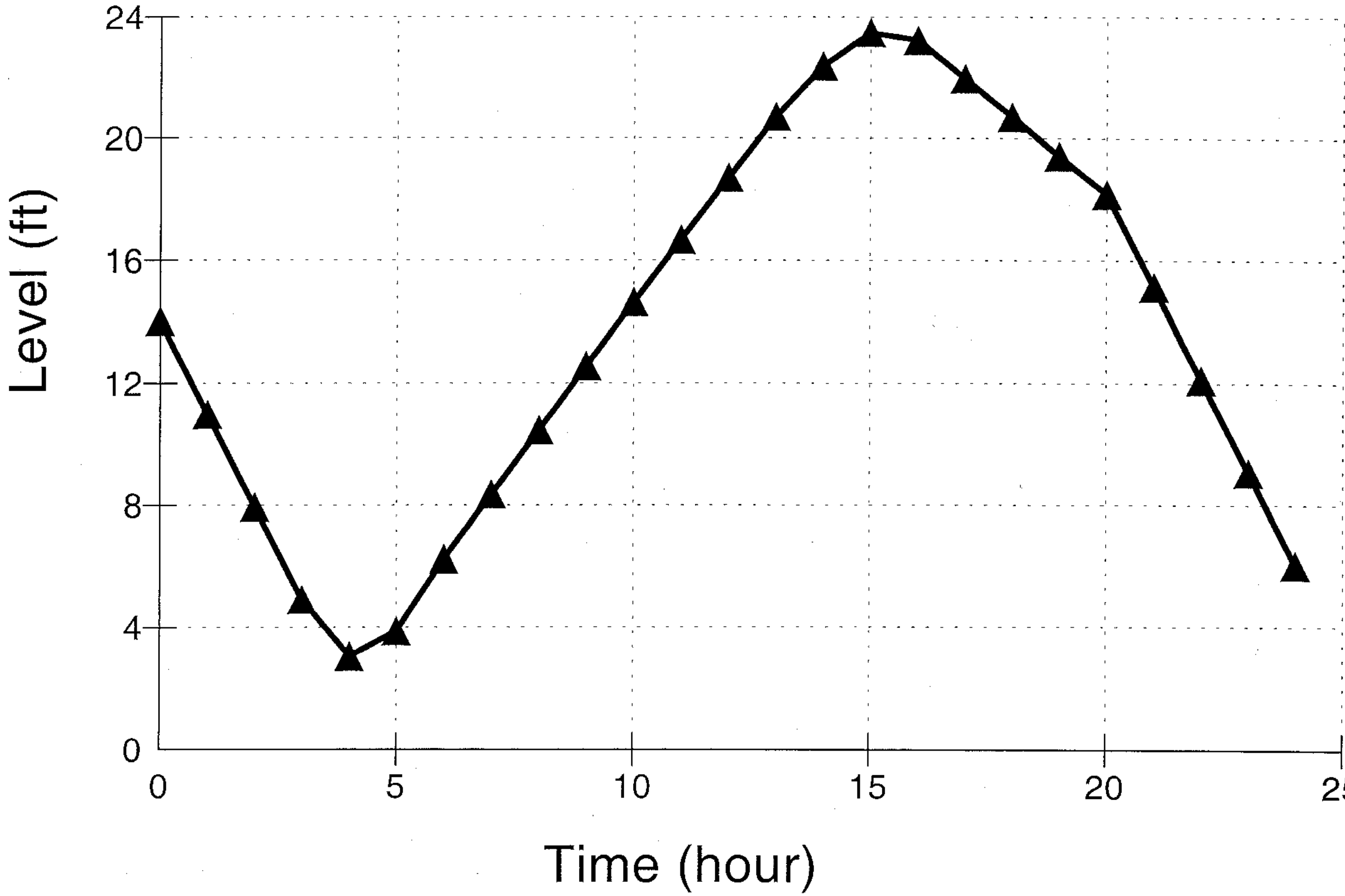
Scenario A + C - Max Day Demand - Tank 7000



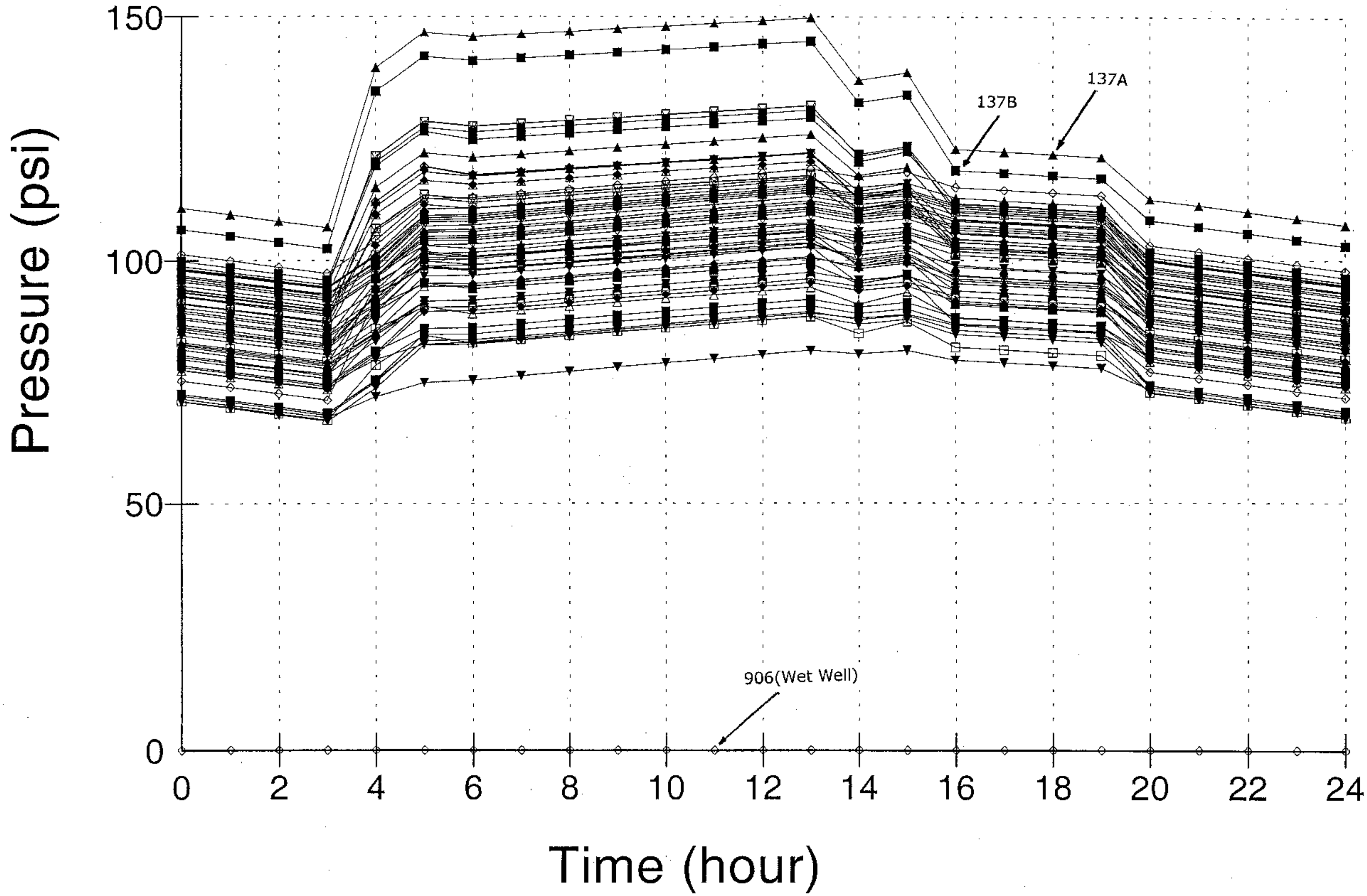
Scenario A + C - Max Day Demand - Pressure at All Nodes



Scenario A + C - Avg Day Demand - Tank 7000



Scenario A + C - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

A + G

MODEL SCENARIO
A + G

PARAMETERS

TOTAL DEMAND	552 MG/YR
MAX DAY DEMAND	5.7 mgd
TOTAL ACRES	721 Acres
Meets Potable Offset Criteria	YES (238 MG)
Meets City-Owned Agricultural Land Requirement	NO

SYSTEM REQUIREMENTS

Pump Station	
Number:	2
Location A:	Tertiary Plant
Size A:	5.7 mgd @ 300' TDH
Location B:	Petaluma Country Club (Bottom of Hill)
Size B:	0.46 mgd @ 150' TDH
Reservoir	
Number:	1
Location:	Northeast on East Washington
Size:	0.90 MG
Elevation:	265 Feet

ISSUES

-Pressure at Petaluma Country Club Pump Station exceeds 150 psi for Max day and 200 psi for Avg day. (Design pipe on golf course for 250 psi.)
-Discharge pressure at Petaluma Country Club < 50 psi. (No issue since discharges into lake for repumping by golf course.)

TERTIARY RECYCLED WATER SYSTEM - Scenario A&G

Date: Sunday, November 02, 2003

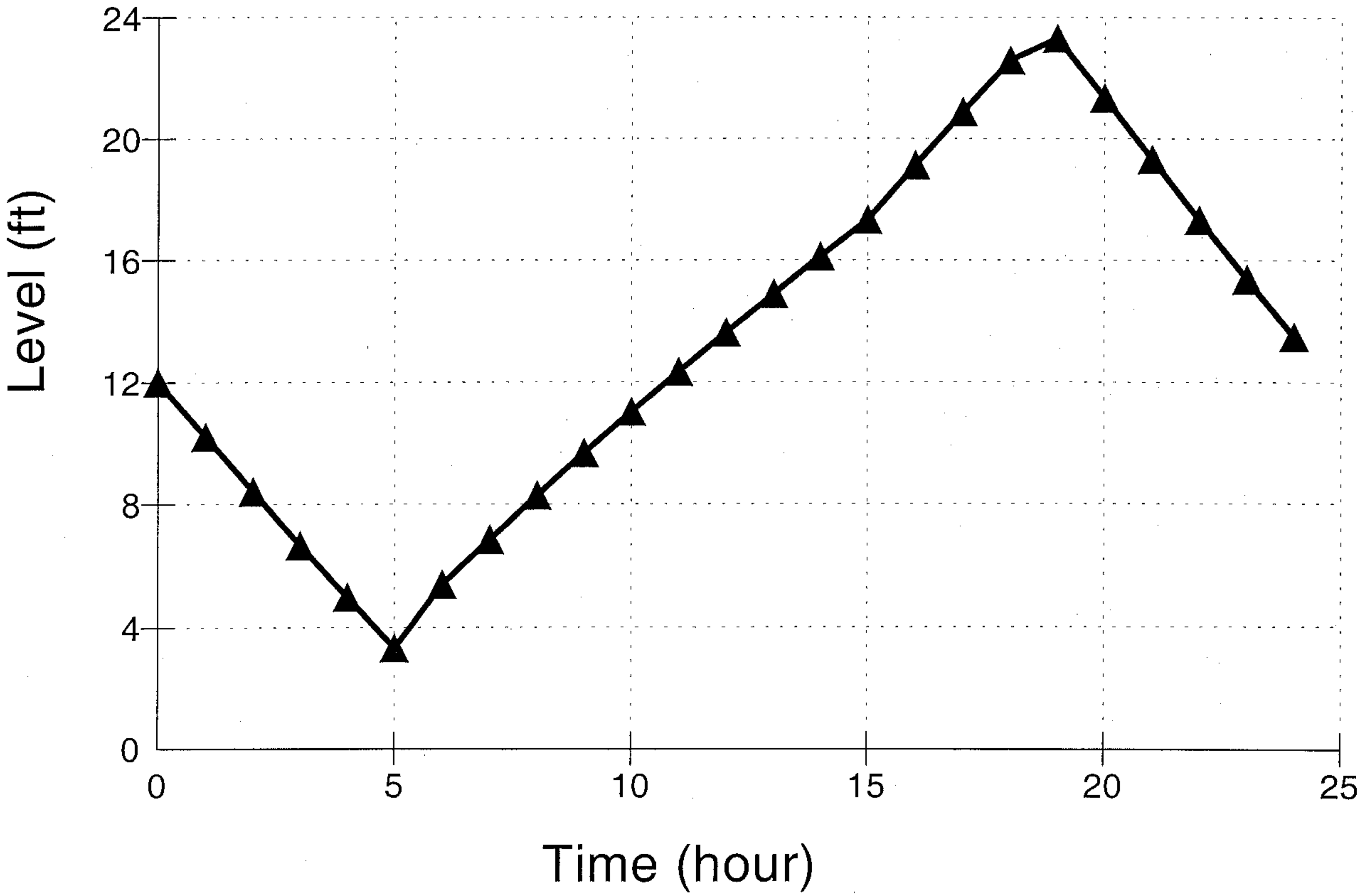
NODE INPUT DATA FOR SCENARIO A + G

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
A	Adobe Creek (S)	1	201	132	G	75
A	Airport (Current Irrigation)	2	44	18	T	72
A	Arroyo Park	3	58	23	T	63
A	Casa Grande High School	6	453	181	T	53
A	Ceja Vineyards (#3)	7	115	99	V	88
A	Herrerias Vineyards (#4)	13	122	105	V	81
A	Open Space (City Owned)	22	217	93	A	74
A	Prince Park	24	214	86	T	89
A	RESA (Redwood Estate Sports Plex)	25	347	139	T	110
A	Rooster Run	26	671	440	G	93
A	Wiseman Park (Extended)	32	374	150	T	70
A	A15 (Matteri)	100	228	98	A	51
A	A16 (Adobe Creek N)	101	466	305	G	80
A	A18 (Karren)	103	70	60	V	33
A	Old Adobe School	306	127	51	T	102
A	Greenway (Future)	316	299	120	T	45
A	8-inch bend	901				35
A	8-inch lateral	902				35
A	Service line to 3 and 13	903				67
A	Service line	904				69
A	Junction	906				5
A	New Junction	912				50
A	Reduce to 16-inch	914				79
A	Zone G	927				54
A	Existing 8 Tee	940				48
A	Existing 20 to 8 Connection	942				48
A	Service line Matteri	953				51
A	Service to Adobe Creek S	959				52
A	Service to Carinalli (310)	966				39
A	Service to Gurmeet Luthra	968				31
A	Treatment Plant Irr (none returning)	137A	771	308	T	5
A	Treatment Plant 3W (returning)	137B	689	451	G	15
G	Petaluma Golf Course (9 holes)	73	160	105	G	400
G	Petaluma Golf Course (Future 9 holes)	79	160	105	G	400
G	Petaluma Golf Club Pump Station	944				16
G	Petaluma Golf Club Pump Station	946				16

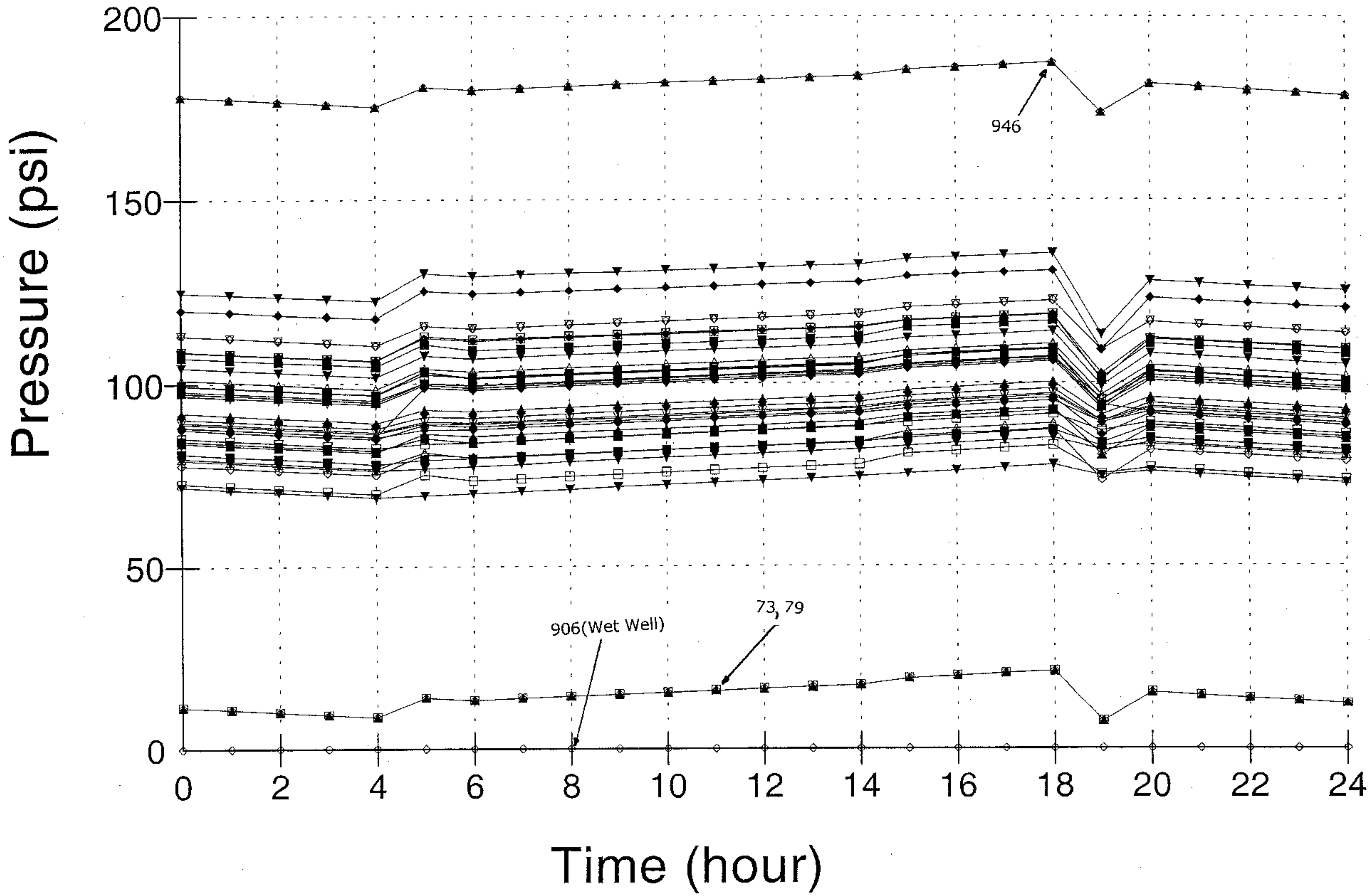
LINK INPUT DATA FOR SCENARIO A + G

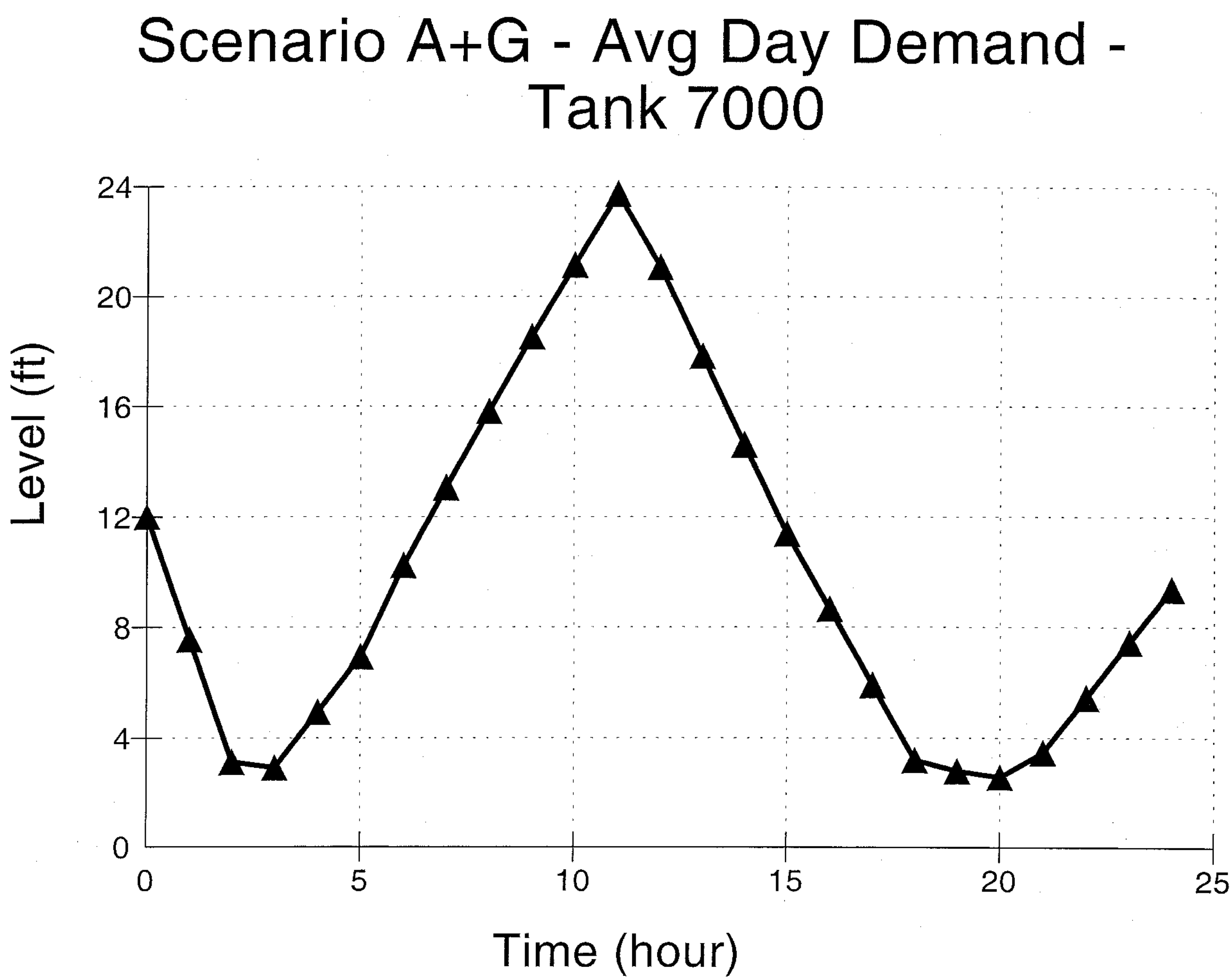
Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2,203	20	125	2.2
A	Service to Arroyo Park	3	903	1,077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1,660	20	125	1.66
A	To Reservoir	25	7000	4,140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.6
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3,854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2,790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1,041	6	125	1.04
A	Existing 20	903	32	1,664	20	125	1.66
A	Service to 7 and 306	904	7	2,239	6	125	2.24
A	Existing 20 at Airport	904	2	2,185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1,629	20	125	1.63
A	Existing 8 - Casa Grande High	912	6	1,069	6	125	1.07
A	Existing 20 Casa Grande Rd	912	22	2,523	20	125	2.52
A	New East Wahington St	914	26	1,625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3,717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1,581	8	125	1.58
A	Service to Matteri	953	100	284	8	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.7
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2,095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1,210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1,700	20	125	1.7
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3,655	20	125	3.66
G	Petaluma Golf Club	73	79	137	8	125	0.14
G	Existing 16 Petaluma Golf Club	927	944	8,821	16	125	8.82
G	Petaluma Golf Club	946	79	1,692	8	125	1.69

Scenario A+G - Max Day Demand - Tank 7000

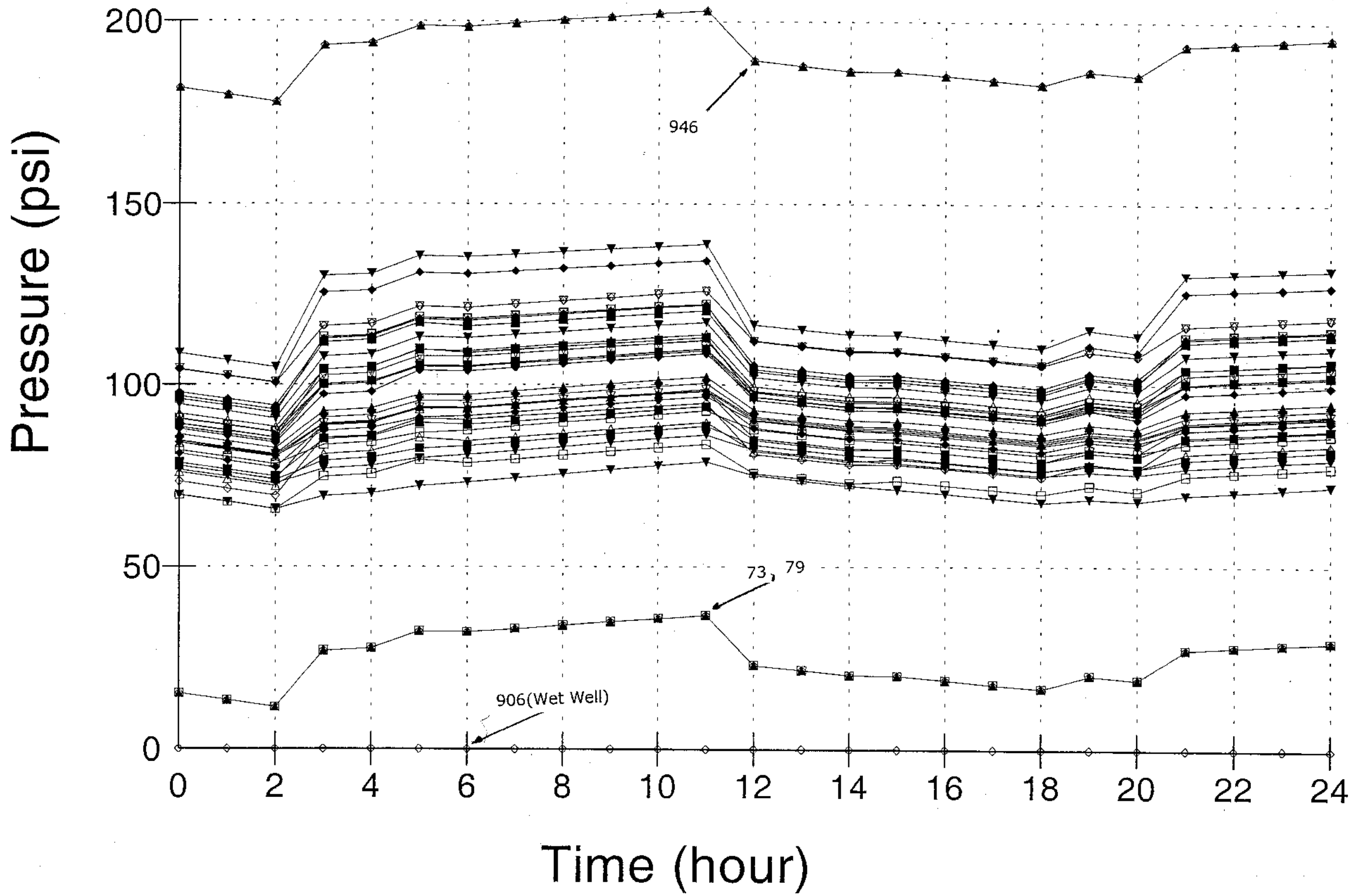


Scenario A+G - Max Day Demand - Pressure at All Nodes




Scenario A+G - Avg Day Demand -
Tank 7000
Level (ft)
0
4
8
12
16
20
24
0
5
10
15
20
25
Time (hour)

Scenario A+G - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

A + E + G

MODEL SCENARIO
A + E + G

PARAMETERS

TOTAL DEMAND	726 MG/YR
MAX DAY DEMAND	7.5 mgd
TOTAL ACRES	886 Acres
Meets Potable Offset Criteria	YES (372 MG)
Meets City-Owned Agricultural Land Requirement	NO

SYSTEM REQUIREMENTS

Pump Station	
Number:	2
Location A:	Tertiary Plant
Size A:	7.5 mgd @ 330' TDH
Location B	Petaluma Country Club (Bottom of Hill)
Size B:	0.46 mgd @ 190' TDH
Reservoir	
Number:	1
Location:	Northeast on East Washington
Size:	1.71 MG
Elevation:	275 Feet

ISSUES

-Max day Customers #67, 41, 36B, 66, 75 < 50 psi, but > 40 psi.
-Avg day Customers #66 < 50 psi, but > 40 psi.
-Pressure at Petaluma Country Club Pump Station exceeds 150 psi at Avg day and Max day demands. (Design pipe on golf course for 250 psi.)
-Discharge Pressure at Petaluma Country Club < 50 psi. (No issue since discharge into lake for repumping by golf course.)
-Pressure at Tertiary Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand. (Design pipe for 250 psi and design pressure relief at tertiary pump station.)

TERTIARY RECYCLED WATER SYSTEM - Scenario A&E&G

Date: Sunday, November 02, 2003

NODE INPUT DATA FOR SCENARIO A + E + G

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type
A	Adobe Creek (S)	1	201	132	G
A	Airport (Current Irrigation)	2	44	18	T
A	Arroyo Park	3	58	23	T
A	Casa Grande High School	6	453	181	T
A	Ceja Vineyards (#3)	7	115	99	V
A	Herrerias Vineyards (#4)	13	122	105	V
A	Open Space (City Owned)	22	217	93	A
A	Prince Park	24	214	86	T
A	RESA (Redwood Estate Sports Plex)	25	347	139	T
A	Rooster Run	26	671	440	G
A	Wiseman Park (Extended)	32	374	150	T
A	A15 (Matteri)	100	228	98	A
A	A16 (Adobe Creek N)	101	466	305	G
A	A18 (Karren)	103	70	60	V
A	Old Adobe School	306	127	51	T
A	Greenway (Future)	316	299	120	T
A	8-inch bend	901			
A	8-inch lateral	902			
A	Service line to 3 and 13	903			
A	Service line	904			
A	Junction	906			
A	New Junction	912			
A	Reduce to 16-inch	914			
A	Zone G	927			
A	Existing 8 Tee	940			
A	Existing 20 to 8 Connection	942			
A	Service line Matteri	953			
A	Service to Adobe Creek S	959			
A	Service to Carinalli (310)	966			
A	Service to Gurmeet Luthra	968			
A	Treatment Plant Irr (none returning)	137A	771	308	T
A	Treatment Plant 3W (returning)	137B	689	451	G
E	Cherry Valley Park	38	14	6	T
E	City Hall	40	13	5	T
E	Mary Collins Elementary	41	27	11	T
E	Cypress Hill Cemetary	44	578	231	T
E	Del Oro Park	45	67	27	T
E	Grant Elementary	47	66	26	T
E	Penry Park	49	35	14	T
E	Jack Cavanaugh Park	50	1	0	T
E	Fairgrounds & Library	52	170	68	T
E	La Tercera Elementary	53	96	38	T
E	La Tercera Park	54	54	22	T
E	McKinley Elementary	61	52	21	T
E	McNear Elementary	62	33	13	T
E	McNear Park	63	93	37	T
E	McNear Landing	64	3	1	T
E	Miwok Valley Elementary and Park	65	133	53	T
E	Oak Hill Park	66	52	21	T

NODE INPUT DATA FOR SCENARIO A + E + G

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type
E	Magnolia Park (Future)	67	77	31	T
E	Holmburg Park (Future)	69	116	46	T
E	McNear Peninsula Park (Future)	70	337	135	T
E	Petaluma High	74	204	82	T
E	Petaluma Junior High	75	127	51	T
E	Saint Vincent's High School	77	54	22	T
E	Elevation point	81			
E	Valley Vista Elementary	84	67	27	T
E	Country Club Open Space	104	46	18	T
E	Wickersham Park	105	39	16	T
E	Walnut Park	106	27	11	T
E	Crinelli Mini Park	109	8	3	T
E	Pomeroy Corp	110	91	57	I
E	Anna Meadows Park	112	7	3	T
E	Grant Park	113	19	8	T
E	Shamrock	138	16	16	S
E	Casa Grande Streetscape	307	10	4	T
E	Kenilworth Fields	308	220	88	T
E	S McDowell Blvd Streetscape	309	2	1	T
E	junction	924			
E	New Junction	926			
E	Service Line Calvary Cemetary	928			
E	Service Line	930			
E	Service McKinley Elementary	931			
E	Service Line St Vincent High	932			
E	Service Line Kenilworth Fields	933			
E	Service Line Holmburg Park	934			
E	New Junction	935			
E	Service line Valley Vista Elementary	937			
E	Service Line Oak Hill Park	939			
E	Service line Penry Park	941			
E	Service line Pomeroy	943			
E	New Junction	945			
E	Howard St and English St	947			
E	Service line G Street	949			
E	Service to Anna Meadows Park	961			
E	Service to S McDowell Blvd Streetscape	963			
E	Service to McNear Landing	965			
E	Calvary Cemetary	36A	106	42	T
E	Calvary Cemetary (Future)	36B	231	92	T
G2	New Junction	957			
G2	Petaluma Golf Course (9 holes)	73B	160	105	G
G2	Petaluma Golf Course (Future 9 holes)	79B	160	105	G

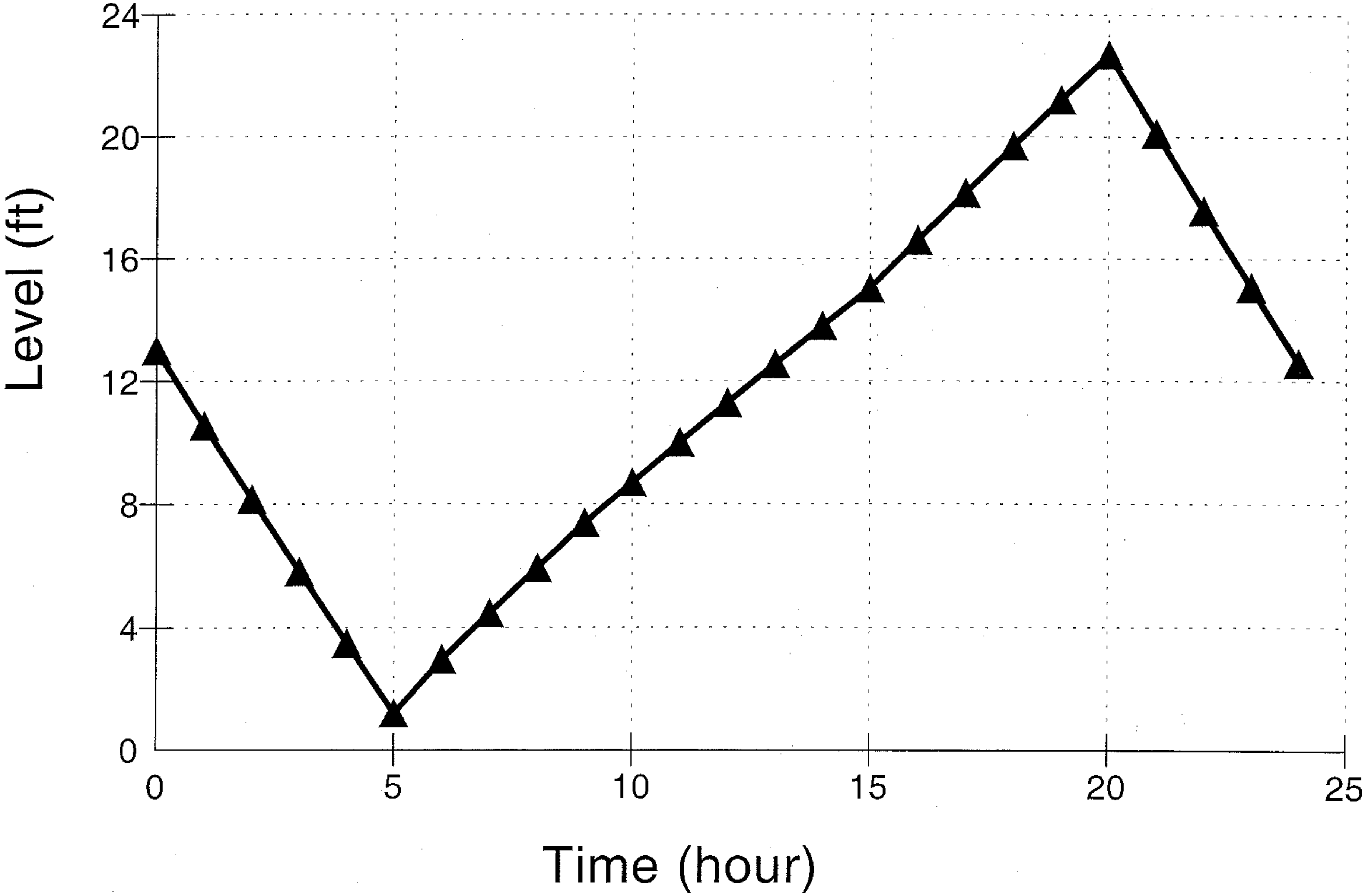
LINK INPUT DATA FOR SCENARIO A + E + G

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2,203	20	125	2.2
A	Service to Arroyo Park	3	903	1,077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1,660	20	125	1.66
A	To Reservoir	25	7000	4,140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.6
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3,854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2,790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1,041	6	125	1.04
A	Existing 20	903	32	1,664	20	125	1.66
A	Service to 7 and 306	904	7	2,239	6	125	2.24
A	Existing 20 at Airport	904	2	2,185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1,629	20	125	1.63
A	Existing 8 - Casa Grande High	912	6	1,069	6	125	1.07
A	Existing 20 Casa Grande Rd	912	22	2,523	20	125	2.52
A	New East Wahington St	914	26	1,625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3,717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1,581	8	125	1.58
A	Service to Matteri	953	100	284	8	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.7
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2,095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1,210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1,700	20	125	1.7
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3,655	20	125	3.66
E	English St	40	74	1,443	8	125	1.44
E	Service to Mary Collins Elementary	41	38	269	6	125	0.27
E	Magnolia Ave	44	930	363	12	125	0.36
E	Service to Grant Park	47	113	342	6	125	0.34
E	Payran St	52	931	1,330	12	125	1.33
E	Service to La Tercera Elementary	54	53	225	6	125	0.22
E	G St	62	63	156	6	125	0.16
E	English St and Webster St	74	937	1,641	8	125	1.64
E	Service to Oak Hill Park	81	66	268	6	125	0.27
E	McNear Ave	104	47	1,749	6	125	1.75
E	G St	105	62	2,120	8	125	2.12
E	Petaluma Blvd S	106	949	1,219	12	125	1.22
E	Crinella Dr	109	54	2,651	6	125	2.65
E	Hopper St	138	943	2,206	14	125	2.21
E	Hopper St	138	945	1,614	14	125	1.61
E	Casa Grande Road	307	926	263	20	125	0.26
E	Crinella Dr	307	109	737	6	125	0.74

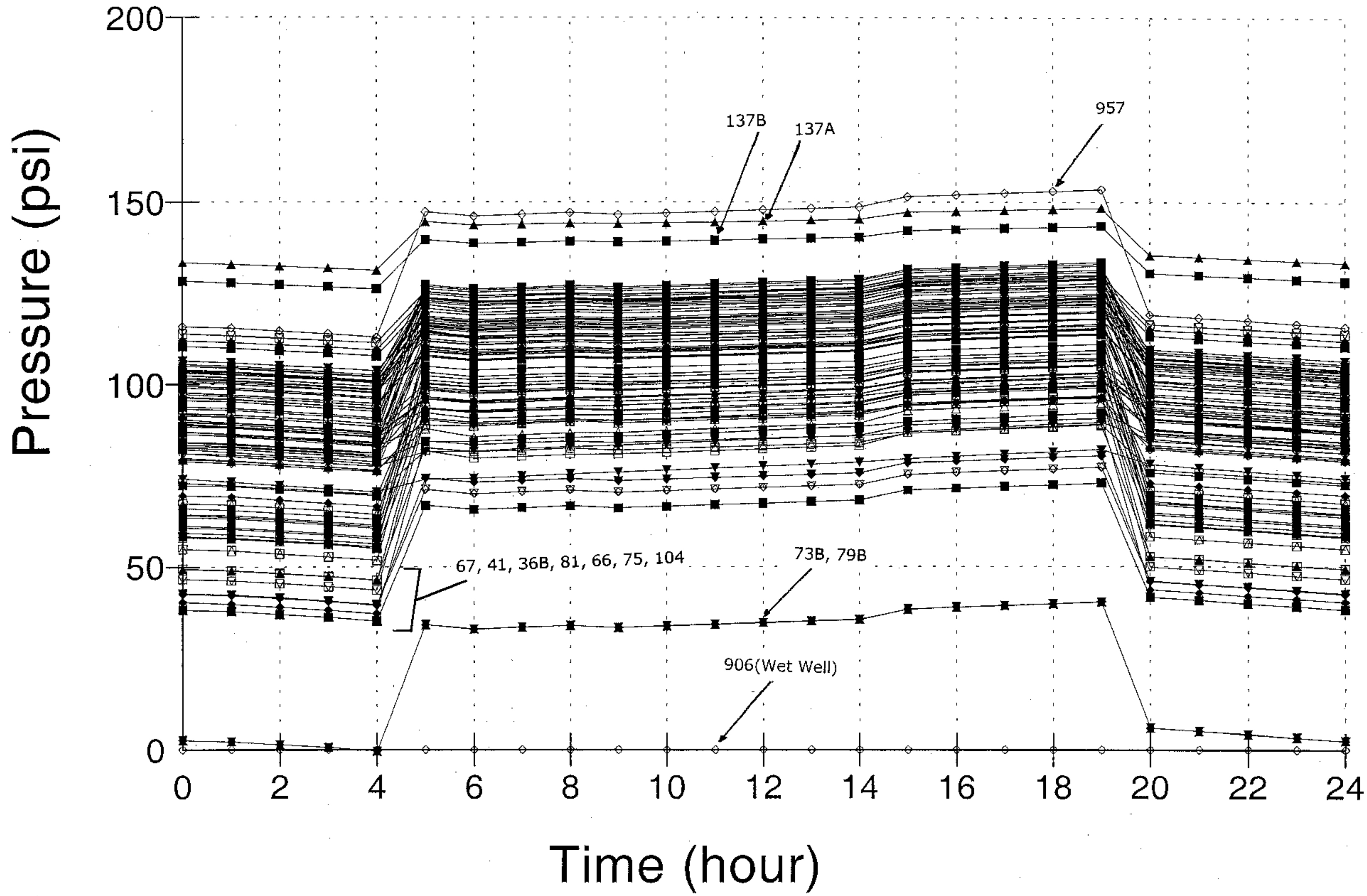
LINK INPUT DATA FOR SCENARIO A + E + G

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
E	Casa Grande Road	912	307	2,077	20	125	2.08
E	Service to Miwok Valley Elementary and Pa	924	65	790	6	125	0.79
E	Lakeville Hwy-Hwy101	924	935	1,713	20	125	1.71
E	Casa Grande	926	961	342	20	125	0.34
E	Sartori Dr	926	45	1,030	6	125	1.03
E	Service to Calvary Cemetary (Future)	928	36B	379	6	125	0.38
E	Magnolia Ave	928	36A	179	12	125	0.18
E	Service to Magnolia Park	930	67	1,033	6	125	1.03
E	Service to 38 and 41	930	41	537	6	125	0.54
E	Service to McKinley Elementary	931	61	293	6	125	0.29
E	Payran St	931	934	1,710	12	125	1.71
E	Magnolia Ave	932	44	407	12	125	0.41
E	Service to Saint Vincent's High School	932	77	356	6	125	0.36
E	Service to Kenilworth Fields	933	308	1,197	6	125	1.2
E	Payran St	933	52	2,069	12	125	2.07
E	Service to Holmburg Park	934	69	894	6	125	0.89
E	Payran St-Magnolia Ave	934	928	3,493	12	125	3.49
E	Payran St	935	933	2,550	12	125	2.55
E	Hopper St	935	943	1,228	14	125	1.23
E	Service to Petalum Jr High	937	75	720	6	125	0.72
E	Service to Valley Vista Elementary	937	84	794	6	125	0.79
E	Service to Oak Hill Park	939	81	1,311	6	125	1.31
E	Howard St	939	947	785	14	125	0.78
E	Service to Penry Park	941	49	173	6	125	0.17
E	Washington St	941	939	1,224	14	125	1.22
E	Service to Pomeroy	943	110	552	6	125	0.55
E	Service to McNear Peninsula Park	945	70	1,847	8	125	1.85
E	Service to Jack Cavanaugh Park	945	50	310	6	125	0.31
E	Washington St	945	941	2,257	14	125	2.26
E	English St	947	40	552	8	125	0.55
E	Howard St and D St	947	106	2,944	12	125	2.94
E	G St	949	105	447	8	125	0.45
E	Petaluma Blvd S	949	965	2,787	12	125	2.79
E	Casa Grande Rd	961	963	701	20	125	0.7
E	Service to Anna Meadows Park	961	112	186	6	125	0.19
E	Casa Grande-Lakeville Hwy	963	924	3,394	20	125	3.39
E	Service to S McDowell Streetscape	963	309	427	6	125	0.43
E	McNear Ave	965	104	2,509	10	125	2.51
E	Service to McNear Landing	965	64	931	6	125	0.93
E	Magnolia Ave	36A	932	144	12	125	0.14
G2	Service to Petaluma Golf Course	957	73B	2,555	8	125	2.56
G2	Service to Petaluma Golf Course	73B	79B	140	8	125	0.14

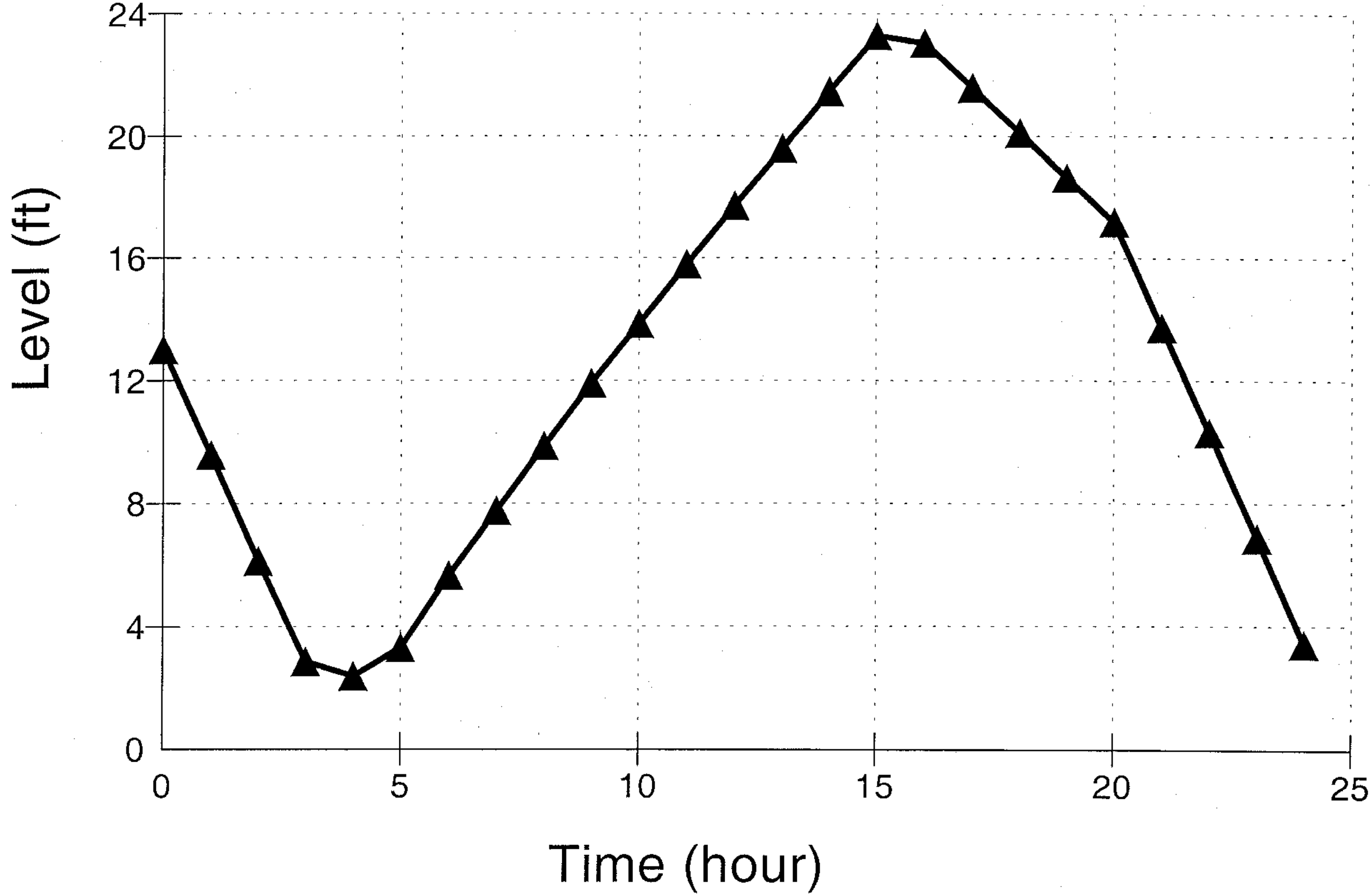
Scenario A+E+G - Max Day Demand - Tank 7000



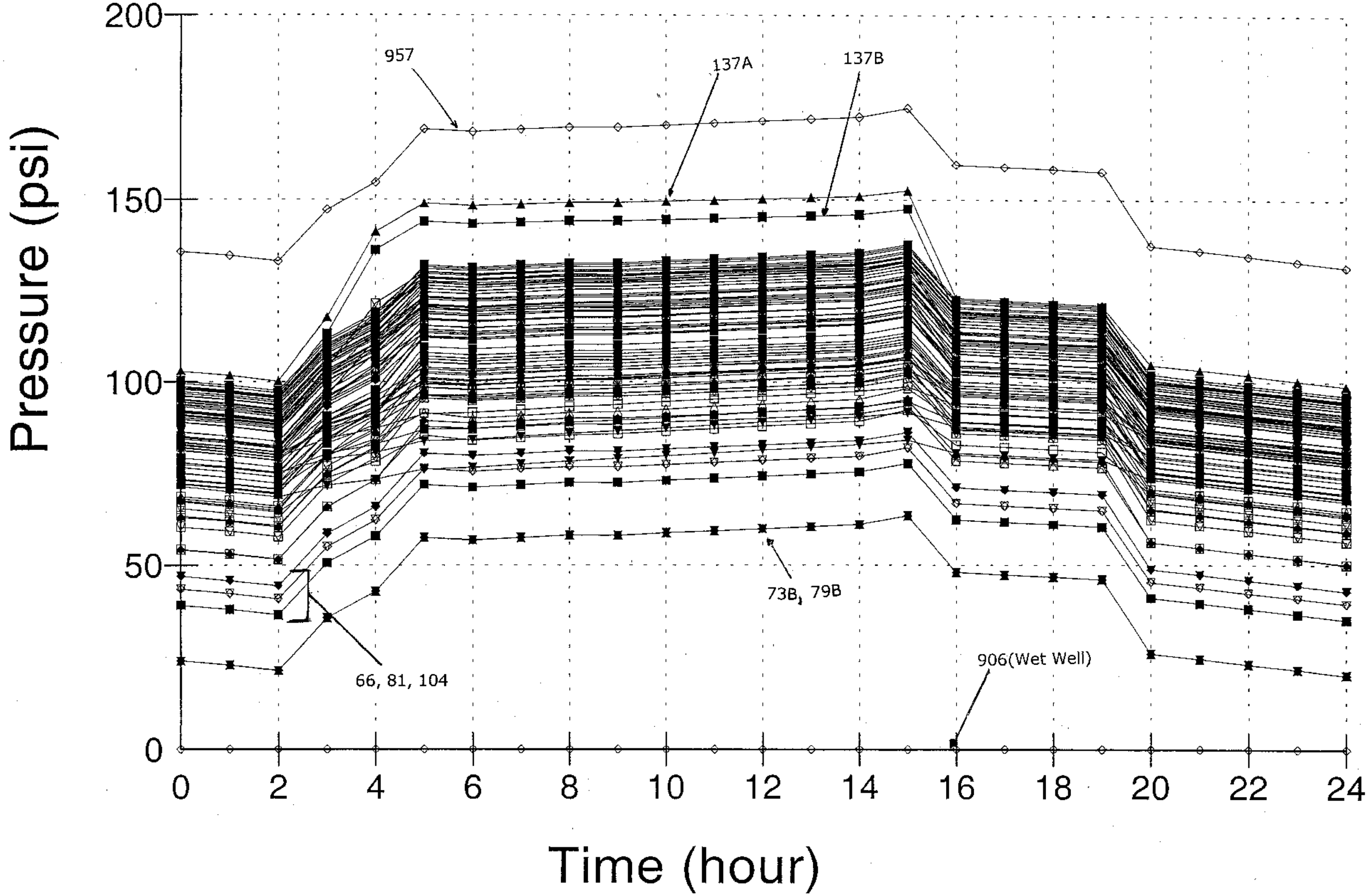
Scenario A+E+G - Max Day Demand - Pressure at All Nodes



Scenario A+E+G - Avg Day Demand - Tank 7000



Scenario A+E+G - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

A + C + G

MODEL SCENARIO
A + C + G

PARAMETERS

TOTAL DEMAND	685 MG/YR
MAX DAY DEMAND	7.1 mgd
TOTAL ACRES	863 Acres
Meets Potable Offset Criteria	YES (307 MG)
Meets City-Owned Agricultural Land Requirement	NO

SYSTEM REQUIREMENTS

Pump Station

Number:	2
Location A:	Tertiary Plant
Size A:	7.1 mgd @ 350' TDH
Location B:	Petaluma Country Club (Bottom of Hill)
Size B:	0.46 mgd @ 150' TDH

Reservoir

Number:	1
Location:	Northeast on East Washington
Size:	1.71 MG
Elevation:	280 Feet

ISSUES

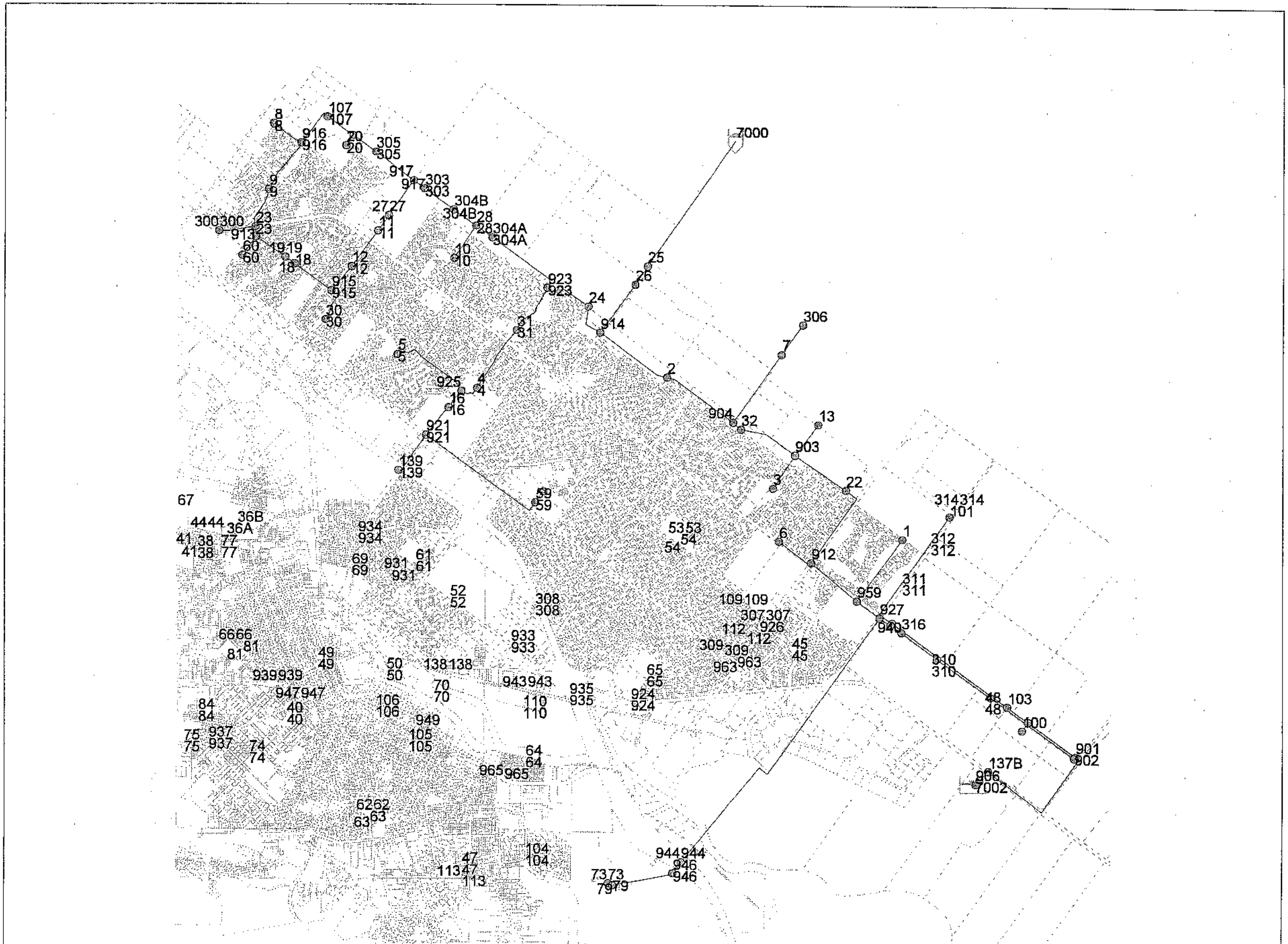
-Pressure at Tertiary Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand (Design Pipe for 250 psi and design pressure relief at Tertiary Pump Station).

-Pressure at Tertiary Pump Station exceeds 150 psi on Max and Avg day (Design pipe for 250 psi). Pressure at Browns Lane and Ely Road is below 150 psi.

-Pressure at Petaluma Country Club Pump Station exceeds 150 psi for Max day and Avg day demands. (Design pipe on golf course for 250 psi.)

-Discharge pressure at Petaluma Country Club < 50 psi. (No issue since discharges into lake for repumping by golf course.)

TERTIARY RECYCLED WATER SYSTEM - Scenario A+C+G



Prepared By:

Date: Friday, January 16, 2004

NODE INPUT DATA FOR SCENARIO A + C + G

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
A	Adobe Creek (S)	1	201	132	G	75
A	Airport (Current Irrigation)	2	44	18	T	72
A	Arroyo Park	3	58	23	T	63
A	Casa Grande High School	6	453	181	T	53
A	Ceja Vineyards (#3)	7	115	99	V	88
A	Herrerias Vineyards (#4)	13	122	105	V	81
A	Open Space (City Owned)	22	217	93	A	74
A	Prince Park	24	214	86	T	89
A	RESA (Redwood Estate Sports Plex)	25	347	139	T	110
A	Rooster Run	26	671	440	G	93
A	Wiseman Park (Extended)	32	374	150	T	70
A	A15 (Matteri)	100	228	98	A	51
A	A16 (Adobe Creek N)	101	466	305	G	80
A	A18 (Karren)	103	70	60	V	33
A	Old Adobe School	306	127	51	T	102
A	Greenway (Future)	316	299	120	T	45
A	8-inch bend	901				35
A	8-inch lateral	902				35
A	Service line to 3 and 13	903				67
A	Service line	904				69
A	Junction	906				5
A	New Junction	912				50
A	Reduce to 16-inch	914				79
A	Zone G	927				54
A	Existing 8 Tee	940				48
A	Existing 20 to 8 Connection	942				48
A	Service line Matteri	953				51
A	Service to Adobe Creek S	959				52
A	Service to Carinalli (310)	966				39
A	Service to Gurmeet Luthra	968				31
A	Treatment Plant Irr (none returning)	137A	771	308	T	5
A	Treatment Plant 3W (returning)	137B	689	451	G	15
C	Bernard Eldrige School	4	39	16	T	46
C	Bond Park	5	116	46	T	45
C	Corona Creek Elementary	8	58	23	T	55
C	Corona Creek LAD	9	48	19	T	43
C	Eagle Park	10	56	22	T	76
C	Gatti Park	11	141	56	T	59
C	Glenbrook Park	12	50	20	T	49

NODE INPUT DATA FOR SCENARIO A + C + G

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
C	Lucchesi Park	16	253	101	T	35
C	McDowell Park	17	102	41	T	36
C	Meadow Elementary	18	42	17	T	37
C	Meadow Park	19	52	21	T	37
C	Kenilworth Jr High (Relocated)	20	386	154	T	59
C	City Right-of-Way (Maria & Sonoma Mtn)	23	58	23	T	42
C	Santa Rosa Junior College	27	96	38	T	69
C	Sonoma Mountain ElementaryTurf	28	52	21	T	95
C	Sunrise Park	30	40	16	T	38
C	Turtle Creek Park	31	96	38	T	76
C	McDowell Elementary	59	71	28	T	32
C	McDowell Meadow Park	60	15	6	T	35
C	Open Space (by new Jr High)	107	58	23	T	56
C	Lynch Creek Park	139	135	54	T	27
C	Trun Bridge Park	300	44	18	T	40
C	Santa Rosa JC Phase 2	303	104	42	T	81
C	Urban Separator N	305	229	92	T	79
C	Service to Meadow Park	913				38
C	Service to Sunrise Park	915				43
C	Service to Corona Creek Elementary	916				53
C	New Junction	917				92
C	Service to Kenilworth Jr High	919				64
C	Service to Lynch Creek Park	921				35
C	New Junction	923				76
C	New Junction	925				47
C	Urban Separator S	304A	110	44	T	95
C	Urban Separator S	304B	110	44	T	97
G	Petaluma Golf Course (9 holes)	73	160	105	G	400
G	Petaluma Golf Course (Future 9 holes)	79	160	105	G	400
G	Petaluma Golf Club Pump Station	944				16
G	Petaluma Golf Club Pump Station	946				16

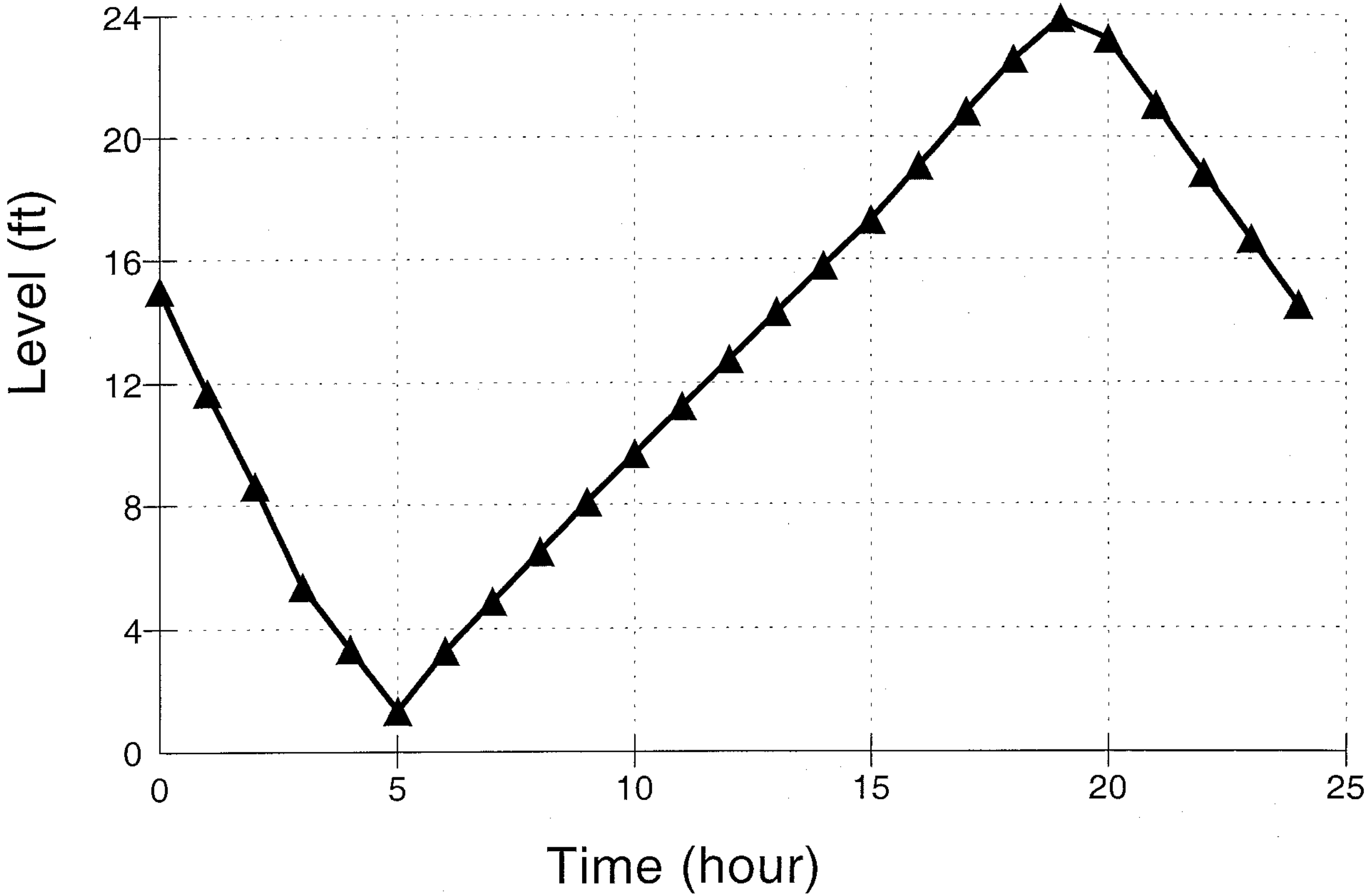
LINK INPUT DATA FOR SCENARIO A + C + G

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2,203	20	125	2.20
A	Service to Arroyo Park	3	903	1,077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1,660	20	125	1.66
A	To Reservoir	25	7000	4,140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.60
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3,854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2,790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1,041	6	125	1.04
A	Existing 20	903	32	1,664	20	125	1.66
A	Service to 7 and 306	904	7	2,239	6	125	2.24
A	Existing 20 at Airport	904	2	2,185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1,629	20	125	1.63
A	Existing 20 Casa Grande Rd	912	22	2,523	20	125	2.52
A	Existing 8 - Casa Grande High	912	6	1,069	6	125	1.07
A	New East Wahington St	914	26	1,625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3,717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1,581	8	125	1.58
A	Service to Matteri	953	100	284	6	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.70
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2,095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1,210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1,700	20	125	1.70
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3,655	20	125	3.66
C	Monroe St	4	925	551	10	125	0.55
C	Maria Dr	9	23	1,117	10	125	1.12
C	Sunrise Pkwy	11	12	1,206	12	125	1.21
C	Sunrise Pkwy	12	915	855	12	125	0.85
C	Luchesi Park	16	921	968	8	125	0.97
C	Maria Dr	18	915	1,239	10	125	1.24
C	Maria Dr	19	18	302	10	125	0.30

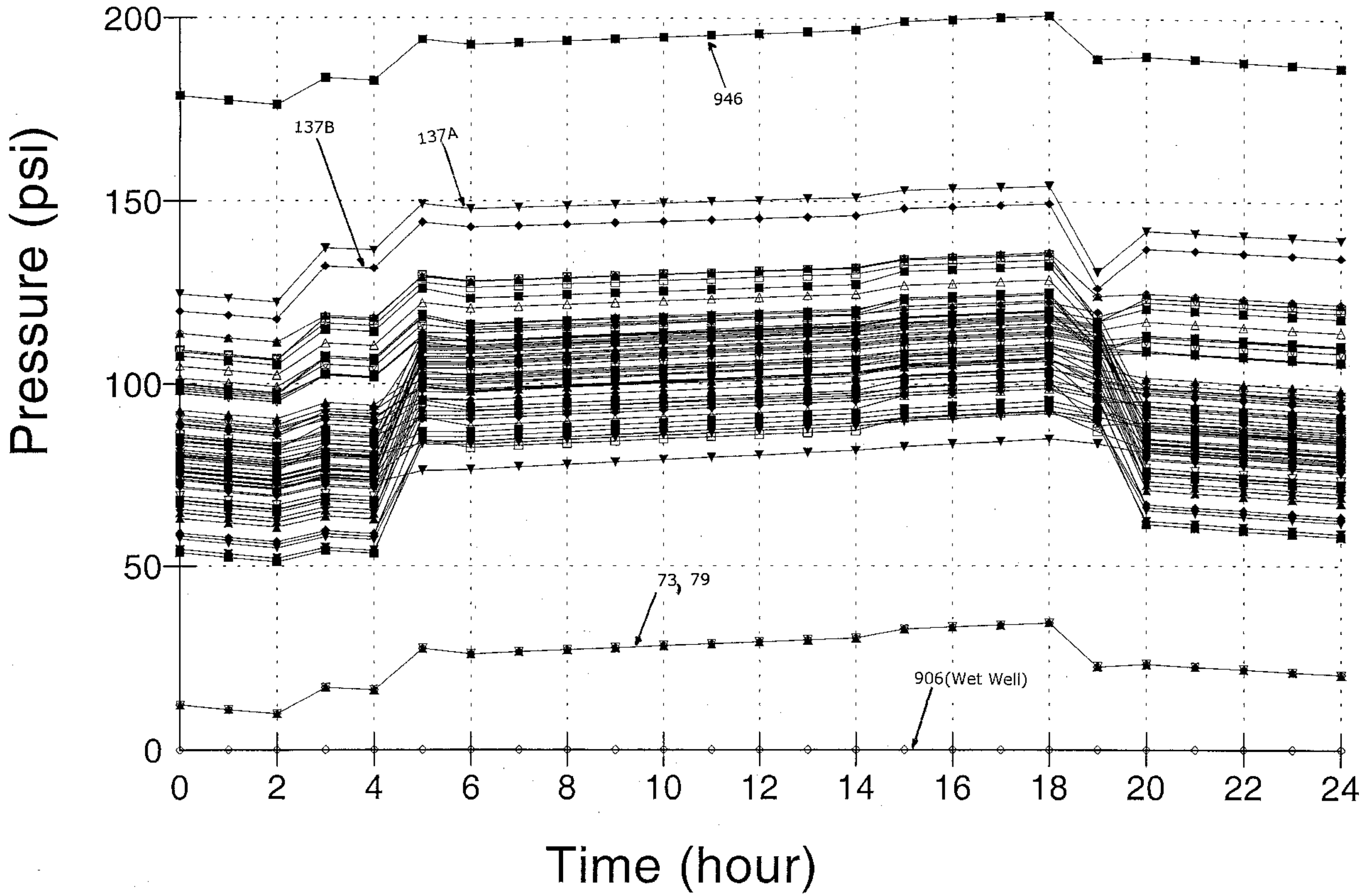
LINK INPUT DATA FOR SCENARIO A + C + G

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
C	Service to Kenilworth Jr High	20	919	339	6	125	0.34
C	Service to Trun Bridge Park	23	300	986	6	125	0.99
C	Maria Dr	23	913	268	10	125	0.27
C	New pipe (C)	24	923	1,486	12	125	1.49
C	Campus Cir	27	11	512	12	125	0.51
C	Existing 10 - Turtle Creek Park	28	10	1,061	10	125	1.06
C	New Pipe (C)	28	304B	746	12	125	0.75
C	Monroe St	31	4	1,905	10	125	1.90
C	Service to McDowell Park	59	17	387	6	125	0.39
C	New Pipe (C)	107	916	1,123	12	125	1.12
C	New Pipe (C)	303	917	370	12	125	0.37
C	New Pipe (C)	305	919	771	12	125	0.77
C	Service to McDowell Meadow Park	913	60	628	6	125	0.63
C	Maria Dr	913	19	972	10	125	0.97
C	Service to Sunrise Park	915	30	961	6	125	0.96
C	Service to Corona Creek Elementary	916	8	914	6	125	0.91
C	Maria Dr	916	9	1,537	10	125	1.54
C	New Pipe (C)	917	305	1,278	12	125	1.28
C	New Pipe (C)	917	27	1,158	12	125	1.16
C	New Pipe (C)	919	107	854	12	125	0.85
C	Service to Lynch Creek Park	921	139	1,271	6	125	1.27
C	South McDowell Blvd	921	59	3,755	6	125	3.75
C	Sleepy Hollow Ln	923	31	1,471	10	125	1.47
C	Service to Bond Park	925	5	2,190	6	125	2.19
C	Luchesi Park	925	16	565	8	125	0.56
C	New Pipe (C)	304A	923	2,162	12	125	2.16
C	New Pipe (C)	304A	28	545	12	125	0.54
C	New Pipe (C)	304B	303	975	12	125	0.97
G	Petaluma Golf Club	73	79	137	8	125	0.14
G	Existing 16 Petaluma Golf Club	927	944	8,821	16	125	8.82
G	Petaluma Golf Club	946	79	1,692	8	125	1.69

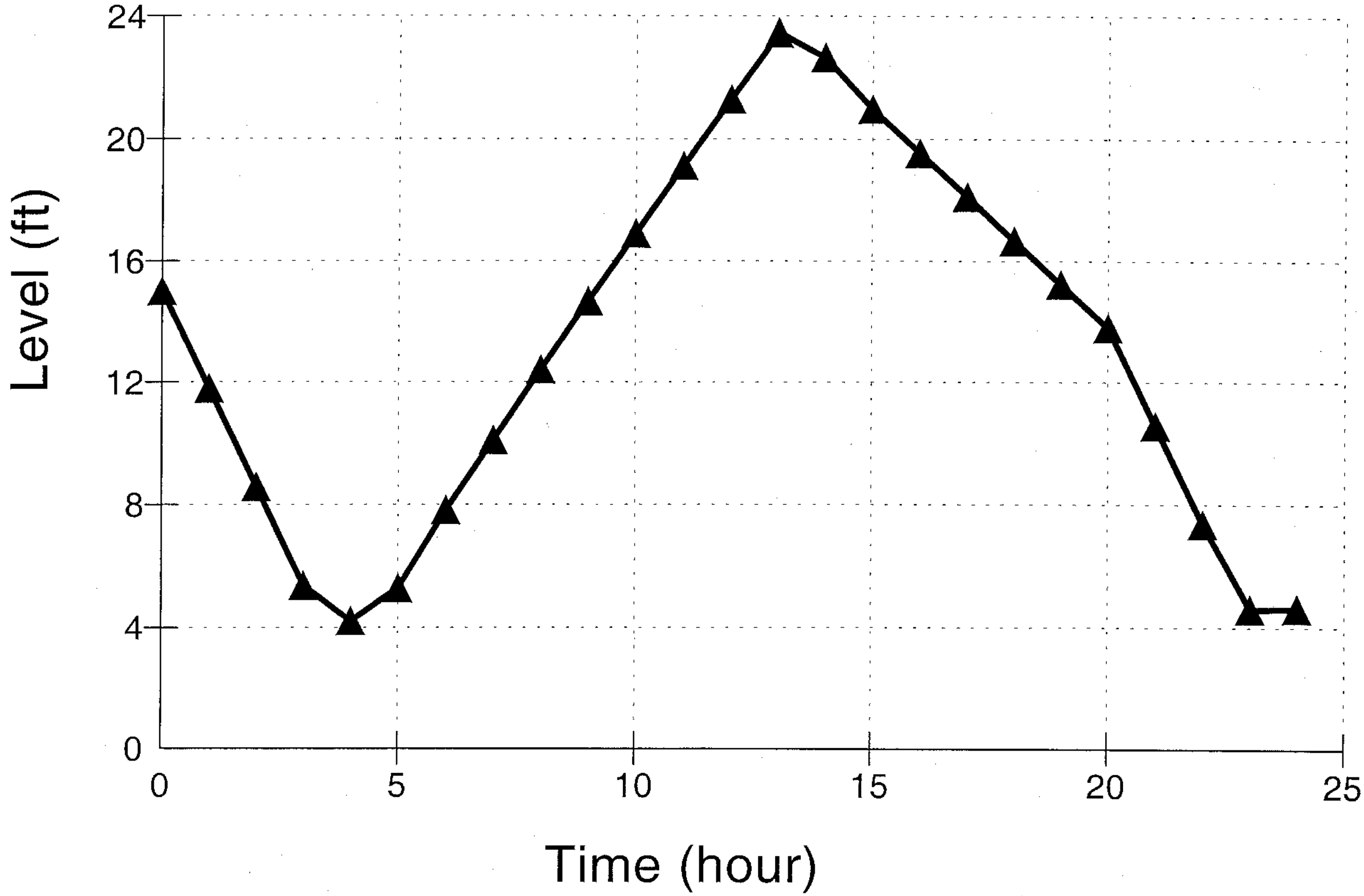
Scenario A+C+G - Max Day Demand - Tank 7000



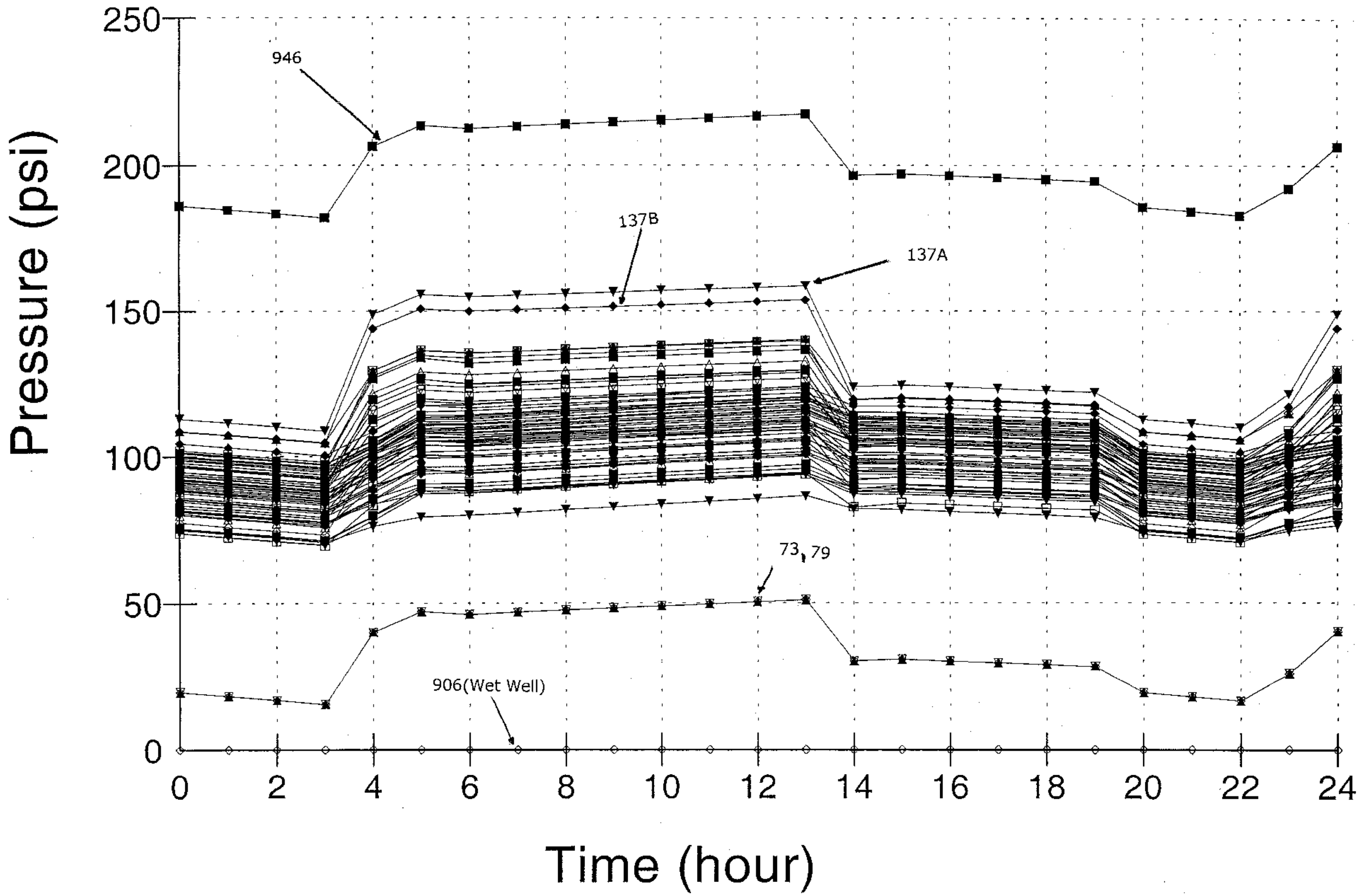
Scenario A+C+G - Max Day Demand - Pressure at All Nodes



Scenario A+C+G - Avg Day Demand - Tank 7000



Scenario A+C+G - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

H + I

MODEL SCENARIO
H + I

PARAMETERS

TOTAL DEMAND	344 MG/YR
MAX DAY DEMAND	3.6 mgd
TOTAL ACRES	361 Acres
Meets Potable Offset Criteria	NO
Meets City-Owned Agricultural Land Requirement	YES (205 Acres)

SYSTEM REQUIREMENTS

Pump Stations Required

Main P.S.	YES
Booster P.S. #1	YES
Booster P.S. #2	NO
Additional Pump Stations	NO

Reservoir

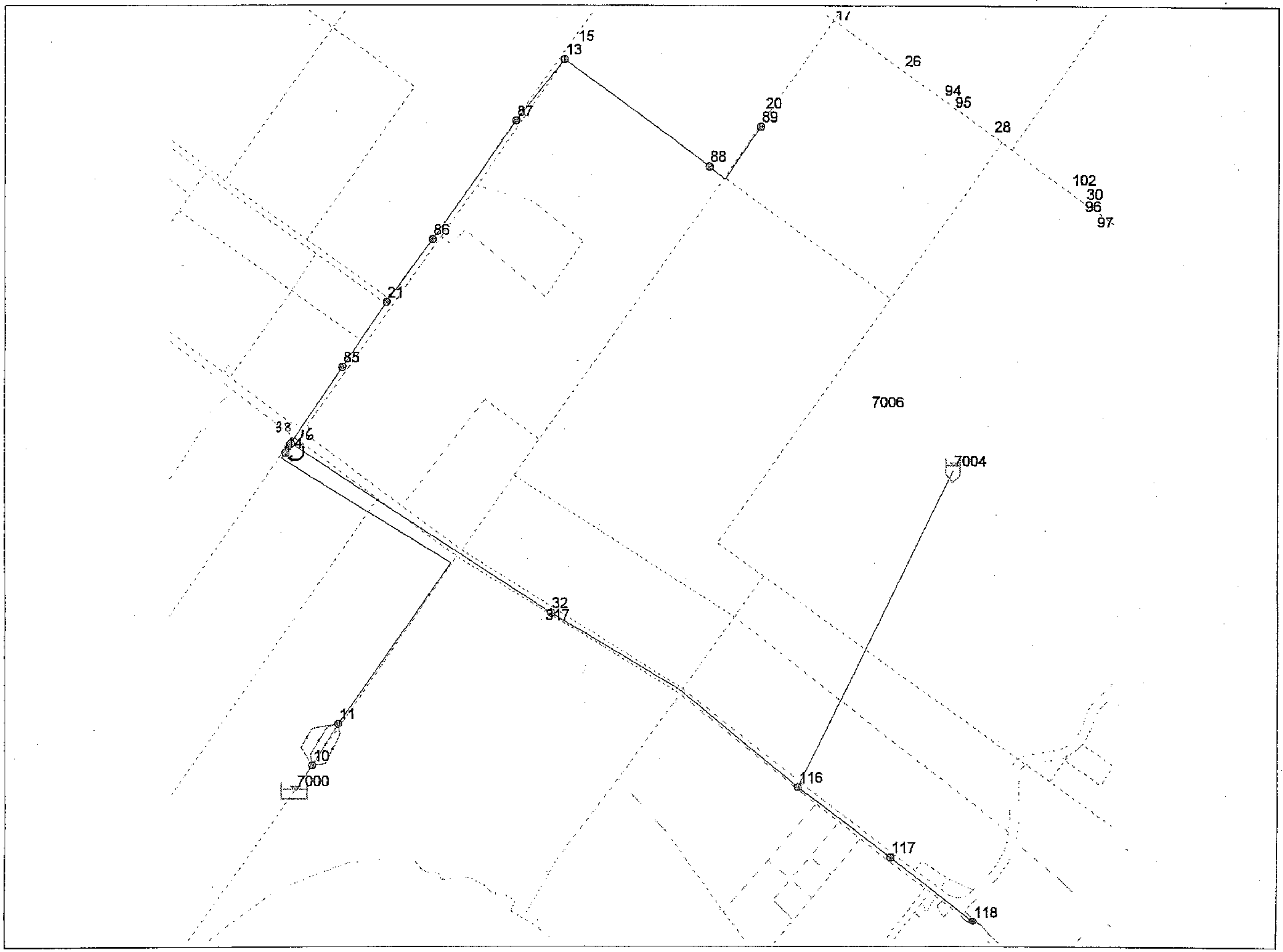
Number:	1
Location:	County
Size:	0.56 MG
Elevation:	350 Feet

ISSUES

-Pressure at Customer #89 ≅ 40 psi (max day and Avg day)

-Can serve customers #90, #92, and #93 within Area J under this scenario without Booster Pump Station No. 2 and minor piping modifications at Booster Pump Station No. 2. This is based on reservoir size and elevation listed above.

SECONDARY RECYCLED WATER SYSTEM- Scenario H&I



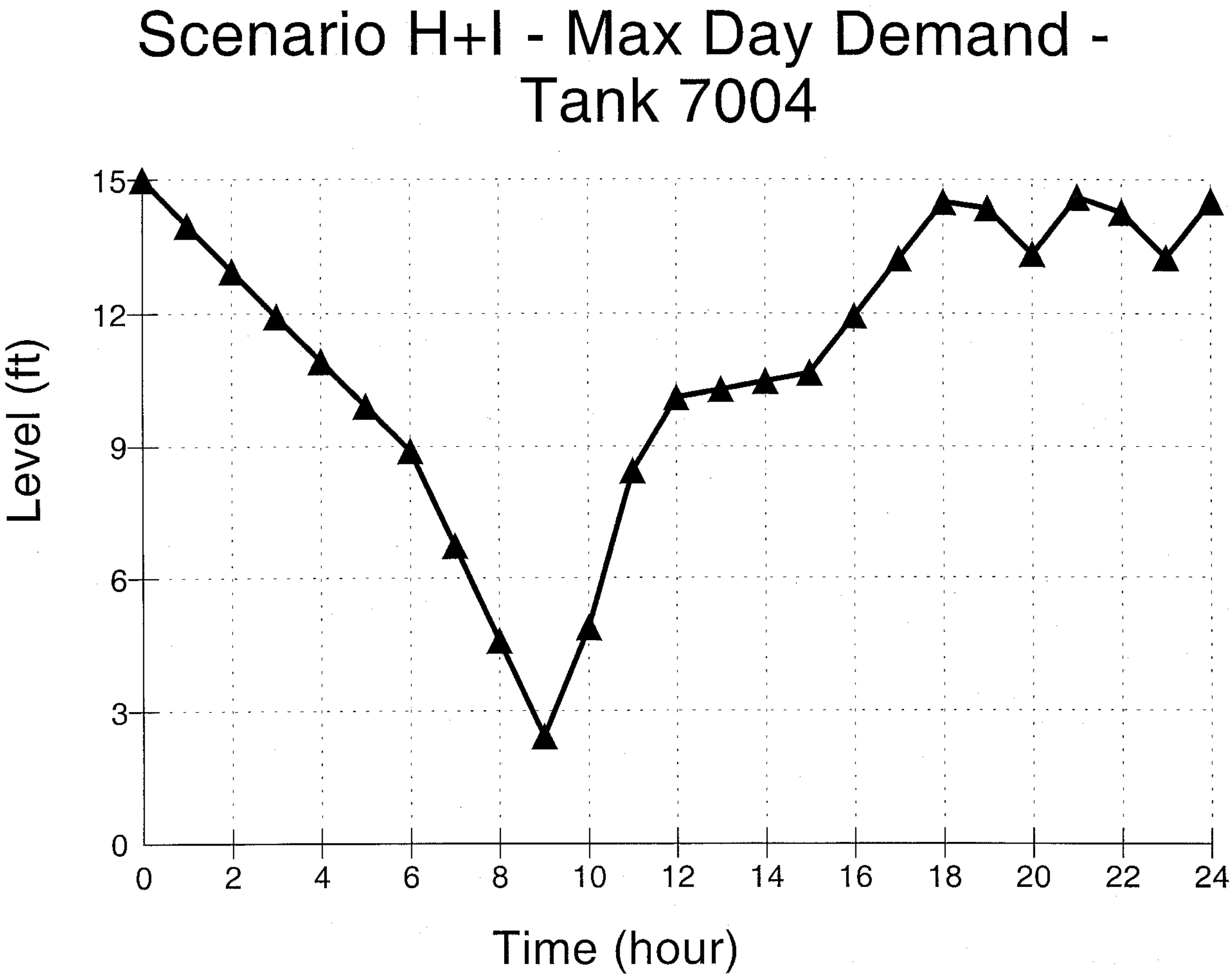
Date: Sunday, November 02, 2003

NODE INPUT DATA FOR SCENARIO H + I

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
H	Main Pump Station	10				-2
H	Pump Station	11				5
H	Booster Pump Station 1	14				10
H	Booster Pump Station 1	16				15
H	Service to Brazil	32				20
H	New Junction	38				15
H	Potentially City Owned	116	397	171	A	45
H	Potentially City Owned	117	276	119	A	45
H	Potentially City Owned	118	806	347	A	30
I	Booster Pump #2	13				157
I	Existing 20 to 18 Brown's Ln	21				39
I	A1 (Silacci)	85	297	128	A	24
I	A2 (Silacci)	86	163	70	A	65
I	A3 (Silacci)	87	193	83	A	127
I	A4 (Silacci)	88	261	112	A	207
I	A5 (Cardinaux)	89	145	62	A	260

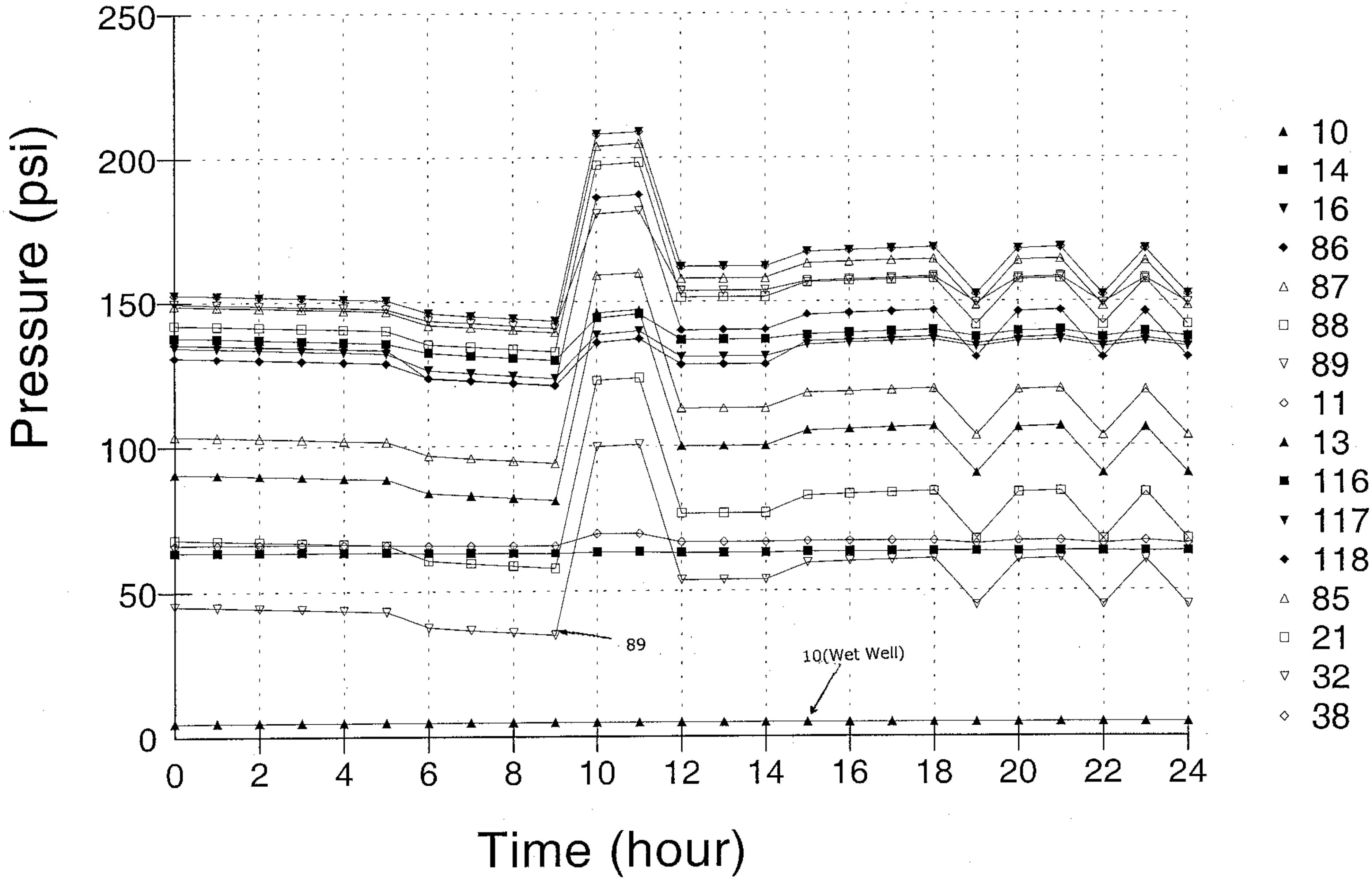
LINK INPUT DATA FOR SCENARIO H + I

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
H	Existing 24 Treatment Plant Access Rd	11	14	4,319	24	125.00	4.32
H	Existing 20 Brown's Lane (I)	16	38	15	20	125	0.02
H	New Lakeville Hwy (H)	32	116	3,277	14	125.00	3.28
H	New Lakeville Hwy (H)	38	32	3,342	14	125.00	3.34
H	New Lakeville Hwy (H)	116	117	1,247	10	125.00	1.25
H	To Reservoir R1 (H)	116	7004	3,778	14	125.00	3.78
H	New Lakeville Hwy (H)	117	118	1,137	8	125.00	1.14
H	Reservoir- Main Pump Station	7000	10	NA	NA	NA	NA
I	Existing 10 (J)	13	88	2,000	10	125.00	2
I	Existing 20 Brown's Ln (I)	38	85	987	20	125	0.99
I	Existing 20 Brown's Lane (I)	85	21	1,000	20	125.00	1
I	Existing 18 Brown's Ln (I)	86	21	925	18	125	0.93
I	Existing 18 Brown's Ln (I)	86	87	1,544	18	125.00	1.54
I	Existing 18 Brown's Ln (J)	87	13	841	18	125	0.84
I	Existing 10 (J)	88	89	888	10	125	0.89

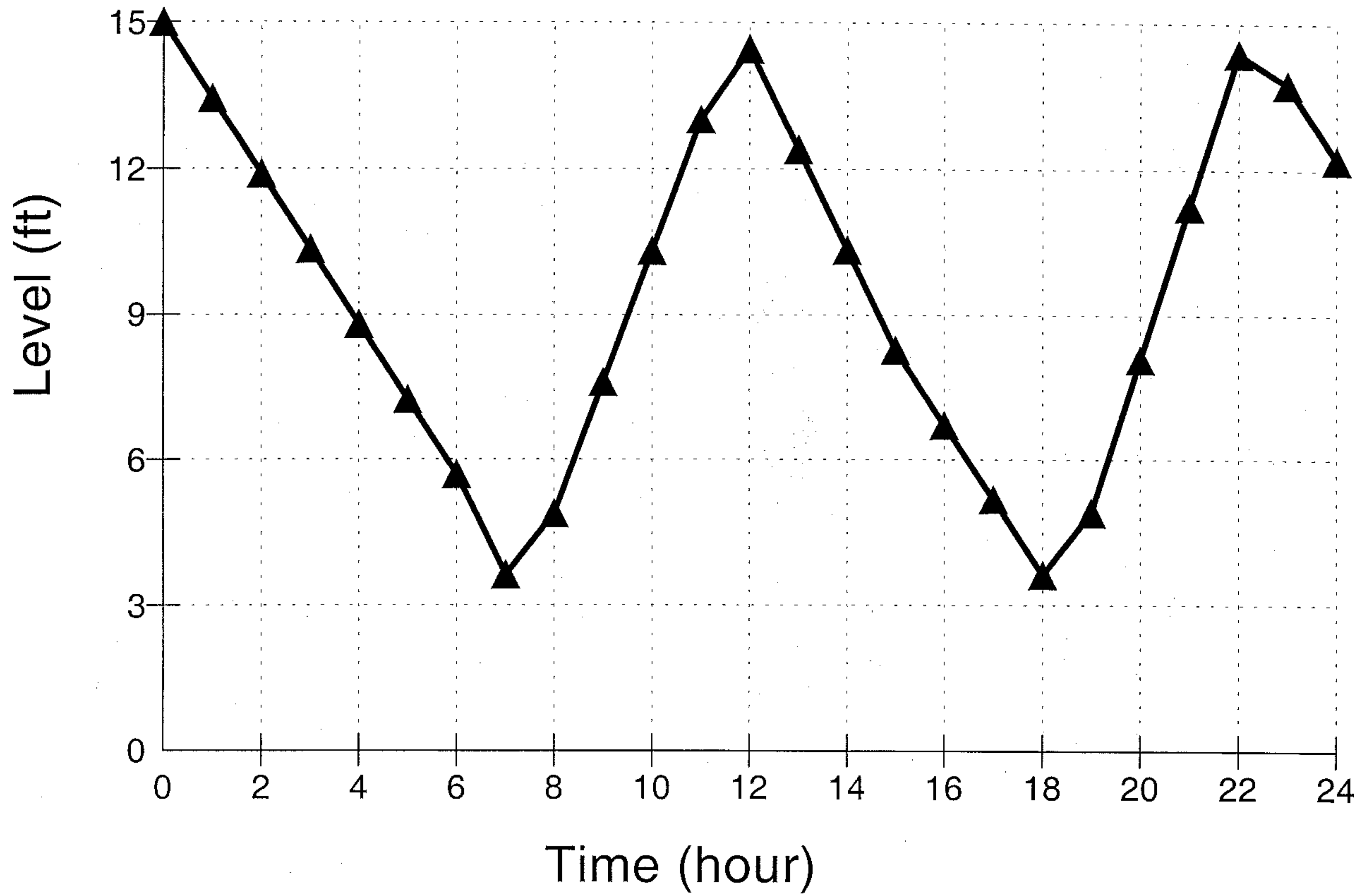


Scenario H+I - Max Day Demand - Tank 7004
Level (ft)
0
3
6
9
12
15
0
2
4
6
8
10
12
14
16
18
20
22
24
Time (hour)

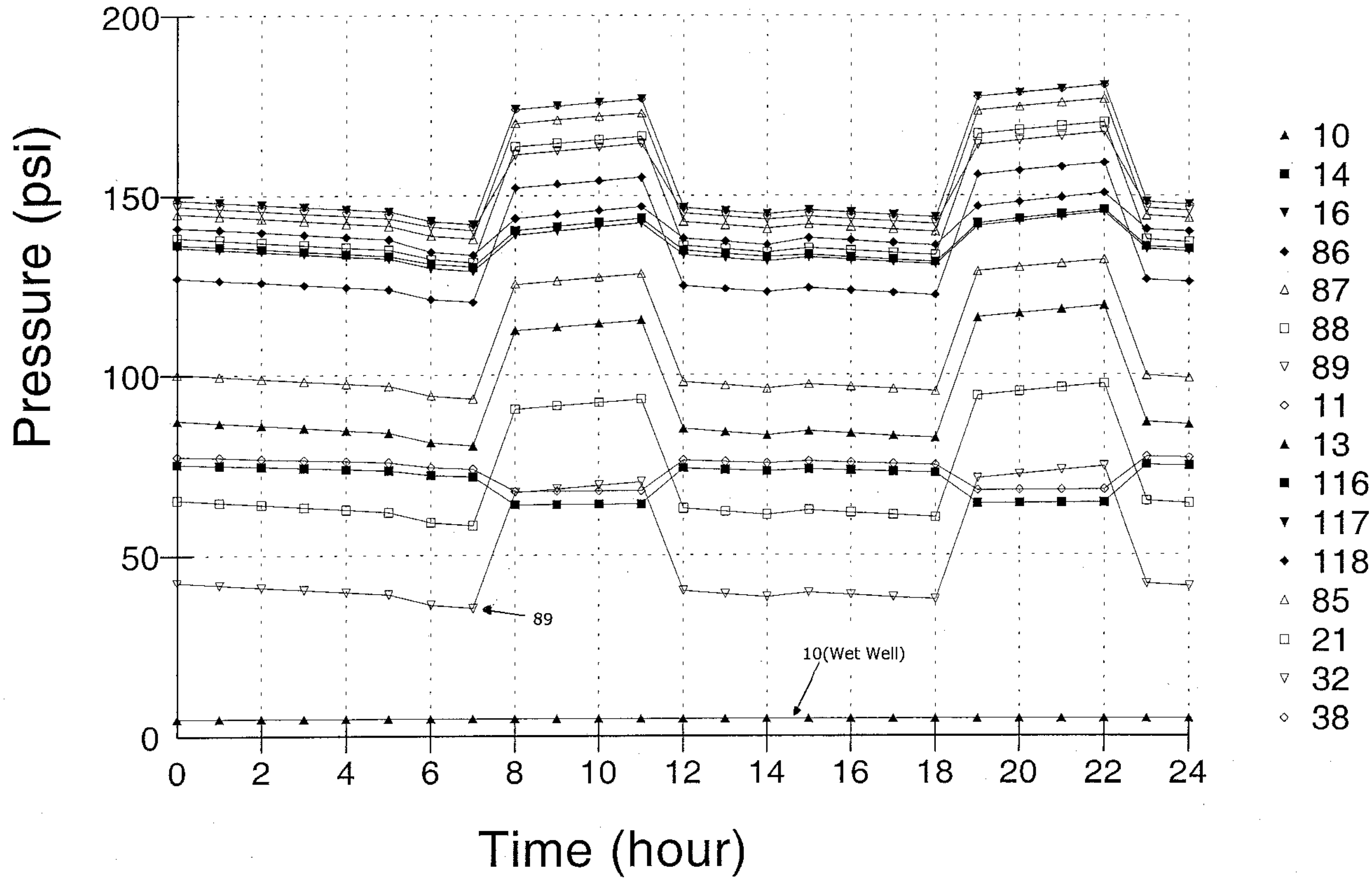
Scenario H+I - Max Day Demand - Pressure at All Nodes



Scenario H+I - Avg Day Demand - Tank 7004



Scenario H+I - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

H + I + J

MODEL SCENARIO
H + I + J

PARAMETERS

TOTAL DEMAND	764 MG/YR
MAX DAY DEMAND	7.7 mgd
TOTAL ACRES	880 Acres
Meets Potable Offset Criteria	NO
Meets City-Owned Agricultural Land Requirement	YES (205 Acres)

SYSTEM REQUIREMENTS

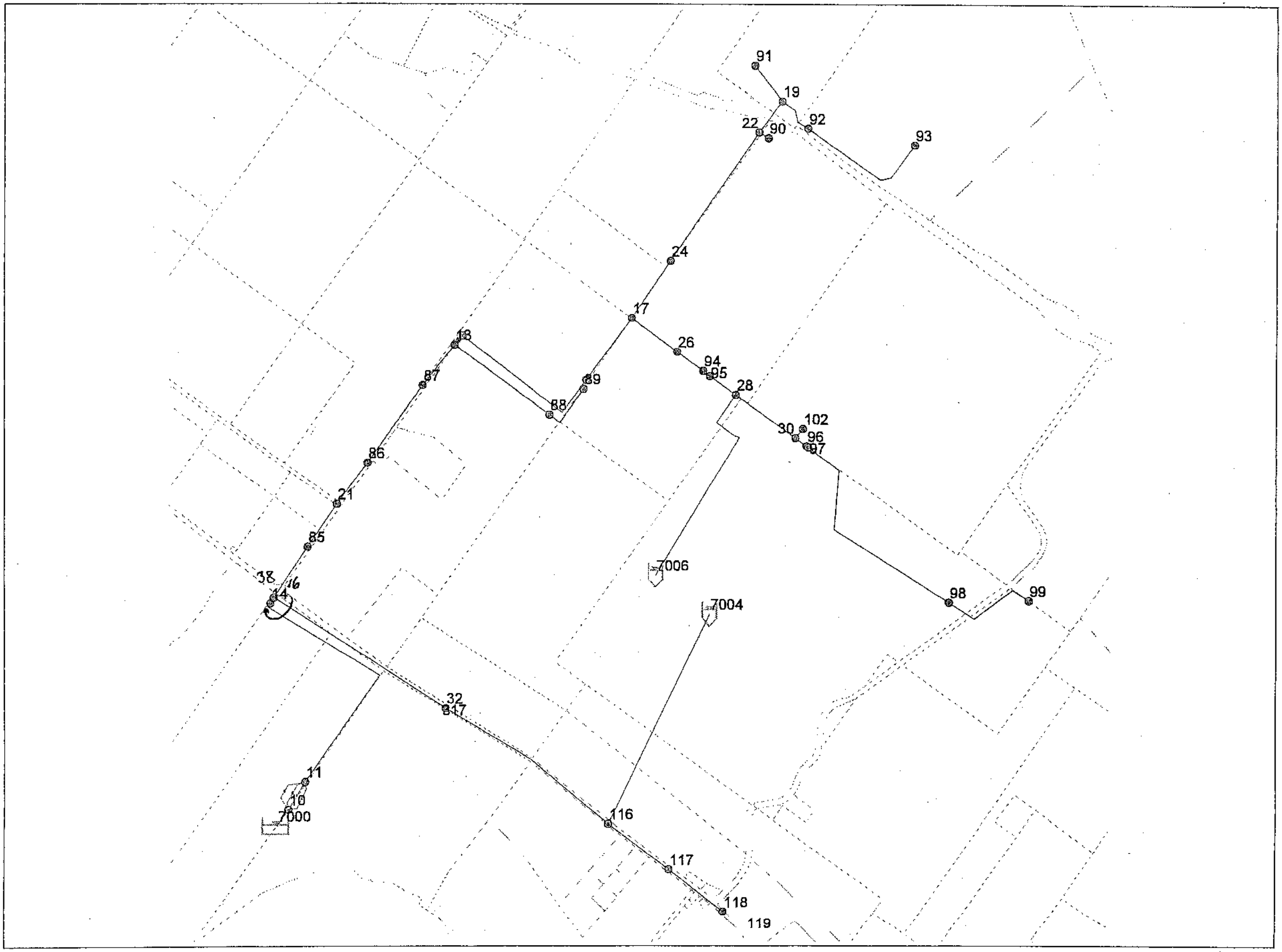
Pump Stations Required	
Main P.S.	YES
Booster P.S. #1	YES
Booster P.S. #2	YES
Additional Pump Stations	NO
Reservoir	
Number:	2
Location:	County
Size A:	0.32 MG
Elevation A:	410 Feet
Size B:	0.18 MG
Elevation B:	478 Feet (highest land available)

ISSUES

-Pressure at Customer #89 ≅ 40 psi Avg day.

-Low pressure at nodes #96, 97, and 102 max day (≅ 40 psi) due to high elevation along ridge. Reservoir serving this area is at maximum elevation.

SECONDARY RECYCLED WATER SYSTEM- Scenario H&I&J



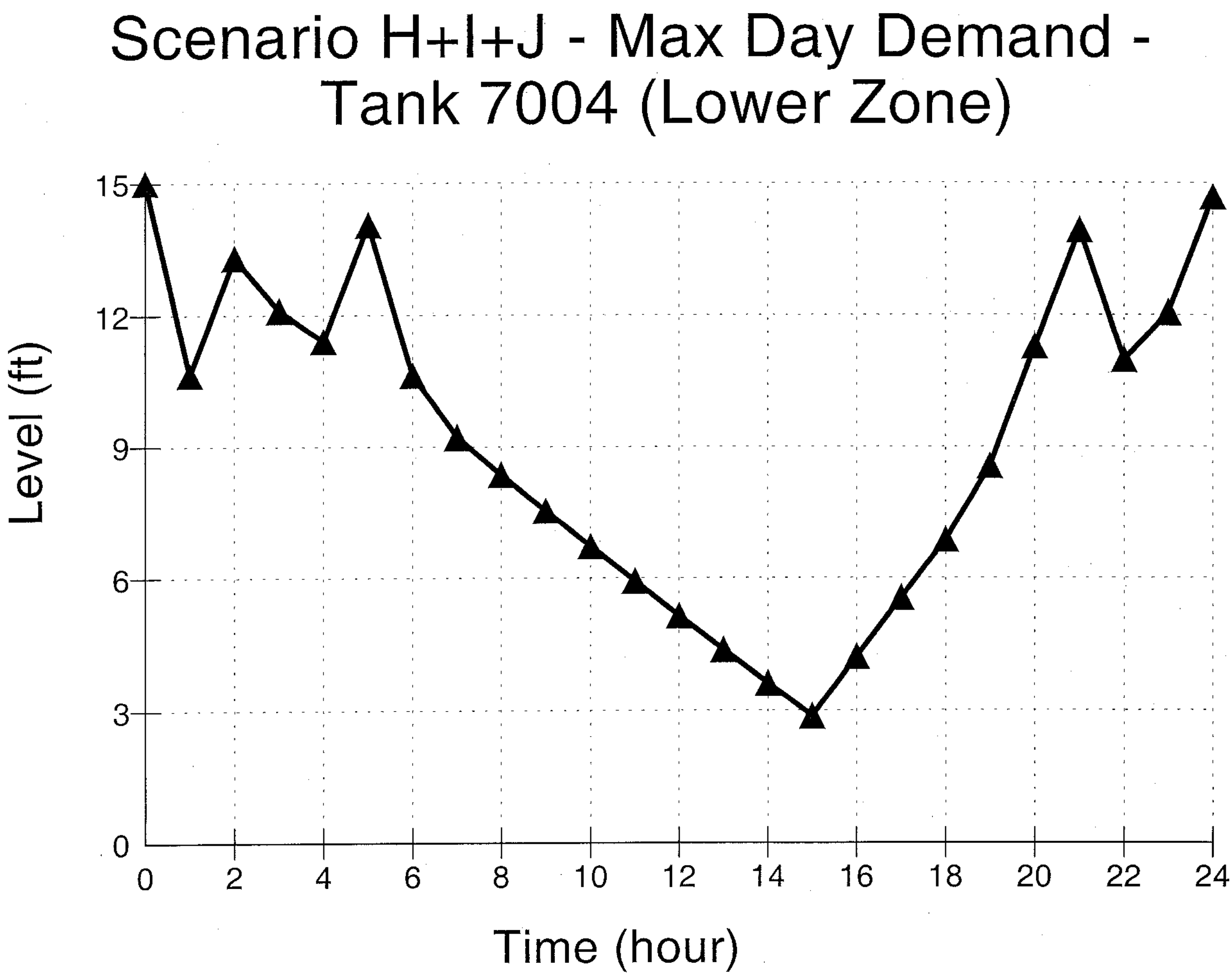
Date: Sunday, November 02, 2003

NODE INPUT DATA FOR SCENARIO H + I + J

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
H	Main Pump Station	10				-2
H	Pump Station	11				5
H	Booster Pump Station 1	14				10
H	Booster Pump Station 1	16				15
H	Service to Brazil	32				20
H	New Junction	38				15
H	Potentially City Owned	116	397	171	A	45
H	Potentially City Owned	117	276	119	A	45
H	Potentially City Owned	118	806	347	A	30
I	Booster Pump #2	13				157
I	Existing 20 to 18 Brown's Ln	21				39
I	A1 (Silacci)	85	297	128	A	24
I	A2 (Silacci)	86	163	70	A	65
I	A3 (Silacci)	87	193	83	A	127
I	A4 (Silacci)	88	261	112	A	207
I	A5 (Cardinaux)	89	145	62	A	260
J	Booster Pump Station 2	15				157
J	Junction	17				255
J	Service to Tunzi	19				130
J	Elevation Node	20				265
J	Service toTunzi (90)	22				144
J	Elevation point	24				280
J	Elevation point	26				354
J	To Reservoir R2	28				352
J	Service to Teixeira (A17)	30				330
J	A6 (Tunzi)	90	42	18	A	144
J	A7 (Tunzi)	91	0	0	A	150
J	A8 (Bettinelli)	92	203	87	A	143
J	A9 (Bettinelli)	93	360	155	A	175
J	A10 (Tunzi)	94	414	178	A	304
J	A11 (Cardinaux)	95	137	59	A	304
J	M12 (Mendoza)	96	314	135	A	340
J	T12 (Teixeira/Pinhiero)	97	411	177	A	340
J	A13 (Mendoza)	98	208	89	A	260
J	A14 (Mendoza)	99	420	181	A	219
J	A17 (Teixeira/Pinhiero)	102	362	156	A	330

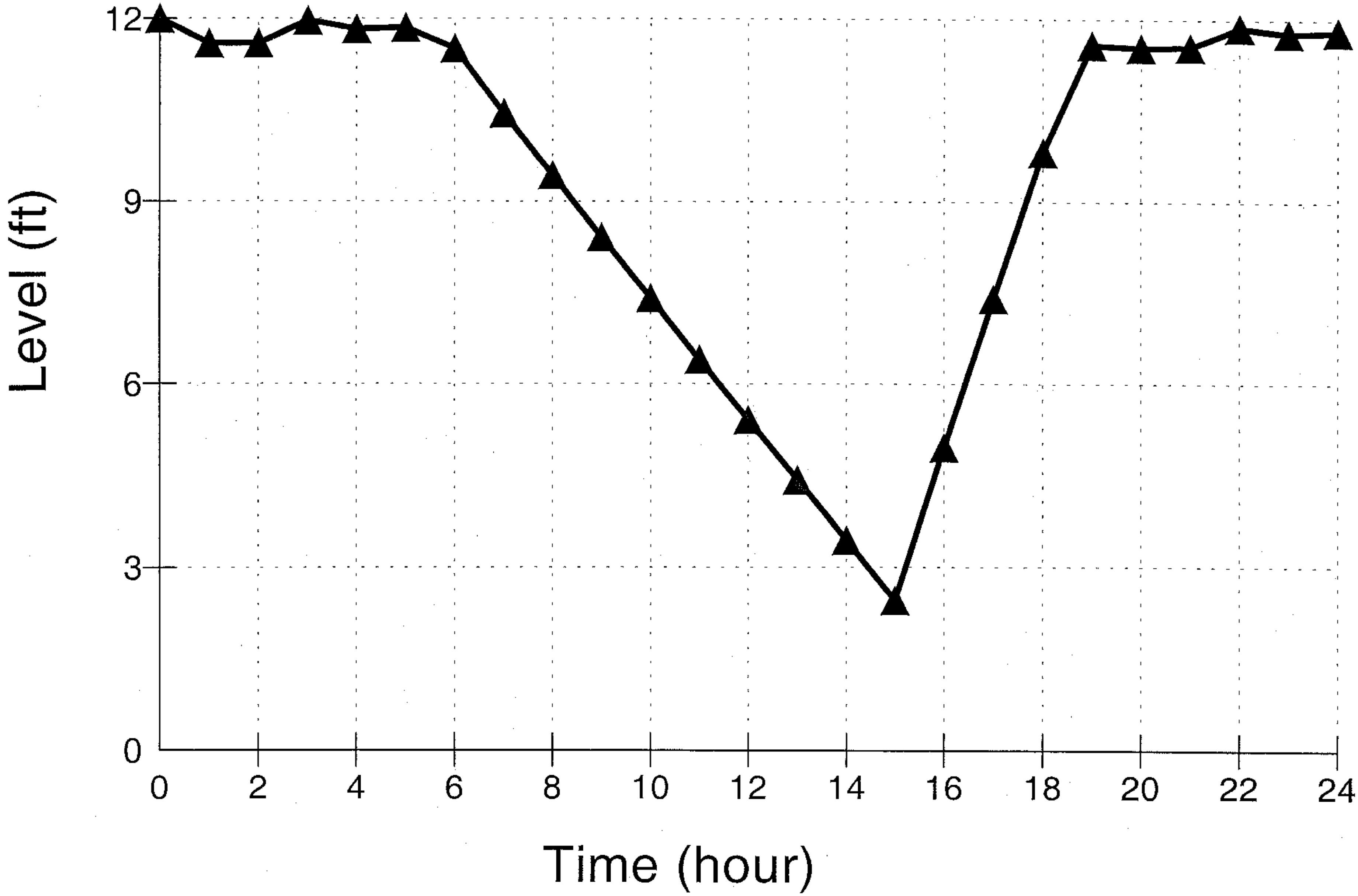
LINK INPUT DATA FOR SCENARIO H + I + J

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
H	Existing 24 Treatment Plant Access Rd	11	14	4,319	24	125	4.32
H	Existing 20 Brown's Lane (I)	16	38	15	20	125	0.02
H	New Lakeville Hwy (H)	32	116	3,277	18	125	3.28
H	New Lakeville Hwy (H)	38	32	2,147	18	125	2.15
H	New Lakeville Hwy (H)	116	117	1,247	10	125	1.25
H	To Reservoir R1 (H)	116	7004	3,778	18	125	3.78
H	New Lakeville Hwy (H)	117	118	1,137	8	125	1.14
H	Reservoir- Main Pump Station	7000	10	NA	NA	NA	NA
I	Existing 10 (J)	13	88	2,000	10	125	2
I	Existing 20 Brown's Ln (I)	38	85	987	20	125	0.99
I	Existing 20 Brown's Lane (I)	85	21	1,000	20	125	1
I	Existing 18 Brown's Ln (I)	86	87	1,544	18	125	1.54
I	Existing 18 Brown's Ln (I)	86	21	840	18	125	0.93
I	Existing 18 Brown's Ln (J)	87	13	841	18	125	0.84
I	Existing 10 (J)	88	89	888	10	125	0.89
J	Existing 16 (J)	15	20	2,725	16	125	2.73
J	Existing 10 (J)	17	24	1,129	10	125	1.13
J	Existing 14 (J)	17	26	929	14	125	0.93
J	Service Line Tunzi (A7) (J)	19	91	625	8	125	0.63
J	Existing 10 (J)	19	92	400	10	125	0.4
J	Existing Pipe (J)	20	17	1,250	16	125	1.25
J	Service to Tunzi (A6)(J)	22	90	120	8	125	0.12
J	Existing 10 (J)	22	19	636	10	125	0.64
J	Existing 14(J)	24	22	2,549	10	125	2.55
J	Existing 14 (J)	26	94	533	14	125	0.53
J	Existing 10 (J)	28	30	1,209	10	125	1.21
J	To Reservoir R2	28	7006	3,634	14	125	3.63
J	Existing 10 (J)	30	96	222	10	125	0.22
J	Service to Teixeira (A17)(J)	30	102	196	4	125	0.2
J	Service to Bettinelli (A9) (J)	92	93	2,600	8	125	2.6
J	Existing 14 (J)	94	95	150	14	125	0.15
J	Existing 14 (J)	95	28	520	14	125	0.52
J	Existing 10 (J)	96	97	36	10	125	0.04
J	Existing 10 (J)	97	98	3,700	10	125	3.7
J	Existing 8 (J)	98	99	1,350	8	125	1.35

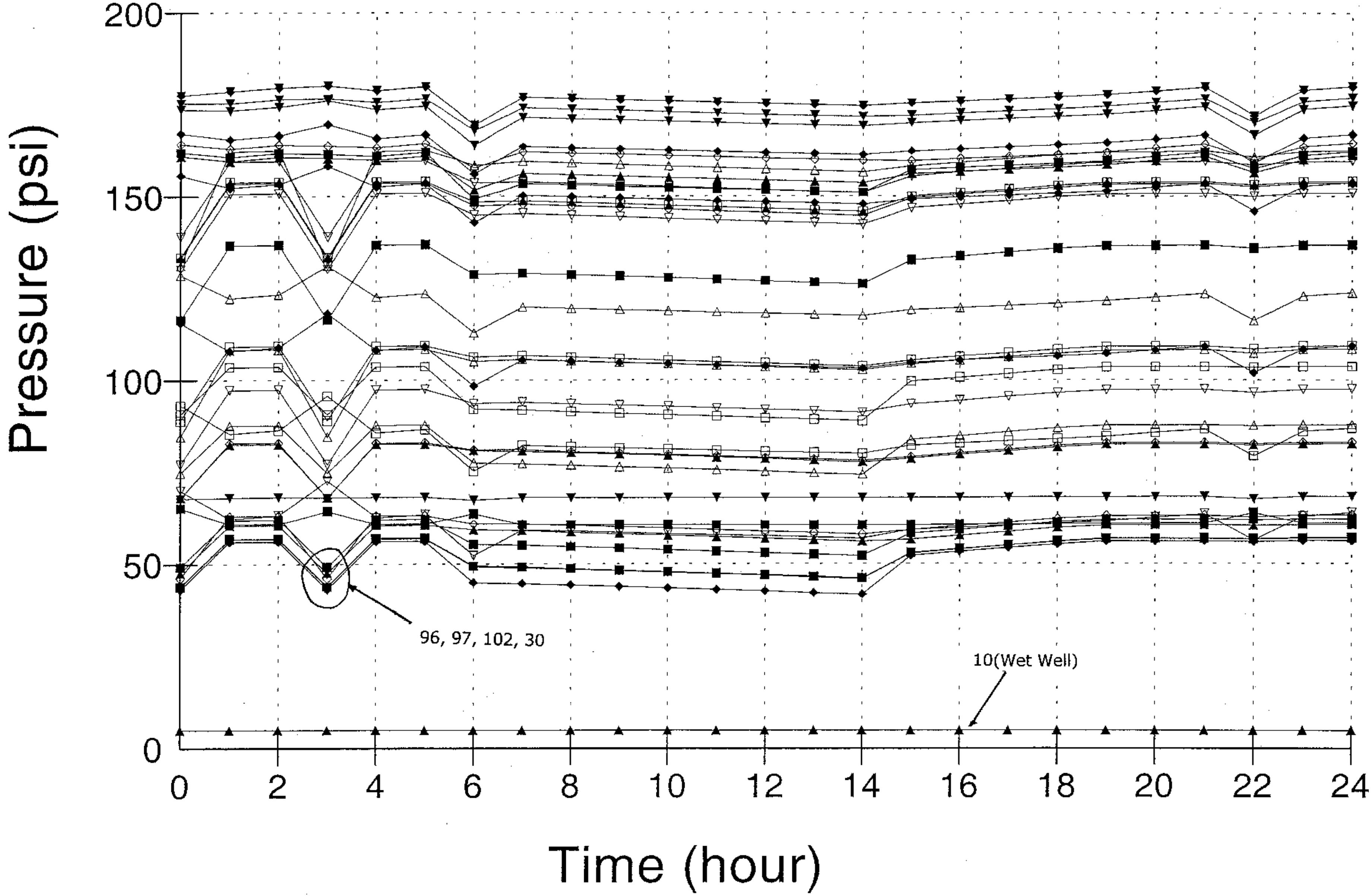


Scenario H+I+J - Max Day Demand -
Tank 7004 (Lower Zone)
Level (ft)
0
3
6
9
12
15
0
2
4
6
8
10
12
14
16
18
20
22
24
Time (hour)

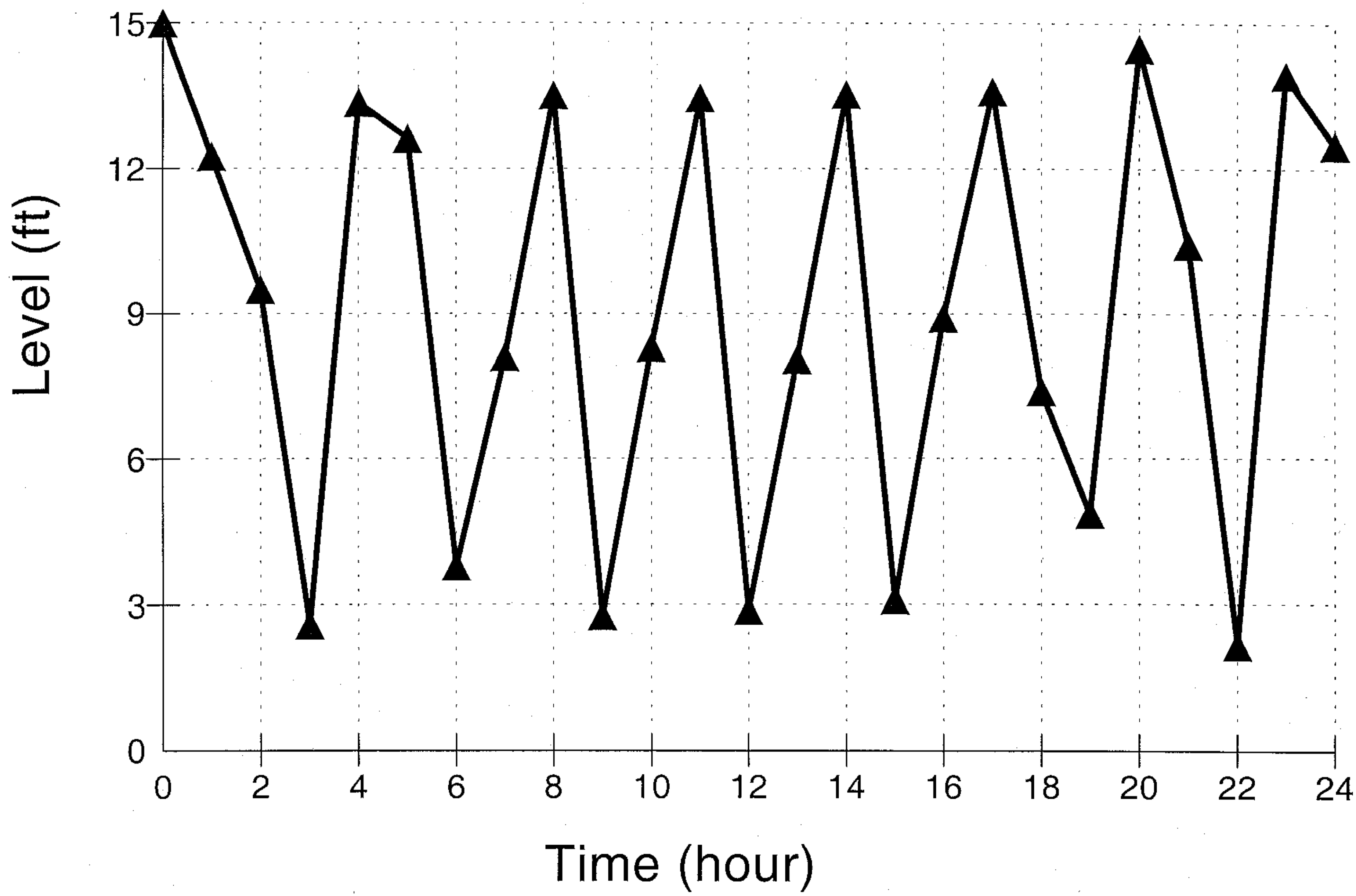
Scenario H+I+J - Max Day Demand - Tank 7006 (Upper Zone)

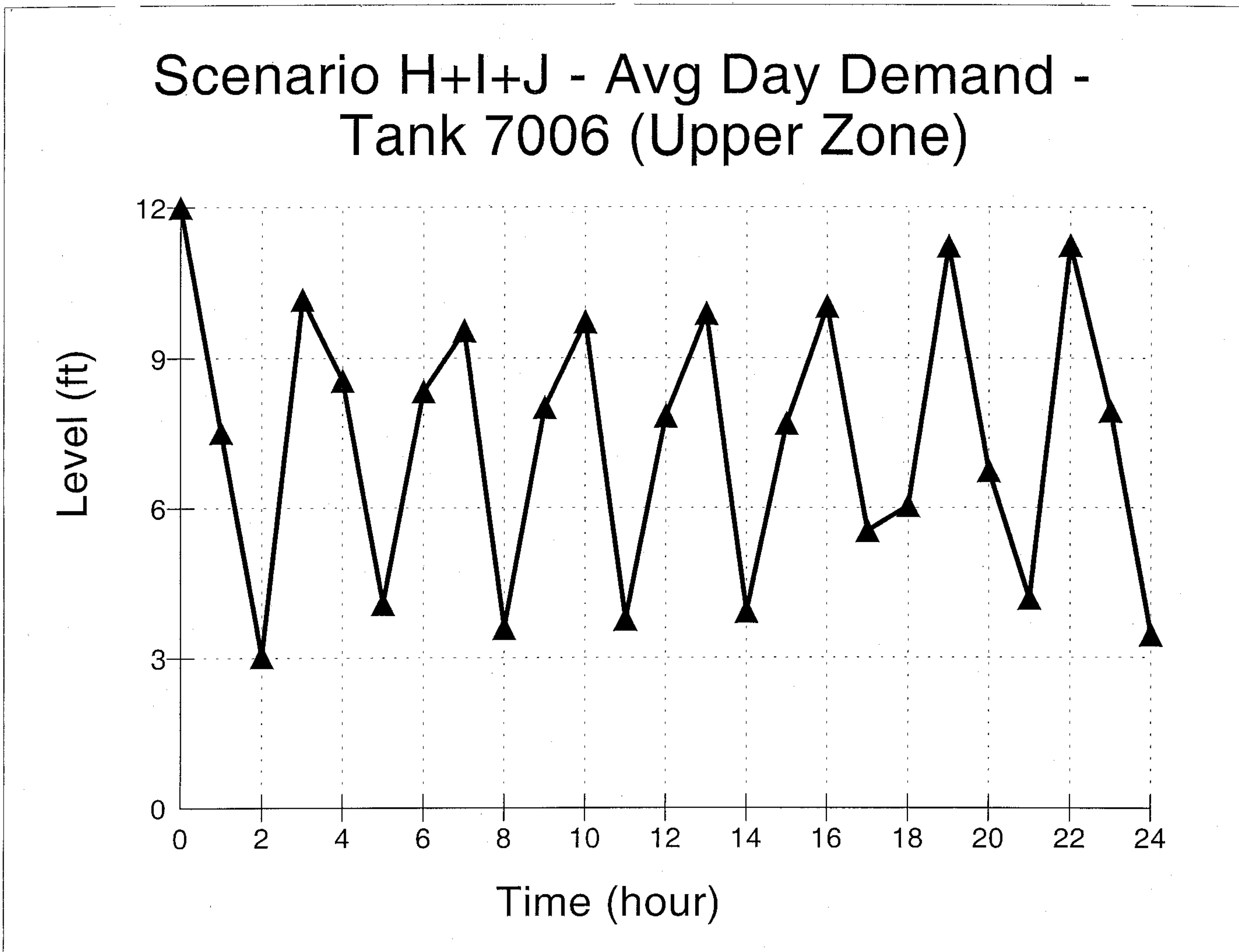


Scenario H+I+J - Max Day Demand - Pressure at All Nodes



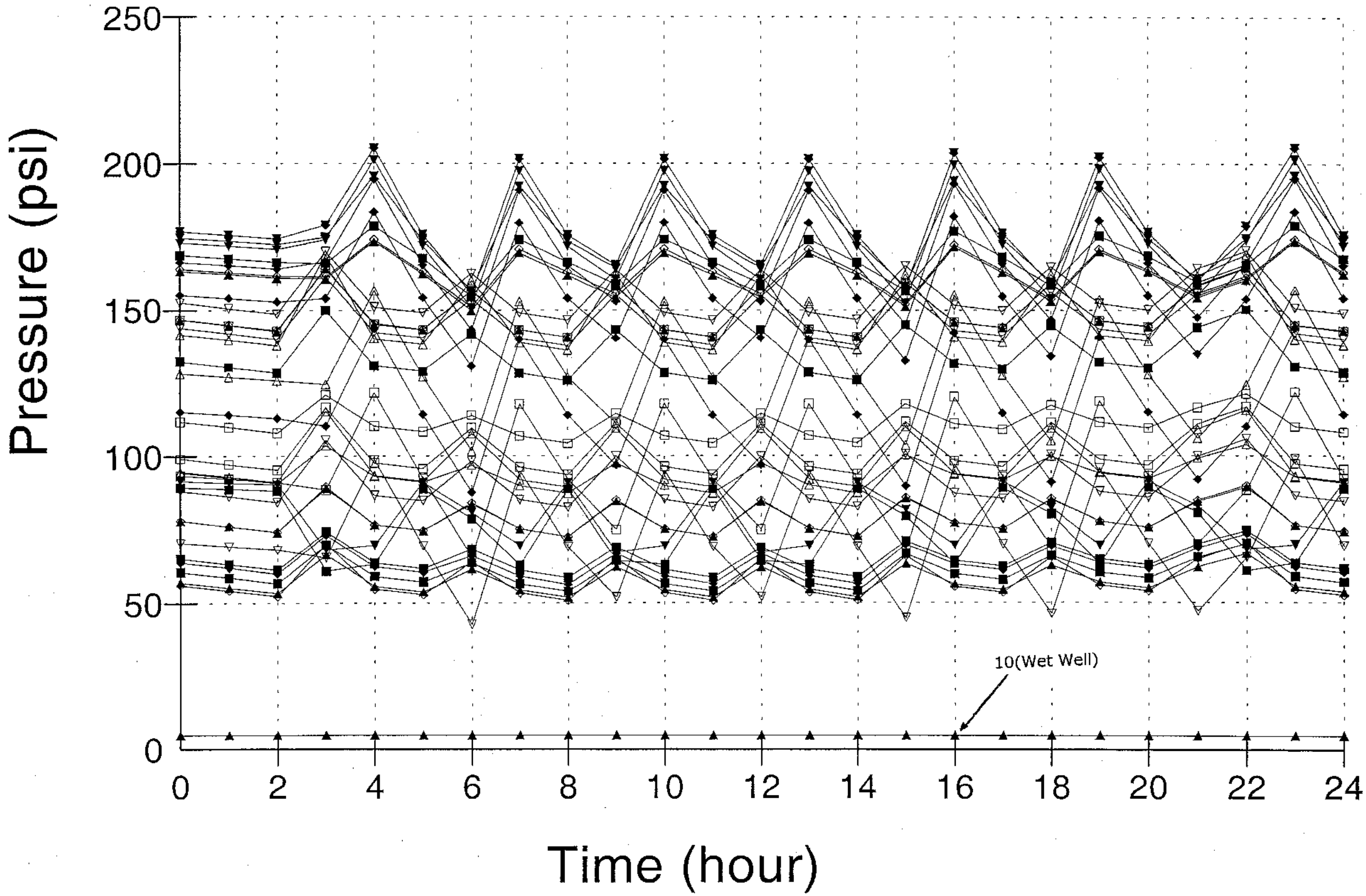
Scenario H+I+J - Avg Day Demand - Tank 7004 (Lower Zone)





Scenario H+I+J - Avg Day Demand -
Tank 7006 (Upper Zone)
Level (ft)
0
3
6
9
12
Time (hour)
0
2
4
6
8
10
12
14
16
18
20
22
24

Scenario H+I+J - Avg Day Demand - Pressure at All Nodes



MODEL SCENARIO

H + I + K

MODEL SCENARIO
H + I + K

PARAMETERS

TOTAL DEMAND	691 MG/YR
MAX DAY DEMAND	7.4 mgd
TOTAL ACRES	799 Acres
Meets Potable Offset Criteria	NO
Meets City-Owned Agricultural Land Requirement	YES (205 Acres)

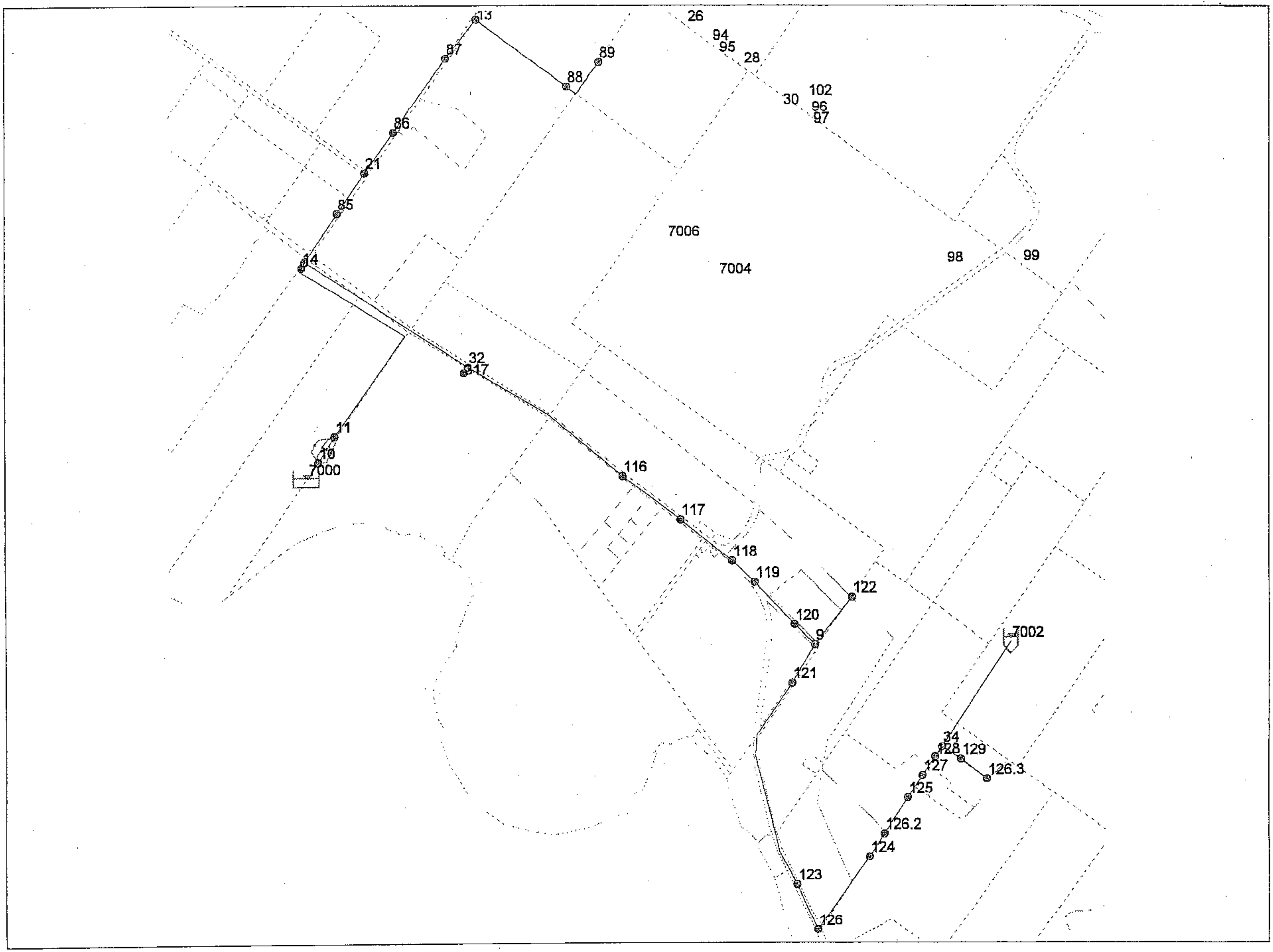
SYSTEM REQUIREMENTS

Pump Stations Required	
Main P.S.	YES
Booster P.S. #1	YES
Booster P.S. #2	NO
Additional Pump Stations	NO
Reservoir	
Number:	1
Location:	County
Size:	0.26 MG
Elevation:	360 Feet

ISSUES

-Pressure at Customer #89 ≅ 40 psi (max day and Avg day)

SECONDARY RECYCLED WATER SYSTEMScenario H&I&K



Date: Sunday, November 02, 2003

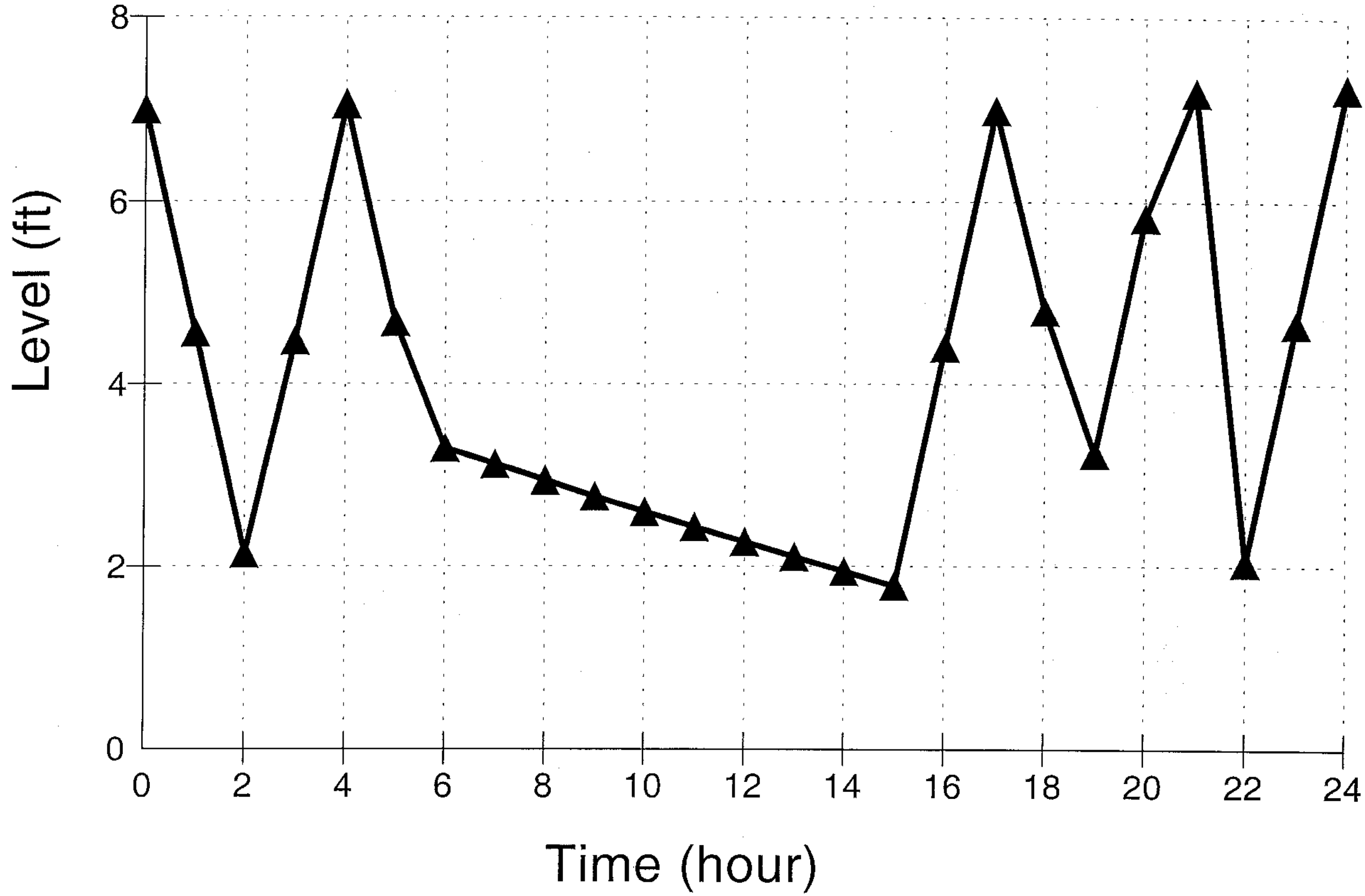
NODE INPUT DATA FOR SCENARIO H + I + K

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
H	Main Pump Station	10				-2
H	Pump Station	11				5
H	Booster Pump Station 1	14				10
H	Booster Pump Station 1	16				15
H	Service to Brazil	32				20
H	New Junction	38				15
H	Potentially City Owned	116	397	171	A	45
H	Potentially City Owned	117	276	119	A	45
H	Potentially City Owned	118	806	347	A	30
I	Booster Pump #2	13				157
I	Existing 20 to 18 Brown's Ln	21				39
I	A1 (Silacci)	85	297	128	A	24
I	A2 (Silacci)	86	163	70	A	65
I	A3 (Silacci)	87	193	83	A	127
I	A4 (Silacci)	88	261	112	A	207
I	A5 (Cardinaux)	89	145	62	A	260
K	Service line Roberts	9				40
K	To Reservoir R3	34				140
K	Ag User	119	197	85	A	30
K	Ag User	120	121	52	A	35
K	Roberts	121	542	233	A	40
K	Roberts	122	222	95	A	50
K	Ag User	123	244	105	A	10
K	Ag User	124	153	66	A	40
K	Ag User	125	203	87	A	80
K	Buck Ag (A)	126	57	25	A	10
K	Buck Vineyard (B)	126.2	144	124	V	40
K	Buck Ag (A)	126.3	114	49	A	150
K	Ag User	127	42	18	A	100
K	Ag User	128	72	31	A	125
K	Ag User	129	73	31	A	140
K	Brazil	317	533	229	A	20

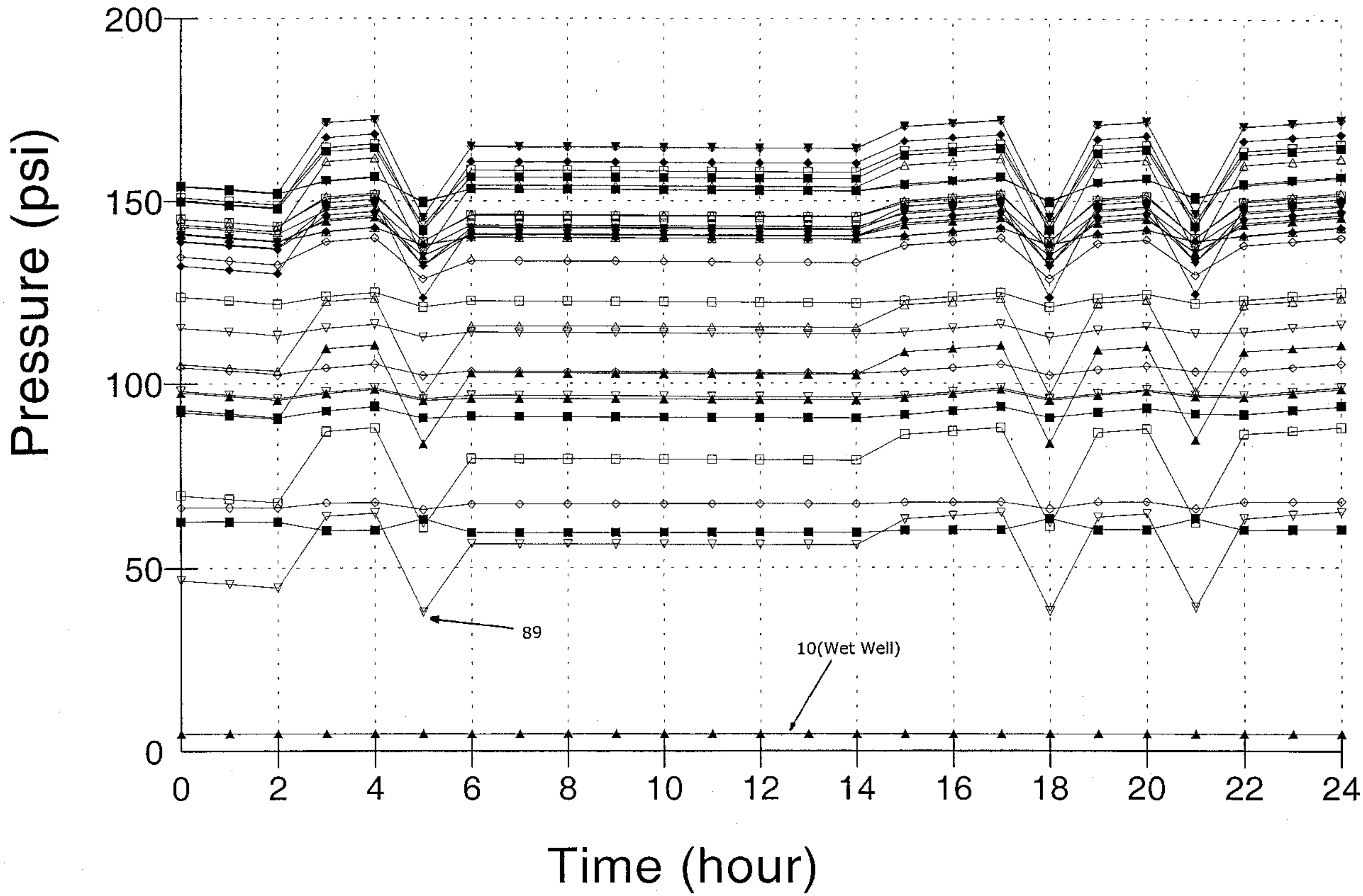
LINK INPUT DATA FOR SCENARIO H + I + K

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
H	Existing 24 Treatment Plant Access Rd	11	14	4,319	24	125	4.32
H	Existing 20 Brown's Lane (I)	16	38	15	20	125	0.02
H	New Lakeville Hwy (H)	32	116	3,277	20	125	3.28
H	New Lakeville Hwy (H)	38	32	2,147	20	125	2.15
H	New Lakeville Hwy (H)	116	117	1,247	20	125	1.25
H	To Reservoir R1 (H)	116	7004	3,778	20	125	3.78
H	New Lakeville Hwy (H)	117	118	1,137	20	125	1.14
H	Reservoir- Main Pump Station	7000	10	NA	NA	NA	NA
I	Existing 10 (J)	13	88	2,000	10	125	2
I	Existing 20 Brown's Ln (I)	38	85	987	20	125	0.99
I	Existing 20 Brown's Lane (I)	85	21	1,000	20	125	1
I	Existing 18 Brown's Ln (I)	86	21	925	18	125	0.93
I	Existing 18 Brown's Ln (I)	86	87	1,544	18	125	1.54
I	Existing 18 Brown's Ln (J)	87	13	841	18	125	0.84
I	Existing 10 (J)	88	89	888	10	125	0.89
K	Service line Roberts	9	122	1,038	6	125	1.04
K	New Lakeville Hwy (K)	9	121	767	20	125	0.77
K	New 10 (K)	34	129	385	6	125	0.38
K	New 16 to R3	34	7002	2,139	20	125	2.14
K	New Lakeville Hwy (K)	118	119	527	20	125	0.53
K	New 20 Lakeville Hwy (K)	119	120	994	20	125	0.99
K	New 20 Lakeville Hwy (K)	120	9	496	20	125	0.5
K	New Lakeville Hwy (K)	121	123	3,768	20	125	3.77
K	New Lakeville Hwy (K)	123	126	867	20	125	0.87
K	New 16 (K)	124	126.2	461	20	125	0.46
K	New 16 (K)	125	127	461	20	125	0.46
K	New 16 (K)	126	124	1,559	20	125	1.56
K	New 16 (K)	126.2	125	738	20	125	0.74
K	New 16 (K)	127	128	384	20	125	0.38
K	New 16 (K)	128	34	209	20	125	0.21
K	New 10 (K)	129	126.3	562	6	125	0.56
K	Service to Brazil (K)	317	32	122	6	125	0.12

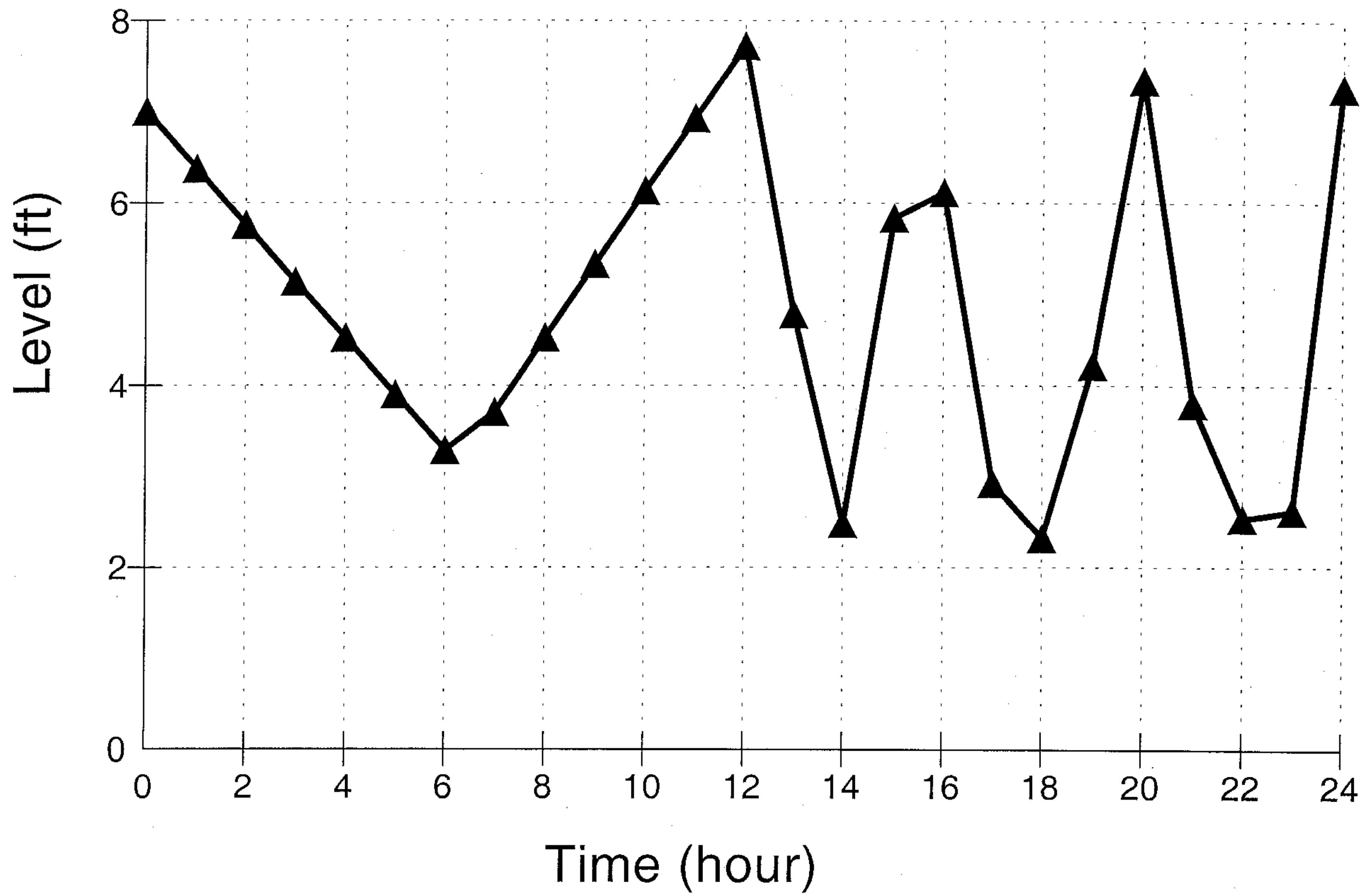
Scenario H+I+K - Max Day Demand - Tank 7002



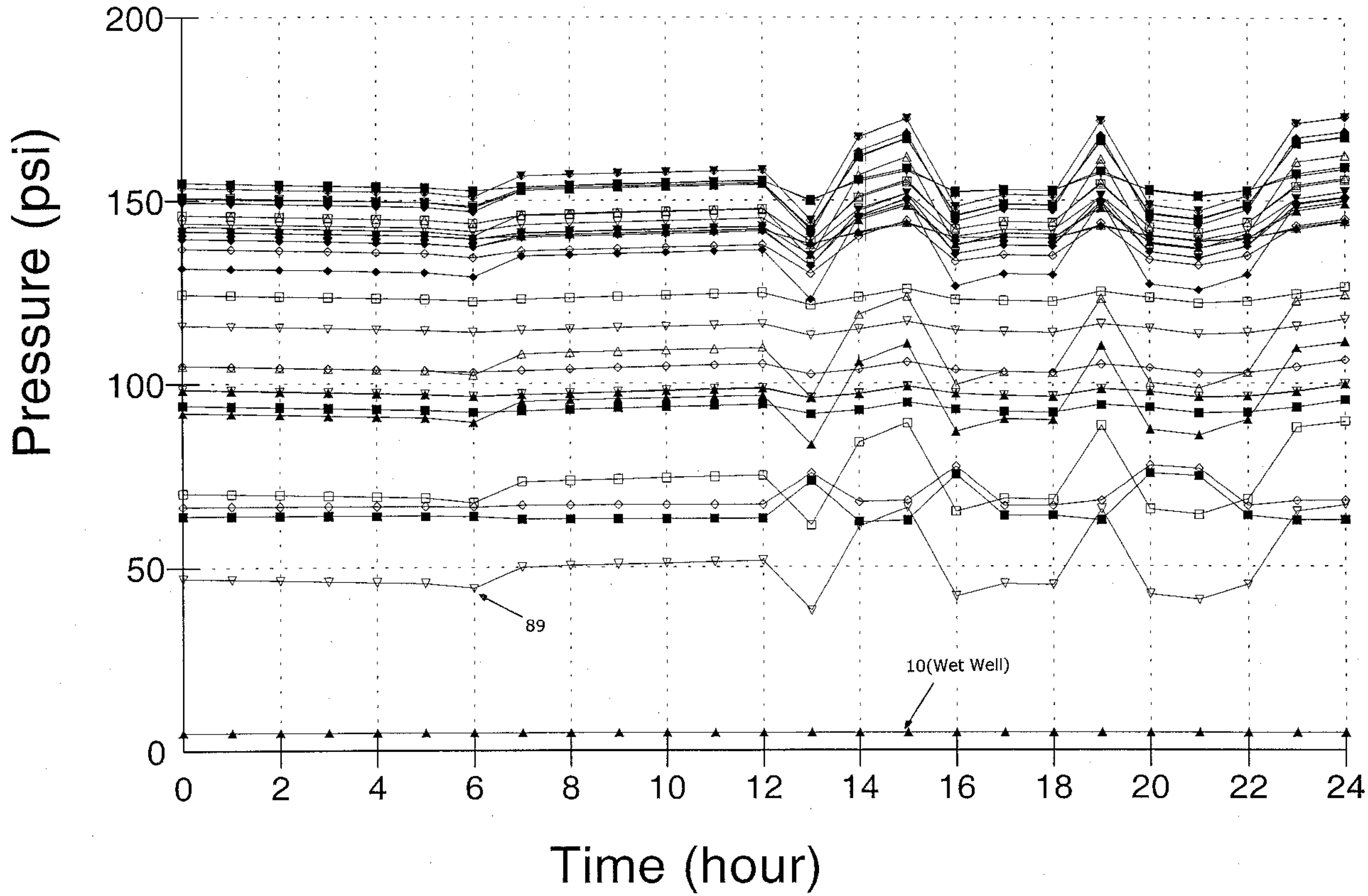
Scenario H+I+K - Max Day Demand - Pressure at All Nodes



Scenario H+I+K - Avg Day Demand - Tank 7002



Scenario H+I+K - Avg Day Demand - Pressure at All Nodes



RECOMMENDED MODEL SCENARIO

A (MODIFIED)

RECOMMENDED
MODEL SCENARIO
A (MODIFIED)

PARAMETERS

TOTAL DEMAND	485 MG/YR
MAX DAY DEMAND	5.2 mgd
TOTAL ACRES	635 Acres
Meets Potable Offset Criteria	YES (204 MG)
Meets City-Owned Agricultural Land Requirement	NO

SYSTEM REQUIREMENTS

Pump Station	
Number:	1
Location:	Tertiary Plant
Size:	5.2 mgd @ 320' TDH[B] (Alternative 1) 5.2 mgd @ 350' TDH[B] (Alternative 2)
Reservoir	
Number:	1
Location:	Northeast on East Washington
Size:	1.71 MG[A]
Elevation:	280 Feet

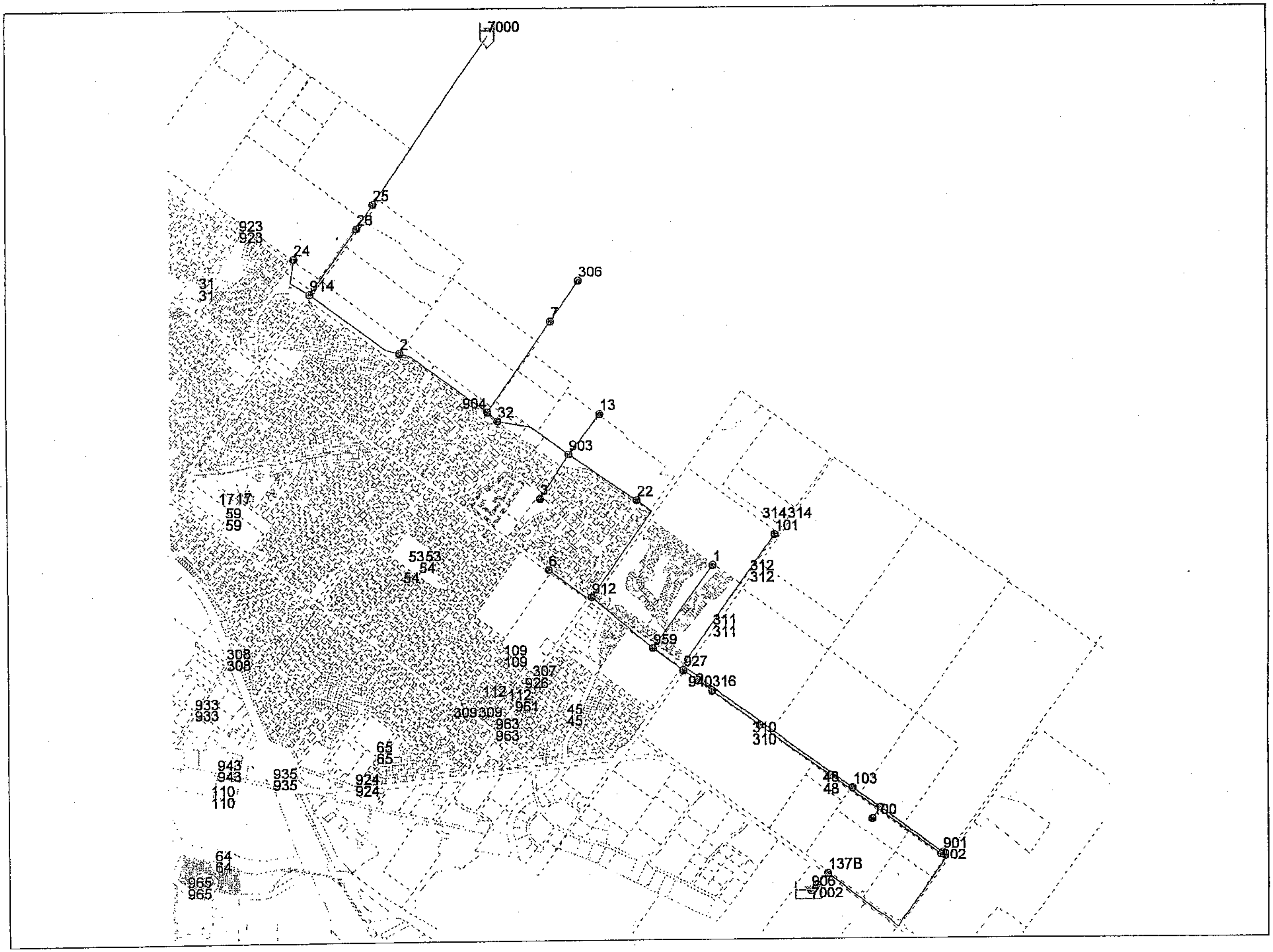
ISSUES

-Pressure at Pump Station exceeds 150 psi with all pumps filling reservoir with no system demand (Design Pipe for 250 psi) and design pressure relief at tertiary pump station.

[A] Reservoir of 1.71 MGs may be added initially or a 0.9 MG tank may be constructed initially with space for an additional tank at the same site to be added at a later date, if additional potable offset is required.

[B] Pump station may be sized for future TDH of 350 feet, but initial TDH required is 320 feet (minimum). It is possible to design pumps with ultimate motor size required for a TDH of 350 feet, but sized for 5.2 mgd at 320 feet TDH with ability to add additional pump stage(s) to achieve 350 feet TDH at a later date, if required.

TERTIARY RECYCLED WATER SYSTEM - Scenario A



Date: Sunday, November 02, 2003

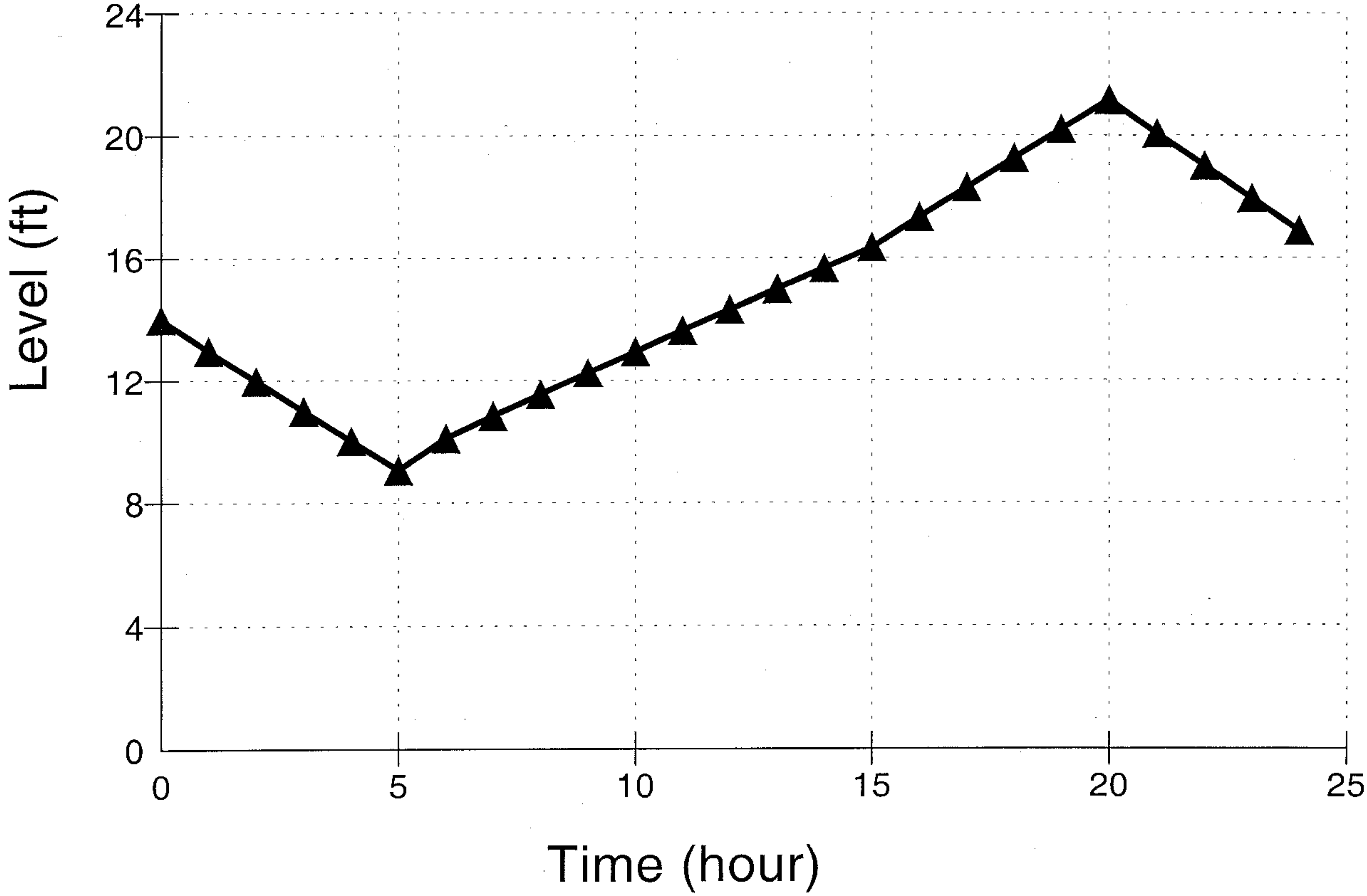
NODE INPUT DATA FOR SCENARIO A

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
A	Adobe Creek (S)	1	201	132	G	75
A	Airport (Current Irrigation)	2	44	18	T	72
A	Arroyo Park	3	58	23	T	63
A	Casa Grande High School	6	453	181	T	53
A	Ceja Vineyards (#3)	7	115	99	V	88
A	Herrerias Vineyards (#4)	13	122	105	V	81
A	Open Space (City Owned)	22	217	93	A	74
A	Prince Park	24	214	86	T	89
A	RESA (Redwood Estate Sports Plex)	25	347	139	T	110
A	Rooster Run	26	671	440	G	93
A	Wiseman Park (Extended)	32	374	150	T	70
A	A15 (Matteri)	100	228	98	A	51
A	A16 (Adobe Creek N)	101	466	305	G	80
A	A18 (Karren)	103	70	60	V	33
A	Old Adobe School	306	127	51	T	102
A	Greenway (Future)	316	299	120	T	45
A	8-inch bend	901				35
A	8-inch lateral	902				35
A	Service line to 3 and 13	903				67
A	Service line	904				69
A	Junction	906				5
A	New Junction	912				50
A	Reduce to 16-inch	914				79
A	Zone G	927				54
A	Existing 8 Tee	940				48
A	Existing 20 to 8 Connection	942				48
A	Service line Matteri	953				51
A	Service to Adobe Creek S	959				52
A	Service to Carinalli (310)	966				39
A	Service to Gurmeet Luthra	968				31
A	Treatment Plant Irr (none returning)	137A	771	308	T	5
A	Treatment Plant 3W (returning)	137B	689	451	G	15

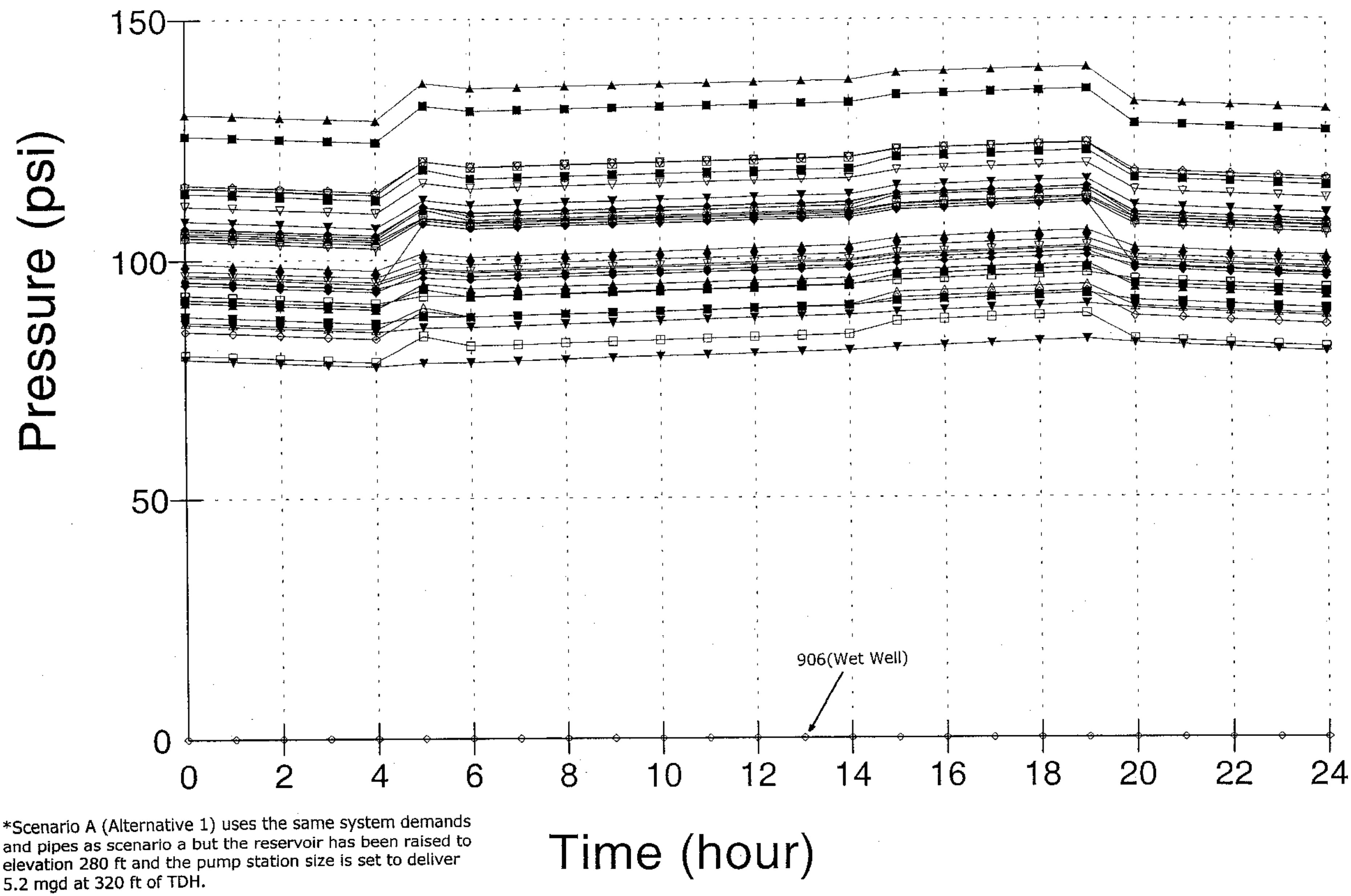
LINK INPUT DATA FOR SCENARIO A

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
A	Existing 20 East Washington St	2	914	2,203	20	125	2.2
A	Service to Arroyo Park	3	903	1,077	6	125	1.08
A	Service to 306	7	306	987	6	125	0.99
A	Existing 20 Hidden Valley Dr	22	903	1,660	20	125	1.66
A	To Reservoir	25	7000	4,140	20	125	4.14
A	New East Washington St	26	25	596	20	125	0.6
A	Existing 20	32	904	280	20	125	0.28
A	Existing 8 Ely Rd	103	940	3,854	8	125	3.85
A	Existing 20 Ely Rd	316	942	358	20	125	0.36
A	Existing 8 Ely Road	902	901	53	8	125	0.05
A	Existing 20 Ely Rd	902	968	2,790	20	125	2.79
A	Service to Herrerias Vineyard	903	13	1,041	6	125	1.04
A	Existing 20	903	32	1,664	20	125	1.66
A	Service to 7 and 306	904	7	2,239	6	125	2.24
A	Existing 20 at Airport	904	2	2,185	20	125	2.18
A	Existing 20 Ely Blvd S	912	959	1,629	20	125	1.63
A	Existing 8 - Casa Grande High	912	6	1,069	6	125	1.07
A	Existing 20 Casa Grande Rd	912	22	2,523	20	125	2.52
A	New East Wahington St	914	26	1,625	20	125	1.62
A	Existing 16	914	24	945	16	125	0.94
A	Existing 8 Service to Adobe Creek N	940	101	3,717	8	125	3.72
A	Existing 20 Ely Rd	942	927	356	20	125	0.36
A	Existing 8 to 20 Connection	942	940	69	8	125	0.07
A	Existing 8 Ely Rd	953	901	1,581	8	125	1.58
A	Service to Matteri	953	100	284	6	125	0.28
A	Existing 8 Ely Rd	953	103	700	8	125	0.7
A	Existing 20 Ely Blvd S	959	927	772	20	125	0.77
A	Service to Adobe Creek S	959	1	2,095	6	125	2.09
A	Existing 20 Ely Rd	966	316	1,210	20	125	1.21
A	Existing 20 Ely Rd	968	966	1,700	20	125	1.7
A	Tertiary Reservoir	7002	906	22	50	125	0.02
A	Tertiary Plant Discharge	137A	137B	328	20	125	0.33
A	Existing 20 Brown's Lane	137B	902	3,655	20	125	3.66

Scenario A (Alt 1)* - Max Day Demand - Tank 7000

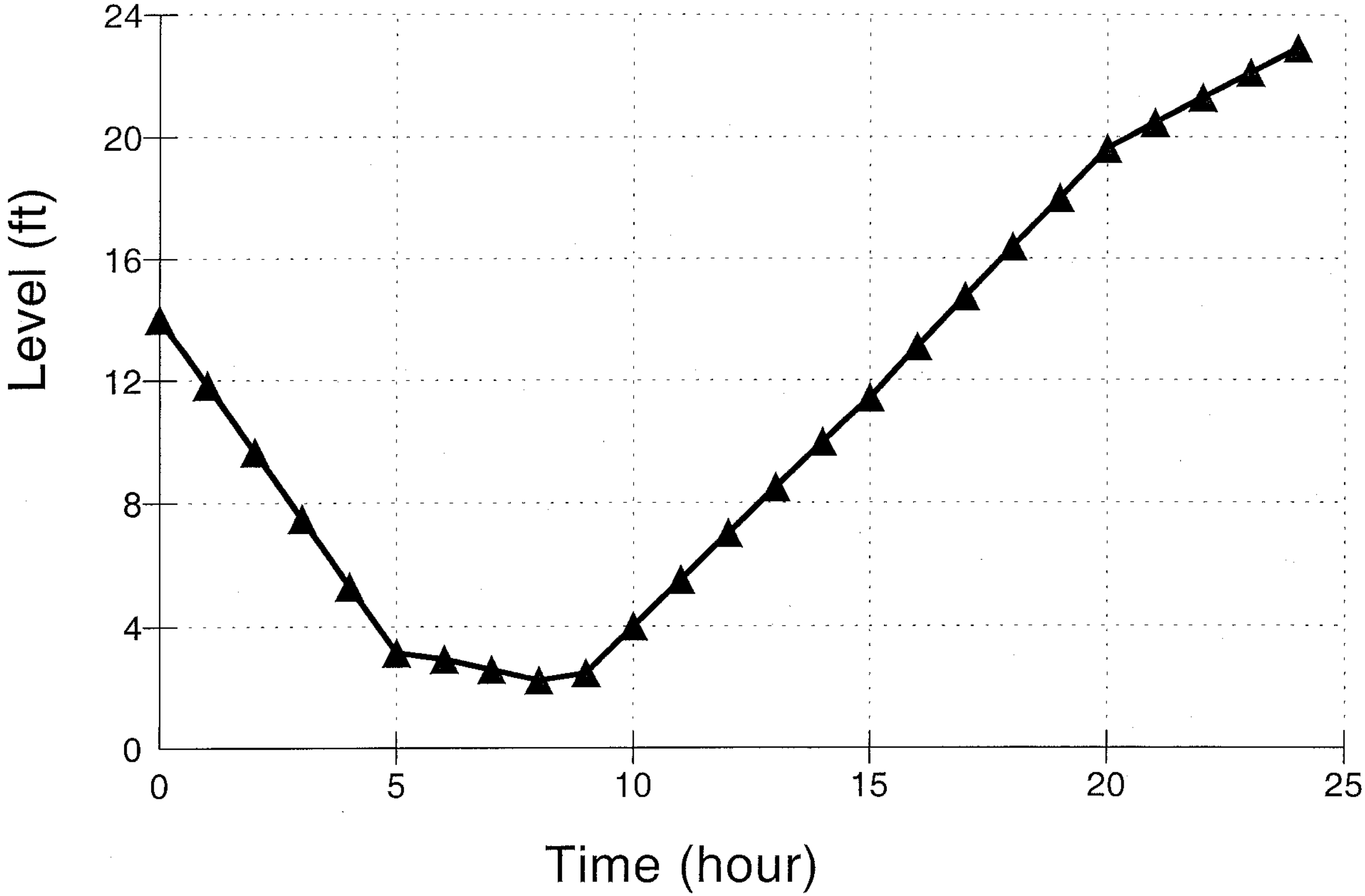


Scenario A (Alt 1)* - Max Day Demand - Pressure at All Nodes

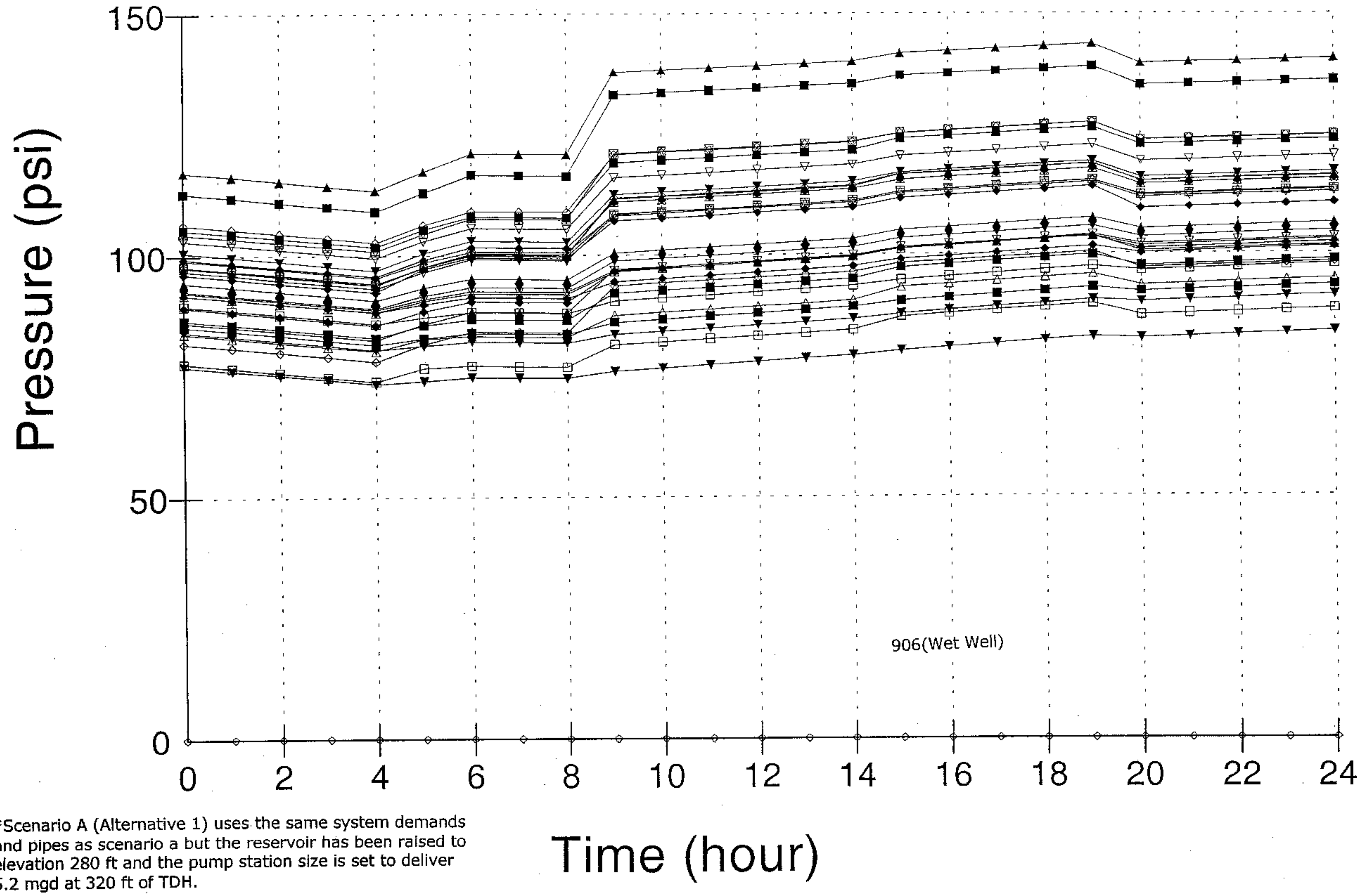


*Scenario A (Alternative 1) uses the same system demands and pipes as scenario a but the reservoir has been raised to elevation 280 ft and the pump station size is set to deliver 5.2 mgd at 320 ft of TDH.

Scenario A (Alt 1)* - Avg Day Demand - Tank 7000

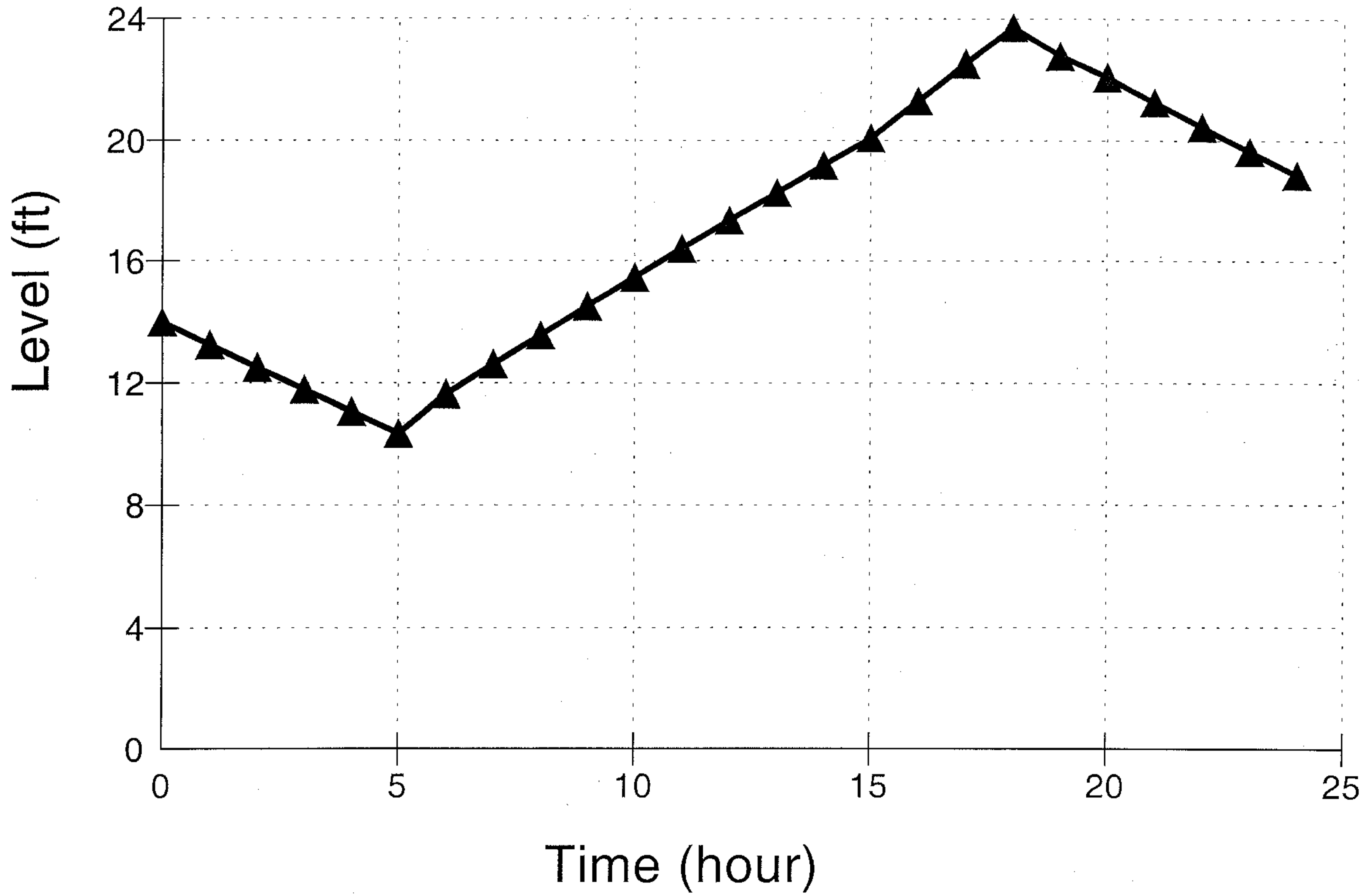


Scenario A (Alt 1)* - Avg Day Demand - Pressure at All Nodes

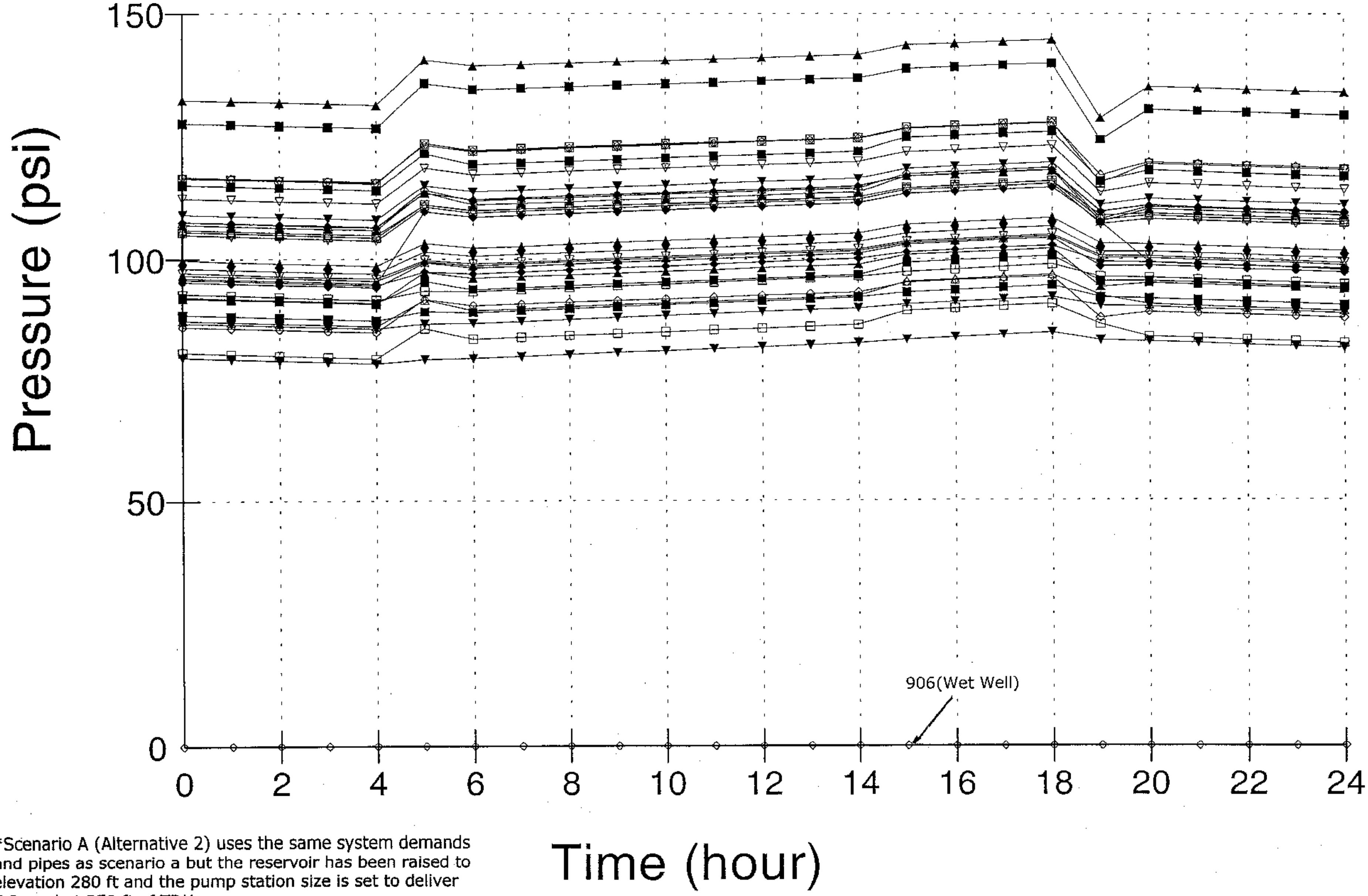


*Scenario A (Alternative 1) uses the same system demands and pipes as scenario a but the reservoir has been raised to elevation 280 ft and the pump station size is set to deliver 5.2 mgd at 320 ft of TDH.

Scenario A (Alt 2)* - Max Day Demand - Tank 7000

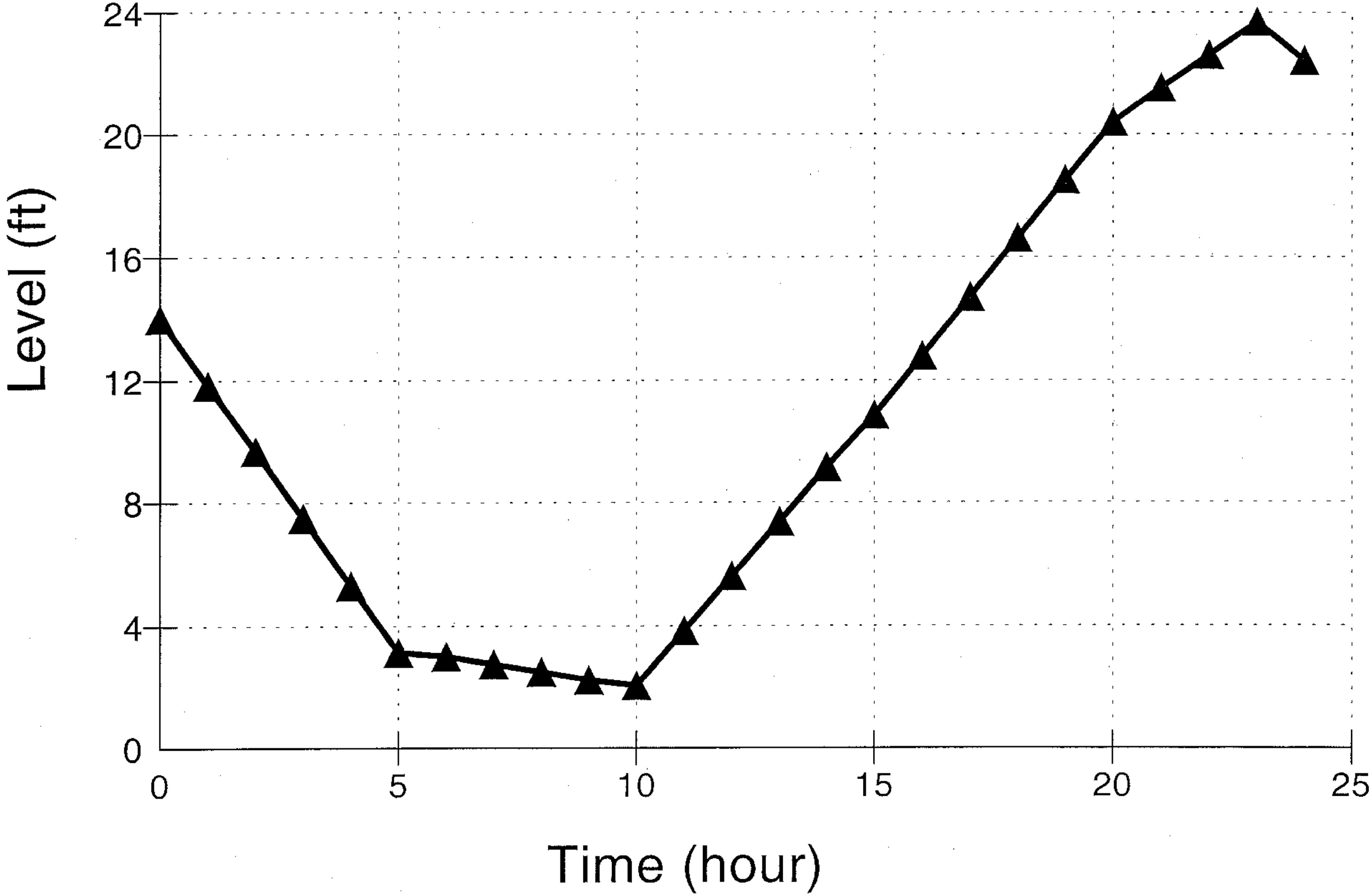


Scenario A (Alt 2)* - Max Day Demand - Pressure at All Nodes

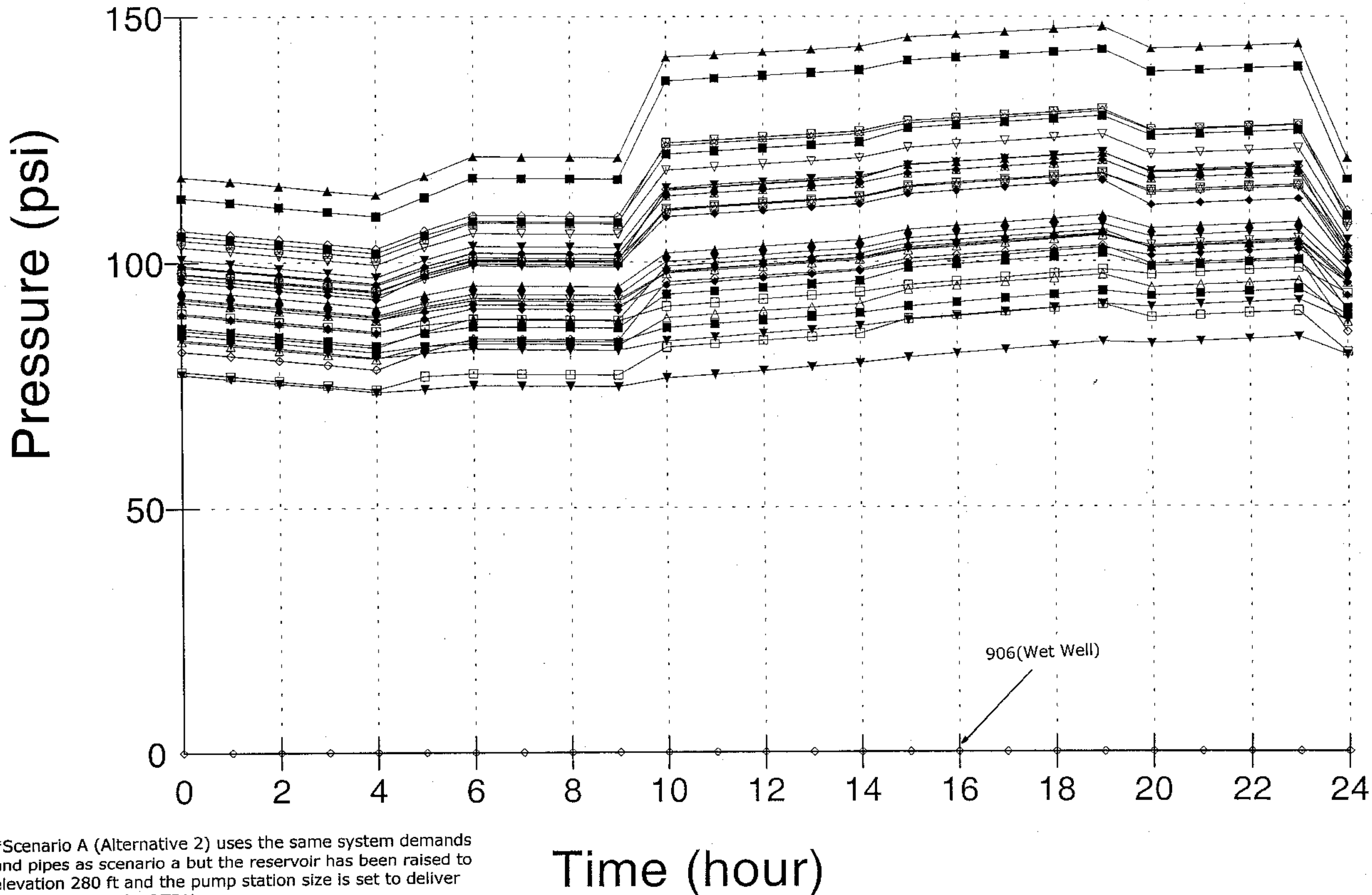


*Scenario A (Alternative 2) uses the same system demands and pipes as scenario a but the reservoir has been raised to elevation 280 ft and the pump station size is set to deliver 5.2 mgd at 350 ft of TDH.

Scenario A (Alt 2)* - Avg Day Demand - Tank 7000



Scenario A (Alt 2)* - Avg Day Demand - Pressure at All Nodes



*Scenario A (Alternative 2) uses the same system demands and pipes as scenario a but the reservoir has been raised to elevation 280 ft and the pump station size is set to deliver 5.2 mgd at 350 ft of TDH.

RECOMMENDED MODEL SCENARIO

H + I + K (PARTIAL)

RECOMMENDED
MODEL SCENARIO
H + I + K (PARTIAL)

<u>PARAMETERS</u>

TOTAL DEMAND	515 [A] MG/YR
MAX DAY DEMAND	5.2 mgd
TOTAL ACRES	634 Acres
Meets Potable Offset Criteria	NO
Meets City-Owned Agricultural Land Requirement	YES (205 Acres)

<u>SYSTEM REQUIREMENTS</u>

Pump Stations Required	
Main P.S.	YES
Booster P.S. #1	YES
Booster P.S. #2	NO
Additional Pump Stations	NO
Reservoir	
Number:	1
Location:	County
Size:	0.56 MG
Elevation:	360 Feet

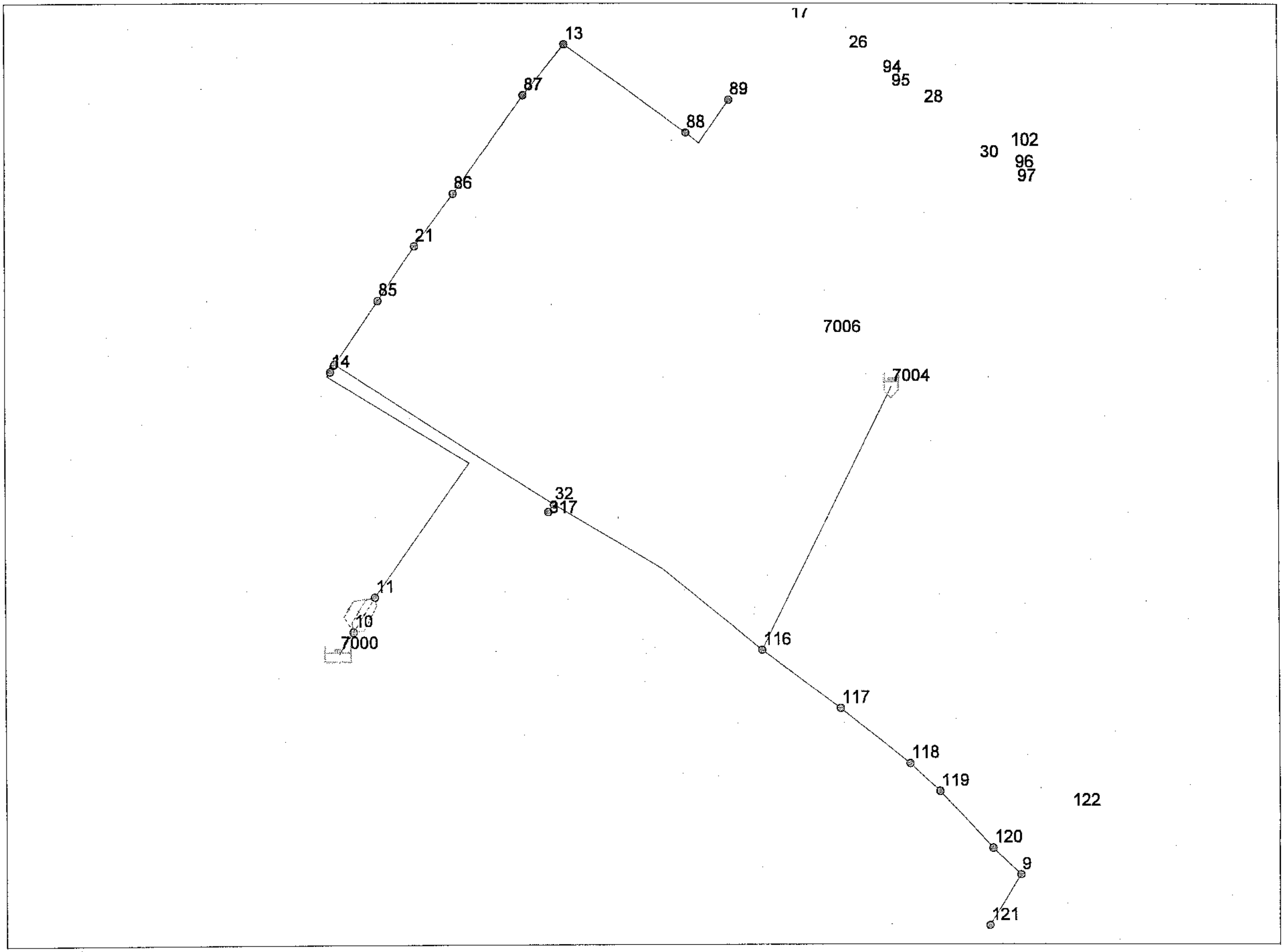
<u>ISSUES</u>

-Pressure at Customer #89 ≅ 40 psi (max day and Avg day)

-Can serve customers #90, #92, and #93 within Area J under this scenario without Booster Pump Station No. 2 and minor piping modifications at Booster Pump Station No. 2. This is based on reservoir size and elevation listed above.

[A] Model was run assuming recommended customers #317, #119, #120, and #121 make up model area K (partial).

SECONDARY RECYCLED WATER SYSTEM - Scenario H+I+K(Partial)



Prepared By:

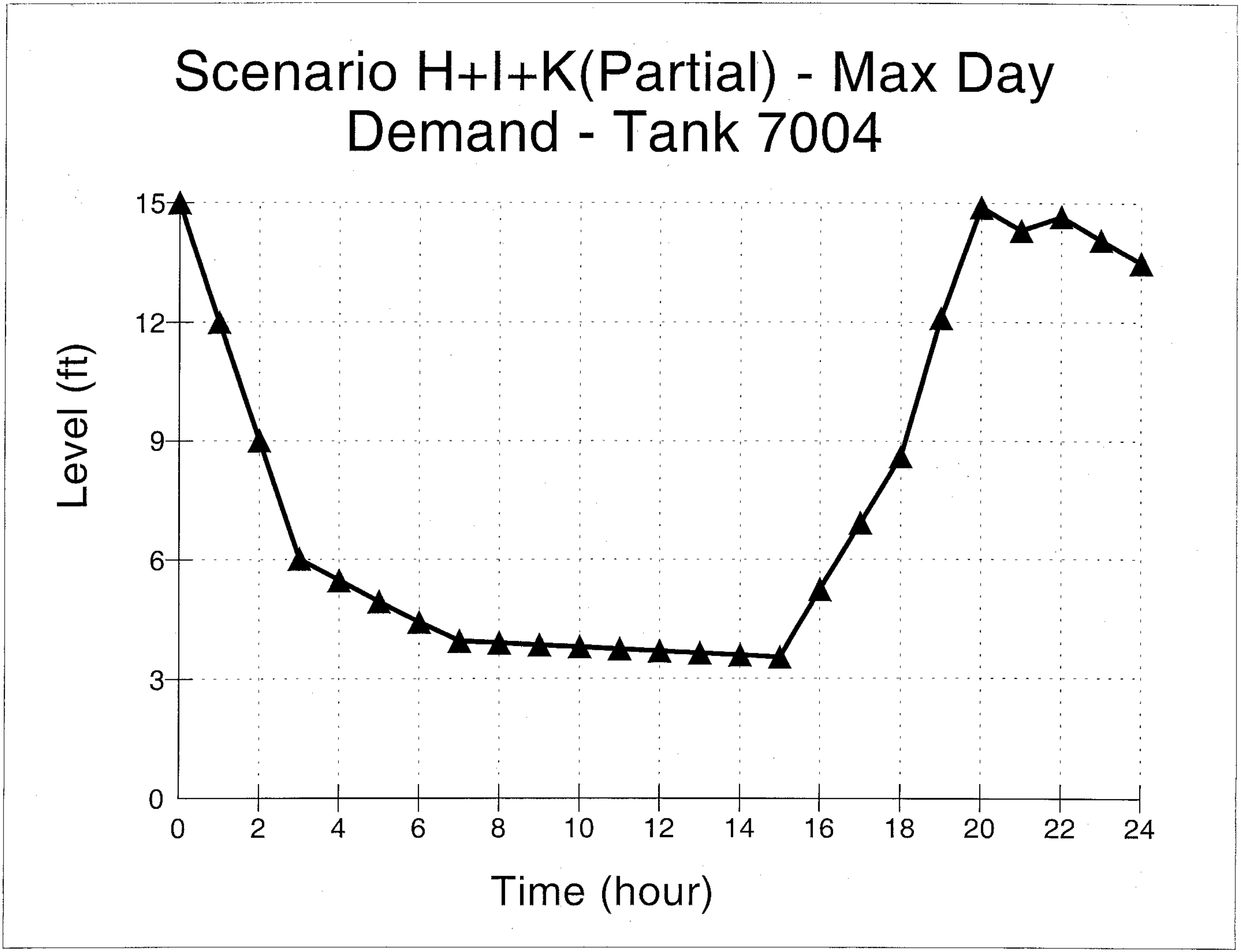
Date: Monday, January 26, 2004

NODE INPUT DATA FOR SCENARIO H + I + K (PARTIAL)

Scenario	Description	ID #	Max Demand (gpm)	Avg Demand (gpm)	User Type	Elevation (ft)
H	Main Pump Station	10				-2
H	Pump Station	11				5
H	Booster Pump Station 1	14				10
H	Booster Pump Station 1	16				15
H	Service to Brazil	32				20
H	New Junction	38				15
H	Potentially City Owned	116	397	171	A	45
H	Potentially City Owned	117	276	119	A	45
H	Potentially City Owned	118	806	347	A	30
I	Booster Pump #2	13				157
I	Existing 20 to 18 Brown's Ln	21				39
I	A1 (Silacci)	85	297	128	A	24
I	A2 (Silacci)	86	163	70	A	65
I	A3 (Silacci)	87	193	83	A	127
I	A4 (Silacci)	88	261	112	A	207
I	A5 (Cardinaux)	89	145	62	A	260
K	Service line Roberts	9				40
K	Ag User	119	197	85	A	30
K	Ag User	120	121	52	A	35
K	Roberts	121	542	233	A	40
K	Brazil	317	533	229	A	20

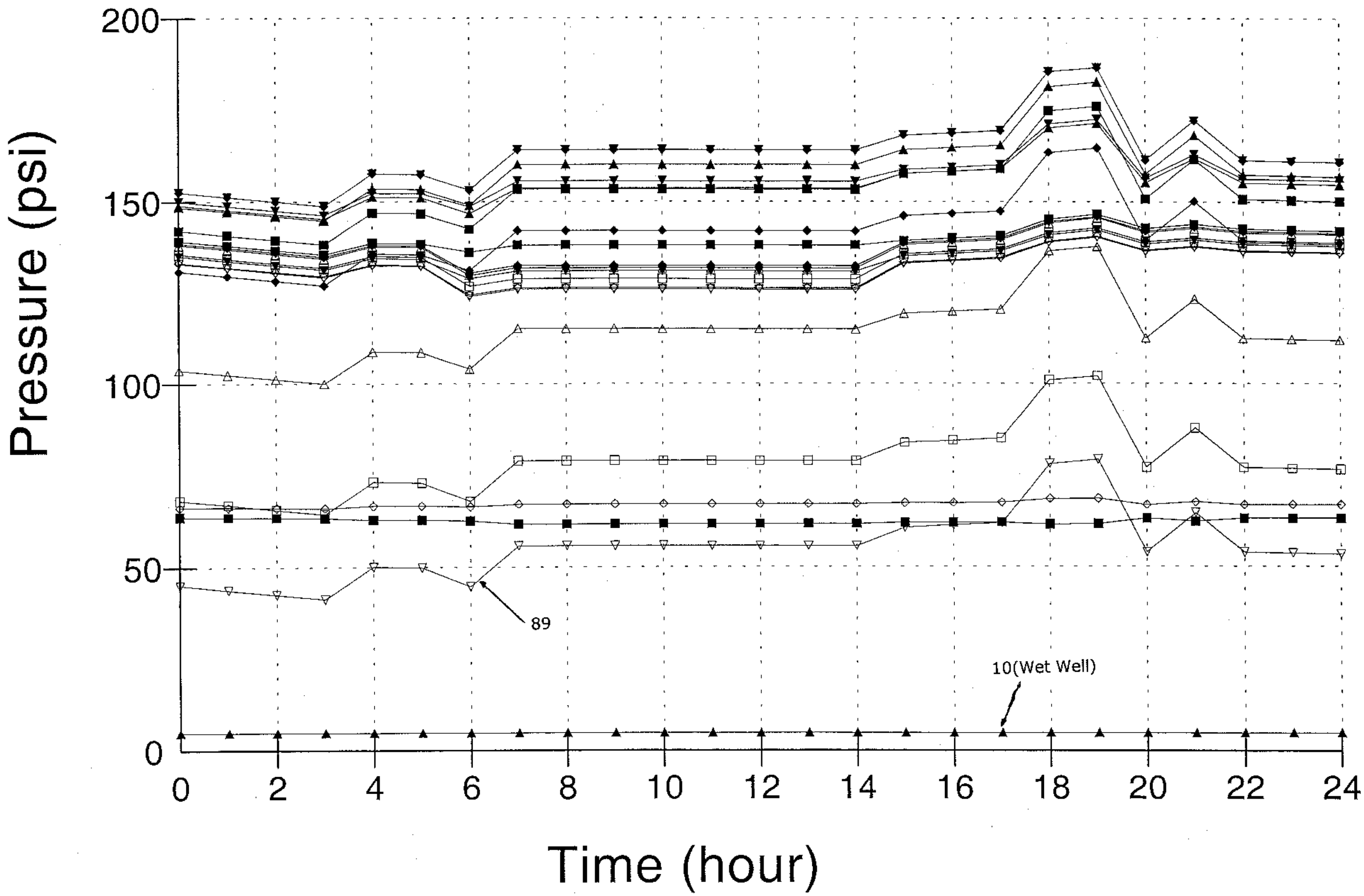
LINK INPUT DATA FOR SCENARIO H + I + K (PARTIAL)

Scenario	Description	From ID #:	To ID #:	Length (ft)	Diameter (in)	Roughness	Minor Loss
H	New Lakeville Hwy (H)	116	117	1,246.66	12	125	1.25
H	New Lakeville Hwy (H)	38	32	2,147.02	16	125	2.15
H	Existing 24 Treatment Plant Access Rd	11	14	4,318.90	24	125	4.32
H	Existing 20 Brown's Lane (I)	16	38	15.18	20	125	0.02
H	To Reservoir R1 (H)	116	7004	3,777.70	16	125	3.78
H	New Lakeville Hwy (H)	117	118	1,137.01	12	125	1.14
H	New Lakeville Hwy (H)	32	116	3,276.79	16	125	3.28
H	Reservoir- Main Pump Station	7000	10	2	50	125	0.00
I	Existing 20 Brown's Lane (I)	85	21	1,000.00	20	125	1.00
I	Existing 18 Brown's Ln (I)	86	21	925	18	125	0.93
I	Existing 18 Brown's Ln (I)	86	87	1,544.26	18	125	1.54
I	Existing 18 Brown's Ln (J)	87	13	841.21	18	125	0.84
I	Existing 10 (J)	13	88	2,000.00	10	125	2.00
I	Existing 10 (J)	88	89	887.52	10	125	0.89
I	Existing 20 Brown's Ln (I)	38	85	986.68	20	125	0.99
K	New Lakeville Hwy (K)	9	121	766.82	12	125	0.77
K	New 20 Lakeville Hwy (K)	120	9	496.32	12	125	0.50
K	New 20 Lakeville Hwy (K)	119	120	993.89	12	125	0.99
K	New Lakeville Hwy (K)	118	119	527.04	12	125	0.53

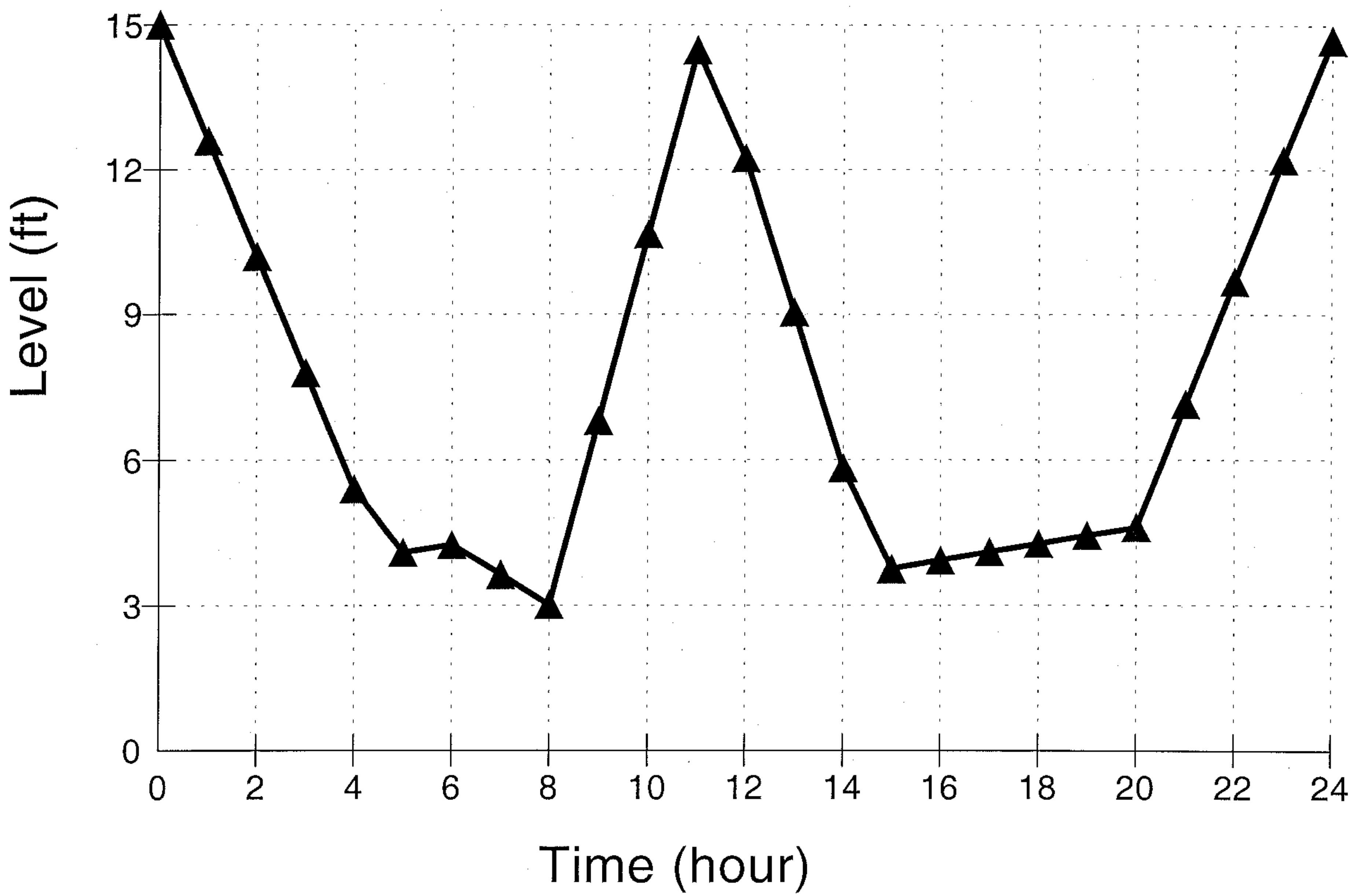


Scenario H+I+K(Partial) - Max Day
Demand - Tank 7004
Level (ft)
0
3
6
9
12
15
0
2
4
6
8
10
12
14
16
18
20
22
24
Time (hour)

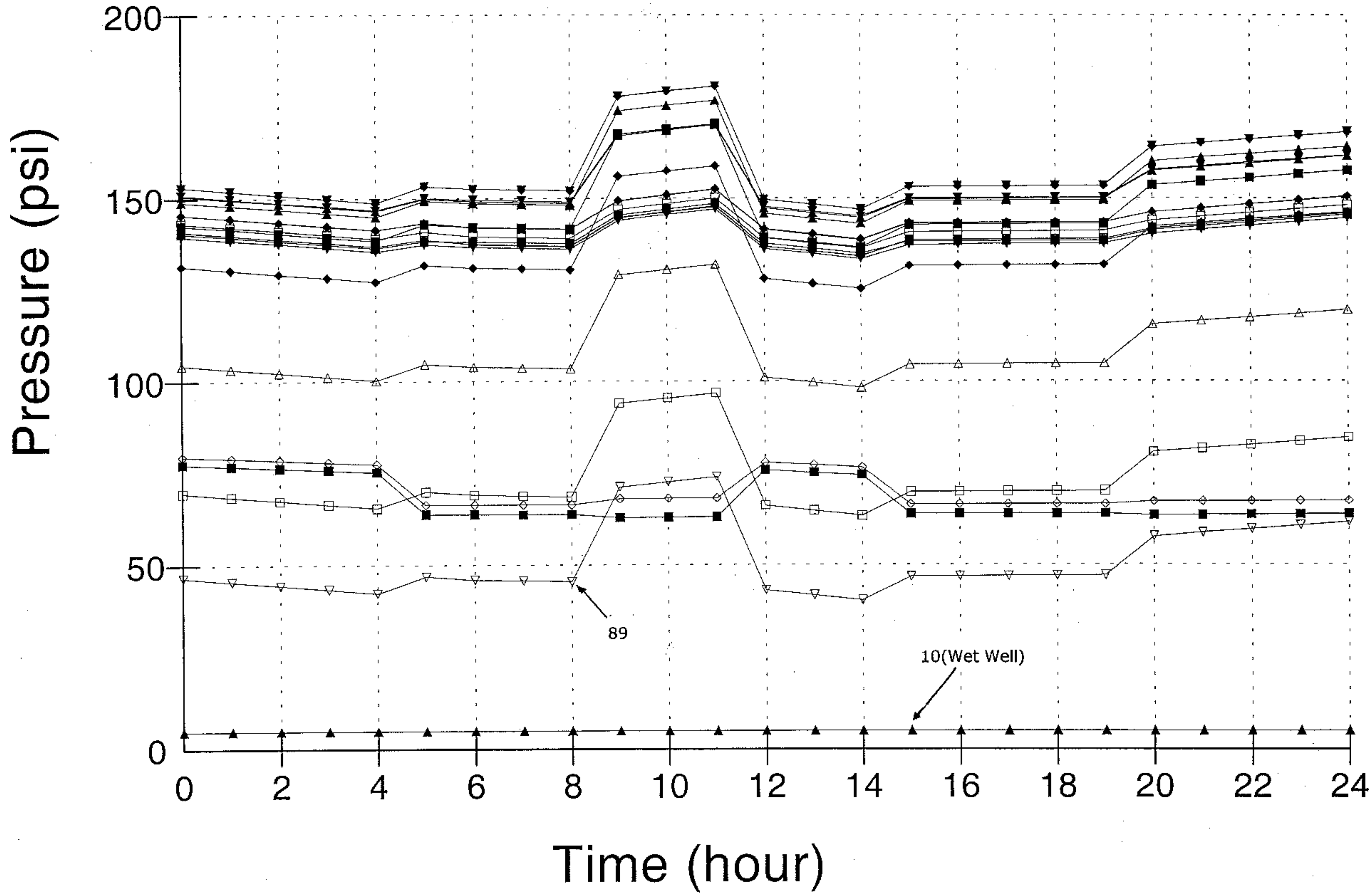
Sceanrio H+I+K(Partial) - Max Day Demand - Pressure at All Nodes



Scenario H+I+K(Partial) - Avg Day Demand - Tank 7004



Scenario H+I+K(Partial) - Avg Day Demand - Pressure at All Nodes



APPENDIX C

COST EVALUATION DATA

APPENDIX C
COST EVALUATION DATA

A present worth analysis over an 80 year life was developed for each scenario modeled for cost comparison of the scenarios. Also included in this appendix are 80 present worth costs for partial scenarios that were not modeled. Costs for these scenarios were estimated based on modeled scenarios. Partial scenarios include A + B (partial), H + I + J (partial), H + I + K (partial), and H only.

Table C-1
TERTIARY COST EVALUATION

	A	A+B	A+B (Partial)	A+C	A+C+G	A+G	A+E+G
General Statistics							
Total Acres	635	977	825	777	863	721	886
Total Acres - City Owned Agricultural Land	30	30	30	30	30	30	30
Includes required City Owned Agricultural Land	no	no	no	no	no	no	no
Total MG	485	793	656	618	685	552	726
Total Max Day Demand, mgd	5.2	8.6	7.1	6.6	7.1	5.7	7.5
Includes required Potable Offset	yes	yes	yes	yes	yes	yes	yes
Capital Costs							
Tertiary Facilities - Initial	0	0	0	0	0	0	0
Tertiary Facilities - Add .8 MGD	1,280,000	1,280,000	1,280,000	1,280,000	1,280,000	1,280,000	1,280,000
Tertiary Facilities - Additional	1,480,000	7,400,000	4,440,000	4,440,000	4,440,000	2,960,000	5,920,000
Upgrade	1,742,000	1,742,000	1,742,000	1,742,000	1,742,000	1,742,000	1,742,000
Add .8	214,000	214,000	214,000	214,000	214,000	214,000	214,000
Additional	248,000	1,238,000	743,000	743,000	743,000	495,000	991,000
Reservoir	3,150,000	3,150,000	3,150,000	3,450,000	3,450,000	3,150,000	3,450,000
New Pipes	2,540,000	3,104,000	*2,853,000*	8,844,000	8,844,000	2,540,000	20,136,000
New Valves	82,000	95,000	*89,000*	276,000	276,000	82,000	621,000
Hydrants - New	27,000	72,000	*52,000*	27,000	27,000	27,000	27,000
Hydrants - Upgrade All	14,000	28,000	*22,000*	14,000	14,000	14,000	14,000
Irrigation - Initial	78,000	78,000	78,000	78,000	78,000	78,000	78,000
Irrigation - Upgrade	24,000	24,000	24,000	24,000	24,000	24,000	24,000
O&M Costs							
Tertiary 4 mgd	8,215,000	8,215,000	8,215,000	8,215,000	8,215,000	8,215,000	8,215,000
Tertiary Additional	2,356,000	5,829,000	3,866,000	3,866,000	3,866,000	3,111,000	4,893,000
Pump Power Cost	3,838,000	6,429,000	*5,276,000*	5,696,000	6,105,000	4,467,000	5,232,000
Reservoirs	762,000	762,000	762,000	762,000	762,000	762,000	762,000
Pipelines - New	1,268,000	1,370,000	*1,325,000*	2,228,000	2,228,000	1,268,000	2,959,000
Pipelines - Old	0	0	0	0	453,000	453,000	0
Valves	149,000	161,000	*156,000*	262,000	289,000	176,000	348,000
Hydrants	76,000	151,000	*117,000*	76,000	76,000	76,000	76,000
Irrigation	317,000	317,000	317,000	317,000	317,000	317,000	317,000
Monitoring	489,000	1,522,000	*574,000*	489,000	489,000	489,000	489,000
Program Administration	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Income							
Reduction - Standard Rates	741,000	741,000	741,000	7,137,000	10,195,000	3,800,000	12,976,000
Income - (Future) Standard	-8,280,000	-8,280,000	-8,280,000	-13,070,000	-17,728,000	-12,861,000	-24,958,000
Income - Special Rates	-2,044,000	-2,044,000	-2,044,000	-2,044,000	-2,044,000	-2,044,000	-2,044,000
Income - Well	-1,411,000	-1,411,000	-1,411,000	-1,411,000	-1,411,000	-1,411,000	-3,824,000
Income - Vin Tertiary	-1,207,000	-1,346,000	*-1,284,000*	-1,207,000	-1,207,000	-1,207,000	-1,207,000
Expense - Ag	199,000	1,118,000	*709,000*	199,000	199,000	199,000	199,000
Income - Rental of City Owned	-91,000	-91,000	-91,000	-100,000	-100,000	-91,000	-91,000
Total Present Worth $s	16,256,000	31,868,000	23,635,000	32,547,000	31,836,000	18,325,000	38,839,000
Annualized Cost $/MG	1,106	1,326	1,189	1,738	1,534	1,096	1,765
Annualized Cost $/Acre-ft	360	432	387	566	500	357	575

Italicized numbers represent estimated cost since these scenarios were not modeled and system not determined.

Agricultural expense was determined using proposed payment rate rather than current payment rate.

Table C-2
SECONDARY COST EVALUATION

	H+I	H+I+J	H+I+J (Partial)	H+I+K	H+I+K (Partial)	H Only
General Statistics						
Total Acres	361	880	634	799	634	205
Total Acres - City Owned	205	205	205	205	205	205
Includes required City Owned Land	yes	yes	yes	yes	yes	yes
Total MG	344	764	515	691	515	195
Total Max Day Demand, mgd	3.6	7.7	5.2	7.4	5.2	2.1
Includes required Potable Offset	no	no	no	no	no	no
Capital Costs						
Initial Capital Cost- Main PS						
Initial Capital Cost- BPS#1						
Pump Station Initial - Main	525,000	525,000	525,000	525,000	525,000	525,000
Pump Station Initial - BPS#1	687,500	687,500	687,500	687,500	687,500	687,500
Pump Station Initial - BPS#2		450,000	450,000			0
Pump Station Upgrade - Main	160,944	160,944	160,944	160,944	160,944	160,944
Pump Station Upgrade - BPS#1	210,760	210,760	210,760	210,760	210,760	210,760
Pump Station Upgrade - BPS#2		137,952	137,952			0
Reservoir	1,400,000	2,800,000	*2,800,000*	1,400,000	1,400,000	1,400,000
New Pipes	2,121,868	2,987,902	2,987,902	6,590,826	*4,325,064*	2,121,868
New Valves	65,484	109,846	109,846	260,470	*161,612*	65,484
Hydrants - New	27,000	27,000	27,000	144,000	*84,681*	27,000
Hydrants - Upgrade All	19,310	52,421	*32,786*	55,180	*36,994*	8,275
Irrigation - Initial	533,000	533,000	533,000	533,000	533,000	533,000
Irrigation - Upgrade	163,396	163,396	163,396	163,397	163,397	163,396
O&M Costs						
Pump Stations	2,174,400	3,261,600	3,261,600	2,174,400	2,174,400	2,174,400
Pump Power Cost	4,180,611	9,493,004	*6,340,595*	8,254,610	*6,186,464*	*4,180,611*
Reservoirs	151,000	302,000	302,000	151,000	151,000	151,000
Pipelines - New	328,062	390,697	390,697	694,655	*508,792*	328,062
Pipelines - Old	642,725	1,710,186	*1,077,182*	642,725	642,725	0
Valves	76,403	146,564	*104,959*	119,529	*97,664*	*76,403*
Hydrants	105,700	286,900	*179,448*	302,000	*202,476*	45,300
Irrigation	2,166,850	2,166,850	2,166,850	2,166,850	2,166,850	2,166,850
Monitoring	1,026,800	2,657,600	*1,690,536*	2,349,560	*1,678,921*	583,086
Program Administration	N/A	N/A	N/A	N/A	N/A	N/A
Income						
Income - Vin Secondary	0	0	0	-370,614	0	0
Expense - Ag	728,726	3,276,398	1,847,636	2,673,908	1,894,056	0
Income - Rental of City Owned	-619100	-619100	-619100	-619100	-619100	-619,100
Total Present Worth Cost	16,876,439	31,918,420	25,568,489	29,270,600	23,373,200	14,989,839
Annualized Cost $/MG	1,619	1,379	1,638	1,398	1,498	2,537
Annualized Cost $/Acre-ft	528	449	534	455	488	827
	100,334,672	*227,832,101*	*152,174,280*	*198,110,648*	*148,475,136*	*100,334,664*

Italicized numbers represent estimated cost since these scenarios were not modeled and system not determined.

APPENDIX D

COORDINATION WITH CAROLLO ENGINEERS FOR TERTIARY FACILITY DESIGN, COST, AND WATER BALANCE

APPENDIX D

COORDINATION WITH CAROLLO ENGINEERS FOR TERTIARY FACILITY DESIGN, COST, AND WATER BALANCE

Dodson Engineers work directly with Carollo Engineers, the design engineer for the City of Petaluma's Water Reclamation Plant, to obtain cost and water balance information essential for the preparation of the Recycled Water Master Plan. In turn, Dodson Engineers provided valuable input to Carollo Engineers for the design of the Tertiary Recycled Water Pump Station.

Subject: Recycled Water Master Plan
From: Dana Hunt <dhunt@dodsonforwater.com>
Date: Thu, 22 Jan 2004 16:58:14 -0800
To: "Wing, Doug" <dwing@carollo.com>, ceaton@carollo.com
CC: "Orr, Margaret" <morr@ci.petaluma.ca.us>

Doug and Courtney,

I will submit the draft master plan for the recycled water project next Thursday to the City. I am making an extra copy for you. You can pick it up on next Wed or Thurs if you want. Through additional work, I have a few minor changes to what I provided to you on December 19, 2003 for design of the tertiary pump station.

1) The future A+B scenario has been eliminated. I therefore think that the pump station could be designed for expansion to a ultimate capacity of 8 mgd (equal to the ultimate tertiary treatment) rather than 8.6 mgd as required for Scenario A+B. The largest capacity scenario that I now identify is A+C+G which equals 7.1 mgd, but 8.0 may be better just because of ultimate tertiary capacity.

2) Initial facilities should still be designed as previously indicated. 5.2 mgd at 350 feet TDH. However, initial facilities can be designed for as low of a TDH as 320 feet as long as the pumps can have a stage added at a later date to get them to 350 feet TDH and they should be provided with motors of adequate size to handle the future 350 feet TDH. We have modeled Scenario A (modified). This model run places the reservoir at elevation 280 as required for future conditions. We also modeled it with a 5.2 mgd pump station at 320 feet TDH and 350 feet TDH. Both work fine. Your call as to what you design. The draft master plan will include average and max day model runs for this Scenario A modified condition for your use. I will also provide you with the pump curves generated by the model. When we modeled it we used 3 pumps to produce 5.2 mgd. It is my understanding that you will use less.

3) I recommend that you provide pressure relief at 150 psi at the pump station rather than 160 psi as stated in December 19, 2003 meeting. It will need to be adjusted to 160 psi in the future.

4) I recommend that the recycled water pipeline be designed for 250 psi that you are designing with the plant. 200 psi is adequate, but I don't think DIP comes in that pressure class and the master plan will state 250 psi.

5) As stated before, the TDH that I provide, does not include station losses inside your pump station. Please increase TDH as required.

6) Pump station capacity includes 1 mgd capacity for max day at WRF for your 3W.

7) Nothing in the master plan or modeling work was done for the fire flow at the plant. Add pumping capacity as required.

8) The master plan states that 1 standby pump will be provided and standby power for the pump station.

9) It is my understanding that you can produce 5.2 mgd of tertiary water on max day with the facilities being designed.

Dana

CITY OF PETALUMA
RECYCLED WATER MASTER PLAN

COORDINATION MEETING WITH CAROLLO ENGINEERS

DECEMBER 19, 2003
11:00 A.M. TO 1:00 P.M.

AGENDA

I. DISCUSS ITEMS AS REQUIRED FOR CAROLLO TO COMPLETE DESIGN WORK AT NEW TERTIARY FACILITY

At start-up when approximately 790 MG is of recycled water is available, recommendations include serving Area A with Tertiary water and Areas I and H with Secondary water. As recycled water increases to approximately 1000 MG customers within Area B or K should be added depending upon payment amount to agricultural customers. Area B would be served with Tertiary water and Area K would be served with Secondary water. If additional potable offset is required within the City, it is recommended to expand the tertiary system into Areas C and G. The cost of serving these areas with tertiary recycled water is much less costly then obtaining additional potable supply. Since tertiary facilities will initially serve area A, but may serve area A + B or A+C+G at a later date, it is recommended to design facilities so that they may be designed with the future in mind or that they may be expanded.

A. Tertiary Pump Station Design/Phasing and Pressure Relief.
1. Initial 2007, Area A (5.2 mgd @ 290 feet TDH, design for 350 feet TDH)
2. Future requirements:
   a. Area A+B (8.6 mgd @ 320 feet TDH) or
   b. Area A+C (6.6 mgd @ 350 feet TDH) or
   c. Area A+G (5.7 mgd @ 300 feet TDH) or
   d. Area A+C+G (7.1 mgd @ 350 feet TDH)
3. Pipeline from new plant to Browns Lane and Ely Road should be designed for 200 psi or 250 psi.
4. Design pressure relief at plant to not allow pump station to not exceed 160 psi.
5. Add additional head for pump station losses.
6. Pump station size includes 1 mgd for 3W at plant.
7. Fire flow or standby pumps are not included in above numbers.

B. In-Plant Tertiary Reservoir/Phasing
1. Initial 2007, Area A 5.2 mgd, includes 1 mgd for 3W at plant.
2. Future requirements (plant should be expandable):
   a. Area A+B (8.6 mgd) or
   b. Area A+C (6.6 mgd) or
   c. Area A+G (5.7 mgd) or
   d. Area A+C+G (7.1 mgd)

3. On max day the pump station will pump continuously at rates indicated above. The in-system reservoir will account for fluctuations of max hour. The in-plant reservoir and system shall be designed to accommodate this operation.

C. In-System Reservoir

1. On max day the pump station will pump continuously at rates indicated above. The in-system reservoir will account for fluctuations of max hour. The in-plant reservoir and system shall be designed to accommodate this operation.
2. Initial 2007, Area A requires a 0.9 MG reservoir at elev 250 feet, but place at elev 280 feet and size for 1.71 MG or size for 0.94MG and provide space for additional 0.77 MG reservoir on same site in future.
3. Future requirements (plant should be expandable):
   a. Area A+B (0.94 MG at elev 260 feet) or
   b. Area A+C (1.71 MG at elev 272 feet) or
   c. Area A+G (0.9 MG at elev 265 feet) or
   d. Area A+C+G (1.71 MG at elev 280 feet)

D. Max Day Tertiary Requirements/Phasing

1. Initial 2007, Area A 5.2 mgd, includes 1 mgd for 3W at plant.
2. Future requirements (plant should be expandable):
   a. Area A+B (8.6 mgd) or
   b. Area A+C (6.6 mgd) or
   c. Area A+G (5.7 mgd) or
   d. Area A+C+G (7.1 mgd)
3. All flow>ADWF must treat pond water.

E. Any Other Items

Subject: Re: Recycled Water MasterPlan
From: "Doug Wing" <DWing@carollo.com>
Date: Tue, 04 Nov 2003 16:44:46 -0700
To: <dhunt@dodsonforwater.com>
CC: "Lydia Holmes" <LHolmes@carollo.com>

Dana

The cost numbers below appear to be correct. We have not developed any new information. In addition, for your purpose please use $ 1 million additional for pretreatment of pond effluent for urban recycled water (URW) or tertiary water.

Item 1 - Water Balance. Lydia based her estimate of 317 using a max month usage if 3.5 mgd plus lower monthly uses for the remainder of the irrigation period based on current agricultural recycled water usage. I do not know the exact numbers, but if July average 3.5 mgd, then June and August might average 2.3 mgd and May and September might average 1.0 mgd. If you have a better estimate of usage, then use it.

Item 2 - Tertiary capacity and costs. The tertiary design is 4 mgd total treating secondary effluent, therefore it is limited by ADWF. The costs provided have not changed. If the usage goes above ADWF, then we estimate (WAG) that an additional $ 1 million is required to treat pond effluent. ALL other cost are the same.

The last question still seems off the mark, treating more than ADWF or if needed annual average (AA) would probably require additional storage in the ponds for treatment. The cost of additional storage ponds , constructed to today's standards would be prohibitive. Therefore the existing pond storage will be the limiting factor. I do not recall what the current peak ag system usage is, but I thought the peak ag discharge was about 8 mgd. Therefore the ponds may limit the reuse to 8 MG. While the city currently does store water for agricultural irrigation, we doubt that it feasible to store much more than the current volume.

Finally it will never be cost effective to treat all the effluent to tertiary standards, wet weather flows might average up to a max. month of 12 mgd, with peaks above 20 mgd. Such a treatment system would be very costly.

Call to discuss this response. Thanks

Douglas Wing
Carollo Engineers
925-932-1710
dwing@carollo.com

| | | Dana Hunt <dhunt@dodsonforwater.com> 10/29/2003 6:19:10 PM >>>
Doug and Lydia,

I have a few questions on the information below and need some additional
cost information as well as information on how you are proceeding with

the design. Shortly, we will be doing cost analysis of our model runs and need some additional cost data (if possible by Tuesday 11/4). Thanks
for your help.

1)Water Balance. Lydia-On the information below I have a question and some clarifications. It is unclear to me why you think that you can only give me 317mg with a 4 mgd tertiary facility. I calculate that with a 4mgd facility, namely producing 4mgd on a max day, I get about 368 to 387 mg. The 368mg to 387 mg that I get is based on my numbers in my tables relating irrigation season use to max day demand. This 4mgd /368 to 387 mg number includes 40 acres of irrigation at the plant and 1 mgd of return flow to the plant. The plant return flow of 1mgd is included in the 4mgd since the 1mgd needs to be treated to tertiary standards on the peak day, but not in the 368 to 387 number since we are not getting rid of the returning water since it is being recycled. I understand this may be confusing, please call me to discuss. I am using max hour of 689 gpm in my model for the returning flow which equates to 1 mgd on max day which was given to me by Corollo. Where do you get the .576 mgd number?

2) Doug/Lydia- How much tertiary capacity are you planning to build? What are you planning to treat (ADWF influent vs pond water)? In my analysis, I want to tell the City how much it cost to deliver tertiary water above 4mgd (max day demand). I need costs.
a) Capital cost to build first 4mgd tertiary (includes tertiary facilities+ recycled water pump station). You gave me previously = $10,676,492 dollars.
b) Additional Capital cost to build SECOND 4mgd tertiary (includes tertiary facilities+ recycled water pump station). (Need $ for treating POND water above ADWF?) You previously gave me $6,400,000 but I assume that was not treating pond water and you could only treat upto ADWF which would be less than 8mgd always).
c) Need upgrade costs in 2007 $s to upgrade/ replace all equipment,etc... in 40 years for item a) above. Was given $5,684,000 previously.
d) Need upgrade costs in 2007 $s to upgrade/ replace all equipment,etc... in 40 years for item b) above. Was given $3,494,000 previously.

In my estimation, the most tertiary water that could be provide at buildout (if all water could be made into tertiary) is 1000 mg per irrigation season per your water balance and for me to dispose of that much tertiary water in an irrigation season, my peak day demand would be about 10.6 mgd. Do you have any idea how much it would cost to build tertiary facilities to treat that much water? The City may ask how much it would cost to build facilities to treat all water to tertiary standards, and this would be that answer.

In reality, I recommend to the City that they provide about 200MG per irrigation season to City owned land and I see no need for that land to be irrigated with tertiary water. That would reduce the maximum amount of tertiary water (max) from 1000 mg to 800 mg and the max day demand for tertiary would then be about 8.6 mgd. I have a model run which is very close to this. It is area A + B which equals 793 mg with a max day demand of 8.6 mgd. I really do need a capital cost plus upgrade costs for this scenario so the City understands how expensive this

alternative
is. Could you squeeze 8.6mgd out of your 8 mgd facility in b) above?
for
cost analysis purposes?

Please let me know if you would like to meet to discuss. Thanks for all

your help. Dana

Lydia Holmes wrote:

> Dana -
> I have re-run the water balance. The way I have it set up is I have a continuous 3 water demand for in-plant use of 0.576 mgd (this number will be refined later). Then I have tertiary water used for irrigation -
> this would include in-plant irrigation and the 40 acres adjacent to the
> plant -if they decide to irrigated it with tertiary water. This is similar to your table of the A model area which includes the treatment
> plant irrigation. Based on my calcs, assuming only 4 mgd of tertiary water is produced - you have about 317 mg to use over the year.
>
> For 2008:
> Start up min (assumes 1.5% pop growth = 5.31 mgd ADW flow) - need minimum of 300 acres of secondary effluent users (284 mg/yr)
> Start up max (assume 2% pop growth = 5.44 mgd ADW flow) - max of 650 acres of secondary effluent users (615 mg/yr)
> Start up average - using 5.38 mgd ADW flow - use 500 acres sec eff on
> Ag = 473 mg/yr - allows no discharge in Oct not as tricky to operate as
> the min or max.

Total Recycled water available is 2008 =
317 MG + 473 MG
$\boxed{= 790 \text{ MG}}$

> Buildout - 6.7 mgd ADW flow
> Using only the 4 mgd tertiary:
> Min = 580 acres Ag = 548 mg/yr sec eff
> Max = 880 acres = 833 mg/yr
> want to actually operate somewhere in between - 700 - 750 acres?

Total Recycled Water at Buildout ⇒
700-750 acre ⇒
661-708 MG
+ 317 MG
$\boxed{\cong 1000 \text{ MG}}$

> If increase to 8 mgd tertiary (can serve about 760 acres or 720 mg/yr
> tertiary):
> Min = 150 acres AG = 142 mg/yr sec eff
> Max = 450 acres AG = 426 mg/yr sec eff
> Again best to have somewhere in between - say 300 acres

720 MG + (142-426 MG)
$\boxed{\cong 1000 \text{ MG}}$

> Hope this helps you determine the best configurations for the City. Let
> me know if you want any other info.
> Lydia
>
> Lydia Holmes
> Carollo Engineers
> Walnut Creek , CA
> (925) 932-1710

Subject: Re: Petaluma Plant and Recycled Water
From: "Doug Wing" <DWing@carollo.com>
Date: Tue, 14 Oct 2003 14:30:20 -0700
To: <dhunt@dodsonforwater.com>
CC: "Lydia Holmes" <LHolmes@carollo.com>, <mban@ci.petaluma.ca.us>, <morr@ci.petaluma.ca.us>

Dana

The actual design capacity of the tertiary facility is 4 mgd. When I noted that the system may be able to produce 5 mgd I was referring to an in-house idea to maximize system capacity. We will review the design criteria with the City on Friday and will explore the concept of pushing the capacity to 5 ± mgd. In addition, the in plant use has not been defined any further, we will have an update in the future. Thanks.

Per Carollo can get 5.2 MG on max day (Scenario A)

Douglas Wing
Carollo Engineers
925-932-1710
dwing@carollo.com

||| Dana Hunt <dhunt@dodsonforwater.com> 10/13/2003 5:56:24 PM >>>
Doug and Lydia,

Thank you for meeting with me today. It was very informative and I understand what you are planning to design. Please keep me informed as to any changes which may affect me. As I mentioned, I will be needing updated water balance information in early December. At that time, I can let you know my findings, but based on what you said today, it seems that I will take all the tertiary you can give me. I will continue my modeling as previously outlined and will determine the best customers to serve. I do have one question. You mentioned that the 4mgd facility can produce 5mgd max day tertiary water (I assume this is based on the fact the ADWF in 2008 is about 5 or 5.2 mgd). We agreed that you need about 1mgd for in plant use and that I could have the other 4 mgd for tertiary users. I was thinking that most of the 1 mgd used in the plant will reenter the flow stream so in general the plant will have an inflow of ADWF plus the plant water reenetering. That would mean that you are always treating ADWF plus 1 mgd. Wouldn't that mean that I could have all of the 5mgd for tertiary users (What comes in must go out if the plant does not continue to gain water) This of course assumes that enough filters were built to treat 6mgd? Please let me know your thoughts on this. Thanks, Dana

Subject: Re: New Water Recycling Facility
From: Dana Hunt <dhunt@dodsonforwater.com>
Date: Tue, 16 Sep 2003 14:57:25 -0700
To: Doug Wing <DWing@carollo.com>

Doug,
Thank you for the information. See my follow-up questions.

Item 3. Is the secret drawing that you gave me last that located the new pump station still accurate? if you have anything better, please send to me.

Item 4. I was not clear. Please re-read item 4 below and then this.I am planning on having both a secondary water system and a tertiary water system. Namely 2 separate systems. Since water demands will vary depending on a hot or cold summer, the City may have extra or not enough water (i.e. water balance) at the plant. A way for the City to deal with this better. i.e. give them better flexibility would be to have them own some land in the distribution system that they could dumb extra water on or turn off the irrigation to better balance the water. I was thinking of putting all of this flexible type land in the county in the secondary system since that water would be cheaper to produce and no one would notice if they stopped watering it and it went brown. BUT... I was thinking that maybe both systems need some flexible land since maybe it is not easy to move extra water into the secondary ponds in the plant. It has to do with water routing inside your plant. So the question is.... if I only have extra flexibility in the secondary system is that sufficient OR do I need to have some flexible irrigation land in the tertiary system too. Hope this makes sense. Dana

Item 6. If I use 9 acres to be irrigated at the new plant site, does that seem like a good guess? I need a guess now.

Thanks. Dana

Doug Wing wrote:

> Dana
>
> We have also been on hold, although we now are restarting the project. I can answer some of your questions now. see response after each question.
>
> Douglas Wing
> Carollo Engineers
> 925-932-1710
> dwing@carollo.com
>
> >>> Dana Hunt <dhunt@dodsonforwater.com> 9/10/2003 6:29:17 PM >>>
>
> Lydia and Doug,
>
> My recycled water masterplan was put on hold for a little while and I will start the modeling part of my project very shortly. Since some time has past, I was wondering if you have any of the following information on the plant yet? Any information will be greatly appreciated.

1) What is min and max water surface elev in your 1 mg recycled water storage basin?

A - Grade El. is approx. 18 in berm around basin, therefore WL El. is max 16, min El. 11, with a bottom El. of 6. Lower 5 feet will be for fire protection

2) What is the min and max water surface elevation in the secondary effluent ponds from which the min secondary eff pump station will pull?

A - I am not sure which pumps you are asking about. The existing agricultural pumps draw from the chlorine contact basin. The current design is based on a constant elev. of 9 in the contact basin.

3) Can I get the latest drawings for the location of the recycled water pump station and any drawings you have of the station piping, including piping down to the Brown's Lane Ely Road intersection.

A - I can send over a sketch for the piping crossing under Lakeville highway. We have not completed any work except rough sketch for any other piping. This might be available by the end of October.

4) I am planning on having some City owned land that can be over or under watered in order to compensate for hot or cold summers so the customers are not impacted and the City does not need to discharge to the river when not permitted. I was planning on having all of this land in the secondary system. Will it be easy to route water within the new plant to secondary or tertiary or would it be beneficial to have some City owned land in both systems?

I assume that you mean the restricted secondary reuse or agricultural water. There will be some areas that can receive secondary, but we assumed that the City would use tertiary, unrestricted or urban recycled water on the Parcel A/B areas, due to public access restrictions.

5) Do you have any idea on the amount of recycled water that you will be pulling off of the tertiary pump station for use at the plant (non irrigation) that will reenter the plant for retreatment? These assumptions should not include a fire since that would be a special case. I really need numbers at this point for:
____mg for a calendar year and ___ mg within the 7 month irrigation season (April - Oct).
____mgd for the max day
and the distribution of the max day use over a 24 hour period. (ie do you use more water during a daytime hour than a nightime hour)

These will be developed in the future. You should use the flows previously identified until we get a better number.

6) I need to know the # of acres that you will be irrigating at the plant? Any other water that will be non returning to the plant besides irrigation? If so how much.

Plant irrigation areas will be limited. We will be working with our landscape architect to get a better handle on area in the near future.

I would really appreciate this information by Tuesday if possible.
Thanks, Dana

Subject: Re: Petaluma
From: "Lydia Holmes" <LHolmes@carollo.com>
Date: Fri, 18 Jul 2003 17:10:32 -0700
To: <dhunt@gsda.com>

Ok Dana - I think I have it all!
For the 4 mgd facilities - $5,684,000 needs to be replaced in yr 40
For the 8 mgd additional facilties - $3,494,000 needs to be repaced in yr 40.
Apply same to both for yr 80 - although at some point pipes will wear out too!
Hope this helps.
Lydia

>>> Dana Hunt <dhunt@gsda.com> 07/17/03 05:34PM >>>
Lydia,
I am comparing my alternatives an a present worth basis of 80 years. In yaer 40 I am assuming that all mechanical equipment and electrical equipment will be replaced then. I need the % of the numbers below that is equipment etc..... This is not included in annual O&M. Dana

Cost for 4mgd tertiary system = 10,676,492 , What is % of this cost will need to be replaced in 40 years?
Cost for 8 mgd tertiary system = 6,400,000, What is % of this cost will need to be replaced in 40 years?

Lydia Holmes wrote:

> Dana-
> The o&m estimated I provided you already included the annual replacement estimates for mechanical components.
> Lydia
>
> >>> Dana Hunt <dhunt@gsda.com> 07/10/03 04:46PM >>>
>
> Lydia,
>
> I need to know the % of the construction cost that you gave me for the tertiary system that is mechanical and electrical (ie the items that will wear out and need to be replaced in 40 years) I am assuming that your plant has a 40 year life and in 40 years I need to replace things that have worn out in a major plant upgrade. Things like concrete and earthwork etc... will not be a cost then.
>
> Cost for 4mgd tertiary system = 10,676,492 , What is % of this cost will need to be replaced in 40 years?
> Cost for 8 mgd tertiary system = 6,400,000, What is % of this cost will need to be replaced in 40 years?
>
> Thanks, Dana

Subject: Re: Recycled Water for Petaluma
From: "Lydia Holmes" <LHolmes@carollo.com>
Date: Mon, 23 Jun 2003 17:17:45 -0700
To: <dhunt@gsda.com>
CC: "Doug Wing" <DWing@carollo.com>

To answer some of your questions:
1) In predesign report (Feb 2002) we used 25 yr life and 6% interest - in reality the life is longer - say 40 yrs? Just look at Hopper St!
2) As we discussed on phone - tertiary facilities designed for 4 mgd max. We assumed 2 mgd average - because the recycled water demand had not been developed.
3) O&M costs - ignore previous numbers
I estimate $272,000/yr for the 4 mgd system (average 2 mgd flow for yr) including operators time and maintenance - not including power for RW pumpstation
I estimate $380,000/yr for the 8 mgd system (4 mgd average flow for yr)
4) Included above
5) Cost to expand tertiary system to 8 mgd - estimate = $6.4 million at ENR 7925 (same as other costs given to you) - includes Recycled water pumpstation upgrades - but assumes no more recycled water storage provided. If your model shows more needs to be provided - use same costs given before.

>From phone conversation - the landscaping water use was a place holder and is unknown.

Attached are files showing layout of facilities on Parcel A.

Hope this helps,
Lydia

Lydia Holmes
Carollo Engineers
Walnut Creek , CA
(925) 932-1710

>>> Dana Hunt <dhunt@gsda.com> 06/20/03 06:02PM >>>
I will assume something. My model will run a 24 hour simulation so it will place water demands at the correct time of day so not to impact peak hour.
1. Do you know the design life for the plant? years
2. What is tertiary system of 4 mgd based on? Ave day or peak day?
3. You gave me annual O&M costs. Is this O&M for tertiary system only? That is what I need.
4. Does it include annual maintenance for Tertiary PS? I need that too, but I need it without power costs for Pump station.
5. The cost to expand Tertiary needs to include the PS too.

Thanks, Dana

Subject: Re: Recycled Water for Petaluma
From: "Lydia Holmes" <LHolmes@carollo.com>
Date: Fri, 20 Jun 2003 14:32:40 -0700
To: <dhunt@gsda.com>
CC: "Doug Wing" <DWing@carollo.com>

Dana-
I'm afraid I will have to defer to the numbers I already provided you. Basically so many things have changed (process wise) and because of the delay in our design, that is the best info we have at this point. Once we start design again we will have a better idea of how much water the biofilters will use. Doug estimates we can give you more in November. So it is up to you how you want to model it. Either you can add in the 3W, or we can, to get the pump station sizing. And once the model is set up we can run it again in 6 months once we have better numbers. One thing to note - for peak demand at the plant - it would be during day hours when operators are doing washdowns. I assume most golf courses and parks irrigate at night when no one is there - so you probably don't want to assume the plant peak demand on top of the irrigation peak demand.

As for the tertiary costs for 8 mgd - I asked the tertiary designer to get the info to me. Hopefully early next week is ok.

Thanks for the other info - I have yet to process it all.
Lydia

> Dana Hunt <dhunt@gsda.com> 06/20/03 09:45AM >>>
>
> Lydia,
>
> My thought was that I really needed to model the 3W at the plant so that I can provide input to Doug on how to size the pumps at the tertiary pump station. I would not be modeling the plant or anything. I would just have a node at the plant with a demand. It would help to model it closer to reality with the storage in the system and how peak day or peak hour might be affected by the plant's needs. I am not sure if you had my latest email to Andre on this matter see below.
>
> > I need additional information on the following. We will model all 3W demand/use for the new WWTP for the pump station, but as far as a true demand/use for the facility, it seems to us
> > that most of the water is returned to the plant and therefore the actual use is only the water not returned which would be the irrigation amounts.
> > I need the following, is the use for the biofilter for irrigation type use on a soil bed, then it should be included in the irrigation numbers for use since it is not returned to the system.
> >
> > FOR IRRIGATION/BIOFILTER IRR USE (demand)
> > Total Irrigation season use (mg/yr or season) =
> > Ave Irrigation Daily use(mg/d) =
> > Max month demand (mg/mo) =
> > Max Day demand (mg/d) =
> > Max Hour (mgd) =
> > How many hours per day do you irrigate? (hours) =
> >
> > FOR NON-IRRIGATION/BIOFILTER IRR USE (ie remainder/ no demand since recycled at plant))
> > Total Irrigation season use (mg/yr or season) =
> > Ave Irrigation Daily use(mg/d) =
> > Max month demand (mg/mo) =
> > Max Day demand (mg/d) =
> > Max Hour (mgd) =
> > How many hours per day should I assume the use is spread (24?)=

Please let me know your opinion on this. If you have any questions,
please let me know. Thanks for the other information. Dana

Lydia Holmes wrote:

> Hi Dana-
> I'm going to try to respond to some of your questions since Andre has left.
>
> The easiest one first:
> D) Cost for tertiary system.
> Based on Info we prepared for SRF and Mike Ban reviewed.
> Construction costs:
> Tertiary PS -$310,000
> Filters/Flocc - $1,510,000
> Filter support - $1,780,000
> UV system - $2,480,000
> Recycled water storage res - $370,000
> Recycled water/3w pumping - $580,000
> Sitework - $985,449
> Yardpiping - $791,733
> Electrical - $1,664,090
> Mob/Demob - $205,219
>
> total = $10,676,492
>
> ~~Annual o&m estimated for 2007 = $382,000 and for 2012 = $443,000~~
>
> C) Quality of tertiary vs secondary
> The tertiary water will have the following characteristics - turbidity 2 ntu, total coliform 2.2 mpn, and TSS of about 5 mg/l. Secondary will be 30 mg/l TSS, coliform of 23 mpn, and ?? turbidity (not a requirement). The parameters that the vineyards are probably interested in are things like SAR - this is not likely to change significantly across the tertiary system.
>
> B) 3W demand
> First I'd like to say we think it would be simpler for you to not include the 3W system in your model - don't start at the RW pumpstation. Christine Eyestone has some thoughts on how to do this - she is familiar with the modeling system you are using. Feel free to call her. The 3W demand will be variable and not too predictable until the plant is operating. But what we have estimated is a continuous demand of bout 400 gpm or 0.576 mgd. On top of that continuous demand (for chlorine dilution and biofilters) is some in plant hose bib usage for washdown... We estimated a percentage of the hose bibs in use and determined a worst case peak of 1200 gpm. This would not last and hour - although we don't have an estimate of peak hour or max day. So again I say if you can avoid including the 3W in the model it may simplify it for you.
>
> I will work on getting you info for item A - water balance.
> Hope this helps you get started.
> Lydia
>
> Lydia Holmes
> Carollo Engineers
> Walnut Creek , CA
> (925) 932-1710

Subject: Re: Recycled Water for Petaluma
From: Dana Hunt <dhunt@gsda.com>
Date: Fri, 20 Jun 2003 13:32:14 -0700
To: Lydia Holmes <LHolmes@carollo.com>

Lydia,
I assume these costs are for the 4mgd tertiary plant. How much is it to expand to 8mgd or full tertiary (Construction Cost in todays $) Dana

Lydia Holmes wrote:

> Hi Dana-
> I'm going to try to respond to some of your questions since Andre has left.
> The easiest one first:
> D) Cost for tertiary system. Based on Info we prepared for SRF and Mike Ban reviewed.
> Construction costs:
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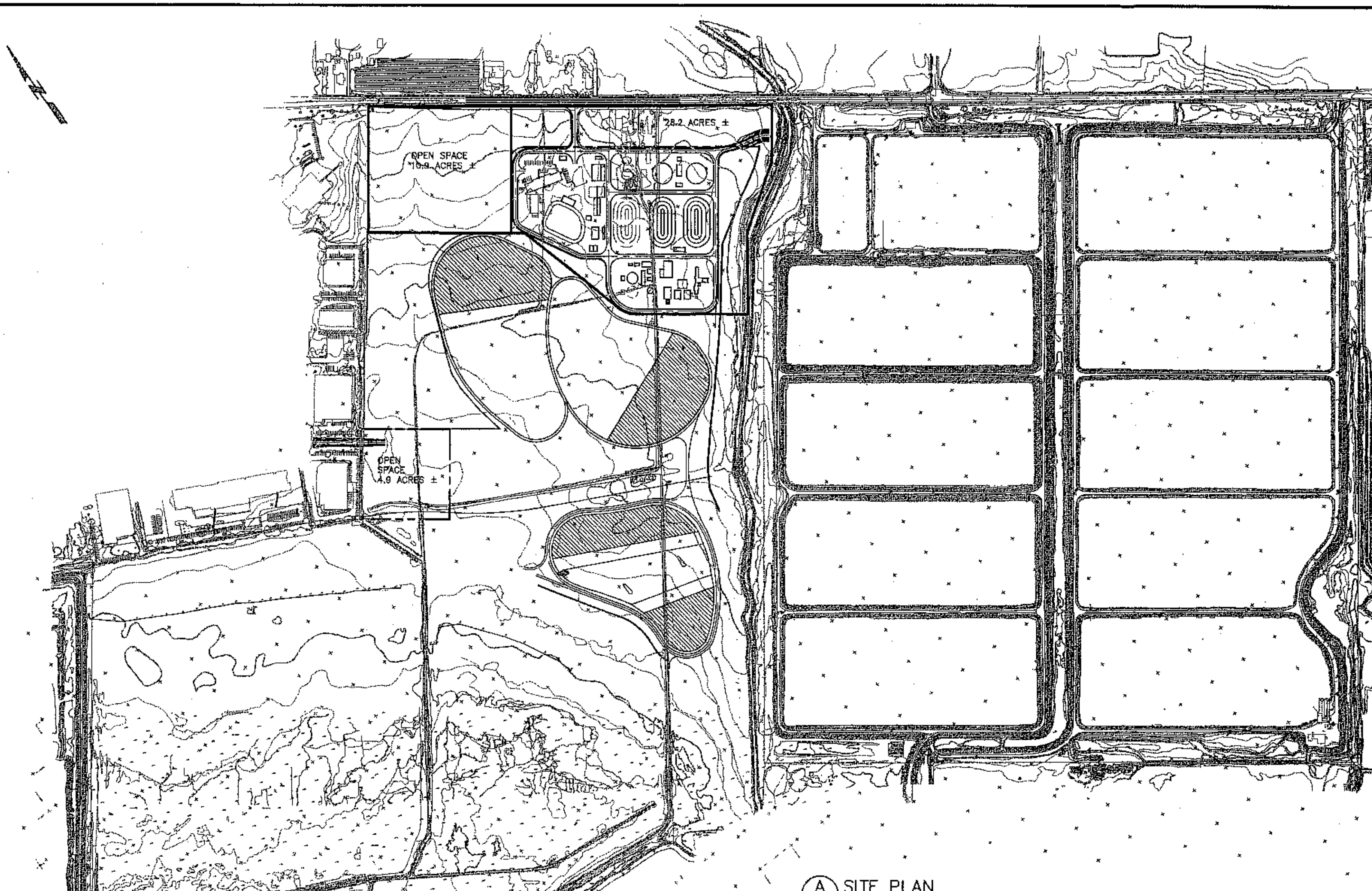
>
> I will work on getting you info for item A - water balance.
> Hope this helps you get started. Lydia
> Lydia Holmes
> Carollo Engineers
> Walnut Creek , CA
> (925) 932-1710



A SITE PLAN
SCALE: 1" = 250'
FILE: 00G035

REV	DATE	BY	90% SUBMITTAL NOT FOR CONSTRUCTION	DESIGNED CE / DRAWN DST / CHECKED / DATE	DISCIPLINE ENGINEER	PROJECT ENGINEER	PARTNER	carollo engineers	CITY OF PETALUMA — LAKEVILLE HIGHWAY WATER RECYCLING FACILITY — GENERAL — GENERAL SITE PLAN	VERIFY SCALES: BAR IS ONE INCH ON ORIGINAL DRAWING 0 — 1" — IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	JOB NO. 6059B.10 / DRAWING NO. G-7 / SHEET NO. OF -

| | | | DESCRIPTION | | | | | | | | |

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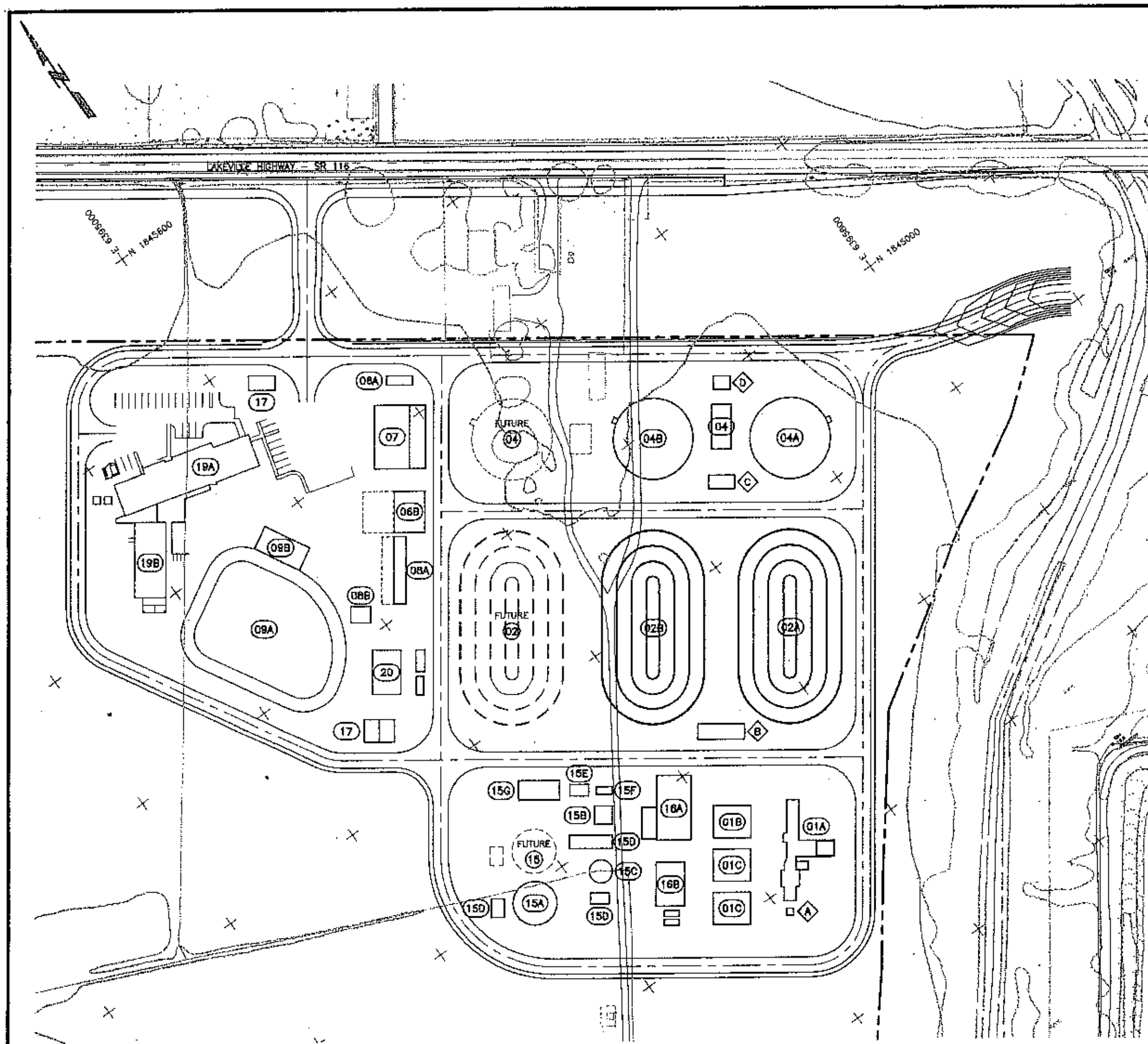

B PARTIAL SITE PLAN 1
SCALE: 1" = 60'
FILE: 00G030

PROCESS AREA	DESCRIPTION		ITEM	STRUCTURE
01	HEADWORKS FACILITY AND ODOR CONTROL	–	01A	HEADWORKS FACILITY
	" "		01B	BIOFILTER MECHANICAL PAD
	" "		01C	BIOFILTERS
02	OXIDATION DITCH	–	02A	OXIDATION DITCH NO.1
	"		02B	OXIDATION DITCH NO.2
03	NOT USED	–	03	NOT USED
04	SECONDARY CLARIFIERS	–	04A	SECONDARY CLARIFIER NO.1
	" "		04B	SECONDARY CLARIFIER NO.2
05	RAS/WAS PUMPING	–	05	RAS/WAS PUMP STATION
06	TERTIARY FILTERS AND PUMPING	–	06A	TERTIARY PUMP STATION
	" "		06B	TERTIARY FILTERS
07	FILTER SUPPORT BUILDING	–	07	FILTER SUPPORT BUILDING
08	UV DISINFECTION	–	08A	UV DISINFECTION
	"		08B	FILTER EFFLUENT METER VAULT
09	RECYCLED WATER STORAGE AND PUMPING	–	09A	RECYCLED WATER STORAGE BASINS
	" "		09B	RECYCLED WATER PUMP STATION
10	OXIDATION POND IMPROVEMENTS	–	10	NOT SHOWN
11	POND 9 FACILITIES	–	11	SEE DWG G-9
12	POND 10 FACILITIES	–	12	SEE DWG G-9
13	OUTFALL MODIFICATIONS	–	13	NOT SHOWN
14	POLISHING WETLANDS	–	14	SEE DWG G-10
15	2-PHASE ANAEROBIC DIGESTION	–	15A	METHANE-PHASE DIGESTERS
	" "		15B	ACID-PHASE DIGESTERS
	" "		15C	DIGESTED SLUDGE HOLDING TANK
	" "		15D	DIGESTER CONTROL AREA
	" "		15E	WASTE GAS FLARE
	" "		15F	GAS HANDLING AREA
	" "		15G	WATER HEATING SYSTEM AREA
16	SOLIDS HANDLING BUILDING AND ODOR CONTROL	–	16A	THICKENING BUILDING
	" "		16B	DEWATERING BUILDING
17	1W SYSTEMS	–	17	1W PUMP STATION
18	IN-PLANT AND STORMWATER PUMPING	–	18	IN-PLANT PUMP STATION
19	OPERATION AND MAINTENANCE FACILITIES	–	19A	OPERATIONS BUILDING
	" "		19B	MAINTENANCE BUILDING
20	ELECTRICAL BUILDING	–	20	ELECTRICAL BUILDING
21	PUBLIC FEATURES	–	21	PUBLIC FEATURES
22	FLOW DIVERSION	–	22	FLOW DIVERSION

DESIGNATION	YARD STRUCTURE
A	INFLUENT JUNCTION BOX
B	OXIDATION DITCH FLOW SPLITTER
C	SECONDARY CLARIFIER FLOW SPLITTER AND SCUM WELL
D	SECONDARY EFFLUENT JUNCTION BOX

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REV	DATE	BY	DESCRIPTION

DESIGNED CE
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DATE
DISCIPLINE ENGINEER
PROJECT ENGINEER
PARTNER

carollo engineers

PETALUMA 1858

CITY OF PETALUMA
LAKEVILLE HIGHWAY WATER RECYCLING FACILITY
GENERAL
PARTIAL SITE PLAN 1

VERIFY SCALES
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Last Saved By: Lloyd Dhung (RCE) 3-12-03 10:50am

carollo engineers

DATE:	April 21, 2003
SUBJECT:	Petaluma Recycled Water Systems
WO#:	6069B.10
COPIES TO:	Doug Wing

2700 YGNACIO VALLEY ROAD, SUITE 300
WALNUT CREEK, CALIFORNIA 94598
FAX: (925) 930-0208
PHONE: (925) 932-1710

TRANSMITTAL FORM

ADDRESS: G.S. Dodson & Associates
165 Lennon Lane, Suite 105
Walnut Creek, CA 94598

ATTENTION: Dana Hunt

THE FOLLOWING ITEMS ARE:

☐ REQUESTED ☐ REPORT ☐ COST ESTIMATE
☒ ENCLOSED ☐ TEST RESULT ☐ CHECK PRINT ☐ CALCULATIONS
☐ SENT SEPARATELY ☐ SPECIFICATION ☐ PROGRESS EST. ☐ OTHER

VIA:

NO. OF COPIES	DESCRIPTION
1	Drawing G-11, Liquid Process Flow Schematic
1	Drawing G-12, Chlorine Contact Basin / Wetlands Flow Schematic
1	Predesign Report Technical Memorandum 9A – Water Balance
1	Interoffice Memo, 4/2/03 – See Table 2, "Recycled Water Pump Station Design Criteria"
1	Plant Utility Water (3W) Design Demands
1	Recycled Water / 3W / FW Pump Station Control Description
1	Drawing 09N1 – 3W, Fire & Recycle Water Pump Station P&ID

THESE DATA ARE SUBMITTED:

☐ AT YOUR REQUEST ☐ FOR YOUR REVIEW ☐ FOR YOUR FILES
☐ FOR YOUR APPROVAL ☐ FOR YOUR ACTION ☒ FOR YOUR INFORMATION

GENERAL REMARKS: Dana,

Enclosed is some background on the treatment plant design as it currently stands. Key elements of the package include:

1) As you review drawing G-11, note that average and peak design process flows are identified there. Average and peak flows for the tertiary process are 2 and 4 mgd, respectively. It is anticipated that both average and peak flows for the tertiary system will be doubled in the next plant expansion to 4 and 8 mgd, respectively. Effluent from the tertiary process is discharged to a one mgal storage basin. The volume of this storage basin was reduced as a result of VE comments and learning that additional storage is planned for in the recycled water distribution system.

2) Secondary effluent which isn't treated in the tertiary process is sent to the plant pond and wetlands system. Effluent from the pond and wetlands system is disinfected and either discharged to the river or sent to Ag-reuse. Drawing G-12 outlines the pond and wetlands flow schematic. Since the plant is not allowed to discharge to the river during the dry weather period, effluent is stored in the ponds then. Management of effluent storage, discharge, and reuse is currently and will be a major element of the new plant operations. A water balance has been prepared which outlines this strategy and is enclosed as Technical Memorandum 9A from the Predesign Report.

3) As a result of the VE and other internal reviews, we have decided to combine the urban recycled water, fire water, and plant utility water (3W) systems. Supply water for all systems will be pumped from one pump station to either the urban recycled water distribution system, or a combined 3W and fire water distribution system. Of the one million gallons of available storage at the plant, approximately 200,000 gallons must be available at all times for fire water. Major design criteria for the pump station is provided in Table 2 of the interoffice memo, dated 4/2/03. It is assumed that with all three pumps on (2 duty + 1 standby), peak daily recycled water, peak daily 3W, and fire water demands can be satisfied. Also, the standby pump may need to be operated to handle peak hourly recycled water or 3W demands (assuming there is no fire water demand). Future pump station expansion would consist of adding 1 or 2 more pumps, depending on future demand.

4) Different plant utility water (3W) demands are also provided. Note the continuous demand of approximately 400 gpm is significantly less than the peak requirement of 1,200 gpm. The peak requirement will be used for sizing the pump station.

5) Control descriptions and a P&ID for the pump station has also been provided. The pump station will essentially be operated in two modes: a "Low Flow" and "High Flow" mode. It is anticipated that during the wet weather season, when urban recycle water demands are minimal (or nonexistent), the pump station will be operated primarily in low flow mode. In this mode, the hydropneumatic tank level will vary and pumps will cycle on and off based on level setpoints within the tank. When operated in high flow mode, pumps and compressors will be controlled based on a constant pressure and level setpoint within the tank so that it operates more as a surge tank.

Feel free to call me with questions or comments as you review this material. We would be particularly interested in any feedback you have on the pump station and storage basin sizing and operation.

Sincerely,

CAROLLO ENGINEERS, P.C.

By: Andre Gharagozian

Enclosures

Client:	Petaluma	**By:**	CLE
Project:	WRF	**Date:**	21-Apr-03
Job Number:	6069b.10	**Checked By:**	
Task Code:	T03	**Date:**	

3-W DESIGN DEMANDS

* 3W pump station shall be designed base on Peak Demand.

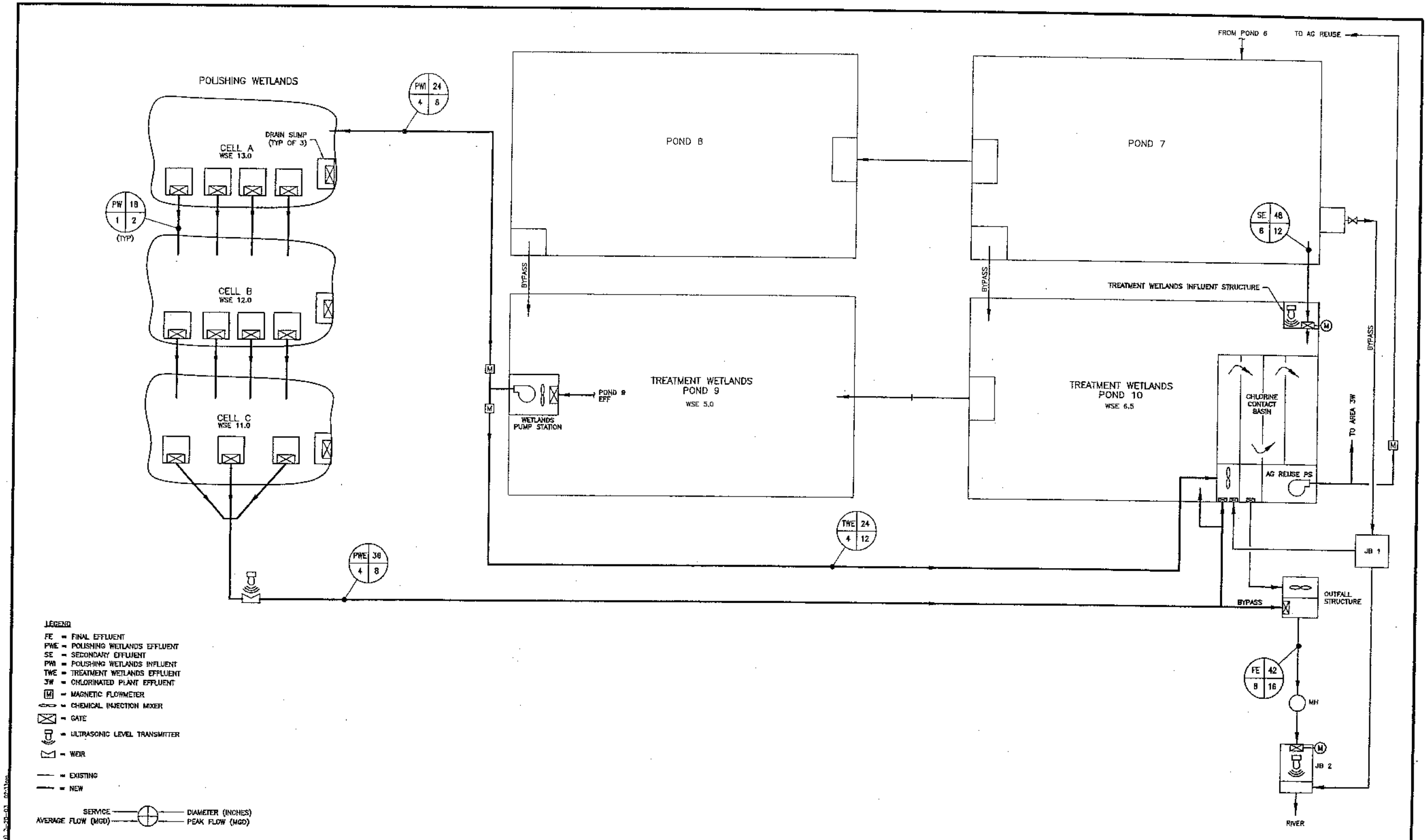
No.	Process Area	(Average) Continuous Demand (gpm)	(Peak) Peak Demand (gpm)	Total 3W Flow (gpm)
1	**Headworks**			
	Screenings Washer	0	19	19
	Channel Washdown (2)	0	10	20
	Grit Classifier	5	5	5
	Grit Fluidizer	0	90	250
	Grit Pump Room Washdown (1)	0	0	10
	Septage Washdown (1)	0	0	10
	Grit pump seal water	1	1	1
2	**Oxidation Ditches**			
	Oxidation Ditch washdown (6)	0	10	60
	Flow Split Scum Suppression	10	10	10
	Flow Split Washdown (1)	0	0	10
4	**Secondary Clarifiers**			
	Scum Suppression	30	30	90
	Washdown	0	0	320
5	**RAS/WAS/Scum Pumping**			
	RAS/WAS Pumps (West pump pad)	2	2	2
	West Pump Pad Washdown (1)	0	0	10
	Secondary Clarifier Flow Split Washdown (1)	0	0	10
6	**Tertiary Filters and Pumping**			
	Chlorine Feed System - Flushing	0	0	10
	Chlorine Feed System - Dilution	259	343	343
	Polymer Feed Pumps	1	1	1
	Alum Feed System - Flushing	0	0	10
	Foam Suppression	0	30	60
	Washdown (2)	0	0	20
7	**Filter Support Building**			
	Washdown (3)	0	10	30
8	**UV Disinfection**			
	Washdown (2)	0	0	20
15	**Anaerobic Digester**			
	Centrifuge Sludge Feed Pumps	1	1	1
	Digestor Pumps	3	3	3
	Washdown	0	0	40
	Hosebibs (2)	0	0	20
16	**Solids Handling Building/Odor Control**			
	Polymer Metering Pump - GBT	1	1	1
	Polymer Metering Pump - CEN	2	2	2

	Thickened Sludge Pumps	1	1	1
	Digester Pumps	1	1	1
	GBT	45	45	45
	Centrifuge	0	0	30
	Washdown (2)	0	10	20
	Biofilter	54	54	54
	Biofilter Washdown (3)	0	0	30
17	**In-Plant and Stormwater Pumping**			
	In-Plant Washdown (1)	0	10	10
	Stormwater Washdown (1)	0	0	10
18	**Maintenance and Operations Building**			
	Washdown (2)	0	0	20
	Miscellaneous Demands			
	Landscaping	0	500 ← NON-return	1000
	Stormwater washdown	0	0	500
	Total 3-W Demand	**416**	**1189**	**3109**

↑ ave daily use
416 gpm ⇒
0.599 MG/day

↑ max hour (return flow)
⇒ 1189 gpm - 500 gpm (irr above)
⇒ 689 gpm
↓
max day demand
= 689 gpm → ≅ 1 mgd max day

Non-use/
Returning Flow (3W)
demands.



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DESIGNED CLAE/EC
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DATE

DISCIPLINE ENGINEER
PROJECT ENGINEER
PARTNER

carollo engineers

PETALUMA 1858

CITY OF PETALUMA
LAKEVILLE HIGHWAY WATER RECYCLING FACILITY
GENERAL
PLANT FLOW SCHEMATIC
CHLORINE CONTACT BASIN/WETLANDS

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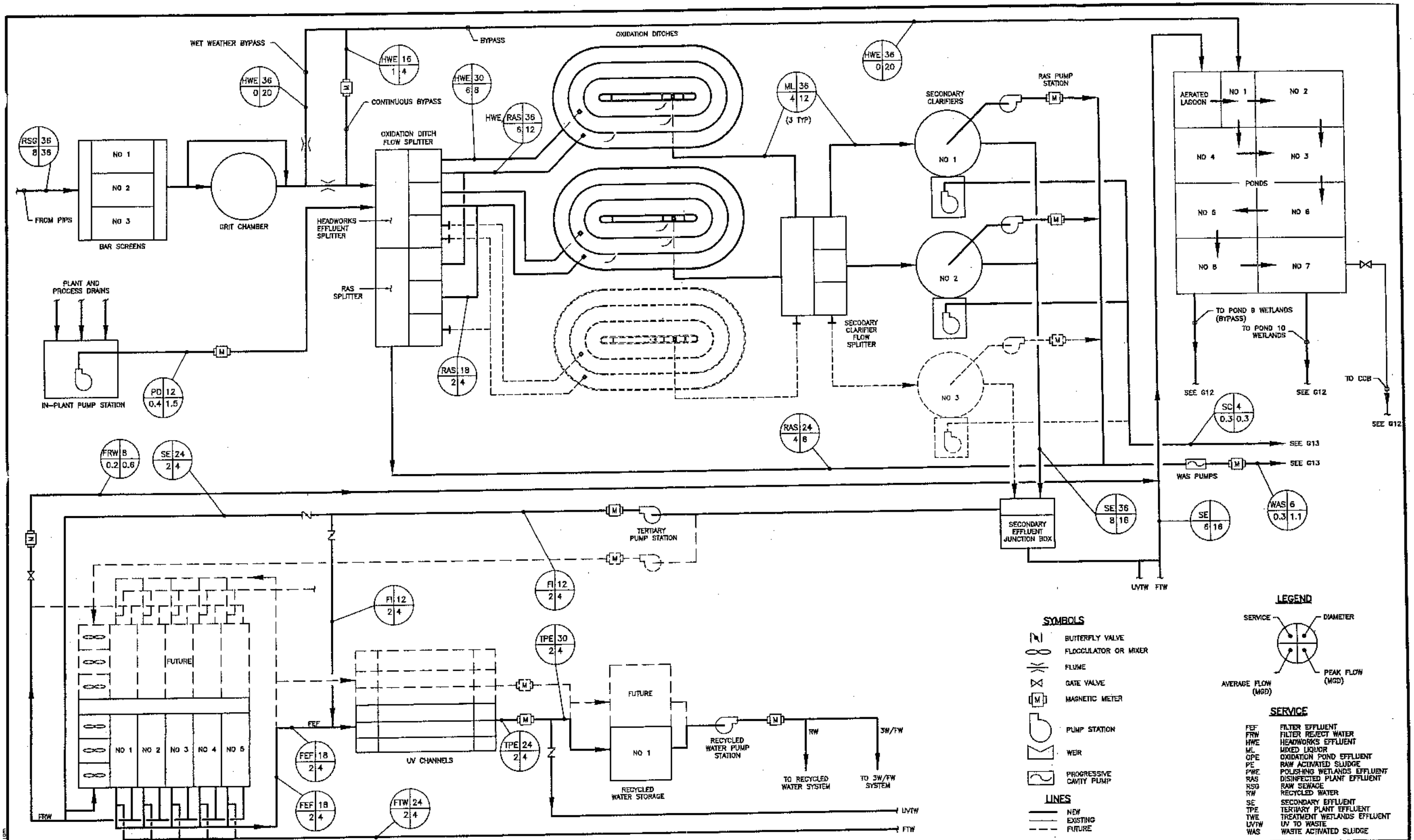

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CHECKED
DATE

DISCIPLINE ENGINEER
PROJECT ENGINEER
PARTNER

carollo engineers

CITY OF PETALUMA
LAKEVILLE HIGHWAY WATER RECYCLING FACILITY
GENERAL
PLANT FLOW SCHEMATIC
LIQUID PROCESS

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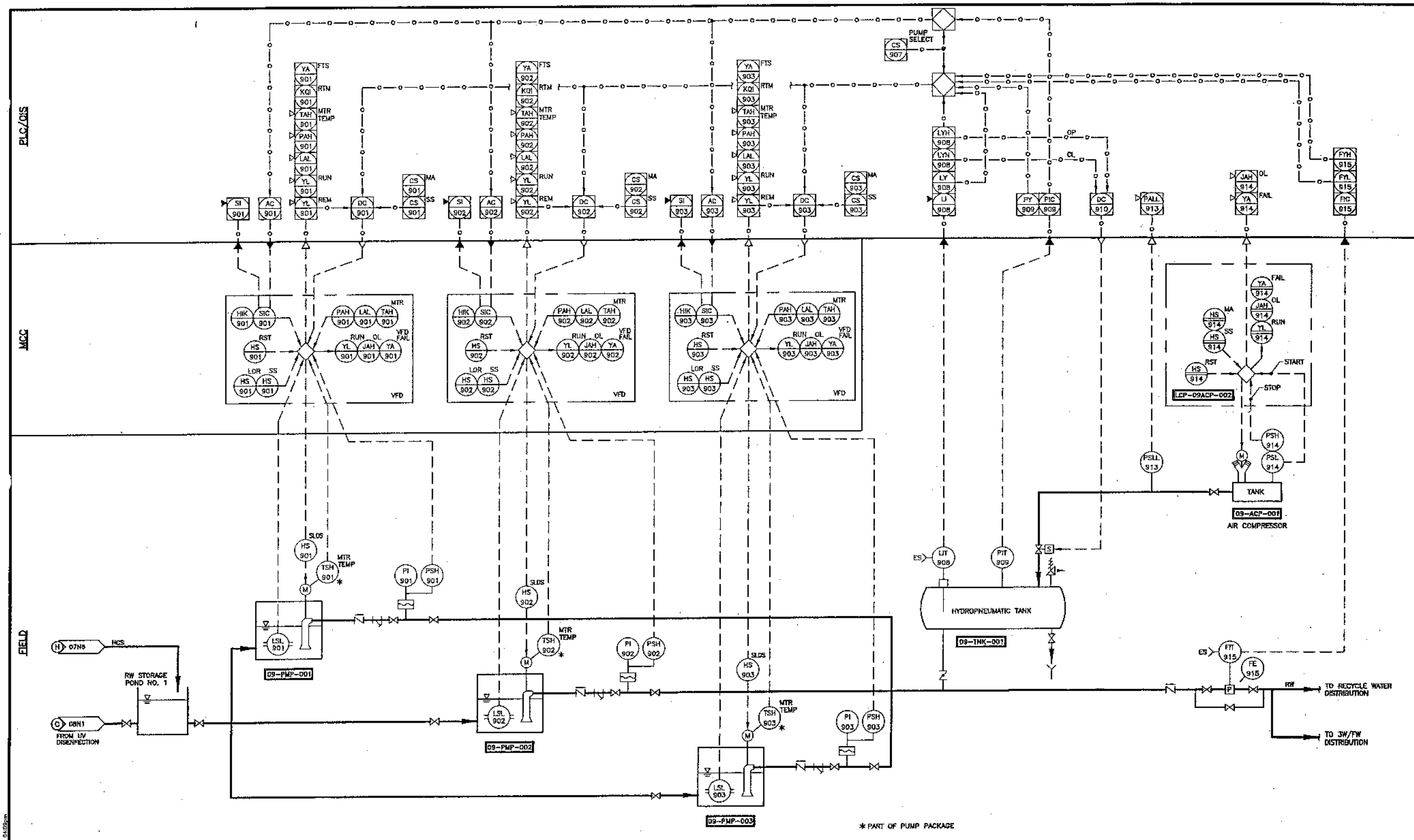

REV	DATE	BY	DESCRIPTION

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DESIGNED PCK
DRAWN CGR
CHECKED
DATE

DISCIPLINE ENGINEER

PROJECT ENGINEER

PARTNER

carollo engineers

PETALUMA 1858

CITY OF PETALUMA
LAKEVILLE HIGHWAY WATER RECYCLING FACILITY
INSTRUMENTATION
P&ID
3W, FIRE & RECYCLE WATER PUMP STATION

VERIFY SCALES
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JOB NO. 6059B.10
DRAWING NO. 09N1
SHEET NO.
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APPENDIX E

EXISTING SECONDARY WATER USER/FACILITY INFORMATION

APPENDIX E

EXISTING SECONDARY WATER USER/FACILITY INFORMATION

Water meter records from 2001 and 2002 were provided by the City for existing secondary recycled water users. This data was used to determine demands to be used in the master plan. These records provided data for total irrigation season use (MG/year) and maximum monthly demand (MG/month). This data was then used to estimate demands for potential agricultural customers. The amount of irrigated acreage for each existing secondary system user was also provided, since actual acreage and the amount of irrigated acreage do not coincide. The data provided is attached for reference.

Included in this appendix is a sample agricultural recycled water use agreement. All existing agricultural customers are currently paid $210 for every acre-ft. of recycled water used.

The existing secondary recycled water system has three pump stations. All water is pumped from the existing wastewater pond system by the Main Pump Station and then repumped by Booster Pump Station No. 1. Booster Pump Station No. 1 serves several customers as well as Booster Pump Station No. 2. Booster Pump Station No. 2 repumps recycled water to customers at higher elevations. Pump data and pump curves, as well as 24 hour flow charts for 4/23/2002, 8/03/2002, and 9/08/2002 are attached for each pump station.

The flow chart information was used to develop the 24 hour agricultural use profile as outline in Section III.

Existing drawings were used for model input to model the existing system. Documents used include:

- Areas Irrigated with Recycled Water Map, City of Petaluma, Water Resource and Conservation Department (June 2003/October 2002).
- Assessor's Parcel Maps, Sonoma County, CA.
- Topographical maps, GIS Department, County of Sonoma.
- Water Pollution Control Facilities, Yoder-Trotter-Orlob & Associates (1972).
- Wastewater Treatment Plant Upgrade, Metcalf & Eddy Inc/Engineers (1981).
- Effluent Irrigation System, Metcalf & Eddy Inc/Engineers (1981).
- 8" Effluent Irrigation Forcemain Extension, Public Works Department, City of Petaluma (1989).
- Effluent Irrigation main For Adobe Creek Golf Club, Golden Empire Golf (1989).

- Effluent Irrigation main Extension Project, Department of Engineering, City of Petaluma (1994).

- Phase 1 Recycled Water Pipeline Project, G. S. Dodson & Associates (2003).

EXISTING SECONDARY USER DATA

2001/2002 METER READING DATA FOR EXISTING SECONDARY RECYCLED WATER USERS

YEAR	2001								2001			2002							2002			MG/YR	2001/2002 MG/MONTH	AF/Y	
										Max	total									Max	total	Average	Ave Max	average	
Hydrants	March	April	May	June	July	August	Septembe	October	Total	Month	afy	April	May	June	July	August	Septembe	October	Total	Month	afy	Total	Month	Total	
1			6.29	7.35	8.36	7.91	4.20	2.58	36.69	8.36	112.58	0.76	2.18	13.97	11.80	7.75	3.52	1.02	41.00	13.97	125.81	**38.841**	**11.163**	119.20	1
2			2.63	4.01	1.92	2.44	1.66	0.85	13.52	4.01	41.50	0.35	2.20	8.24	5.63	5.63	3.00	0.30	25.34	8.24	77.78	**19.434**	**6.126**	59.64	2
3			6.47	6.36	6.97	4.29	4.57	1.64	30.28	6.97	92.92	0.48	2.61	7.54	6.08	4.25	4.48	0.72	26.17	7.54	80.32	**28.225**	**7.256**	86.62	3
4			8.21	10.65	10.45	8.98	4.87	4.47	47.63	10.65	146.16	1.25	3.95	9.03	10.76	9.71	5.07	1.23	41.00	10.76	125.82	**44.313**	**10.703**	135.99	4
5			5.44	4.75	3.69	3.04	3.16	1.07	21.15	5.44	64.90	0.32	2.41	5.11	4.94	5.42	2.76	1.85	22.79	5.42	69.95	**21.970**	**5.426**	67.42	5
6			0.00	1.53	1.40	1.25	1.21	0.73	6.12	1.53	18.77	0.00	0.00	1.63	1.66	1.35	0.71	0.29	5.63	1.66	17.26	**5.870**	**1.591**	18.01	6
7			0.75	1.29	1.20	0.30	0.00	0.00	3.54	1.29	10.86	0.00	1.60	0.26	0.00	0.00	0.00	0.00	1.86	1.60	5.71	**2.699**	**1.441**	8.28	7
8			6.84	6.32	7.17	6.24	4.23	3.23	34.03	7.17	104.42	1.22	4.12	8.08	7.94	3.27	6.27	1.20	32.10	8.08	98.50	**33.062**	**7.622**	101.46	8
9			13.59	10.30	9.13	8.63	8.48	3.60	53.73	13.59	164.89	1.00	6.36	11.68	13.48	11.30	6.45	0.27	50.54	13.48	155.10	**52.136**	**13.537**	160.00	9
10			12.30	14.54	11.85	10.65	9.71	7.79	66.84	14.54	205.12	1.02	6.69	15.15	16.59	13.87	11.31	1.68	66.31	16.59	203.50	**66.576**	**15.564**	204.31	10
11			6.00	6.46	5.09	3.98	4.08	1.78	27.39	6.46	84.05	0.00	2.13	6.42	6.29	5.56	3.98	0.94	25.33	6.42	77.72	**26.357**	**6.439**	80.89	11
12 (M12+T12)																					0.00			0.00	12 (M12+T12)
M12			7.19	12.17	7.37	1.55	1.43	0.66	30.36	12.17	93.17	0.00	0.00	11.44	6.68	5.92	2.67	0.00	26.71	11.44	81.96	**28.534**	**11.805**	87.57	M12
T12			15.71	14.96	7.89	8.37	9.07	3.27	59.26	15.71	181.86	0.00	3.58	6.13	13.29	15.16	10.97	0.00	49.14	15.16	150.81	**54.202**	**15.438**	166.34	T12
13			8.42	8.32	8.03	5.78	4.42	4.94	39.90	8.42	122.45	2.61	3.27	9.27	8.62	7.00	8.11	0.83	39.70	9.27	121.84	**39.801**	**8.847**	122.14	13
14			12.89	10.90	12.70	12.46	12.67	7.01	68.61	12.89	210.56	0.00	7.67	18.63	16.62	13.79	8.71	1.54	66.96	18.63	205.48	**67.783**	**15.760**	208.02	14
15			6.74	8.46	6.98	6.12	4.97	3.87	37.13	8.46	113.94	0.04	0.00	7.00	8.69	7.03	5.30	4.17	32.24	8.69	98.93	**34.683**	**8.572**	106.44	15
16	3.94	8.17	16.07	18.20	17.99	15.74	9.45	10.01	95.62	18.20	293.45	7.69	6.86	15.86	14.35	16.78	15.35	6.27	83.16	16.78	255.21	**89.391**	**17.487**	274.33	16
17			26.97	22.33	21.79	17.69	15.72	6.26	110.76	26.97	339.91	2.42	10.57	27.97	25.00	27.01	19.06	0.52	112.54	27.97	345.37	**111.651**	**27.466**	342.64	17
18*			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	3.89	3.35	7.24	3.89	22.22	3.621	1.944	11.11	18
Total			162.49	168.87	149.97	125.42	103.89	63.74	782.55				66.19	183.42	178.40	160.79	121.61	26.18	755.74			**769.145**			

* Insufficient data provided

	2001	2002
A1+A2+A3+A4=	393.17	409.722
M12+A13+A14=	426.18	409.28
A8+A9=	269.32	253.60
A5+A11=	148.95	147.67
A6+A7+A10=	234.75	226.47
A17+T12=	521.78	496.18

Ag users factor for potential ag users
0.949

Maximum Demand as percentage of Total use of Ag users

28.74%
31.52% Average = 28.50%
25.71%
24.15%
24.70%
27.10%
53.39%
23.05%
25.96%
23.38%
24.43%
41.37%
28.48%

Table 1
Historic Usage of Reclaimed Water - Agricultural Irrigation Program

	Matteri			Silacci			Cardinaux			Tunzi			Bettinelli			Pinhiero/Tlexiera			Mendoza			Total	Total	Average
	Area	Usage	Rate	Area	Usage	Rate	Area	Usage	Rate	Area	Usage	Rate	Area	Usage	Rate	Area	Usage	Rate	Area	Usage	Rate	Acreage	Usage	Rate
Year	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)	(Acres)	(Ac. Ft.)	(AF/A)
1984																								
1985																								
1986		66			141			93			134			96			59			214			803	
1987*		121			162			120			209			110			175			120			1017	
1988		81			197			111			230			138			213			236			1206	
1989	31	88	2.84	129	180	1.40	46	139	3.03	144	298	2.07	79	121	1.53	130	254	1.95	119	237	1.99	678	1317	1.94
1990	26	81	3.11	129	301	2.33	46	145	3.16	144	339	2.35	79	254	3.21	130	302	2.32	119	283	2.37	673	1704	2.53
1991	30	69	2.29	151	325	2.15	46	127	2.76	144	319	2.22	79	192	2.43	150	351	2.34	119	299	2.52	719	1682	2.34
1992	37	85	2.29	111	324	2.92	46	155	3.38	144	361	2.51	79	218	2.76	130	366	2.82	119	304	2.56	666	1814	2.72
1993	37	86	2.32	141	341	2.41	46	152	3.31	144	336	2.33	83	206	2.48	130	372	2.86	119	287	2.41	700	1780	2.54
1994	37	113	3.06	129	402	3.11	46	156	3.39	144	320	2.22	83	218	2.63	150	318	2.12	119	291	2.45	708	1818	2.57
1995	37	88	2.39	141	372	2.64	46	119	2.59	144	355	2.46	83	212	2.55	206	440	2.14	146	310	2.12	803	1896	2.36
1996	37	101	2.73	166	415	2.50	46	152	3.31	144	389	2.70	83	218	2.62	206	532	2.58	146	350	2.40	828	2157	2.61
1997	37	120	3.24	148	423.1	2.86	46	170	3.70	142	460	3.24	83	250	3.01	206	575	2.79	146	400	2.74	808	2398	2.97
1998	37	72	1.95		251		46	100	2.17		145		83	150	1.81	206	382	1.85	146	256	1.75	518	1356	2.62
1999	37	106	2.86		377		46	138	3.00	144	356	2.47	83	199	2.40	206	516	2.50	146	350	2.40	662	2042	3.08
2000	37	92	2.49		311		46	123	2.67	144	343	2.38	83	186	2.24	206	500	2.43	146	362	2.48	662	1917	2.90

* Data by Ag User/not by Hydrant. Actual water meter readings for 2001 & 2002 were used. Acres from this table were used & prorated by flow to assign to hydrant. Acres provided on map were total acres, not irrigated acres.

HISTORICAL RECYCLED WATER USE
City of Petaluma, California
1998 - 2002

Rancher	Year	May Usage (acre feet)	June Usage (acre-feet)	July Usage (acre-feet)	August Usage (acre-feet)	September Usage (acre-feet)	October Usage (acre-feet)	Total Usage (acre-feet)	Max Entitlement (acre-feet)	Difference (acre-feet)
	1998	0	26	69	79	54	21	251	400	149
	1999	64	73	85	75	54	26	377	400	23
	2000	37	62	82	68	31	31	311	400	89
	2001	72	81	85	72	48	30	387	400	13
	2002	38	108	118	85	51	30	430	400	-30
Silacci	Average (1)	53	81	92	75	46	29	376	400	24
	1998	0	22	43	78	78	35	256	350	94
	1999	48	65	83	70	58	25	350	350	0
	2000	59	61	73	82	67	21	362	350	-12
	2001	87	90	58	62	52	21	370	350	-20
	2002	44	88	98	83	51	21	385	350	-35
Mendoza	Average (1)	60	76	78	74	57	22	367	350	-17
	1998	0	9	47	40	41	14	151	240	89
	1999	25	38	50	44	42	21	220	240	20
	2000	21	41	42	48	35	0	186	240	54
	2001	44	41	39	36	33	16	209	240	31
	2002	30	44	58	35	20	16	203	240	37
Bettinelli	Average (1)	30	41	47	41	33	13	205	240	35
	1998	0	12	25	34	21	7	100	150	50
	1999	19	21	30	30	23	15	138	150	12
	2000	19	21	30	31	22	0	123	150	27
	2001	35	21	30	21	24	0	130	150	20
	2002	14	35	35	34	21	8	147	150	3
Cardinaux	Average (1)	22	24	31	29	23	6	134	150	16
	1998	0	0	39	30	62	51	181	400	219
	1999	40	65	78	62	63	48	356	400	44
	2000	23	67	70	65	70	48	343	400	57
	2001	50	63	66	46	41	31	298	400	102
	2002	36	57	73	64	57	9	297	400	103
Tunzi	Average (1)	37	63	72	59	58	34	324	400	76
	1998	0	36	89	120	100	37	382	515	133
	1999	88	108	127	106	73	14	517	515	-2
	2000	89	111	127	108	65	0	500	515	15
	2001	136	105	104	76	97	0	519	515	-4
	2002	131	121	130	94	97	0	574	515	-59
Teixeira	Average (1)	111	111	122	96	83	4	528	515	-13
	1998	0	5	20	22	17	9	72	100	28
	1999	11	23	23	21	19	10	106	100	-6
	2000	4	29	18	24	17	0	92	100	8
	2001	21	26	22	19	15	0	102	100	-2
	2002	0	21	27	21	17	13	99	100	1
Matteri	Average (1)	9	25	23	21	17	6	100	100	0
	1998	16	36	61	66	49	23	251	0	-251
	1999	49	65	75	59	46	26	320	0	-320
	2000	33	42	62	52	42	13	244	0	-244
	2001	49	78	65	42	26	23	283	0	-283
	2002	22	30	47	47	50	20	216	0	-216
ACGC	Average (1)	34	50	62	53	43	21	263	0	-263

Notes: 1) Averages do not include 1998, which was an extremely wet year.
ACGC generally begins using water in April.

* Data by Ag User/not by Hydrant. Actual water meter readings for 2001/2002 were used.

Owner	Total Acres
Adobe Creek	104 ac
Benttinelli	132 ac
Cardinaux	120 ac
City	37 ac
Karren	50 ac
Matteri	43 ac
Mendoza	130 ac
Pinhiero	258 ac
Silacci	211 ac
Tunzi	138 ac

Hydrant	Total Acres
1	64ac
2	30ac
3	31ac
4	64ac
5	29ac
6	15ac
7	41ac
8	53ac
9	71ac
10	74ac

Hydrant	Total Acres
11	32ac
12	132ac
13	114ac
14	89ac
15	39ac
16	100ac
17	165ac
18	44ac

Potential Users	Total Acres
Bachman	100ac
Buck	650ac
Herrerias	70ac
Jacobson	500ac
Luthra	20ac
Painter	300ac
Sangiacomo	200ac
Schmidt	25ac

* Total Acres, not irrigated acres.
From City Provided map

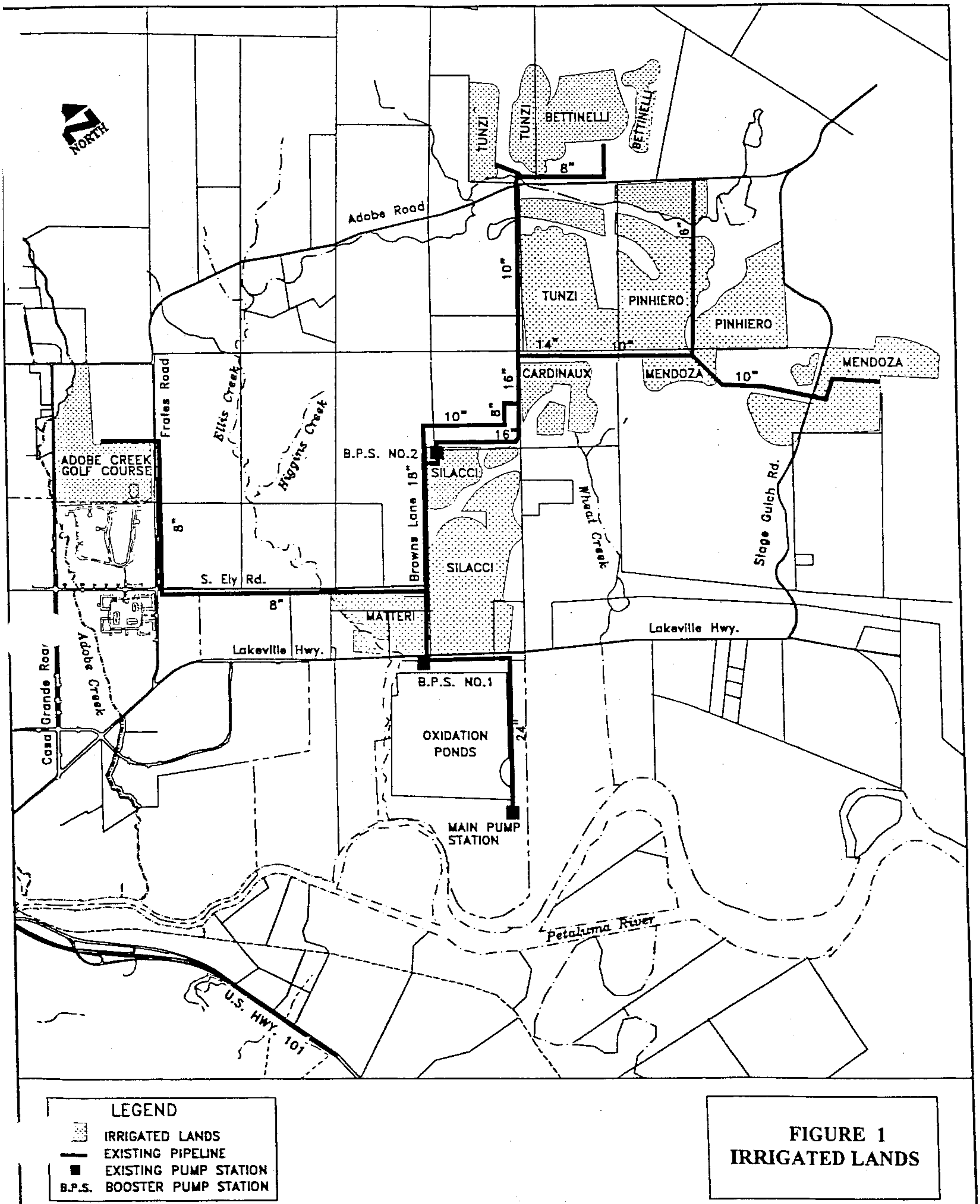


FIGURE 1
IRRIGATED LANDS

CITY OF PETALUMA

POST OFFICE BOX 61
PETALUMA, CA 94953-0061

April 18, 2003

Dana Hunt
G.S. Dodson & Associates
165 Lennon Lane, Suite 105
Walnut Creek, CA 94598

RE: Recycled Water Master Plan – Document Request

Dear Dana,

Enclosed per your request, please find the following documents:

- Recycled water use summary table showing use of recycled water by Adobe Creek Golf Course and agricultural customers from 1998 – 2002
- Sample agricultural recycled water use agreement. Please note the rate of $210 per acre-foot is the same for all customers. All agricultural recycled water use agreements expire in March 2004.
- Aerial photo showing recycled water system and lands irrigated with recycled water.

Rooster Run and Adobe Creek Golf Courses are charged $74/acre-foot of water used. This rate was established as part of the Adobe Creek Golf Course agreement and is not the standard for all recycled water customers.

Please call me if you have any questions.

Sincerely,

Michael J. Ban, P.E.
Interim Director Water Resources & Conservation

Enclosure

xc: File 6106 - 401.2
Margaret Orr

Water Resources & Conservation
11 English Street
Petaluma, CA 94952

Phone (707) 778-4487
Fax (707) 776-3635

E-Mail mban@ci.petaluma.ca.us

AGREEMENT FOR USE OF RECYCLED WATER

THIS AGREEMENT is made this ______ day of ________________, 20____, between the City of Petaluma, a California municipal corporation, hereinafter called "City," and Mr. Ralph Bettinelli, 4695 Old Adobe Road, Petaluma, CA 94954 (User) hereinafter referred to as User.

WITNESSETH

WHEREAS, the City owns and operates a wastewater treatment facility that generates Secondary 23 Recycled Water; and

WHEREAS, User owns, operates and maintains certain land that User desires to irrigate with Recycled Water provided by the City;

NOW, THEREFORE, in consideration of the mutual agreements herein contained and subject to the terms and conditions stated herein, the parties hereto agree as follows:

I. AGREEMENT

User agrees to use Recycled Water provided by the City in accordance with "Specifications For Use of Recycled Water" (Specifications) attached as Exhibit A, which is hereby incorporated by reference as though fully set forth and made part of this Agreement.

II. TERM AND DURATION OF AGREEMENT

Use of Recycled Water under this Agreement shall commence on May 1, 2002, and expire on March 1, 2004, unless this Agreement is terminated sooner in accordance with procedures set forth herein.

III. COMPENSATION

(A) Payment. As compensation for use of Recycled Water described herein, City shall pay User the rate of $210 per acre-foot of Recycled Water used. Payment shall be based on Hydrant meter readings. The conversion from million gallons to acre-feet shall be: 1 million gallons = 3.07 acre-feet. No payment shall be made for Recycled Water used in excess of the maximum entitlement for each Irrigation Season unless said use beyond the maximum entitlement is made at the specific request of the City.

(B) Invoice. User shall invoice City on a monthly basis at the end of the month for which Recycled Water is used. Invoice shall be sent to the designated project contact person. City shall endeavor to make payment of said invoice within thirty (30) days of receipt. Invoice shall include the following information:

(1) Address. Address of property irrigated.

(2) Acreage. Amount of land irrigated with Recycled Water during the month.

(3) Amount. Amount of Recycled Water used during the month, including totalizer hydrant meter readings at the start and at the end of the month.

IV. ENTITLEMENTS AND IRRIGATION RATE

(A) Minimum Entitlement. Minimum entitlement shall be 125 acre-feet for each Irrigation Season.

(B) Maximum Entitlement. Maximum entitlement shall be 240 acre-feet.

(C) Maximum Irrigation Rate. Maximum irrigation rate shall be 575 gallons per minute.

V. AMENDMENTS

This document expresses the entire Agreement between City and User and supersedes any previous or contemporaneous communications, representations or agreements.

This Agreement may be modified only by written amendment signed by both parties and failure on the part of either party to enforce any provision of the Agreement shall not be construed as a waiver of the rights to compel enforcement of such provision or provisions.

VI. ASSIGNMENT

Neither City nor User shall assign, subcontract or transfer their interests in this Agreement without the written consent of the other.

VII. EXHIBITS

The following Exhibits are included with the Agreement:

Exhibit A City of Petaluma Specifications For Use of Recycled Water

Exhibit B Order No. 88-036 of the California Regional Water Quality Control Board, San Francisco Bay Region

VIII. NOTICES

All notices required or permitted by this agreement, including notice of change of address, shall be in writing and give by personal delivery or sent by United States Mail, postage prepaid and addressed to the parties intended to be notified. Notice shall be deemed given as of the date of delivery in person or as of the date deposited in any post office or any post office box regularly maintained by the United States Government. Notice shall be given as follows:

User:

Mr. Ralph Bettinelli
4695 Old Adobe Road
Petaluma, CA 94954

City:

City of Petaluma
Attention: Michael Ban
P.O. Box 61
Petaluma, CA 94953

IN WITNESS WHEREOF, the parties hereto have executed this document the day, month and year first above written.

CITY OF PETALUMA	USER
______________________________ City Manager	By______________________________
ATTEST:	______________________________ Print Name
______________________________ City Clerk	______________________________ Address
APPROVED AS TO FORM:	
______________________________ City Attorney	______________________________ City State Zip
COMPLETED AND APPROVED:	______________________________ Taxpayer I.D. Number
______________________________ Director of Water Resources & Conservation	
APPROVED:	
______________________________ Risk Manager	
APPROVED:	
______________________________ Finance Director	

EXHIBIT A

CITY OF PETALUMA
SPECIFICATIONS FOR USE OF
RECYCLED WATER

SECTION 1.0 INTENT. It is the intent of these Specifications to describe, to the extent practicable, the performance standards for use of Recycled Water provided by the City of Petaluma.

SECTION 2.0 DEFINITIONS.

Agreement means the Agreement between the User and the City to use Recycled Water.

Board means the California Regional Water Quality Control Board, San Francisco Bay Region.

Check Dams means dams located on User's property and designed to prevent Recycled Water runoff from leaving User's property during the Irrigation Season.

City means City of Petaluma, a municipal corporation established pursuant to the laws of the State of California.

Engineer means the City of Petaluma's Director of Engineering.

Hydrant means control valve and metering station located on User's property.

Irrigation Season means the time of year during which Recycled Water is provided to the User by the City.

Land means property designated by User to be irrigated with Recycled Water in accordance with these Specifications.

Permit means all of the following (a) the National Pollutant Discharge Elimination System (NPDES) permit, or successor permit, establishing requirements for the discharge of treated wastewater into the Petaluma River, (b) the Water Reclamation Permit, or successor permit, establishing requirements for reuse of Recycled Water, as may be issued, modified or reissued by the California Regional Water Quality Control Board or successor governmental entity.

Recycled Water means water which, as a result of treatment of wastewater influent to Petaluma's wastewater treatment facility in accordance with the Permit, is suitable for a direct beneficial use that would not otherwise occur.

User means the person or persons using Recycled Water provided by the City.

SECTION 3.0 AGREEMENT. User acknowledges that the City, in meeting its Permit requirements, will rely on the performance by the User of the User's obligations hereunder.

SECTION 3.1 GENERAL. (A) Relationship. The relationship of the User to City shall at all times be that of an independent service provider.

(B) Ownership. Equipment, supplies, documents and parts, furnished by the City and operated and maintained by the User pursuant to these Specifications, shall be the sole property of the City. User shall maintain an inventory of such equipment.

SECTION 3.2 DELIVERY OF RECYCLED WATER. (A) Delivery To Hydrant. City shall deliver Recycled Water to Hydrant located on User's property. From Hydrant recycled water shall enter User's irrigation system for subsequent irrigation use by User.

(B) Delivery Period. User acknowledges the Permit prohibits the discharge of treated wastewater into the Petaluma River from May 1 to October 20 except for emergency situations. Therefore, the normal Recycled Water delivery and irrigation period will be from approximately May 1 to October 20. User agrees, when requested by City, to accept and apply Recycled Water prior to May 1 and/or after October 20, provided such use is consistent with these Specifications.

SECTION 3.3 LIMITATIONS PRECLUDING DELIVERY OF RECYCLED WATER. User recognizes that delivery of Recycled Water may at times be precluded for reasons beyond the control of the City. City shall deliver Recycled Water as set forth in these Specifications unless such delivery is prevented by causes outside the control of the City, including, but not limited to, insufficient Recycled Water in storage, malfunction of City's treatment and/or distribution system, Force Majeure, failure of Recycled Water to meet Permit requirements, power disruption, or order of a governmental regulatory authority.

SECTION 3.4 QUALITY OF RECYCLED WATER. The quality of the Recycled Water shall be in accordance with the Permit.

SECTION 3.5 RECEIPT AND USE OF RECYCLED WATER. (A) General. User agrees to take, accept and use Recycled Water for irrigation of User's Land.

(B) Irrigated Land. User agrees to use Recycled Water for irrigation of certain acres of Land. It is understood that the Land to be irrigated may change yearly depending on the User's ranching operations and management.

(C) Check Dams. User shall maintain any and all Check Dams located on User's property free and clear of silt, sediment, vegetation and any other material that may inhibit function of Check Dam. During the Irrigation Season, User shall maintain lowest possible level in Check Dam. User shall apply ponded water from Check Dam to Land in accordance with these Specifications. At the end of the Irrigation Season, User shall empty Check Dam to lowest possible level. User shall prevent runoff from leaving Check Dams during the Irrigation Season.

(D) Berms. User shall construct and maintain berms as necessary to prevent runoff of Recycled Water. Berms shall be maintained free of gaps, breaks, holes and other conditions which may compromise the function of the berms.

(E) Vector Control. User shall apply Recycled Water in such a manner that does not cause vector problems. Costs for any vector control related activities conducted by the Marin/Sonoma Mosquito Abatement District on the User's property shall be deducted by City from User's payment.

(F) Erosion Control. User shall apply Recycled Water in a manner that does not contribute to erosion of User's property.

(G) Runoff. User shall apply Recycled Water in a manner that does not cause runoff on User's property. User shall prevent Recycled Water from leaving User's property.

(H) Communication. User shall provide City with telephone and/or pager number for 24-hour communication with the User or User's designee.

(I) In-Ranch Access Roads. User shall maintain existing in-ranch access roads used by City, acting through its duly authorized employees, agents and representatives, pursuant to activities conducted in support of the Agreement. Maintenance may include grading and debris removal.

SECTION 3.6 SCHEDULE AND COORDINATION WITH OTHER USERS. (A) Shortage. User acknowledges that City is obligated to deliver Recycled Water to other users. User also acknowledges that City's distribution system is not an "on-demand" system and that distribution and use of Recycled Water must be coordinated among the Users. In the event of Recycled Water shortage, City shall endeavor to equitably distribute Recycled Water between all Users as determined by City.

(B) Parameters. City shall develop parameters for delivery of Recycled Water. User shall take Recycled Water in accordance with the parameters. User acknowledges that to use Recycled Water outside the parameters may impact the ability of other users to take and use Recycled Water. User acknowledges that parameters for use of Recycled Water may be revised during the term of the Agreement if additional Users are brought onto the system.

(1) Minimum Entitlement. City agrees to make available to User a minimum entitlement of Recycled Water each Irrigation Season as indicated in the Agreement.

(2) Maximum Entitlement. Maximum entitlement for use of Recycled Water for each Irrigation Season shall be as indicated in the Agreement. If desired by the User, City shall endeavor to provide User with maximum entitlement, however City is not obligated to provide maximum entitlement. Provision of Recycled Water in excess of the maximum entitlement shall be at the discretion of the City.

(3) Maximum Irrigation Rate. User agrees to irrigate at or below the maximum irrigation rate as indicated in the Agreement.

SECTION 3.7 TRAINING. During the first year of the Agreement, User or User's designee shall participate in up to two (2) hours of training related to use of Recycled Water. Training will focus on operation of hydrants.

SECTION 3.8 REGULATORY REQUIREMENTS. (A) General. User shall at all times use Recycled Water in compliance with applicable requirements of regulatory agencies having jurisdiction over activities covered by these Specifications, including, but not limited to, requirements described herein.

(B) Regional Water Quality Control Board. User shall use Recycled Water in accordance with Section B Reclaimed Water Use Restrictions and Section C1 of Board Order No. 88-036 or successor Permit.

(C) State Health Department. User shall use Recycled Water in accordance with applicable requirements of Title 22 of the California Administrative Code.

SECTION 3.9 PERMISSION TO ENTER. User hereby grants City, acting through its duly authorized employees, agents, representatives, or Users, reasonable access to User's property to do any necessary work associated with these Specifications, including, but not limited to, meter reading, monitoring of Recycled Water use by User, and repair of City owned equipment.

SECTION 3.10 IRRIGATION EQUIPMENT. (A) Use. Any irrigation equipment provided by City, including piping, fittings and pumps, shall be used by User in a manner consistent with standard irrigation practices.

(B) Replacement and Repair. Irrigation equipment downstream of Hydrant located on User's property shall be replaced and repaired as necessary by User and at User's discretion, whether equipment was provided by User or City. City shall not repair or replace above ground or buried irrigation equipment used by User and located downstream of Hydrant. City shall not provide User with new or replacement irrigation equipment. Any additional irrigation equipment, or replacement or repair of irrigation equipment, shall be provided by User at User's sole expense.

(C) Inventory. By December 1 of each irrigation season, User shall provide City with a complete inventory of irrigation equipment used by User during the previous irrigation season, including piping, fittings and pumps.

(D) Termination. Upon termination of this Agreement, User shall collect and neatly stack all City-owned portable irrigation equipment in one location accessible for easy pickup by City.

(E) City Responsibility. City shall maintain and repair Hydrants and associated appurtenances on Hydrant, and irrigation equipment upstream of Hydrant.

SECTION 4.0 HYDRANT LOCKOUT. User acknowledges that City will visually monitor User's use of Recycled Water. If the City determines that Recycled Water is not being used by User in accordance with these Specifications, City reserves the right to immediately lockout User's Hydrant and discontinue providing Recycled Water to User. City shall provide written notice to User within five (5) days of discontinuing the provision of Recycled Water. Resumption of the provision of Recycled Water shall be at the sole discretion of the City. User may appeal hydrant lockout action to Director of Engineering.

SECTION 5.0 ON-RANCH FACILITY MODIFICATIONS. (A) City Responsibilities. If determined by City to be necessary, City shall install and maintain Recycled Water Hydrant(s) on User's property to sufficiently monitor and control Recycled Water deliveries to User.

(B) User Responsibilities. User shall be responsible for all costs for the construction and operation of modifications to User's Recycled Water facilities. Such modifications, which shall be installed at User's discretion, may include:

(1) Fencing. Installation of fencing and other equipment designed to separate land irrigated with Recycled Water.

(2) Irrigation Piping. Installation of above ground or below ground irrigation piping.

(3) Check Dams. Construction of check dams to prevent runoff from leaving User's property and associated pumping equipment to re-apply ponded Check Dam water.

(C) Modification Requirements. The installation, modification or construction of new facilities performed by User on User's irrigation system, shall be in accordance with all applicable laws, statutes, regulations and guidelines pertaining to Recycled Water systems and use, including but not limited to those promulgated by the California Department of Health Services and the Board.

SECTION 6.0 INSURANCE. (A) General. The User shall not commence work under these Specifications until User has obtained insurance required herein and such insurance has been approved by the City, nor shall the User allow any subcontractor to commence work until all insurance required of the User has been obtained and approved. All requirements herein shall appear in the body of the insurance policies or as endorsements and shall specifically bind the insurance carrier.

(B) Minimum Scope of Insurance. Coverage shall be as broad as:

(1) Insurance Services office form number GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office form number GL 0404 covering Broad Form Comprehensive General Liability; or Insurance Services Office Commercial General Liability coverage ("occurrence" form CG 0001).

(2) Insurance Services Office form number CA 0001 (Ed. 1/78) covering Automobile Liability, code 1 "any auto" and endorsement CA 0025 or code 7 "specifically described autos." If code 7 coverage is selected, the auto(s) covered must be specifically described in the coverage. Additionally, only the specifically described autos can be used pursuant to the Agreement.

(3) Workers' Compensation insurance as required by the Labor Code of the State of California and Employers Liability insurance.

(C) Minimum Limits of Insurance.

(1) Comprehensive General Liability: $1,000,000 combined single limit per occurrence for bodily injury, personal injury and property damage or $2,000,000 aggregate limit.

(2) Automobile Liability: $500,000 combined single limit per accident for bodily injury and property damage or $2,000,000 aggregate limit.

(3) Workers' Compensation and Employers Liability: Workers' Compensation limits as required by the Labor Code of the State of California and Employers Liability limits of $1,000,000 per accident.

(D) Deductibles and Self-Insured Retentions. Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officials and employees; or the User shall procure a bond guaranteeing payment of losses and related investigations, claim administration and defense expenses.

(E) Other Insurance Provisions. The policies are to contain, or be endorsed to contain, the following provisions:

(1) General Liability and Automobile Liability Coverages.

(a) The City, its officials, and employees are to be covered as insureds as respects: liability arising out of activities performed by or on behalf of the User; products and completed operations of the User; premises owned, leased or used by the User; or automobiles owned, leased, hired or borrowed by the User. The coverage shall contain no special limitations on the scope of protection afforded to the City, its officials, or employees.

(b) The User's insurance coverage shall be primary insurance as respects the City, its officials, and employees. Any insurance or self-insurance maintained by the City, its officials, and employees shall be excess of the User's insurance and shall not contribute with it.

(c) Any failure to comply with reporting provisions of the policies shall not affect coverage provided to the City, its officials, or employees.

(d) Coverage shall state that the User's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

(2) Workers Compensation and Employers Liability Coverage. The insurer shall agree to waive all rights of subrogation against the City, its officials, and employees for losses arising from work performed by the User for the City.

(3) All Coverages. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the City.

(F) Acceptability of Insurers. Insurers shall have at least an "A" rating in accordance with the current Best's Key Rating Guide.

(G) Verification of Coverage. User shall furnish the City with certificates of insurance and with original endorsements affecting coverage required by this clause. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates and endorsements are to be received and approved by the City prior to commencement of work.

(H) Subcontractors. The User shall include all subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

SECTION 7.0 INDEMNIFICATION. (A) Indemnification by the User. The User agrees to, and shall hold City, its elective and appointive boards, commissions, officers, agents, and employees harmless from any liability for damage or claims for damage for personal injury, including death, as well as from claims for property damage which may arise from User's or subcontractor's agents, or employee operations under these Specifications, whether such operations be by the User or by any of the User's subcontractors. The User agrees to, and shall defend, indemnify and hold harmless the City and its elective and appointive boards, commissions, officers, agents and employees from any suits or actions at law or in equity for damages caused, or alleged to have been caused, by reason of any of the aforesaid operations. City does not, and shall not, waive any rights against the User, which it may have by reason of the aforesaid hold harmless agreement, because of the acceptance by City, of the insurance policies required. The aforesaid hold harmless agreement by the User shall apply to all damages and claims for damages of every kind suffered, or alleged to have been suffered, by reason of any of the aforesaid operations referred to in this section, regardless of whether or not City has prepared, supplied or approved of plans and/or specifications for the project, or regardless of whether or not such insurance policies shall have been determined to be applicable to any of such damages or claims for damages.

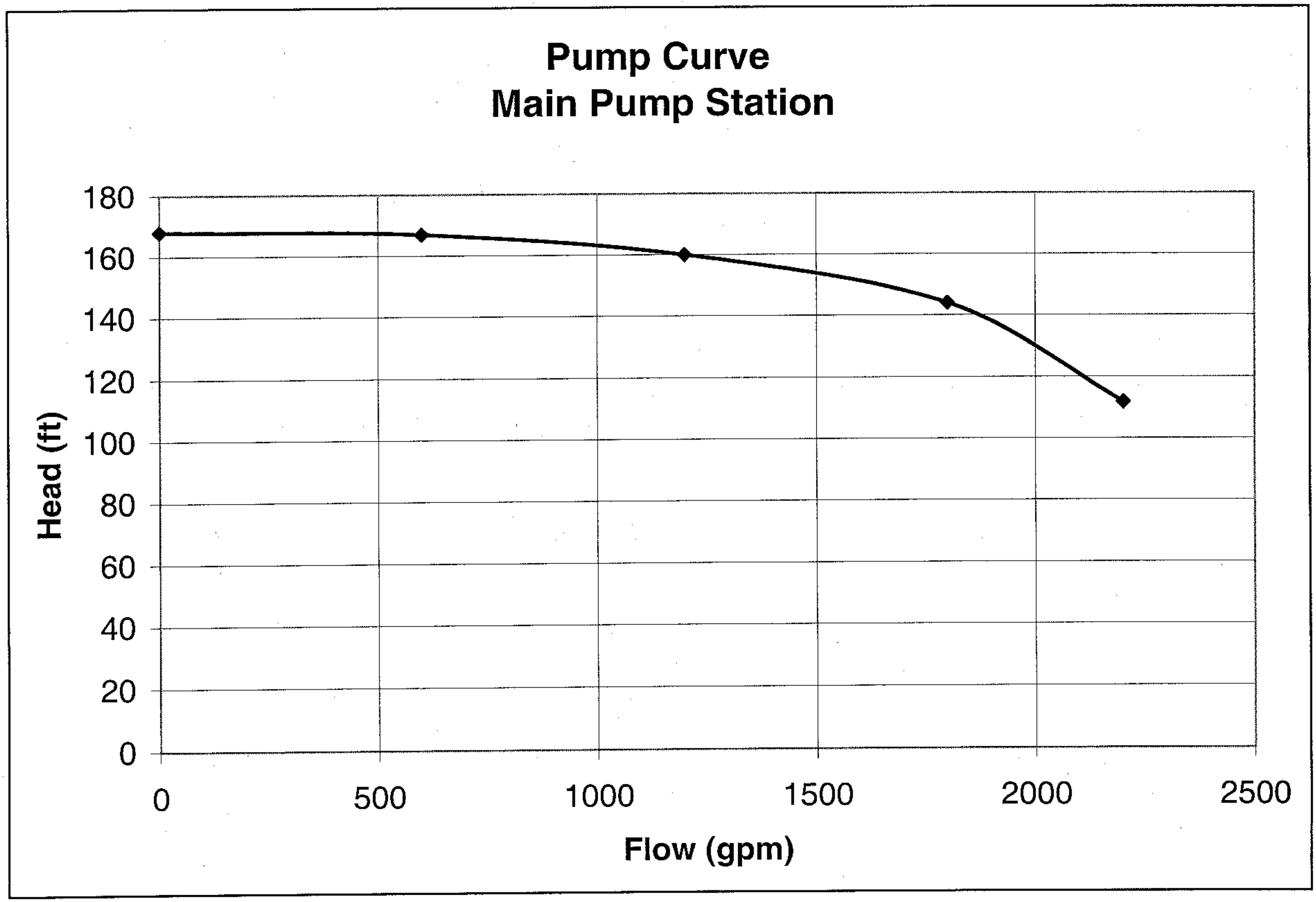
(B) Indemnification by City. The City shall indemnify and hold harmless the User, its officers, agents and employees from any liability for damage or claims for damage for personal injury, including death, as well as from claims for profperty damage which may arise as a result of City's sole negligence and/or willful misconduct. City shall further hold the User, its officers, agents and employees harmless for any liability for ground water contamination which may occur on adjoining properties as the result of the program. Furthermore, should damages occur to other third parties, such as adjacent land owners, and persons handling the Recycled Water and provided that the User has complied with all the terms and conditions of these Specifications and has not acted in a negligent or willful fashion, City shall assume such liability and shall hold User harmless and indemnify User from any such damages and/or claims for damages.

SECTION 8.0 CONTRACT CANCELLATION. (A) General. Contract may be canceled by either party prior to normal end-of-contract termination.

(B) Notice. Either party shall give the other party at least ten (10) days written notice of intent to cancel, setting forth the reason for proposed cancellation, if any.

EXISTING SECONDARY WATER SYSTEM/FACILITY INFORMATION

MAIN PUMP STATION



Pump Curve
Main Pump Station
Head (ft)
180
160
140
120
100
80
60
40
20
0
0
500
1000
1500
2000
2500
Flow (gpm)

ENVIROTECH

SIMPLE **A**UTOMATIC **M**AINTENANCE

TOTAL WORK ORDERS PER YEAR — YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4

PRIORITY | SPECIAL FIELD | EQUIPMENT NO

FREQUENCY: DAILY / WEEKLY / MONTHLY / QUARTERLY / SEMI-ANNUALLY / ANNUALLY — Main Station

IRRIGATION PRESSURIZATION PUMP (NAME OF EQUIPMENT) P-19

~~Pond Main Station (Irrigation)~~ (LOCATION)

(IMPLEMENTATION DATE)

EQUIPMENT NO. #654

PREVENTIVE MAINTENANCE SYSTEM

DRIVE UNIT	DRIVEN UNIT	COUPLING UNIT
MAKE GE Tri/Clad Induction Motor	MAKE Byron Jackson MODEL	MAKE MODEL
TYPE K Model: 5K6237XM714A	TYPE VTP	TYPE NO
SERIAL NO. CWJ309250	SERIAL NO. 026W0070	SERIAL NO.
CODE G DESIGN B	SIZE 10GH RPM 1770	GREASE
FRAME C324VP16 SER FACTOR 1.15	GPM 700 TAH Head:150'	OTHER
HP 40 RPM 1755 CYCLES 60	IMPELLER DIA 6 3/4"	
PHASE 3 SEAL NO. Dudy: Con't.	MATERIAL ~~BRZ~~ 4 stage SEAL NO. Mech QR	
BEARING NOS. Lower:K5903493P011	BEARING NOS.	
GREASE Upper:629A217ABG001	GREASE Lube: water	
OIL DATE INSTALLED / /	Packing 3/8" DATE INSTALLED / /	
VOLTS 230/460 AMPS 104.6/52.3	Byron Jackson Pump Div.	
OTHER	Chico, CA 95926	

SCHEDULED PREVENTIVE MAINTENANCE

NO.	REF.	FREQ.	HRS.	(DESCRIPTION OF WORK · WEEKS TO BE PERFORMED)	TIME
1		A		(start up) Add small amount of grease to lube lubricated lower (guide) bearings on motor through fitting in lower bearing cap; check electrical connections; megger & amp motor	30
2		Q		Clean Drives	15, 29, 38, 52
3		Q		Check condition of nonreverse coupling	15, 29, 38, 52
				Change oil follow SR	

TOTAL WORK ORDER COSTS PER YEAR — YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4

LOCATION

PLANNED MAINTENANCE SCHEDULE 2ND HALF YEAR

YEAR 1	YEAR 2	YEAR 3	YEAR 4	PRIORITY	SPECIAL FIELD	EQUIPMENT NO
TOTAL WORK ORDERS PER YEAR						

ENVIROTECH

S IMPLE
A UTOMATIC
M AINTENANCE

FREQUENCY: DAILY / WEEKLY / MONTHLY / QUARTERLY / SEMI-ANNUALLY / ANNUALLY — Main Station

VERTICAL TURBINE PUMP P-16 (5)
(NAME OF EQUIPMENT)

~~Pond Main Station (Irrigation)~~
(LOCATION)

(IMPLEMENTATION DATE)

EQUIPMENT NO. #651

PREVENTIVE MAINTENANCE SYSTEM

DRIVE UNIT

MAKE ~~Westinghouse~~ MODEL ~~GDDP~~
TYPE ~~Style: 02C63057~~
SERIAL NO. 830404
CODE G DESIGN B
FRAME 360 VP SER FACTOR 1.15
HP 75 RPM 1780 CYCLES 60
PHASE 3 SEAL NO Duty: Con't.
BEARING NOS. ~~Upper:95BT02H Lower:70BC03JPP3~~
GREASE
OIL DATE INSTALLED / /
VOLTS 460 AMPS 89
OTHER Byron Jackson Pump Div., 844 Broadway, Chico, CA 95926

DRIVEN UNIT

MAKE Byron Jackson MODEL
TYPE VTP
SERIAL NO. 826W0068
SIZE 14GN.2ST ? RPM 1770 ??
GPM 1500 TDH Head: 150'
IMPELLER DIA. 9⅛"
MATERIAL BRZ SEAL NO.
BEARING NOS. 2 stage
~~GREASE~~ Lube: Water
OIL DATE INSTALLED / /

COUPLING UNIT

MAKE MODEL
TYPE
SERIAL NO.
GREASE
OTHER

SCHEDULED PREVENTIVE MAINTENANCE

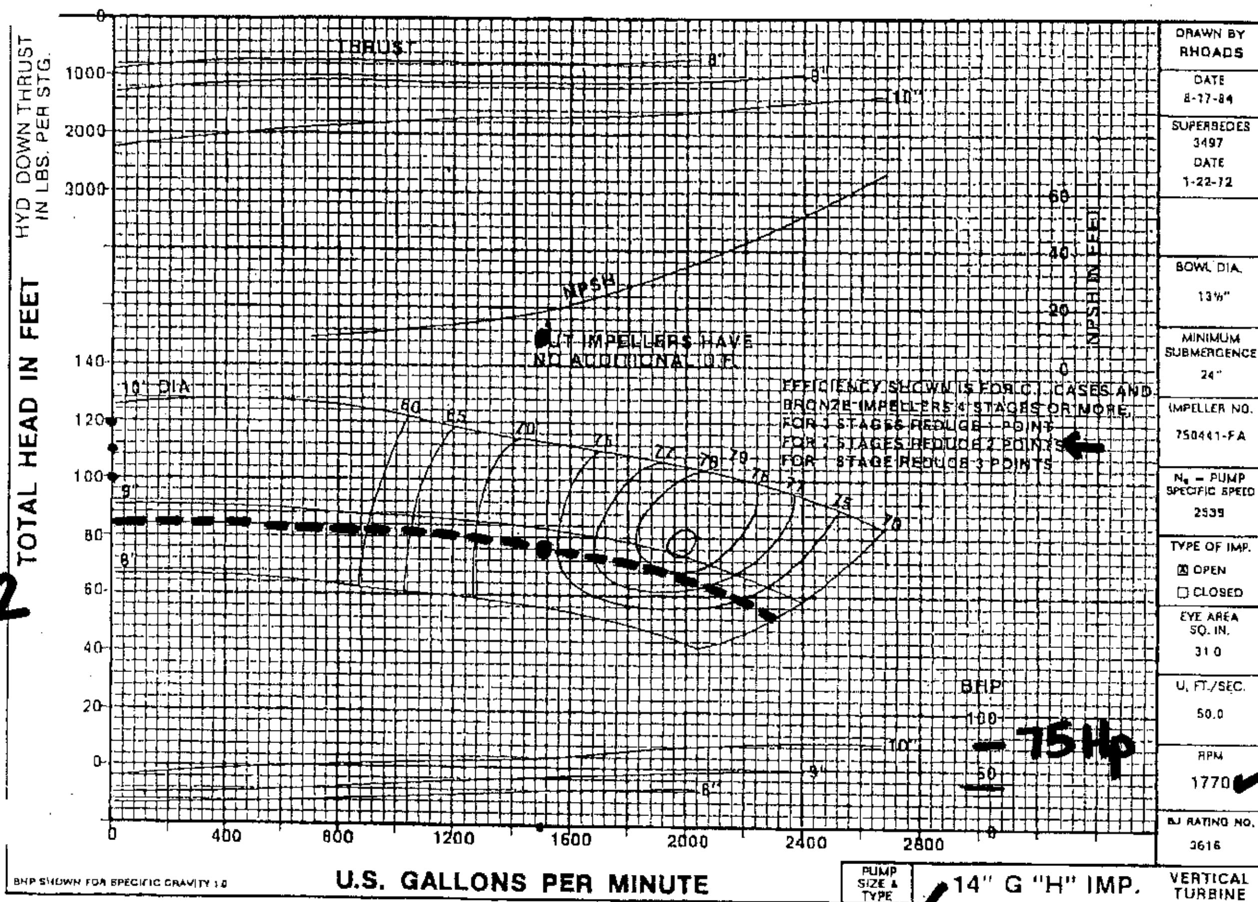
NO.	REF.	FREQ.	HRS.	(DESCRIPTION OF WORK - WEEKS TO BE PERFORMED)	TIME
1		A		Change motor bearing oil. Check electrical connections. Megger & amp motor.	38
2		Q		Clean Drives	15,29,38,52
3		Q		Check Condition of Nonreverse Coupling	15,29,38,52

TOTAL WORK ORDER COSTS PER YEAR — YEAR 1 / YEAR 2 / YEAR 3 / YEAR 4

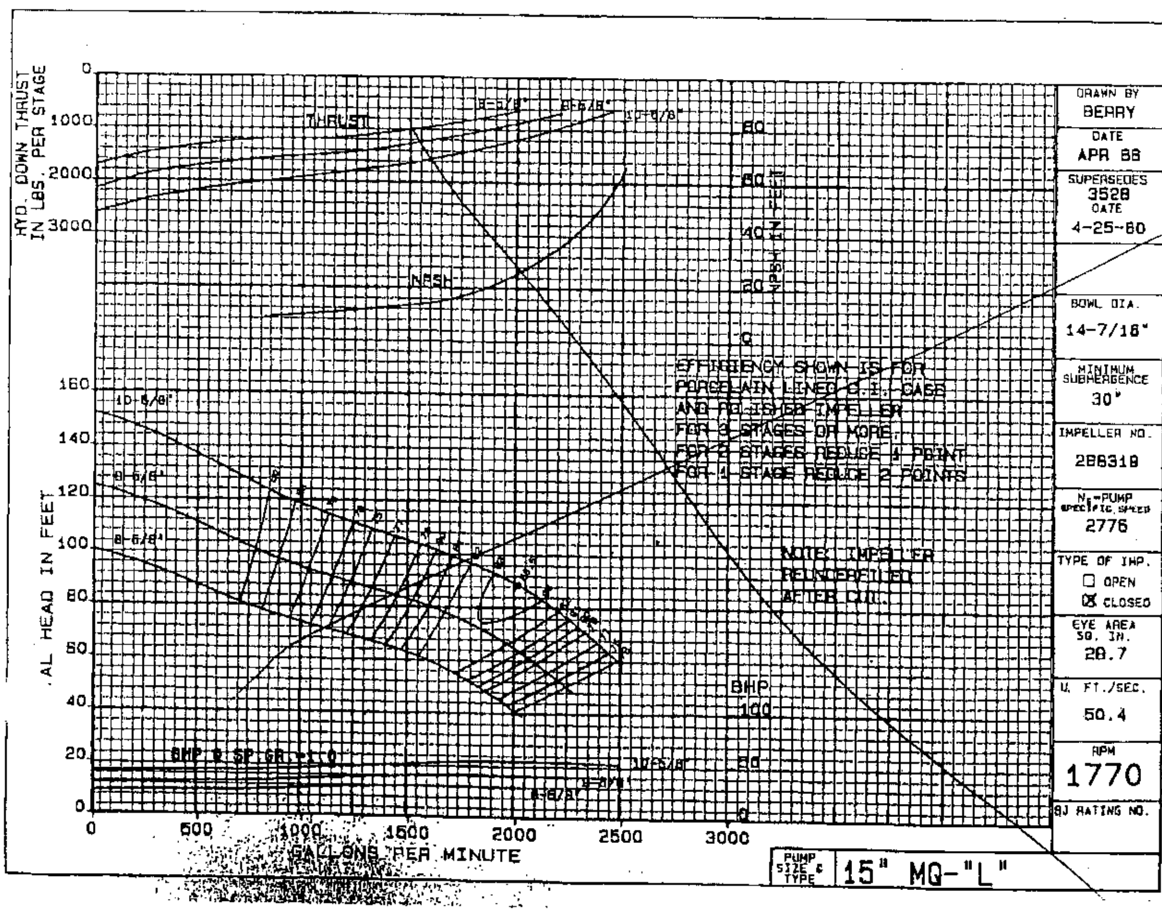
LOCATION

PLANNED MAINTENANCE SCHEDULE 2ND HALF YEAR

Section 2-210 Page 2-210-26	Byron Jackson Pump Division BORG-WARNER CORPORATION	Eff. June 1986 Super. Nov. 84



V9
5
2 stages
Main station



Main Station
5-pumps 2st.

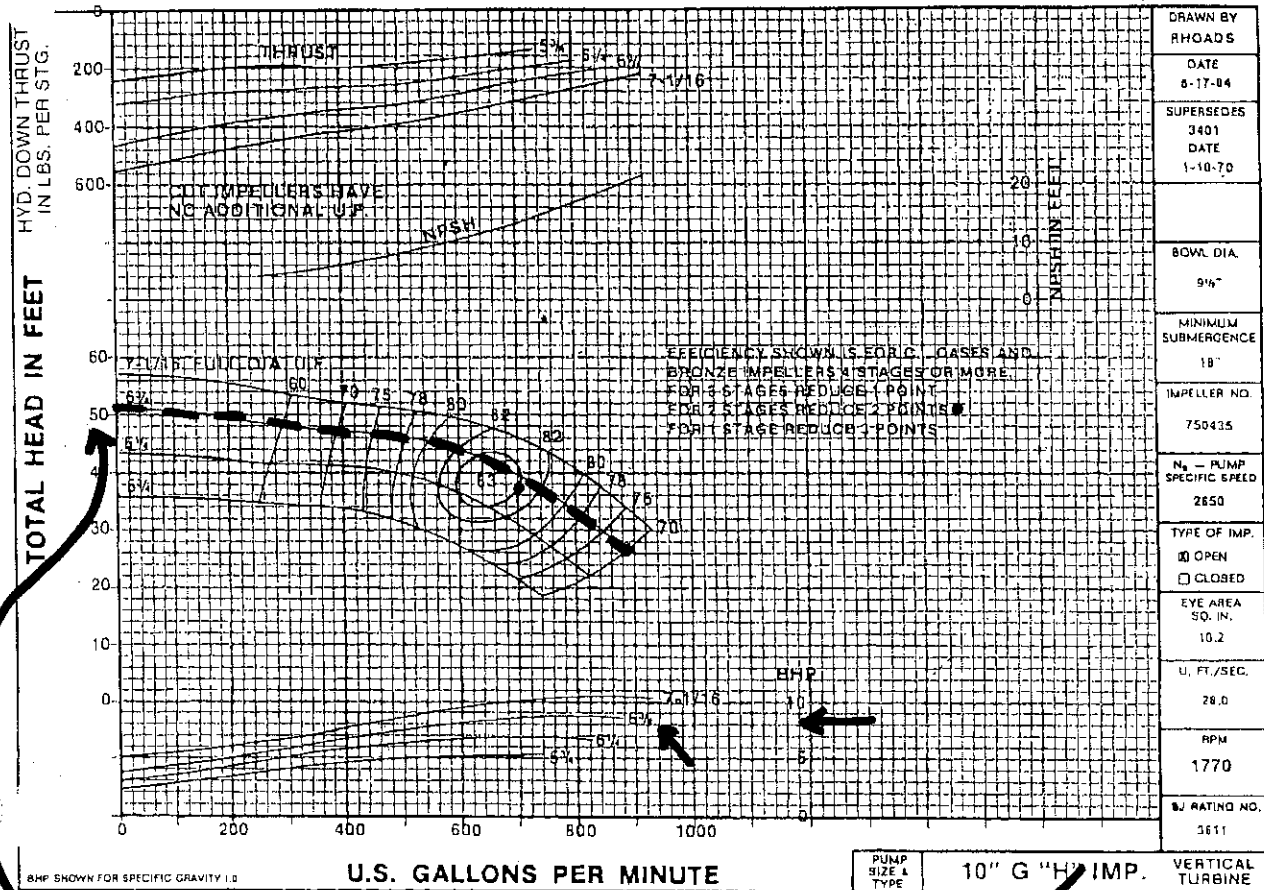
Section 2-210 Page 2-210-18	BW/IP International, Inc. Pump Division	Byron Jackson® Products	Eff. Nov. 1984 Super, July 72

Pressurization

(1)

X stages

4



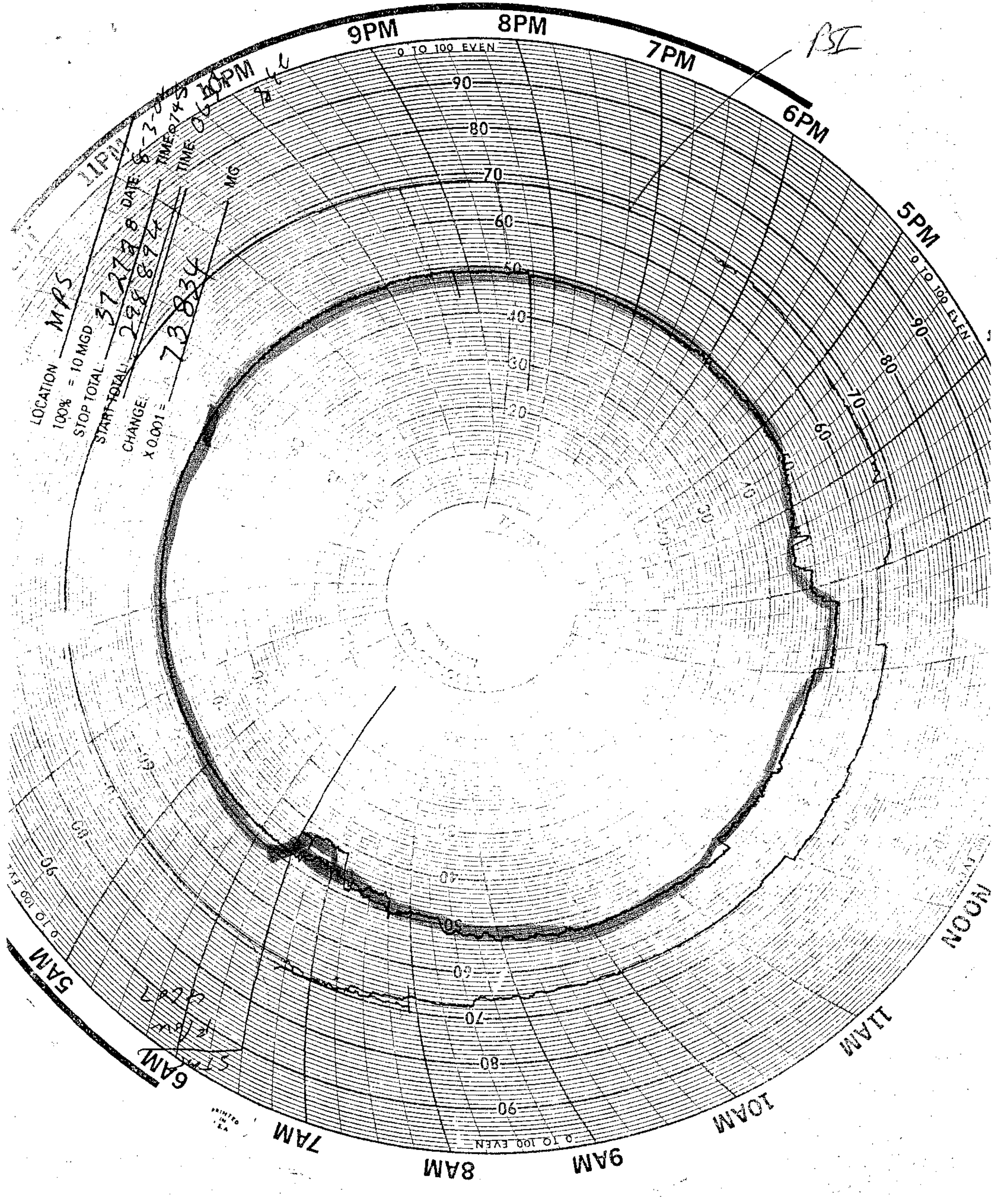
Main station

Multiply by 4

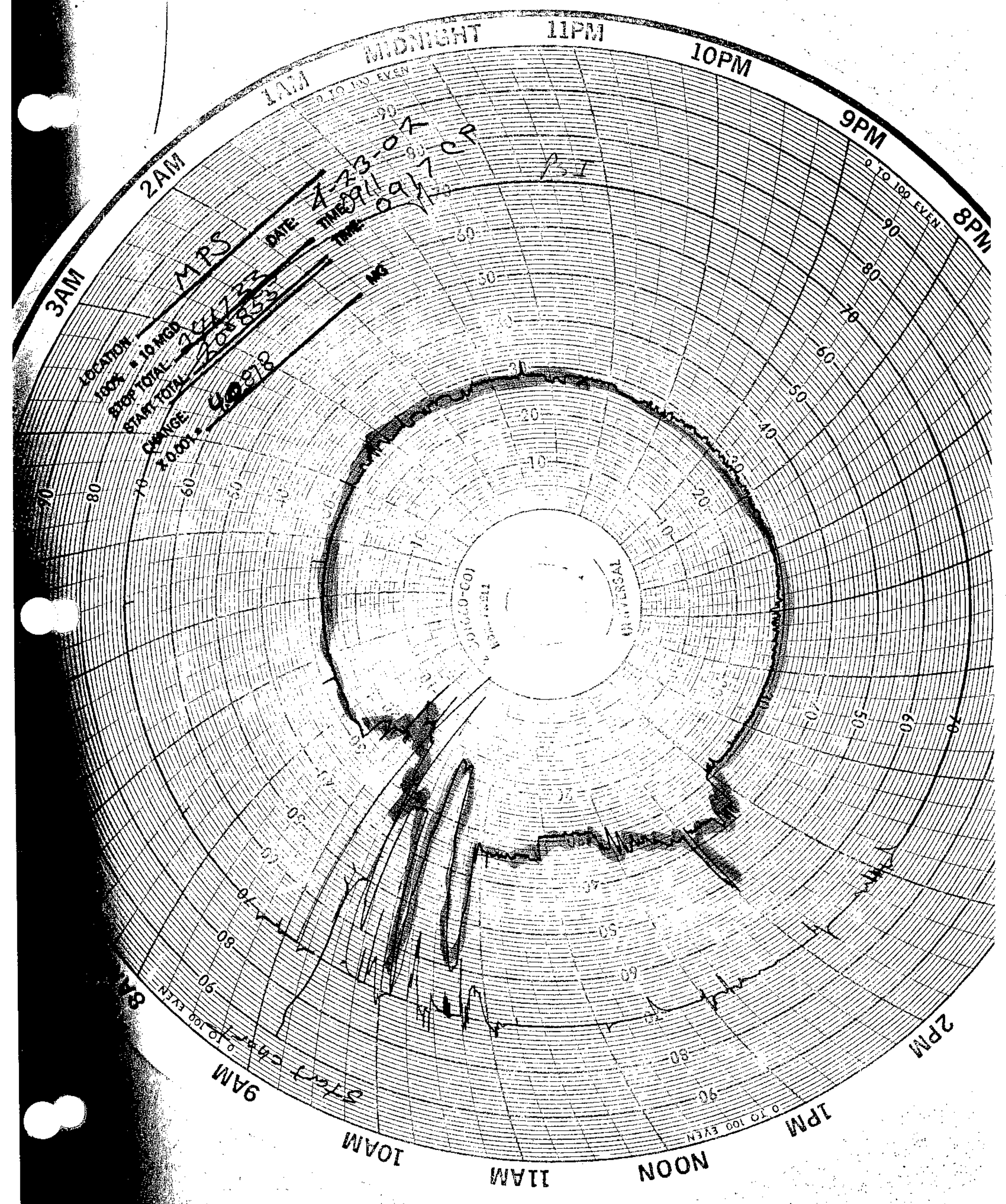
40 Hp ✓

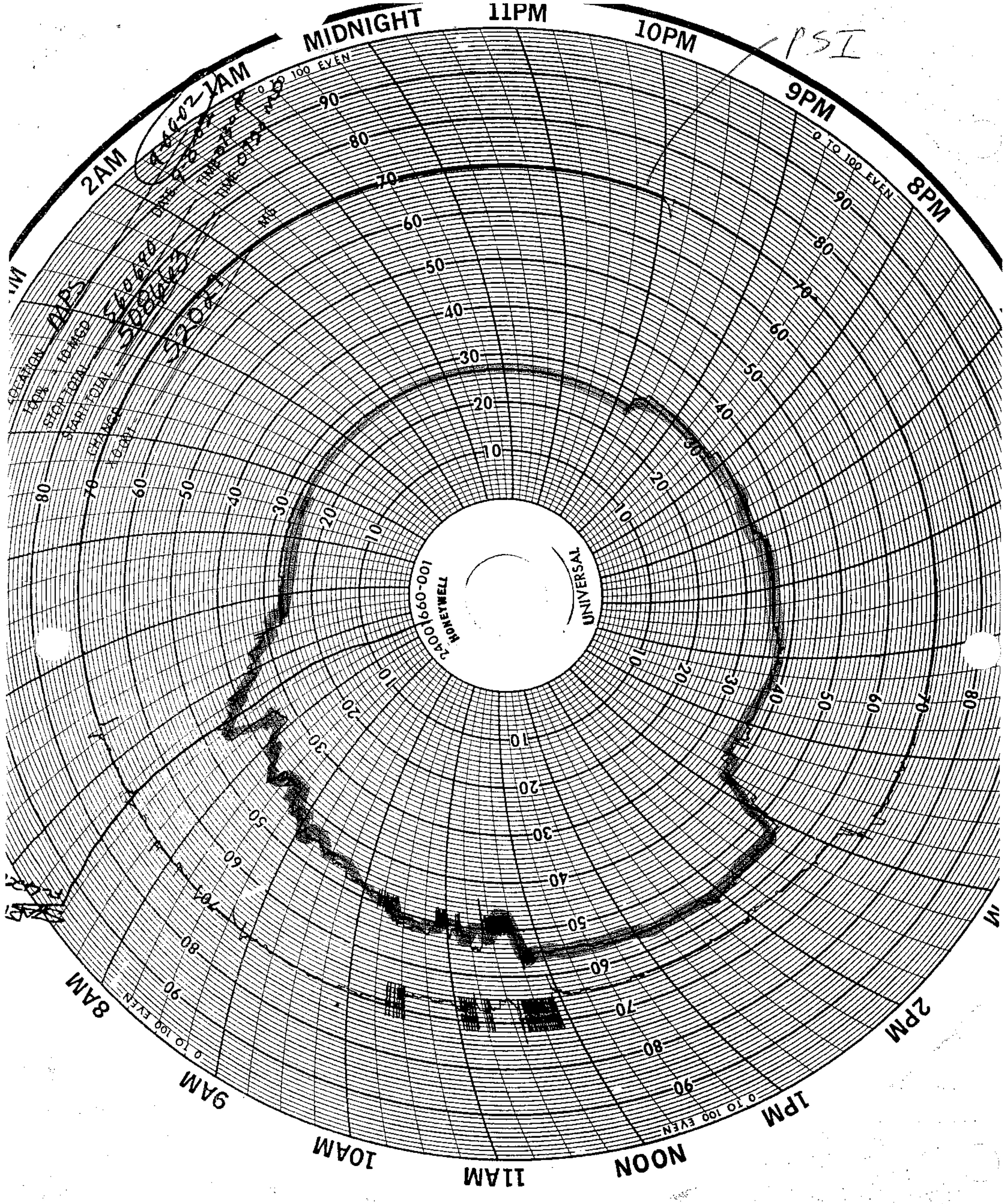
~~Alt. 2pgs.~~

~~C...~~

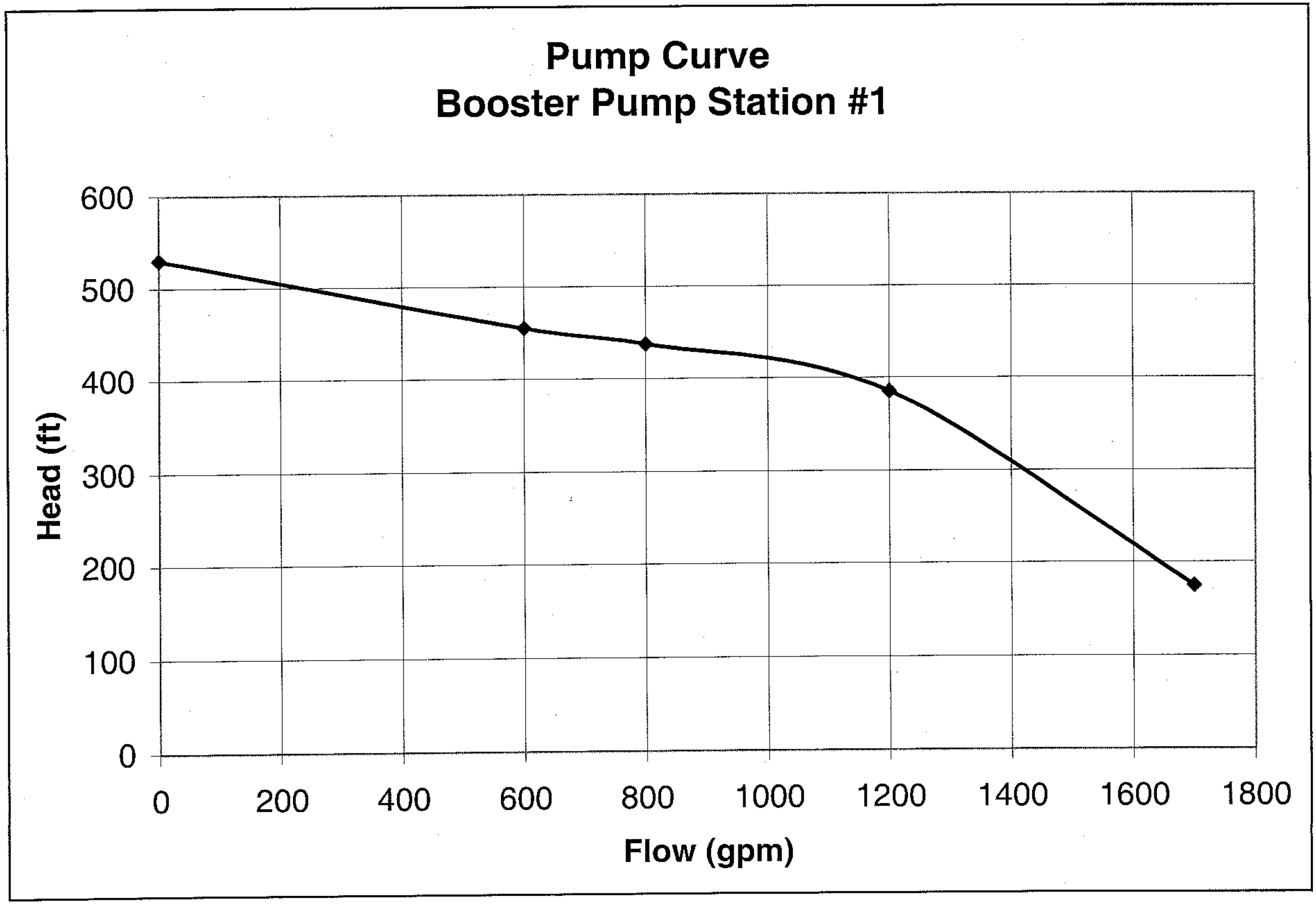


LOCATION MPS
100% = 10 MGD
STOP TOTAL 372728
START TOTAL 298894
CHANGE X 0.001 = 73834 MG
DATE 6-3-04
TIME 0145
TIME 0625
0 TO 100 EVEN
9PM
8PM
7PM
6PM
5PM
NOON
11AM
10AM
9AM
8AM
7AM
6AM
5AM
11PM
10PM
BSI


MIDNIGHT
11PM
10PM
9PM
8PM
1AM
2AM
3AM
8AM
9AM
10AM
11AM
NOON
1PM
2PM
0 TO 100 EVEN
LOCATION
MPS
100% = 10 MGD
STOP TOTAL
START TOTAL
CHANGE
X 0.001 =
DATE
7-23-07
TIME
TIME
MG
UNIVERSAL
Start chart


MIDNIGHT
11PM
10PM
9PM
8PM
1AM
2AM
8AM
9AM
10AM
11AM
NOON
1PM
2PM
0 TO 100 EVEN
0 TO 100 EVEN
0 TO 100 EVEN
PSI
LOCATION
100% = 10 MGD
STOP TOTAL
START TOTAL
CHANGE
DATE
TIME ON
TIME OFF
24001660-001
HONEYWELL
UNIVERSAL

BOOSTER PUMP STATION NO. 1


Pump Curve
Booster Pump Station #1
Head (ft)
600
500
400
300
200
100
0
0
200
400
600
800
1000
1200
1400
1600
1800
Flow (gpm)

ENVIROTECH

SIMPLE **A**UTOMATIC **M**AINTENANCE

FREQUENCY: DAILY / WEEKLY / MONTHLY / QUARTERLY / SEMI-ANNUALLY / ANNUALLY — Sta. #1

~~BOOSTER PUMP #1~~ Pressurization Pump (NAME OF EQUIPMENT)

~~Booster~~ Pump Station #1 (LOCATION)

(IMPLEMENTATION DATE)

EQUIPMENT NO. (4) #700

PREVENTIVE MAINTENANCE SYSTEM

DRIVE UNIT	DRIVEN UNIT	COUPLING UNIT
MAKE: GE Motor 5KS6268XH4001A	MAKE: Peabody-Floway MODEL:	MAKE: MODEL:
TYPE: KS	TYPE: XKH	TYPE:
SERIAL NO.: FWJ615100	SERIAL NO.: 82-3682	SERIAL NO.:
CODE: G DESIGN: B	SIZE: 10" RPM: 3600	GREASE:
FRAME: B405VP16 SER FACTOR: 1.15	GPM: 650 TAH TDH: 375'	OTHER:
HP: 100 RPM: 3570 CYCLES: 60	IMPELLER DIA.:	Mech Seal
PHASE: 3 SEAL NO. Duty: Con't	MATERIAL: BRZ SEAL NO. FF-2 Mech.	1 1/4" FF-2
BEARING NOS.: Lower: K5903493P016	BEARING NOS. Stages: 2	542949-4010
GREASE: Upper: 639A219ABC001	GREASE: Lub: water	
OIL: DATE INSTALLED: / /	OIL: DATE INSTALLED: / /	
VOLTS: 230/460 AMPS: 112.5	Peabody-Floway	
OTHER: Constant Speed	2492 E.R. Ave., P.O. Box 164, Fresno, CA 93707	

SCHEDULED PREVENTIVE MAINTENANCE

(DESCRIPTION OF WORK - WEEKS TO BE PERFORMED)

		Description	Weeks
1	A	(start up) Add small amounts of grease to lube lubricated lower (guide) bearings on motor through fitting in lower bearing cap, check electrical connections - meger & amp	38
2	Q	Clean drives	15, 29, 38, 5[illegible]
3	Q	Check condition of nonreverse coupling	15, 29, 38, 5[illegible]

PS-326(?) seal?

TOTAL WORK ORDERS PER YEAR · PRIORITY · SPECIAL FIELD · PLANNED MAINTENANCE SCHEDULE 2ND HALF YEAR · TOTAL WORK ORDER COSTS PER YEAR · LOCATION

ENVIROTECH

SIMPLE **A**UTOMATIC **M**AINTENANCE

FREQUENCY: DAILY / WEEKLY / MONTHLY / QUARTERLY / SEMI-ANNUALLY / ANNUALLY — 5 ? 2. #1

NAME OF EQUIPMENT: BOOSTER PUMP ~~#2~~ #1 (5)

LOCATION: ~~Booster~~ Pump Station #1

IMPLEMENTATION DATE:

EQUIPMENT NO. #704

PREVENTIVE MAINTENANCE SYSTEM

DRIVE UNIT	DRIVEN UNIT	COUPLING UNIT
MAKE: U.S. Motors — MODEL: H3610093	MAKE: Peabody Floway — MODEL:	MAKE: — MODEL:
TYPE: RV-4	TYPE: DOH	TYPE:
SERIAL NO.: 9302748-673 R2111050	SERIAL NO.: 82-3686	SERIAL NO.:
CODE: F — DESIGN: B	SIZE: 12" — RPM: 1800	GREASE:
FRAME: 444VPWPI — SER. FACTOR: 1.15	GPM: 1250 — TAH: 365'	OTHER:
HP: 150 — RPM: 1800 — CYCLES: 60	IMPELLER DIA.: — Stages: 7	
PHASE: 3 — SEAL NO.: Duty: Con't.	MATERIAL: BRNZ — SEAL NO.: Mech. 1	
BEARING NOS.: Lower:SKF6215J/Upper:SKF7322W	BEARING NOS.:	
GREASE:	GREASE: Water	
OIL: Oil cap upper bearings 4 Qts. — DATE INSTALLED: / /	OIL: — DATE INSTALLED: / /	
VOLTS: 460 — AMPS: 176	Peabody-Floway	
OTHER: Variable Speed	2402 R.R. Ave. Fresno, CA	

SCHEDULED PREVENTIVE MAINTENANCE

NO.				(DESCRIPTION OF WORK - WEEKS TO BE PERFORMED)	
1		A		Lube motors, check electrical connections, megger & amp motor	38
2		Q		Clean drives	15, 29, 38, 52
3		Q		Check condition of nonreverse coupling	15, 29, 38, 52

PLANNED MAINTENANCE SCHEDULE 2ND HALF YEAR

TOTAL WORK ORDERS PER YEAR — PRIORITY — SPECIAL FIELD — EQUIPMENT NO.

TOTAL WORK ORDER COSTS PER YEAR — LOCATION

1770 RPM SEMI-OPEN TYPE IMPELLER 12DOH

NUMBER OF STAGES	ꟳFICIENCY CHANGE (NO. OF POINTS)
1	-3
2	-1
3	-0

HORSEPOWER WILL BE AFFECTED BY CHANGE IN EFFICIENCY

PUMP DATA

Shaft Dia.(IN)	1 11/16
Maximum Sphere (IN)	1
Maximum Head (FT)*	813
Min. Submergence (IN)**	22
Impeller Weight (LBS)	12
Thrust Constant (K)	15
Thrust Bal Const. (K)	N/A
Bowl O.D.(IN.)	1 3/8
Bowl Height (IN.)	1 1/4
Bell DIA. (T) (IN.)	11 1/4
Strainer height (IN.)	9 3/4
Impeller C-line(X)(IN.)	8 1/4
Eye Area (IN^ 2)	26.4

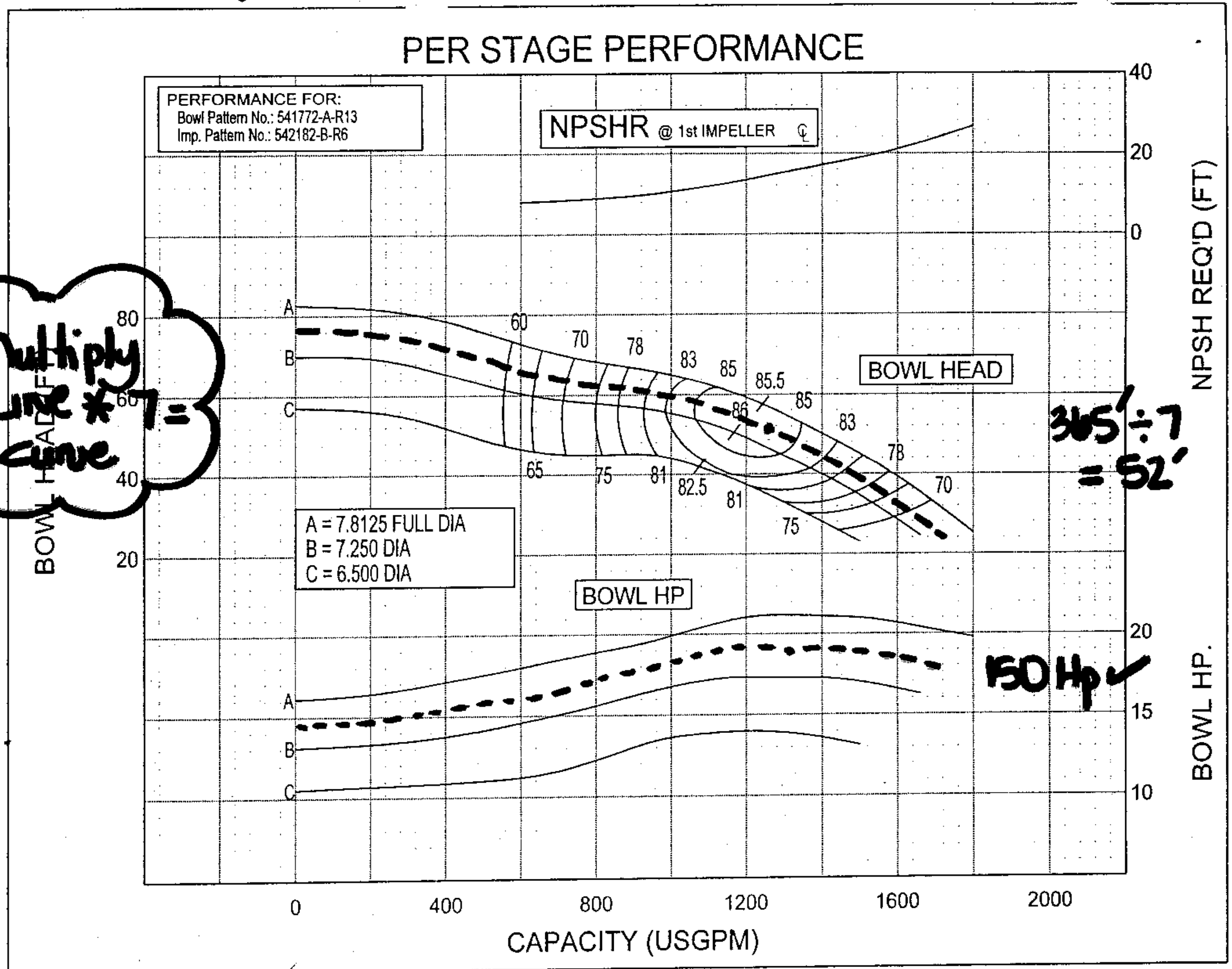
NOTES

Performance indicated based on cold water with specific gravity of 1.0.

* Standard Construction.

** Minimum submergence over lip of bell to prevent vortexing.

Efficiency improvements are available in certain instances. Please contact the factory.



√5

Booster Station #1
7 stages
(Main Pumps)

Peabody/Floway

3550 RPM E[illegible] CLOSED TYPE IMPELLER [illegible]XKH

NUMBER OF STAGES	EFFICIENCY CHANGE (NO. OF POINTS)
1	-3
2	-2
3	-0

HORSEPOWER WILL BE AFFECTED BY CHANGE IN EFFICIENCY

PUMP DATA

Shaft Dia.(IN)	1 1/2
Maximum Sphere (IN)	1/2
Maximum Head (FT)*	1155
Min. Submergence (IN)**	16
Impeller Weight (LBS)	8.7
Thrust Constant (K)	4.6
Thrust Bal Const. (K)	-1.5
Bowl O.D.(IN.)	9 5/8
Bowl Height (IN.)	6 1/2
Bell DIA. (T) (IN.)	9 3/8
Strainer height (IN.)	8 7/8
Impeller C-line(X)(IN.)	4
Eye Area (IN^ 2)	7.9

NOTES

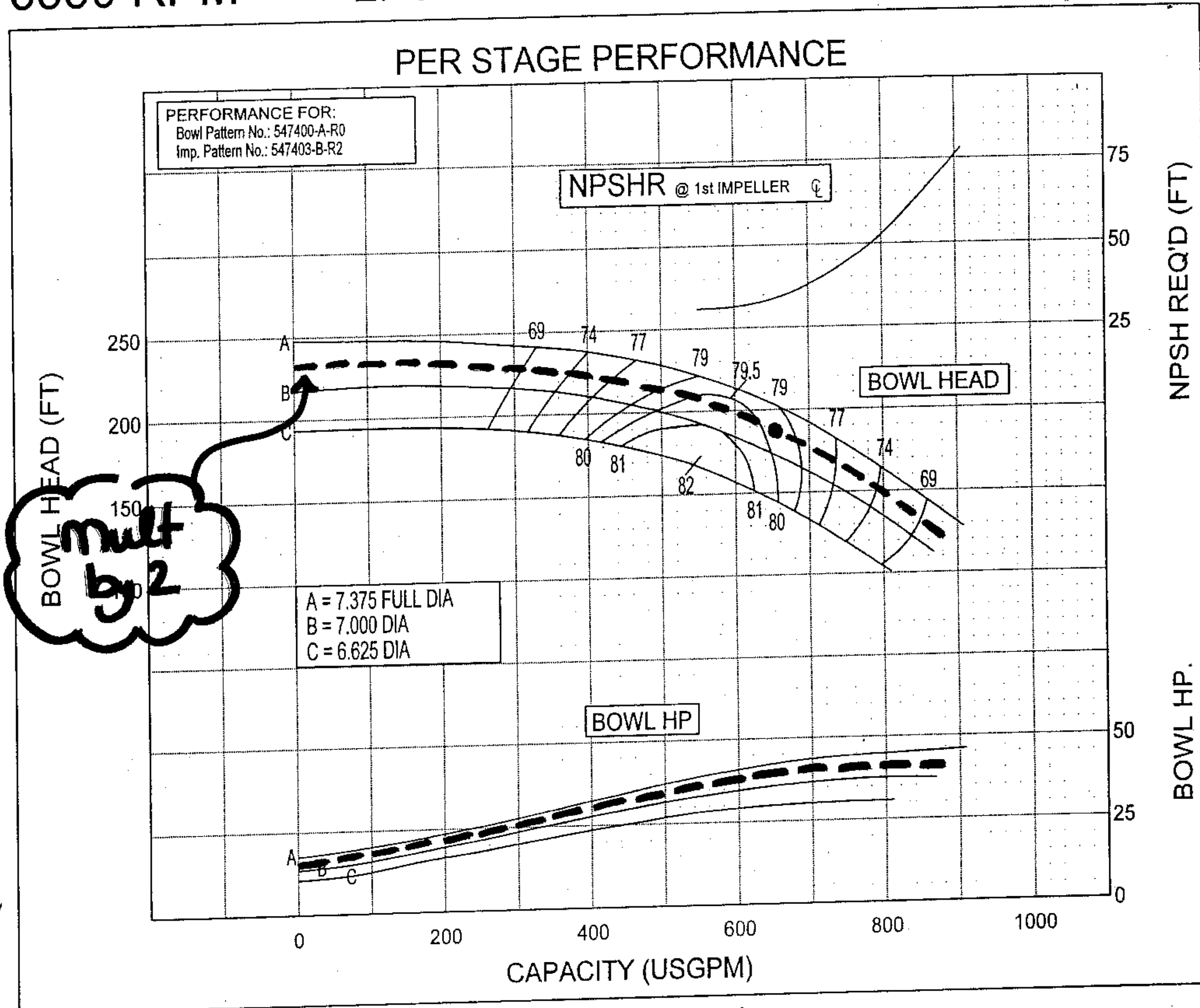
Performance indicated based on cold water with specific gravity of 1.0.

* Standard Construction.

** Minimum submergence over lip of bell to prevent vortexing.

Efficiency improvements are available in certain instances. Please contact the factory.

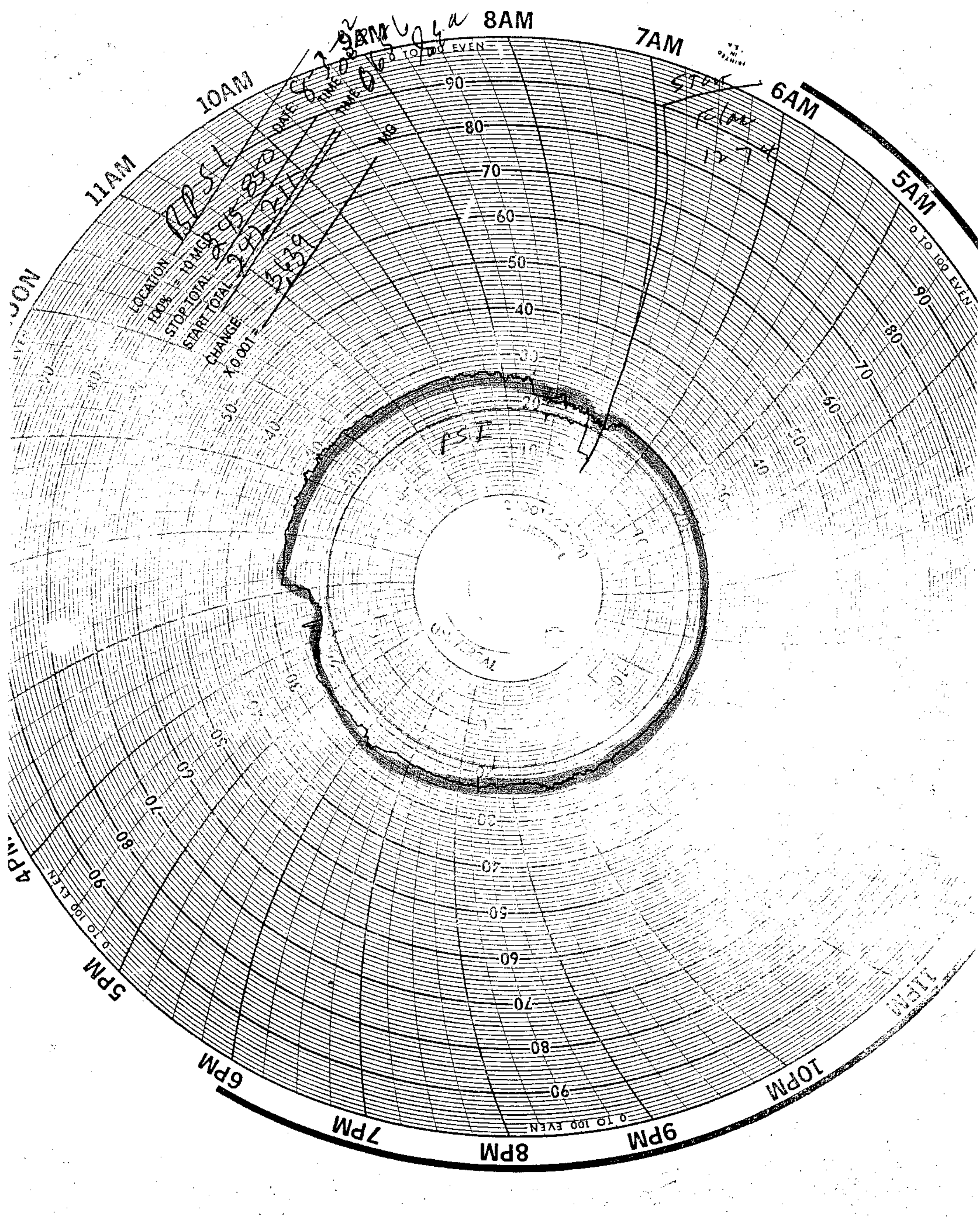
H=375' ÷ 2st = 187.5'



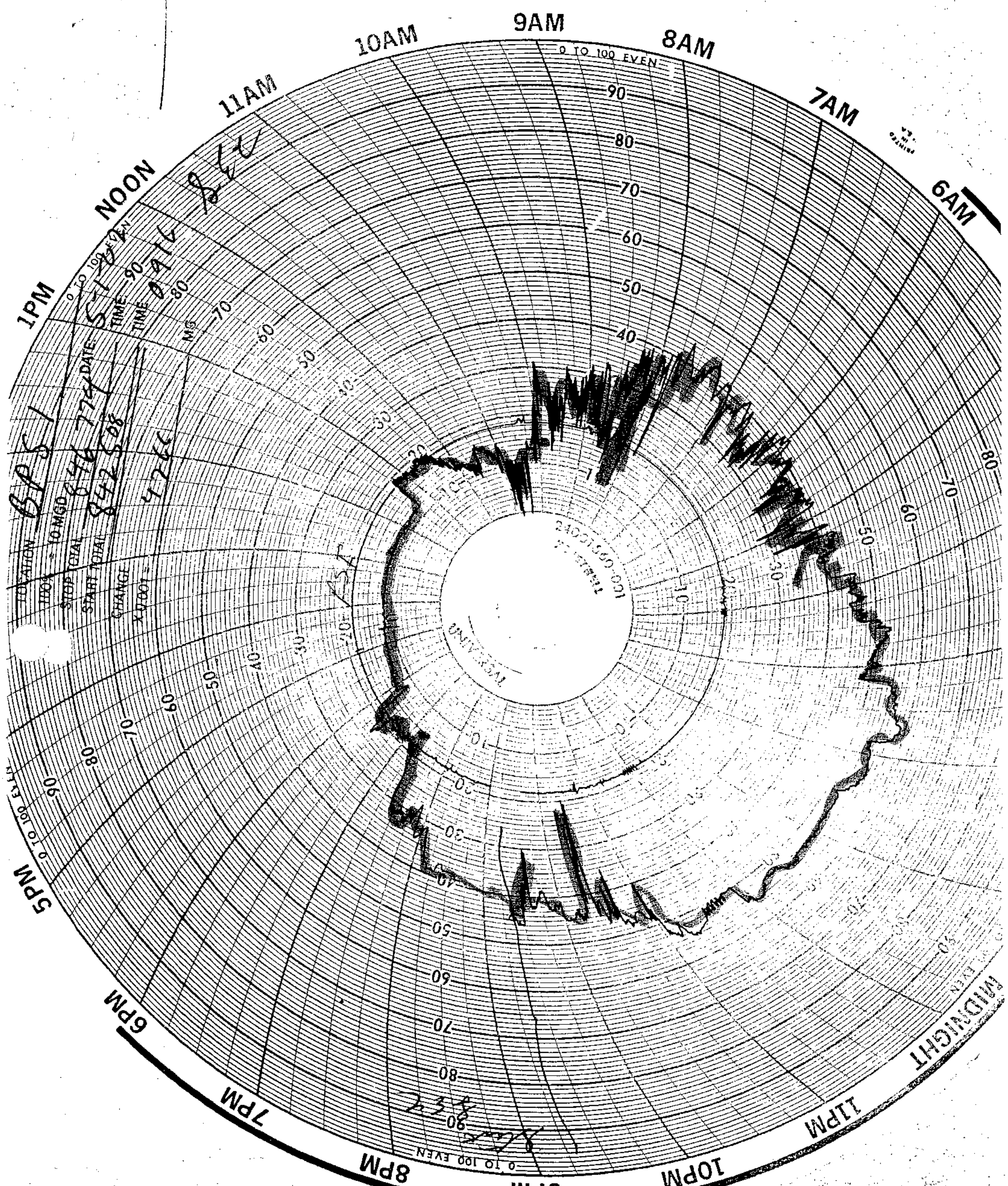
Peabody/Floway

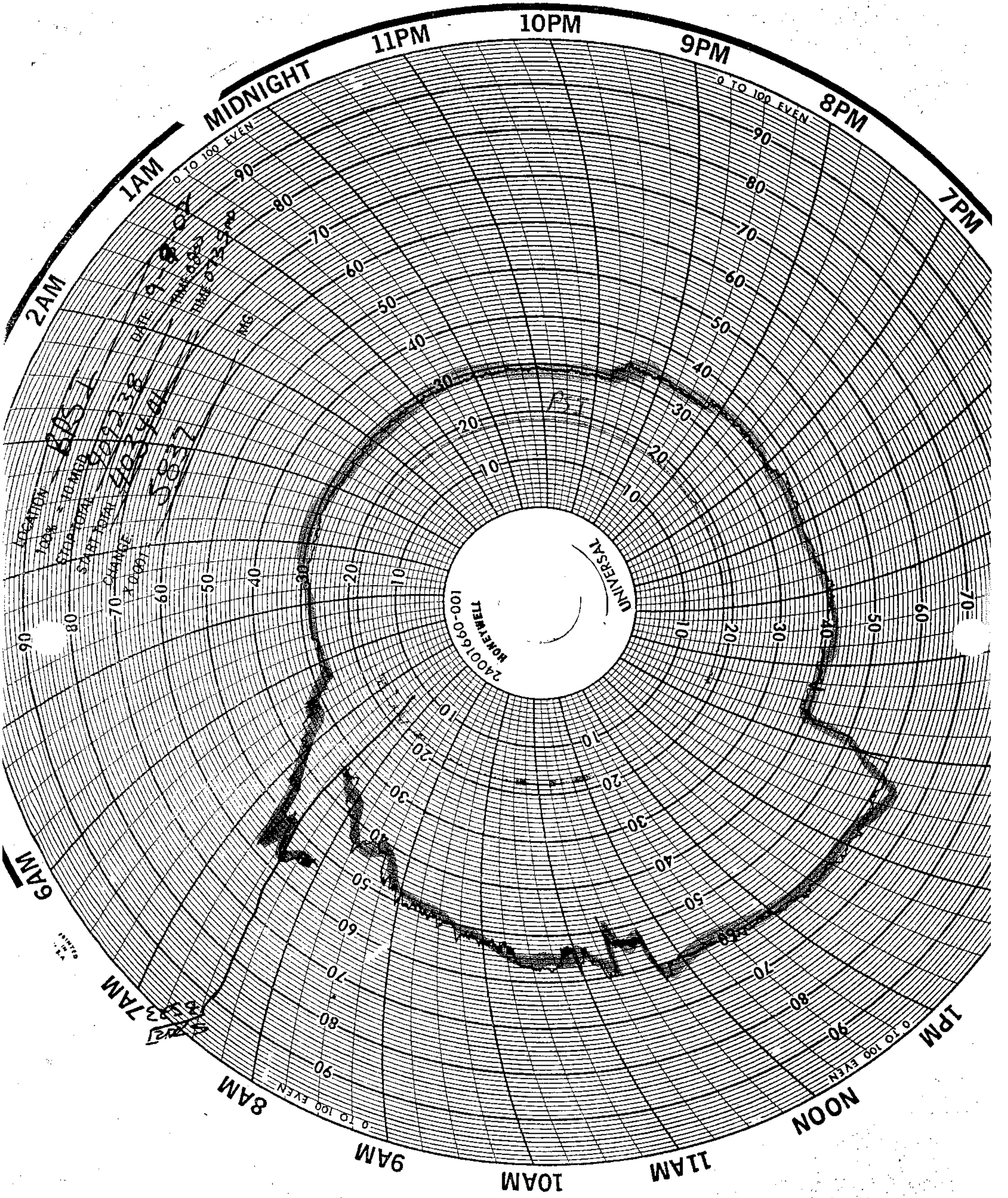
Booster Station #1
Pressurization Pump
2 stages

100Hp



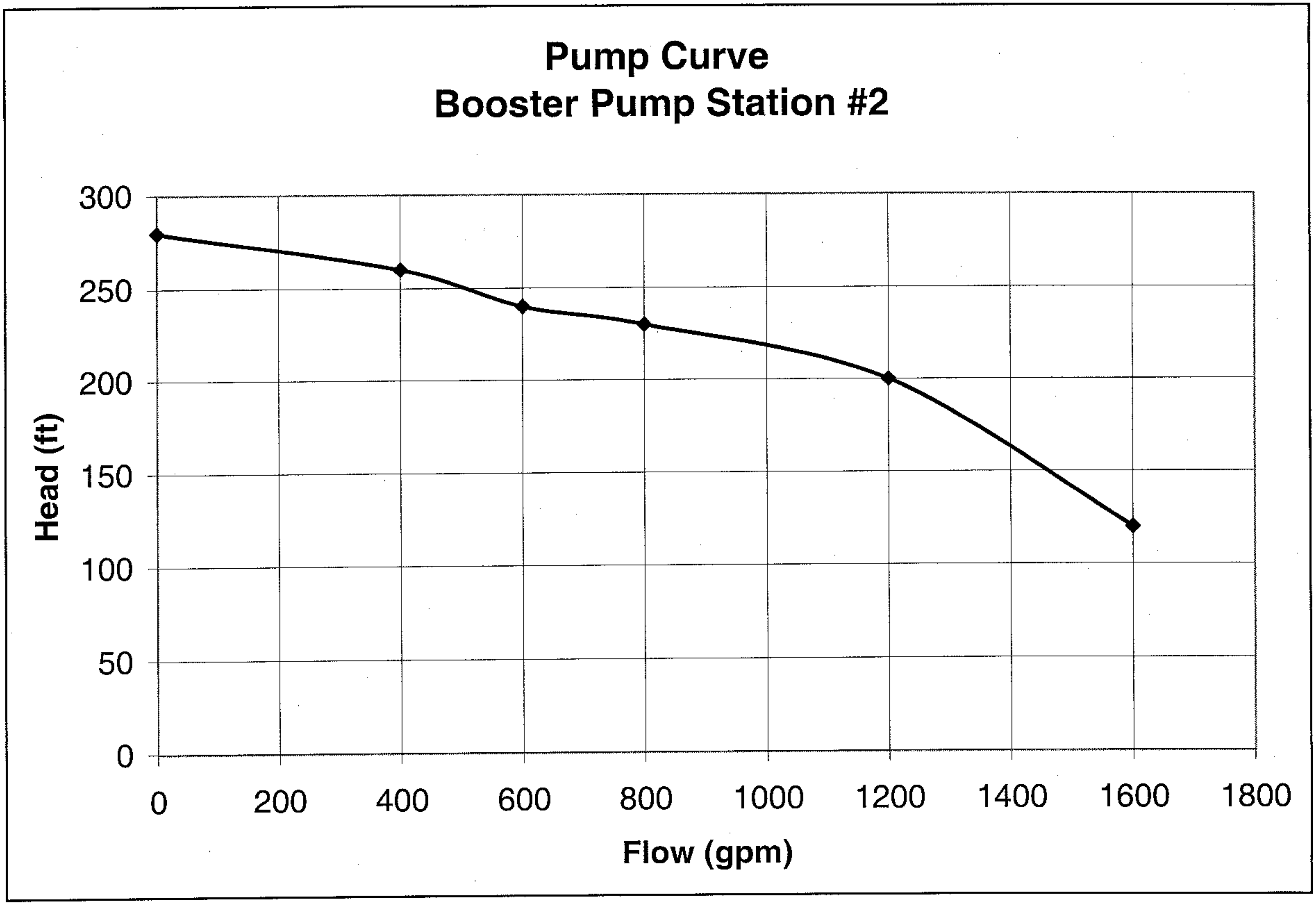
8AM
7AM
6AM
5AM
9AM
10AM
11AM
NOON
4PM
5PM
6PM
7PM
8PM
9PM
10PM
11PM
0 TO 100 EVEN
LOCATION BPS
100% = 10 MGD
STOP TOTAL 2515830
START TOTAL 2512291
CHANGE X 0.001 = 3539
DATE
TIME
TIME
NO
PSI


9AM
8AM
7AM
6AM
MIDNIGHT
11PM
10PM
9PM
8PM
7PM
6PM
5PM
1PM
NOON
11AM
10AM
0 TO 100 EVEN
LOCATION
STOP TOTAL
START TOTAL
CHANGE
DATE
TIME
TIME
UNIVERSAL



MIDNIGHT
1AM
2AM
6AM
7AM
8AM
9AM
10AM
11AM
NOON
1PM
7PM
8PM
9PM
10PM
11PM
0 TO 100 EVEN
LOCATION
100% = 10 MGD
STOP TOTAL
START TOTAL
CHANGE
x 0.001
DATE
TIME ON
TIME OFF
MG.
UNIVERSAL
HONEYWELL
24001660-001

BOOSTER PUMP STATION NO. 2


Pump Curve
Booster Pump Station #2
Head (ft)
300
250
200
150
100
50
0
0
200
400
600
800
1000
1200
1400
1600
1800
Flow (gpm)

ENVIROTECH

SIMPLE **A**UTOMATIC **M**AINTENANCE

FREQUENCY: DAILY / WEEKLY ✓ / MONTHLY / QUARTERLY / SEMI-ANNUALLY / ANNUALLY

Sta #2

BOOSTER PUMP ~~#0~~ #3 (3)
(NAME OF EQUIPMENT)

Booster Station #2
(LOCATION)

(IMPLEMENTATION DATE)

EQUIPMENT NO. #801

PRIORITY | SPECIAL FIELD | EQUIPMENT NO

TOTAL WORK ORDERS PER YEAR: YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4

PREVENTIVE MAINTENANCE SYSTEM

DRIVE UNIT	DRIVEN UNIT	COUPLING UNIT
MAKE U.S. Motors MODEL H3620001	MAKE Peabody-Floway MODEL	MAKE MODEL
TYPE RV-4	TYPE DOH	TYPE
SERIAL NO. 9302749-673 R2111041	SERIAL NO. 82-3680	SERIAL NO.
CODE G DESIGN B	SIZE 12" RPM 1800	GREASE
FRAME 265VPWPI SER FACTOR 1.15	GPM 1350 TAH 170'	OTHER
HP 75 RPM 1770 CYCLES 60	IMPELLER DIA.	
PHASE 3 ~~SEAL NO.~~ Duty: Cont.	MATERIAL BRNZ SEAL NO. Mech. 1	
BEARING NOS. Upper:SKF7220M/Lower:SKF6211J	BEARING NOS. Stages: 4	
GREASE	GREASE Water	
OIL DATE INSTALLED / /	OIL DATE INSTALLED / /	
VOLTS 460 AMPS 88	Peabody-Floway	
OTHER Variable Speed	2494 R.R.Ave., Fresno, CA 93707 (209) 442-4000	

SCHEDULED PREVENTIVE MAINTENANCE

NO.	REF.	FREQ.	HRS.	(DESCRIPTION OF WORK · WEEKS TO BE PERFORMED)	TIME
1		A		Lube motor. Check electrical connections; megger & amp	38
2		Q		Clean drives	15, 29, 38, 52
3		Q		Check condition of nonreverse coupling	15, 29, 38, 52

PLANNED MAINTENANCE SCHEDULE 2ND HALF YEAR

TOTAL WORK ORDER COSTS PER YEAR

LOCATION

PLANNED MAINTENANCE SCHEDULE FIRST HALF YEAR

TOTAL WORK ORDERS PER YEAR — YEAR 1 / YEAR 2 / YEAR 3 / YEAR 4 — PRIORITY — SPECIAL FIELD — EQUIPMENT NO (THOUSANDS / HUNDREDS / TENS / UNITS)

ENVIROTECH

S IMPLE
A UTOMATIC
M AINTENANCE

FREQUENCY: Sta. #2
D AILY
W EEKLY
M ONTHLY
Q UARTERLY
S EMI-ANNUALLY
A NNUALLY

BOOSTER PUMP #Press Pump
(NAME OF EQUIPMENT)

Booster Pump Station #2
(LOCATION)

(IMPLEMENTATION DATE)

EQUIPMENT NO. (1) 9000

PREVENTIVE MAINTENANCE SYSTEM

DRIVE UNIT	DRIVEN UNIT	COUPLING UNIT
MAKE G.E. 5K... [illegible]	MAKE Peabody-Floway MODEL	MAKE MODEL
TYPE HB	TYPE DOU	TYPE
SERIAL NO. FJJE15264	SERIAL NO 82-3687	SERIAL NO
CODE G DESIGN B	SIZE 10" RPM 3600	GREASE
FRAME C-365V.P.16 SER FACTOR 1.15	GPM 650 TAH 176'	OTHER
HP 50 RPM 1700 CYCLES 60	~~IMPELLER DIA~~ Other: 75 H.P.	
PHASE 3 ~~SERIAL NO.~~ Duty: Cont.	MATERIAL BRZ. SEAL NO Mech.	
BEARING NOS. Upper: 039A219A90001	~~BEARING NOS~~ Stages: 5	
Lower: K59034939013	GREASE Water	
DATE INSTALLED / /	OIL DATE INSTALLED / /	
VOLTS 230/460 AMPS 57.8	Peabody-Floway	
OTHER Constant Speed	3494 R.R. Ave., Fresno, CA 93706 (209) 442-8000	

SCHEDULED PREVENTIVE MAINTENANCE

REF.	FREQ.	HRS.	(DESCRIPTION OF WORK - WEEKS TO BE PERFORMED)	TIME
	A		(start up) - Add small amount of grease to lube lubricated lower (guide) bearings on motor through fitting in lower bearing cap - check electrical connections - megger & amp motor.	38
	Q		Clean drives	12, 25, 38, 52
	Q		Check condition of nonreverse coupling	12, 25, 38, 52

TOTAL WORK ORDER COSTS PER YEAR — YEAR 1 / YEAR 2 / YEAR 3 / YEAR 4

LOCATION

INSPECTION FREQ — WEEK

1770 RPM SEMI-OPEN TYPE IMPELLER 12DOH

NUMBER OF STAGES	'ICIENCY CHANGE (NO. OF POINTS)
1	- 3
2	- 1
3	- 0

HORSEPOWER WILL BE AFFECTED BY CHANGE IN EFFICIENCY

PUMP DATA

Shaft Dia.(IN)	1 11/16
Maximum Sphere (IN)	1
Maximum Head (FT)*	813
Min. Submergence (IN)**	22
Impeller Weight (LBS)	12
Thrust Constant (K)	15
Thrust Bal Const. (K)	N/A
Bowl O.D.(IN.)	11 3/8
Bowl Height (IN.)	10 1/4
Bell DIA. (T) (IN.)	11 1/4
Strainer height (IN.)	9 3/4
Impeller C-line(X)(IN.)	8 1/4
Eye Area (IN^ 2)	26.4

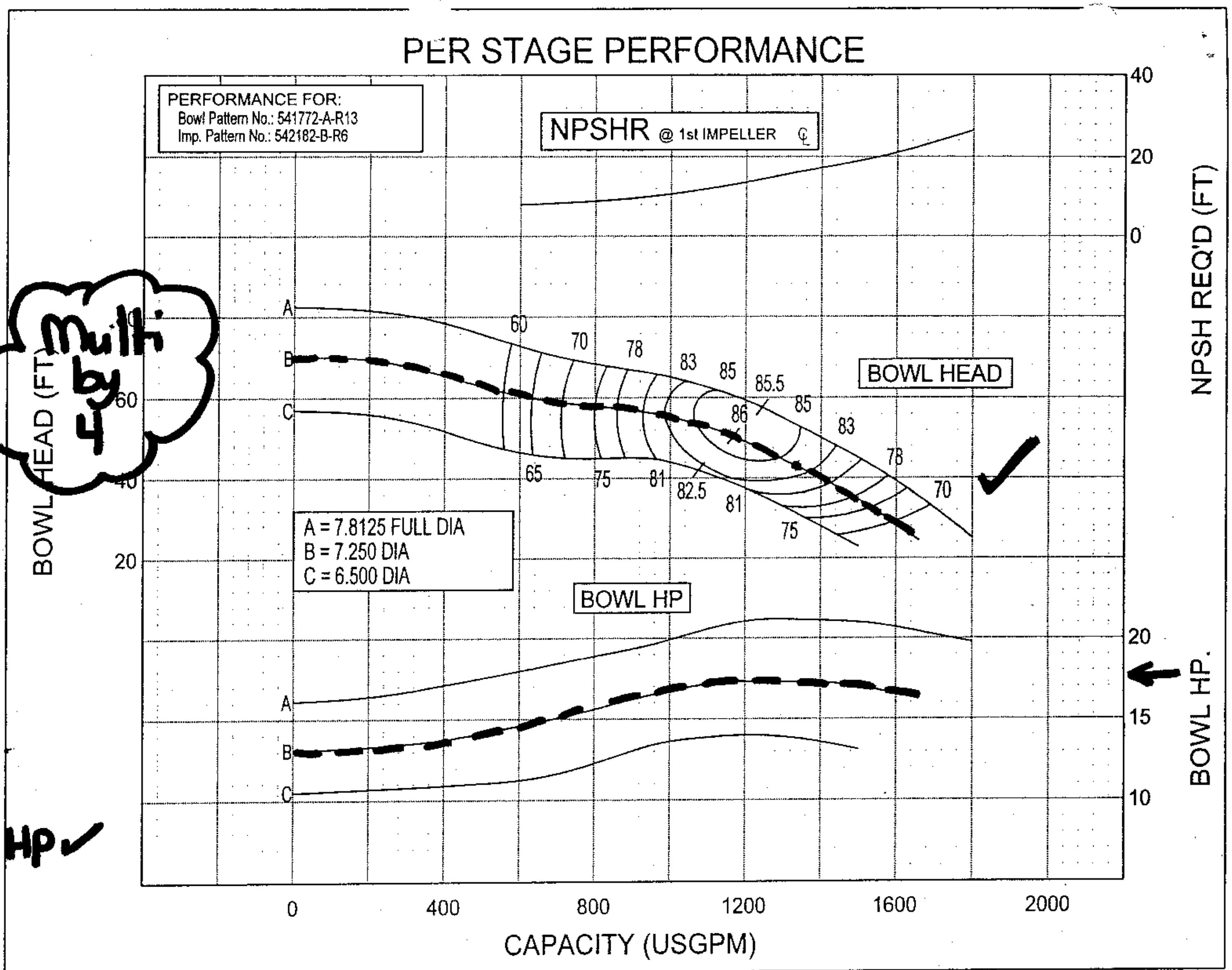
NOTES

Performance indicated based on cold water with specific gravity of 1.0.

* Standard Construction.

** Minimum submergence over lip of bell to prevent vortexing.

Efficiency improvements are available in certain instances. Please contact the factory.

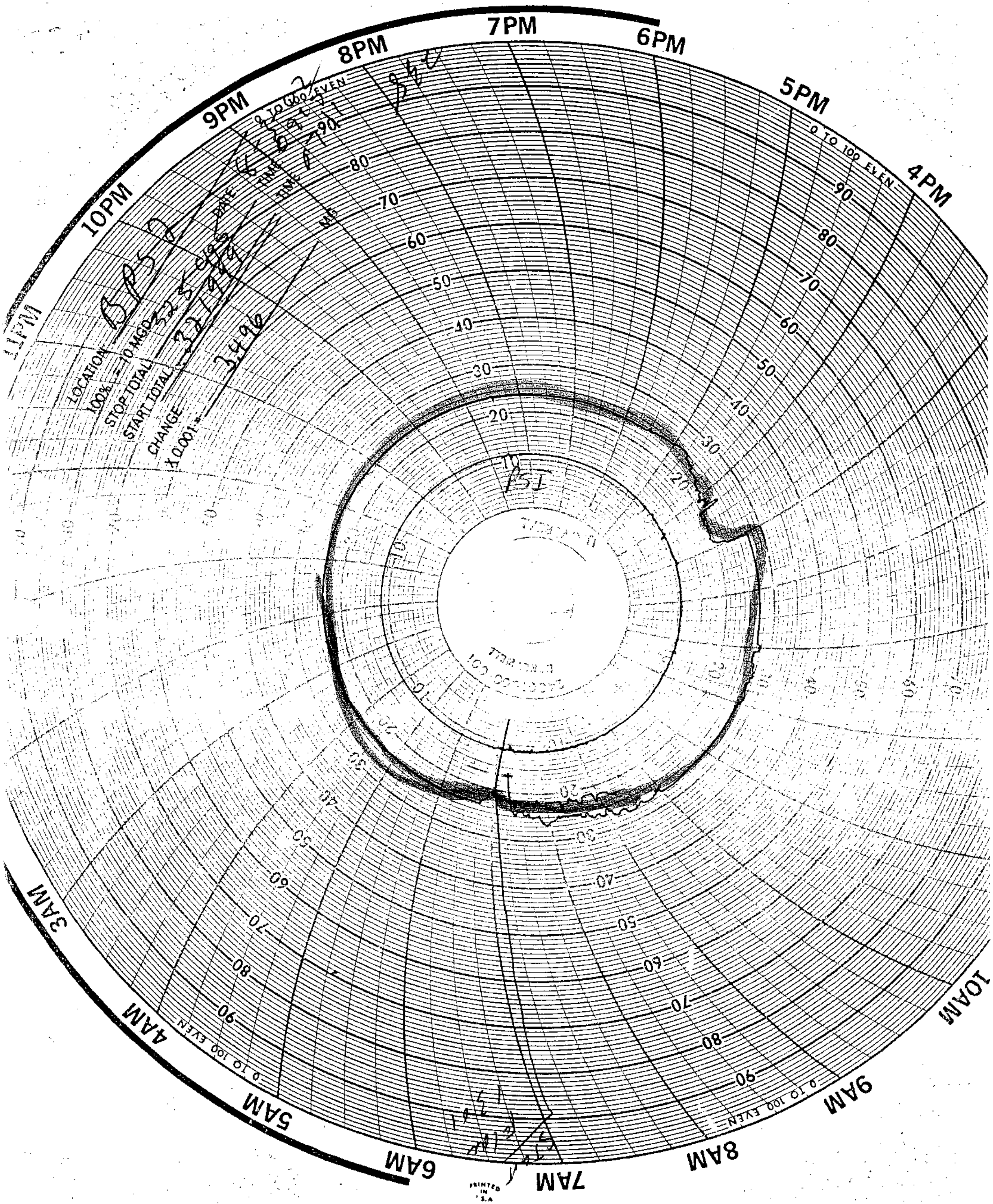


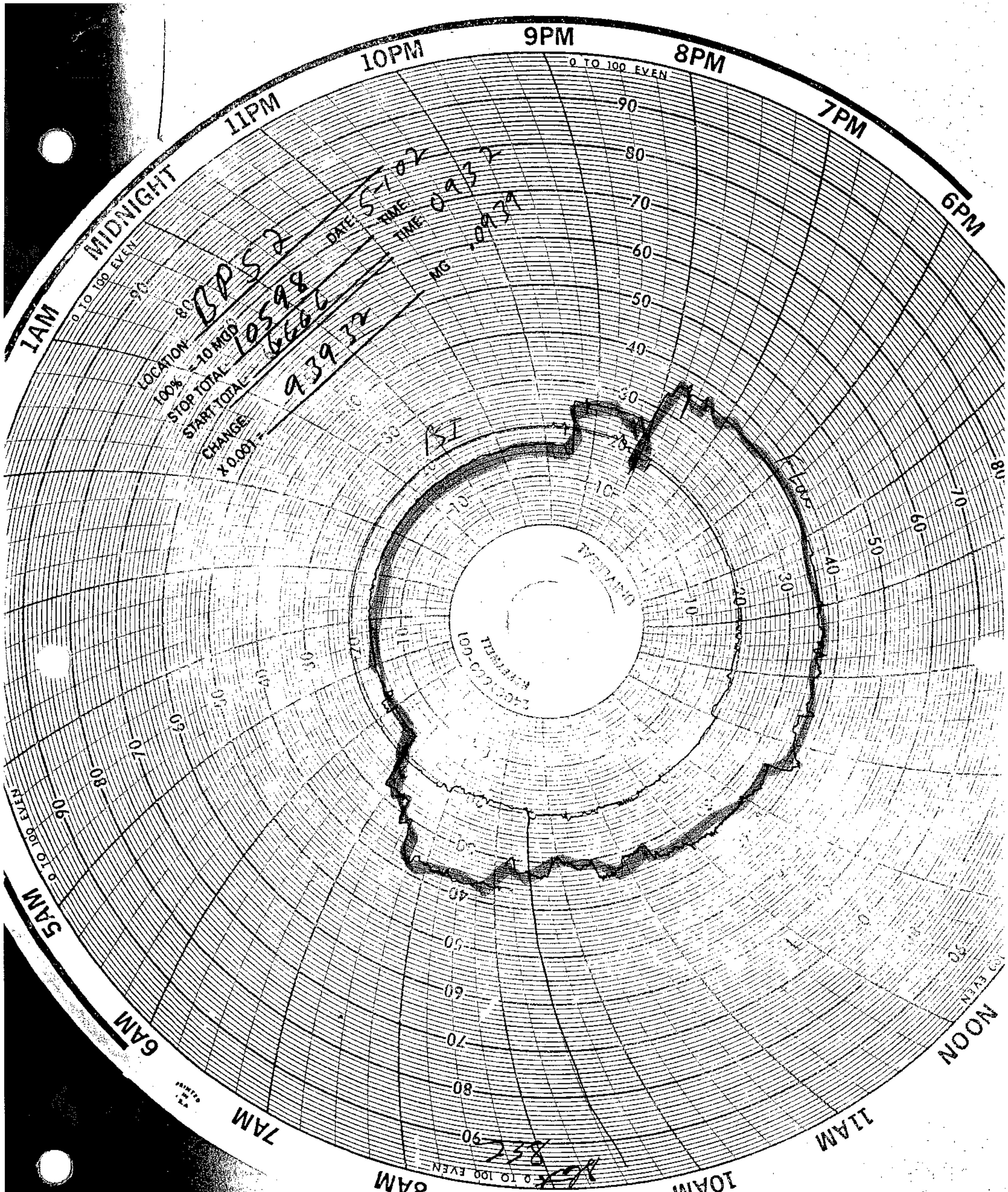
75HP

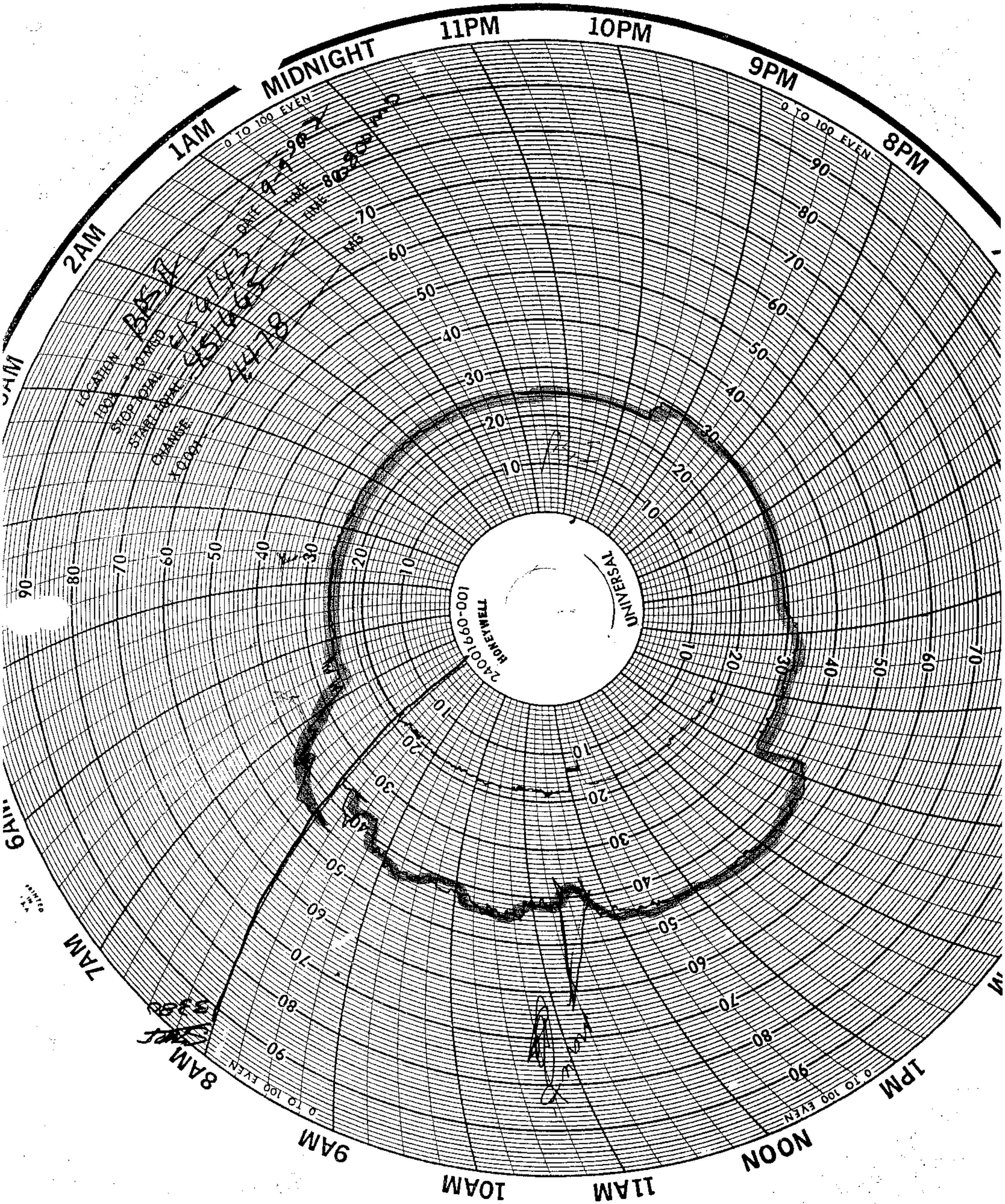
4

Booster Station #2
4 stages

Peabody / Floway


7PM
6PM
5PM
4PM
8PM
9PM
10PM
11PM
3AM
4AM
5AM
6AM
7AM
8AM
9AM
10AM
0 TO 100 EVEN
LOCATION
100% = 10 MGD
STOP TOTAL
START TOTAL
CHANGE
X 0.001 =
DATE
TIME
BPS 2
3496
PRINTED IN U.S.A.


LOCATION BPS2
100% = 10 MGD
STOP TOTAL 10598
START TOTAL 0666
CHANGE 9932
X 0.001 =
DATE 5-1-02
TIME 0932
TIME 0939
MG
0 TO 100 EVEN
MIDNIGHT
1AM
5AM
6AM
7AM
8AM
9AM
10AM
11AM
NOON
6PM
7PM
8PM
9PM
10PM
11PM



MIDNIGHT
11PM
10PM
9PM
8PM
1AM
2AM
6AM
7AM
8AM
9AM
10AM
11AM
NOON
1PM
0 TO 100 EVEN
LOCATION
STOP TOTAL
START TOTAL
CHANGE
X 1000
DATE
TIME
UNIVERSAL
HONEYWELL
24001660-001

APPENDIX F

POTENTIAL RECYCLED WATER USER IRRIGATED ACREAGE

APPENDIX F

POTENTIAL RECYCLED WATER USER IRRIGATED ACREAGE

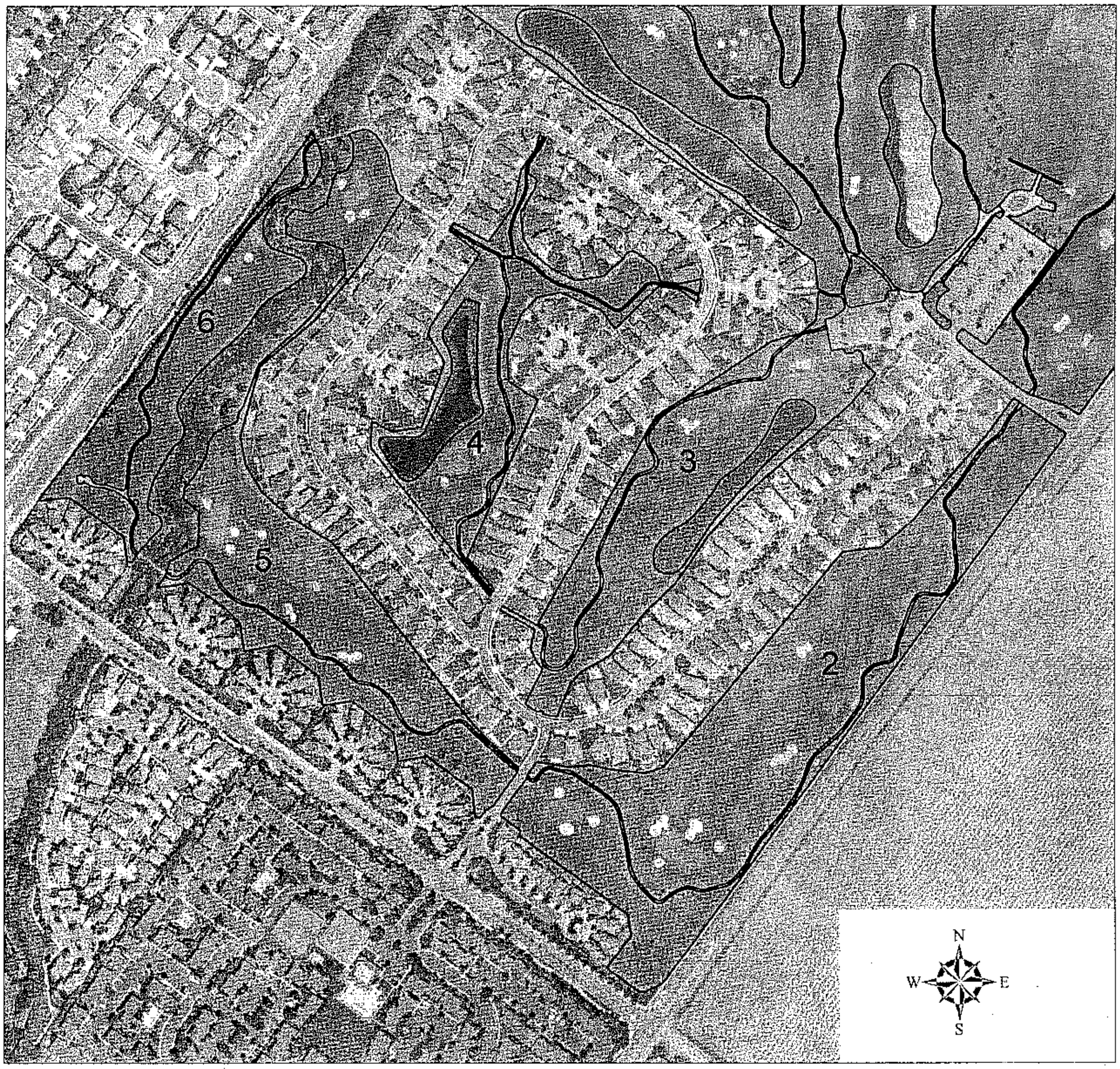
The total amount of irrigated acres for potential customers within the City limits was provided by the City from previous work provided by another consultant. It was determined that several of the areas provided in acres seemed incorrect. The City then provided aerial maps outlining the irrigated areas and the total calculated acreage of irrigated land for land that was in question. This information has been incorporated into Table III-2 and is attached for reference. Irrigated acreage was calculated for the following potential tertiary recycled water customers.

Potential Tertiary Customer	Irrigated Acreage
Adobe Creek Golf Course – Northeast	96.9
Adobe Creek Golf Course – Southwest	40.8
Airport	2.3
Arroyo Park	3
Casa Grande High School	23.5
Casa Grande Streetscape	0.5
Jack Cavanaugh Park	0.04
Country Club Open Space	2.4
Driving Range	11.8
Eagle Park	2.9
Fairgrounds and Library	8.8
Gatti Park	7.3
Kenilworth Fields	11.4
Lucchesi Park	13.1
McDowell Park	5.3
McDowell Meadows Park	0.8
McNear Landing	0.15
McNear Park	4.8
McNear Peninsula	17.5
Meadow Park	2.7
Oak Hill Park	2.7
Old Adobe School	6.6
Petaluma Golf Course	43.1
Petaluma Junior High School	6.6
Prince Park	11.1
Redwood Business Park	5.9
RESA (Redwood Estate Sports Plex)	18
Rooster Run Golf Course	126.4
Sonoma Mountain Elementary School	2.7
Santa Rosa Junior College – Phase II	5.4
South McDowell Streetscape	0.08
Sunrise Park	2.1
Trun Bridge Park	2.3
Urban Separator North	11.9
Urban Separator South	11.4
Valley Vista Elementary School	3.5
Wiseman Park (Extended)	19.4

Adobe Creek Golf Course (NE) Scale: 1" =500'

1) 96.9 ac (area 1) NE

Total: 137.7 ac

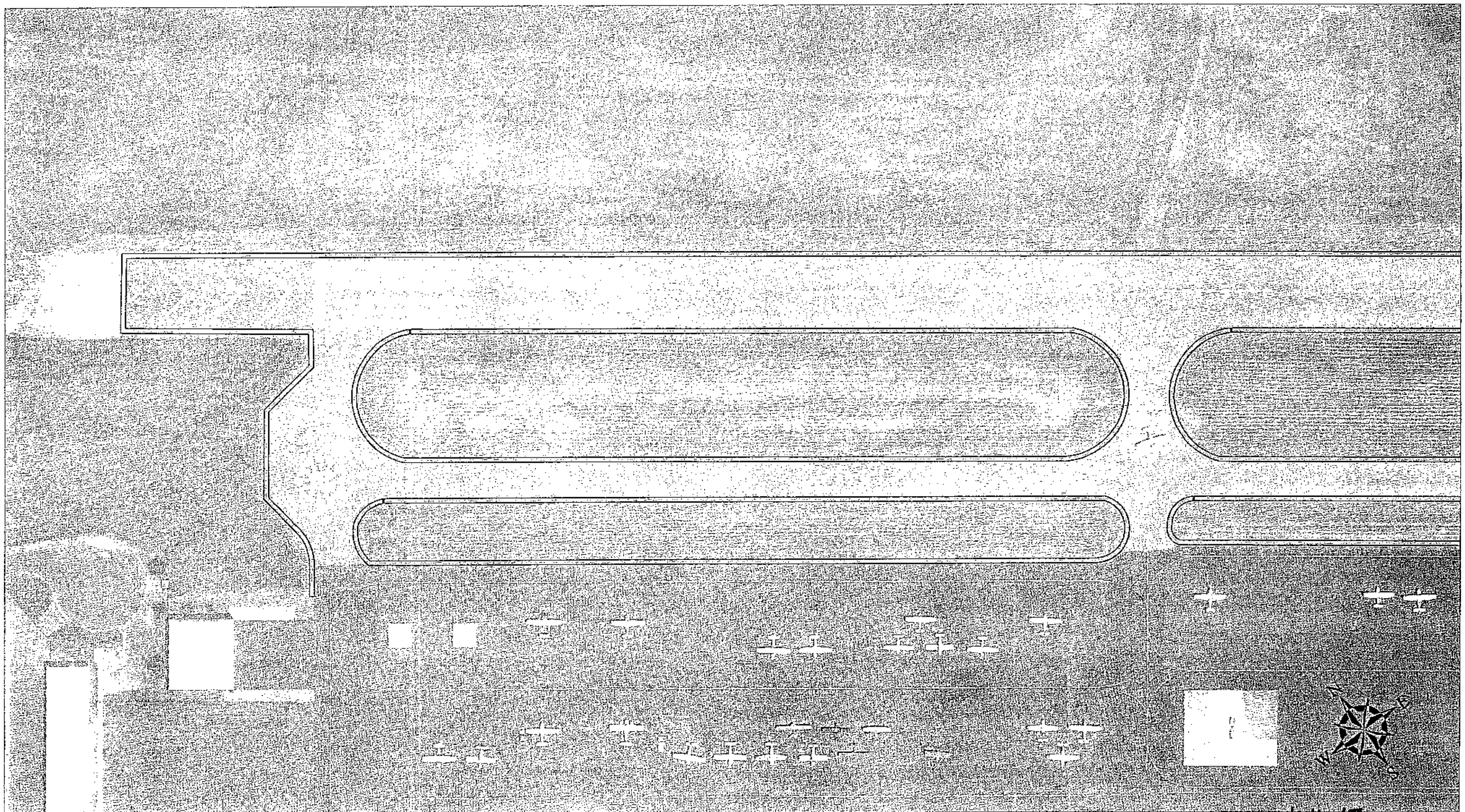


Adobe Creek Golf Course (SW) Scale: 1" =500'

2) 14.9 ac
3) 7.3ac
4) 4.8 ac
5) 9.1 ac
6) 4.7 ac

40.8

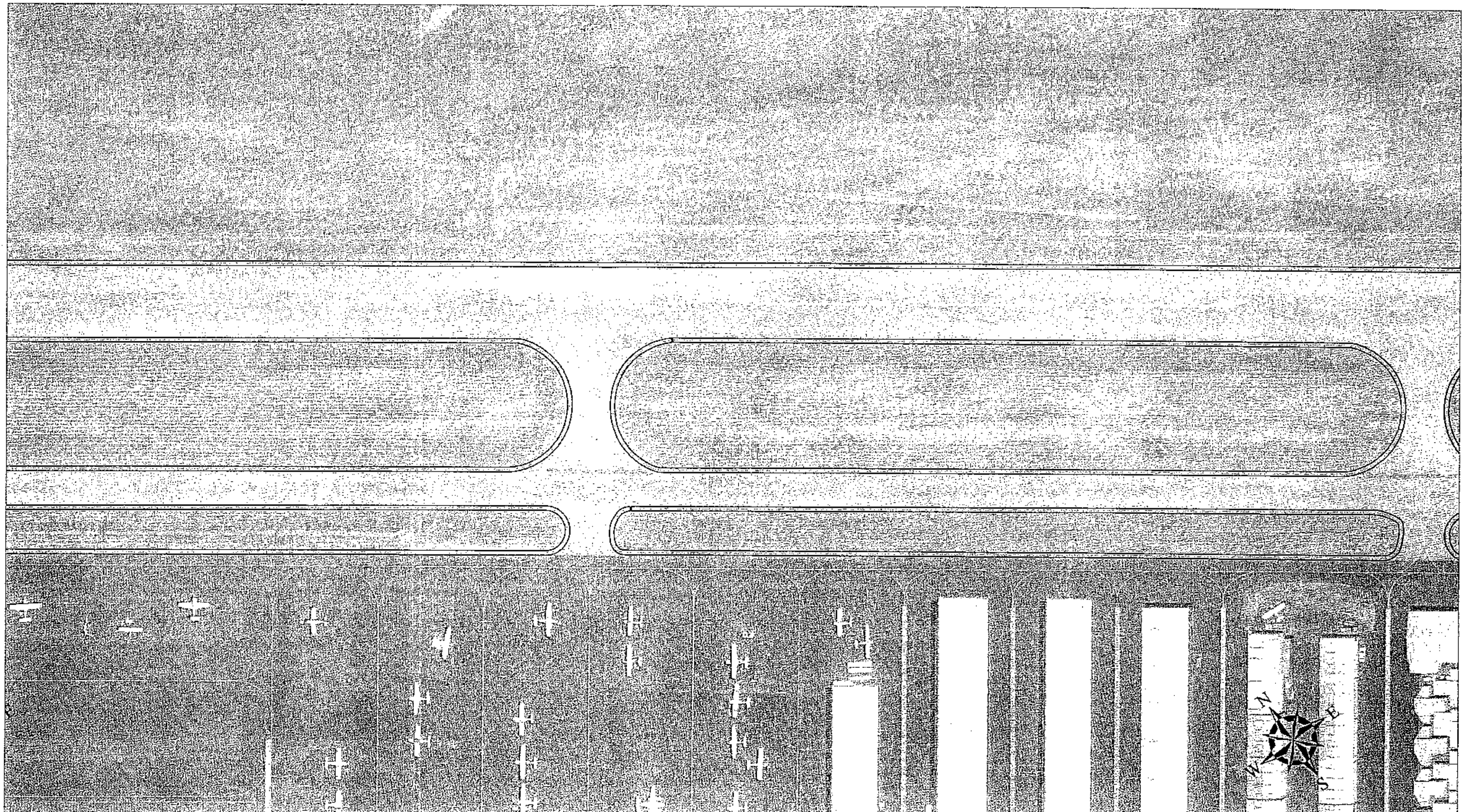
A-2



Airport

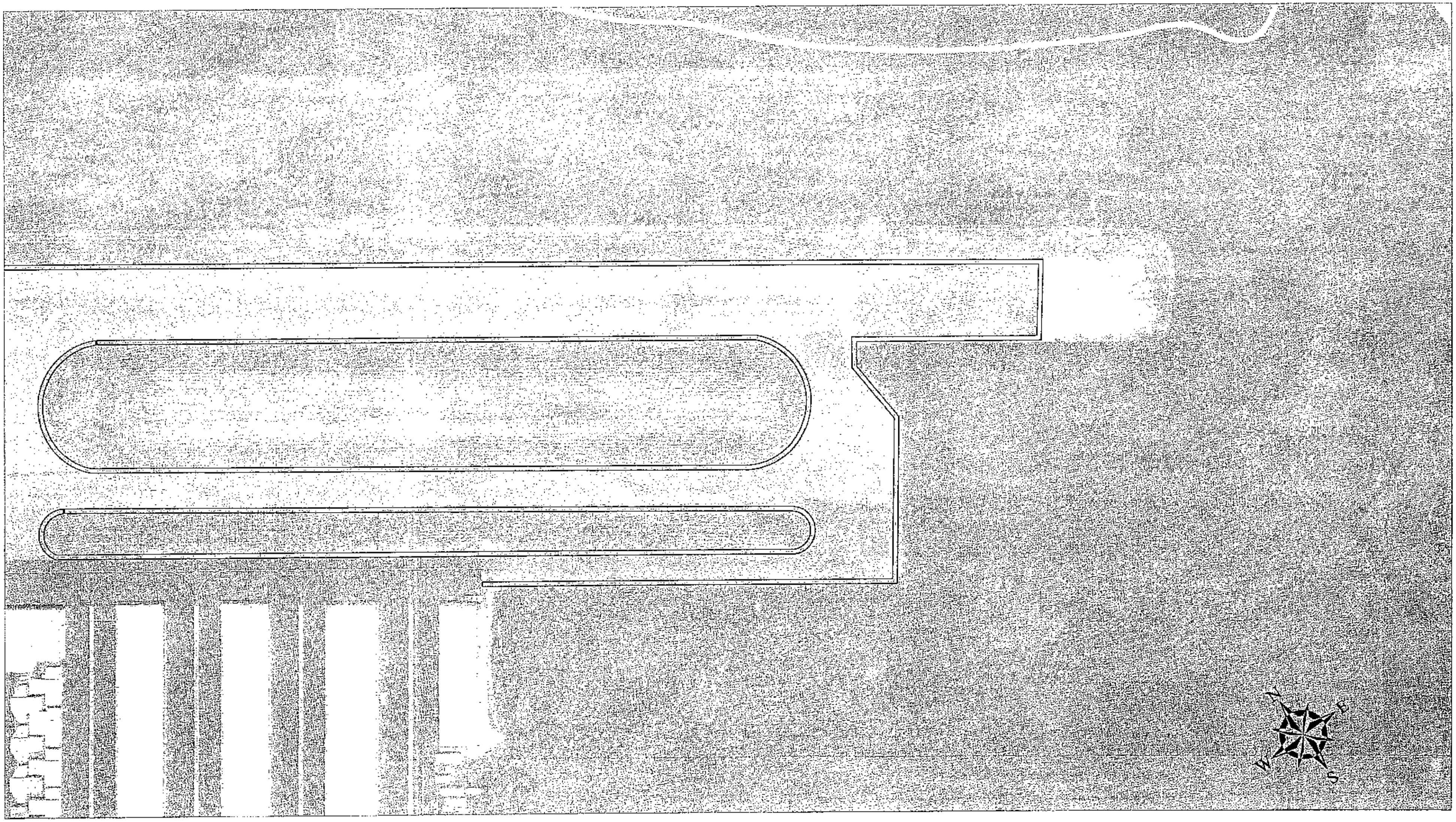
Scale: 1" =100' but
at 11x17
Reduced by 64%

Total: 2.3 ac



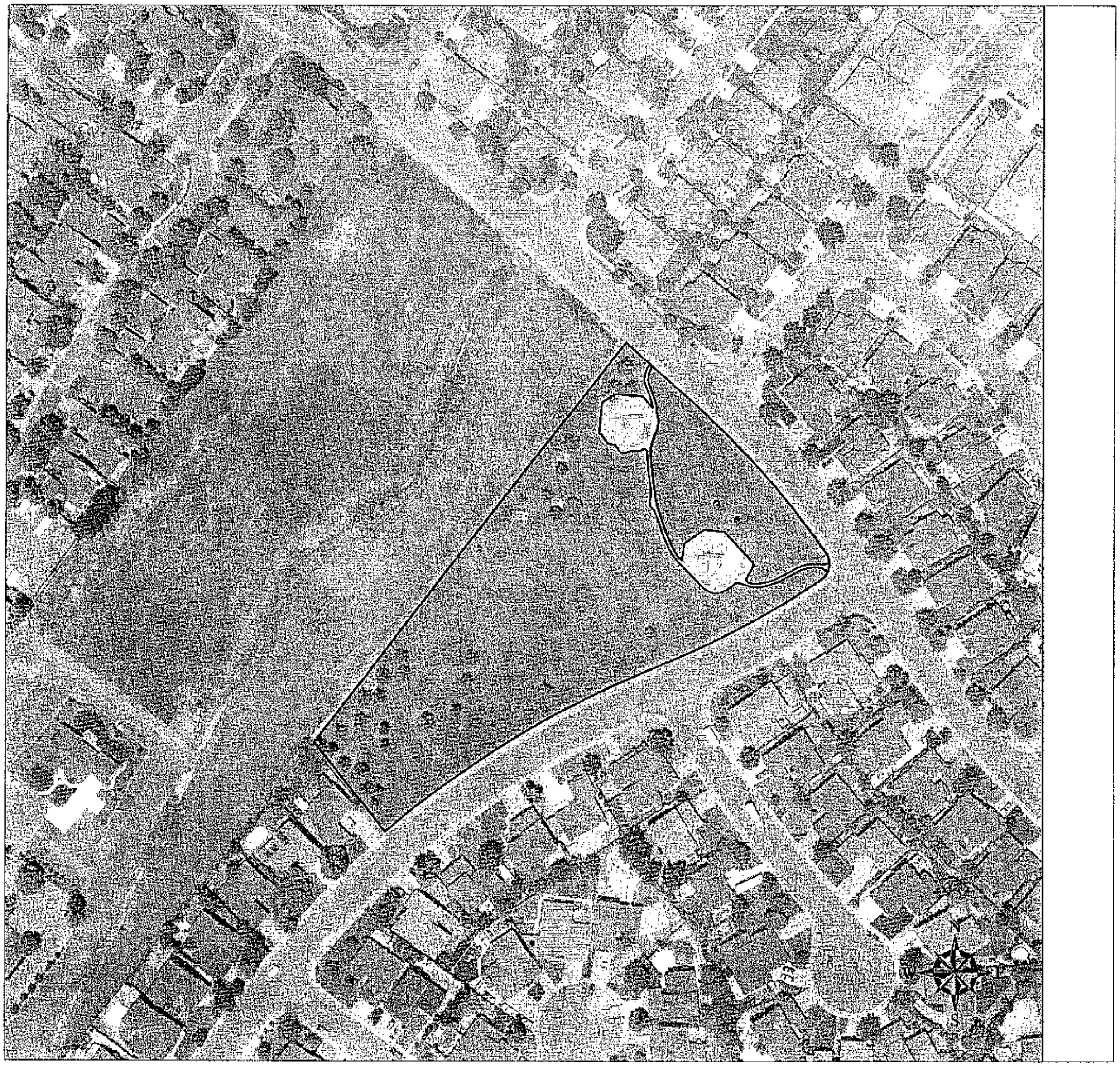
Airport

Scale: 1" =100'@ 11x17
but reduced by 64%



Airport

Scale: 1" =100'@11x17
but reduced by 64%



Arroyo Park

Scale: 1" =200'

Total: 3 ac

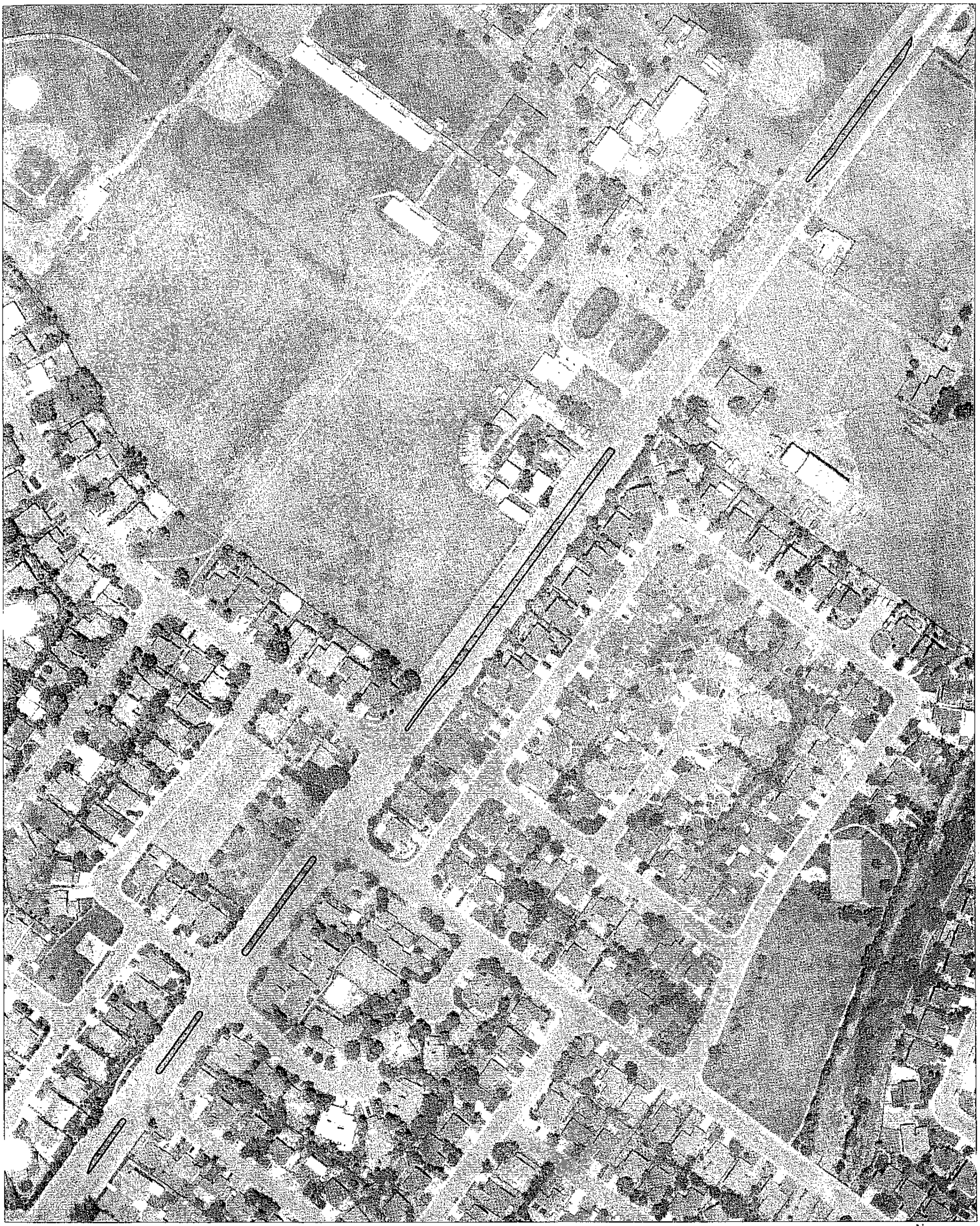
A-6

CASA GRANDE HIGH SCHOOL SCALE: 1' = 400'

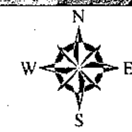
1) 282,061 sq. ft.
2) 357,811 sq. ft.
3) 103,130 sq. ft.
4) 64,706 sq. ft.
5) 131,696 sq. ft.
6) 85,949 sq. ft.

Total: 23.5 ac.

E-307



Casa Grande Street Scape   Total: 0.5 ac   N.T.S.



E-50

Jack Cavanaugh Park

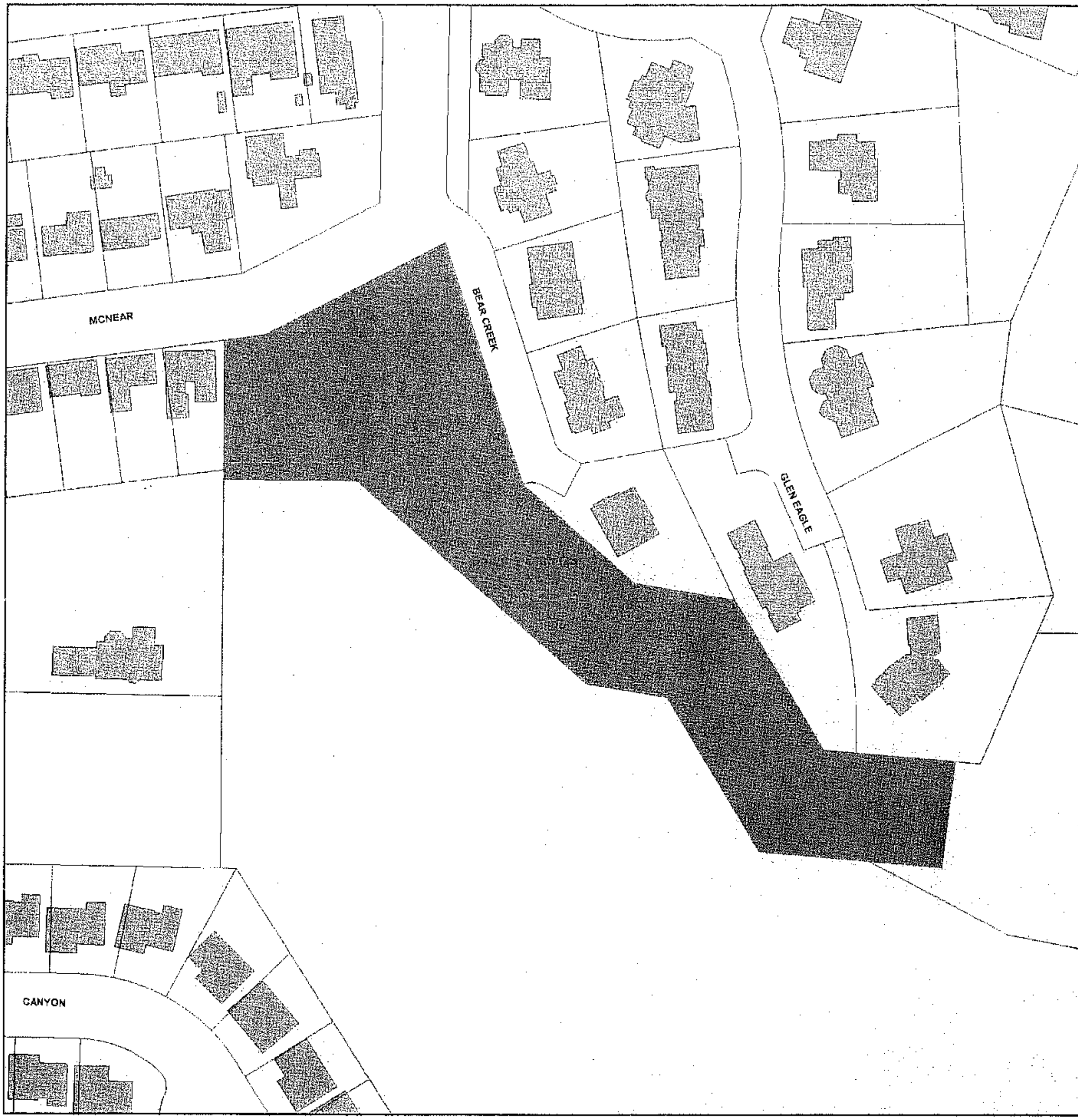
Scale: 1" =50'

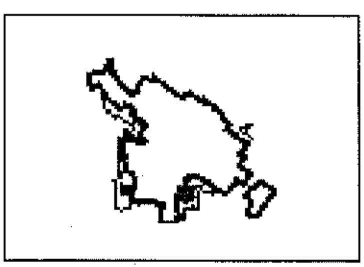
Total: 0.04 ac

E-104

Country Club Open Space

City of Petaluma, California





Street Names
City Limit
Major Streets
Parcel Outlines
Building Footprints
Creeks
Parks

Total: 2.4 ac

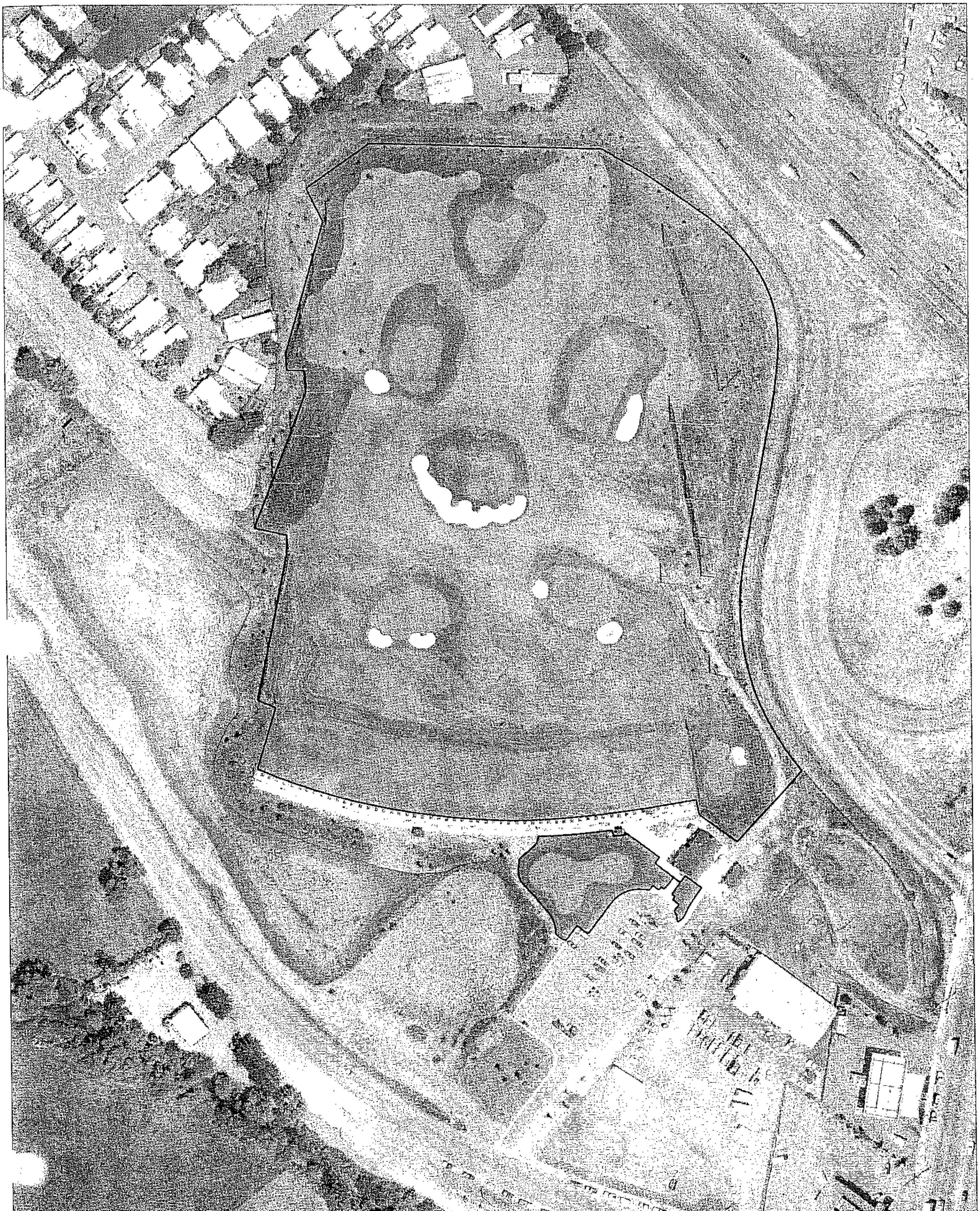
GIS Division

DISCLAIMER
These maps or plans were compiled and digitized via electronic means utilizing many source documents. It is intended to be representative of certain physical, legal and geometric features within the City of Petaluma, CA and its environs. The existence or location of facilities must be field verified and this document does not imply or guarantee neither adequate capacity nor the availability of service. The City of Petaluma assumes no responsibility regarding the accuracy of the information represented herein for legal documentation, representations of actual construction or for any other purpose for which this map was not intended.

Printed: 8/8/2003 12:57:19 PM

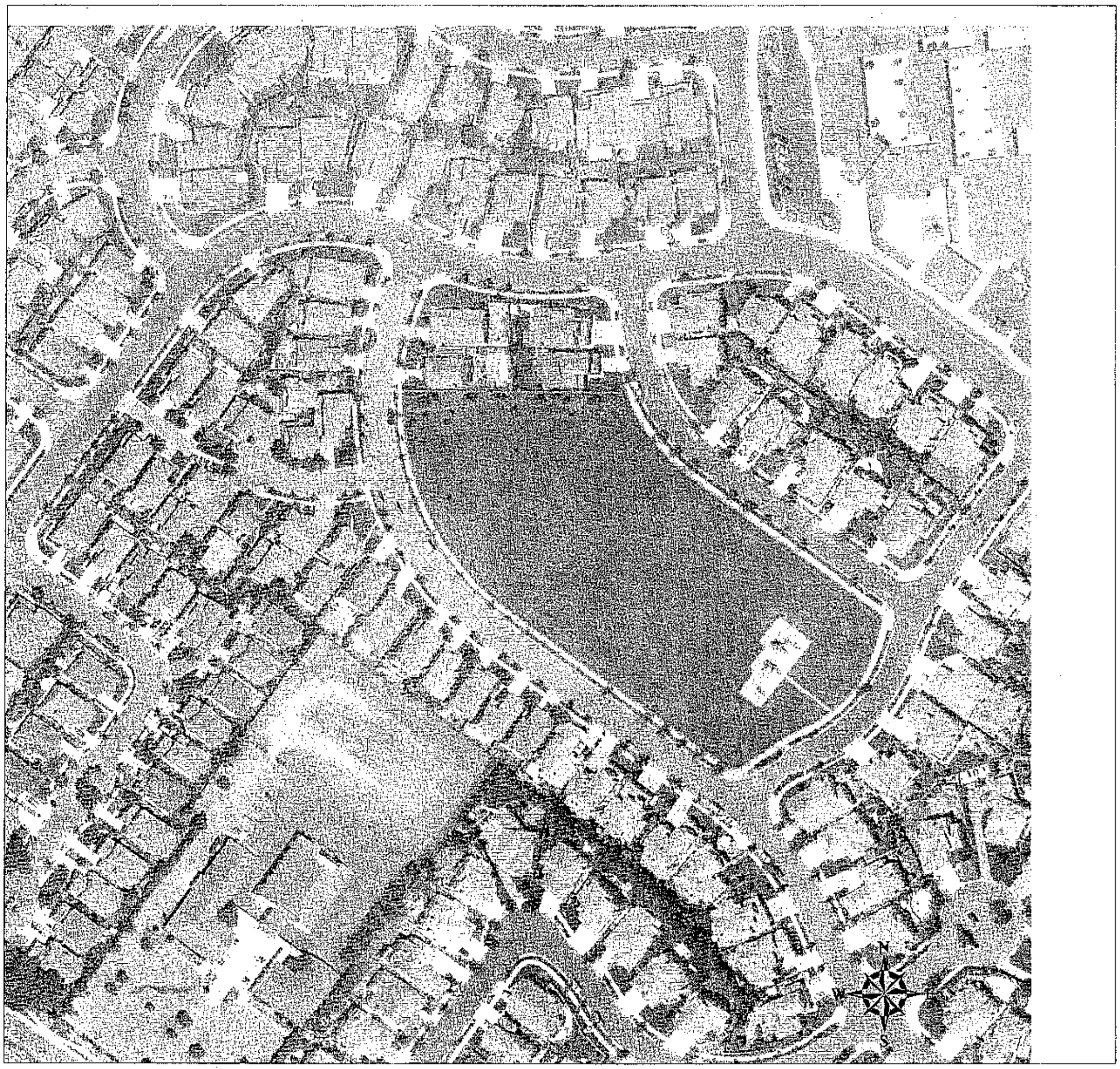
Powered By GeoSmart.net

D-302



Driving Range Total: 11.8 ac Scale: N.T.S.

C-10

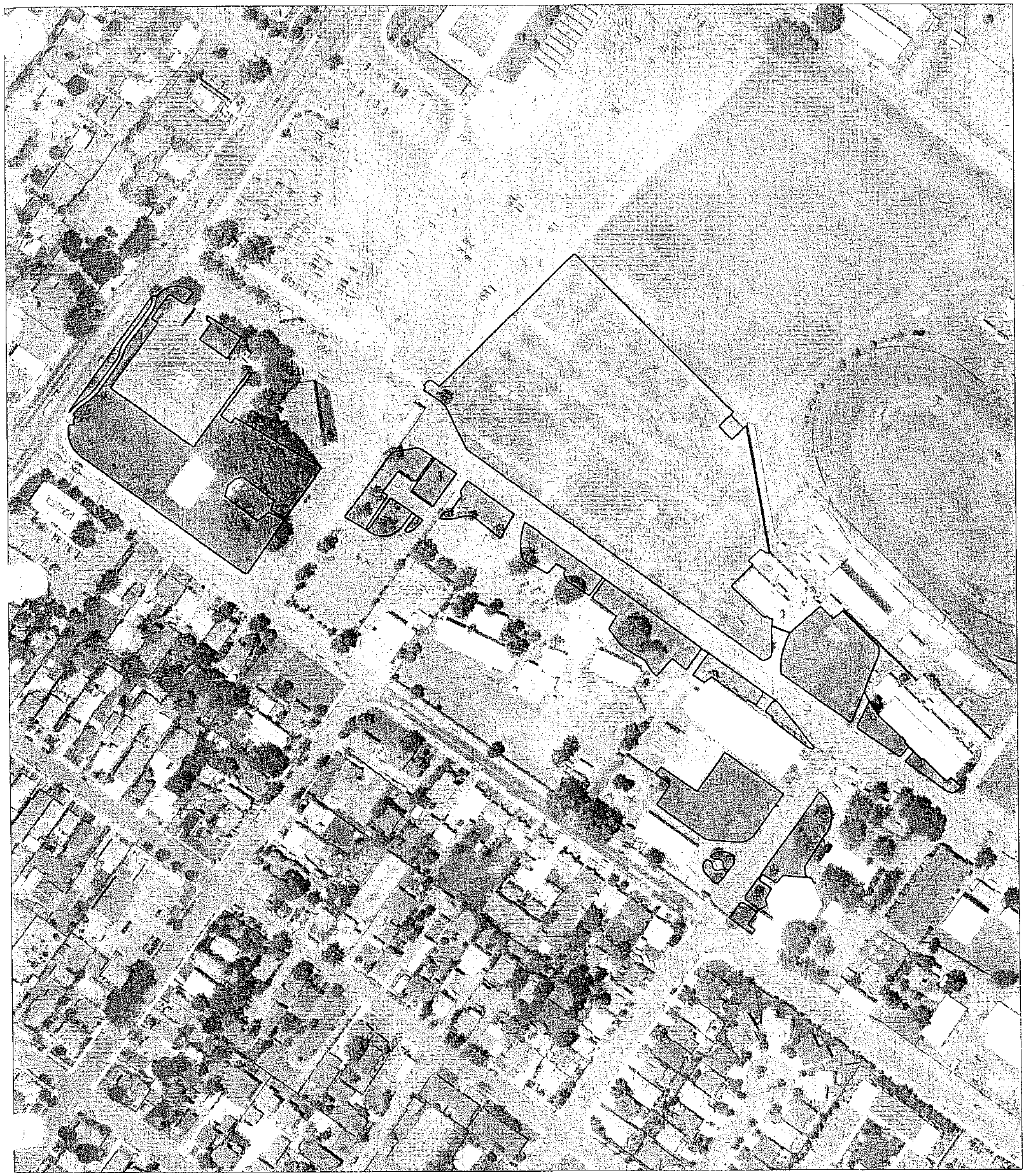


Eagle Park

Scale: 1" =200'

Total: 2.9 ac

E-52

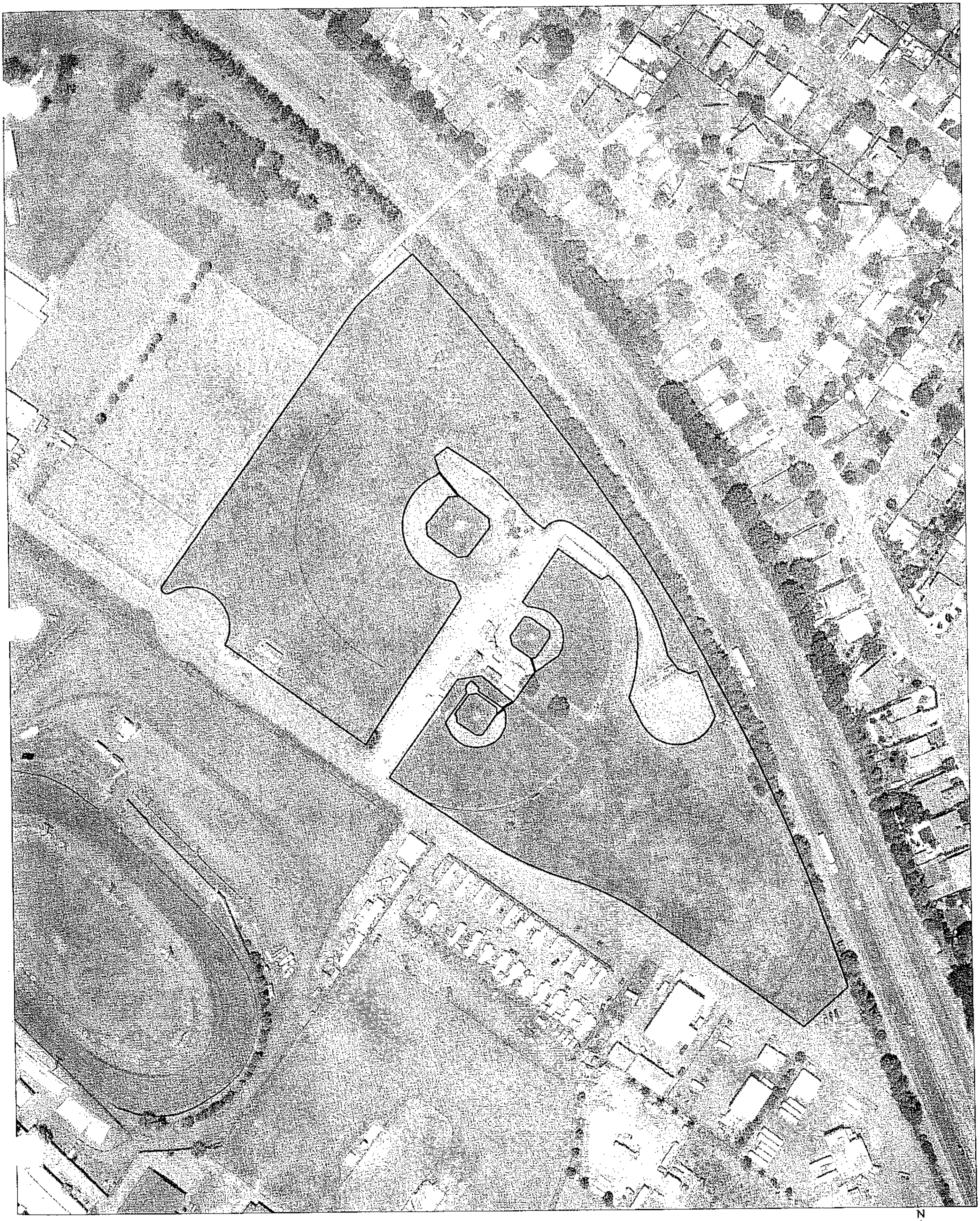


Fair Grounds & Library   Total: 8.8 ac   Scale: N.T.S.

C-11

Gatti Total: 7.3 ac Scale: N.T.S.

E -#308



Kenilworth Fields Total: 11.4 ac Scale: 1"=200'

C-#16

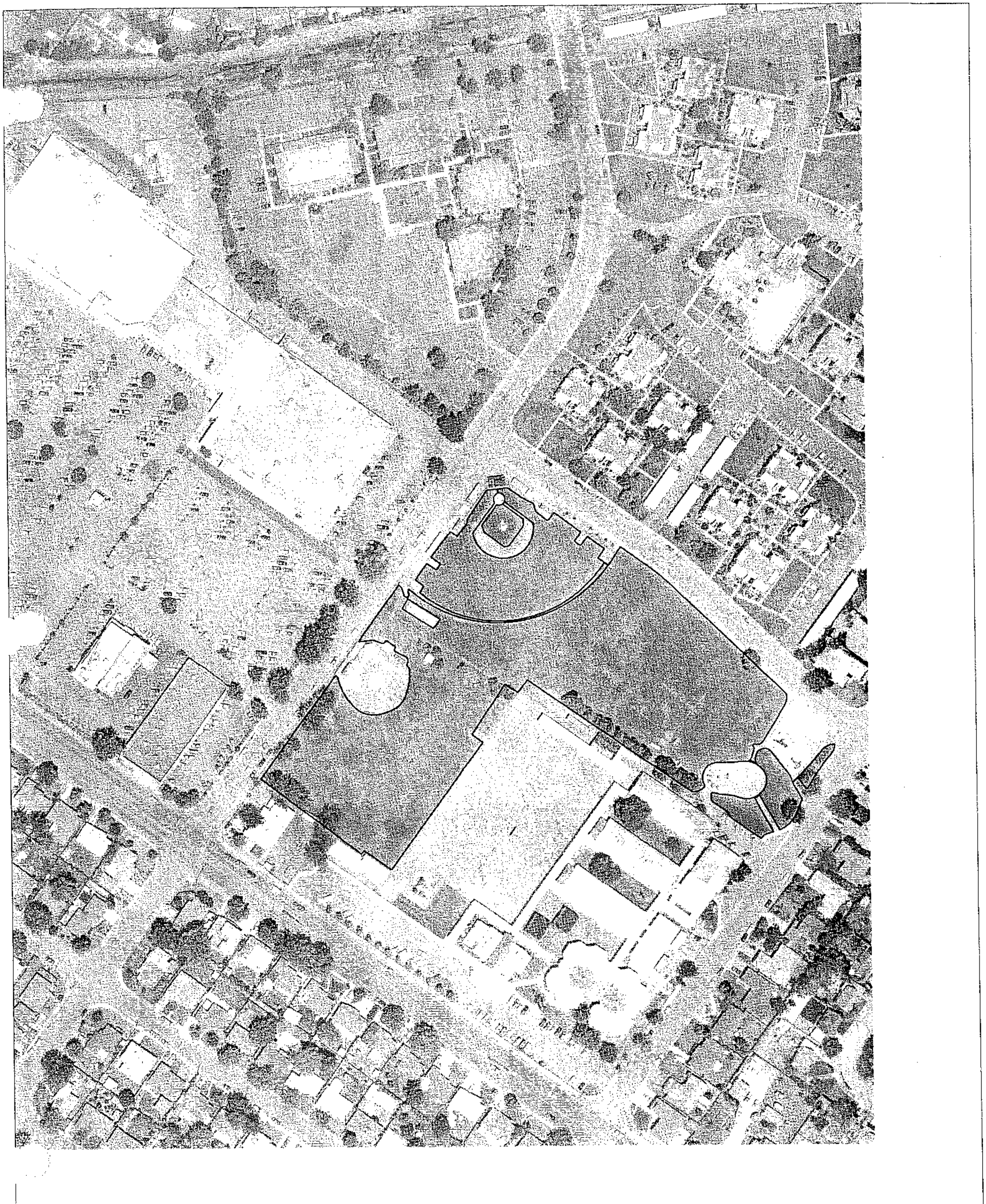
Lucchesi Park

Scale: 1" =200'

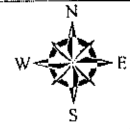
1) 2.3 ac
2) 9.9 ac
3) 0.9ac

Total: 13.1 ac

C-#17



McDowell Park Total: 5.3 ac Scale: 1"=200'



C- #60

Mc Dowell Meadows Park

Scale: 1" =100'

Total: 0.8 ac

E-#64

McNear Landing

Scale: 1" =50'

Total: 0.15 ac

E-#63

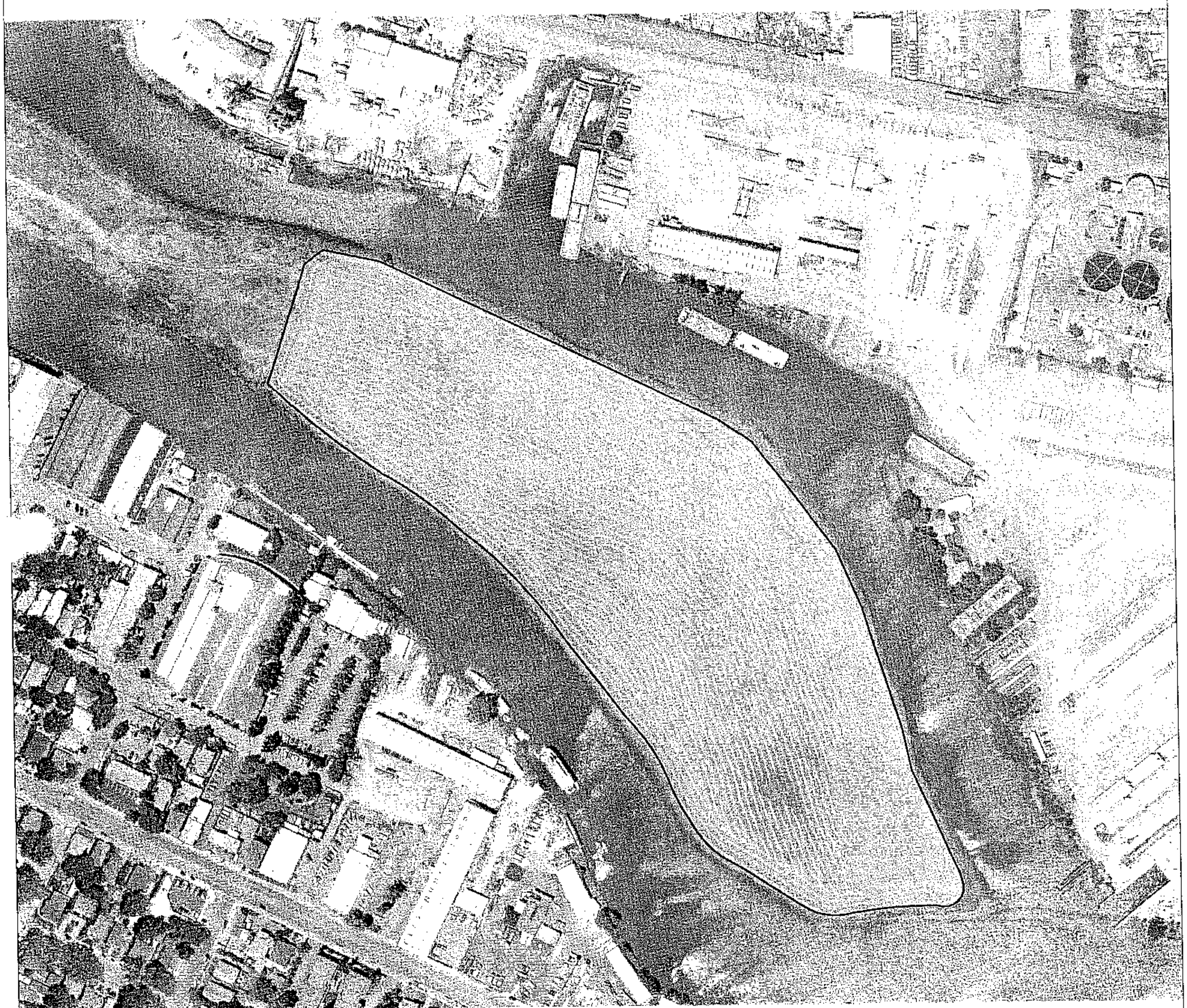
McNear Park

Scale: 1" =200'

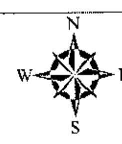
1) 2.8 ac
2) 2.0 ac

Total: 4.8 ac

E-#7C



McNear Peninsula Total: 17.5 ac Scale: 1"=300'



C-#19

Meadow Park Total: 2.7 ac Scale: 1" =200'

N
W E
S

E-#66

Oak Hill Park

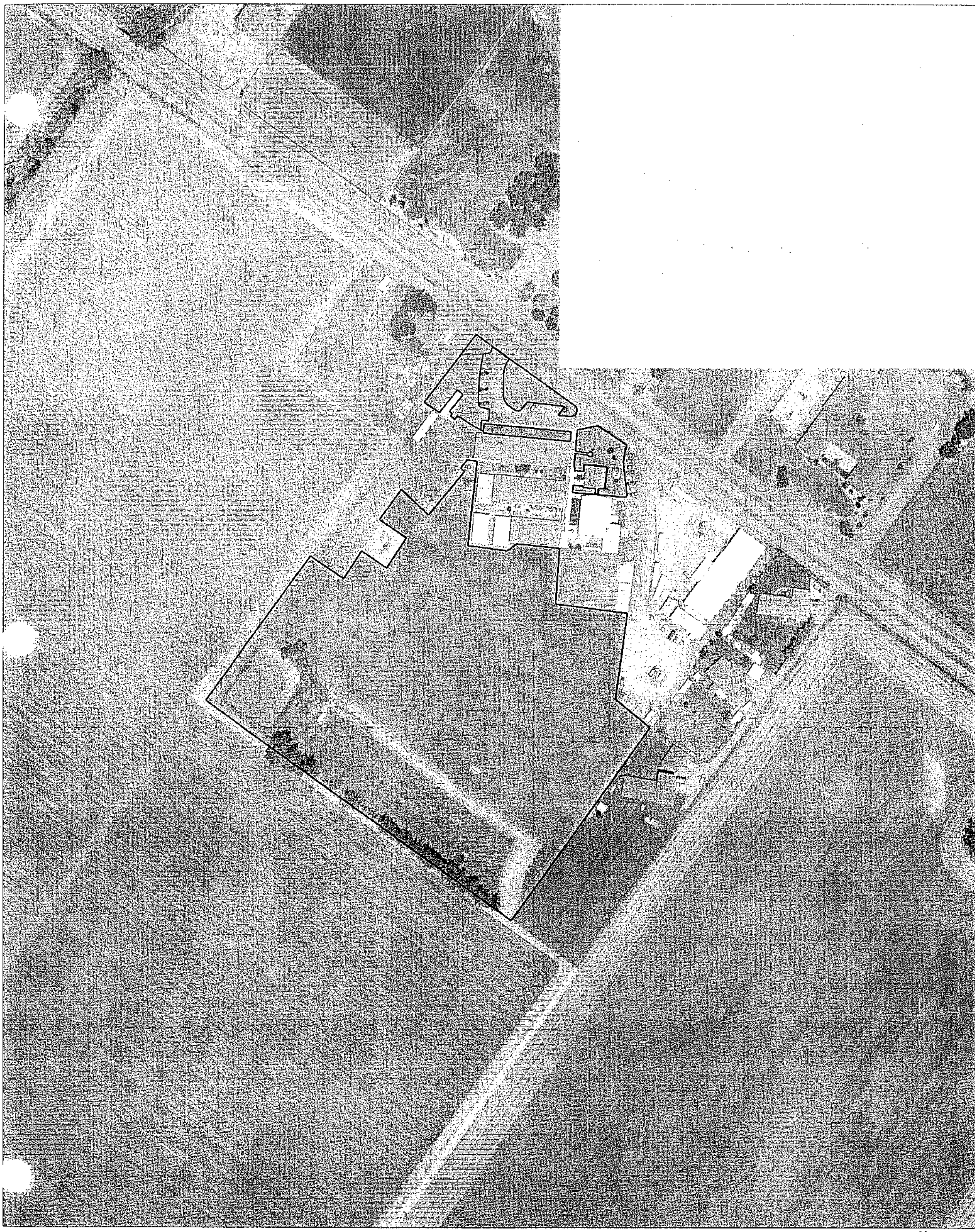
Scale: 1" =100'

7/2003

1) 2.3 ac
2) 0.4 ac

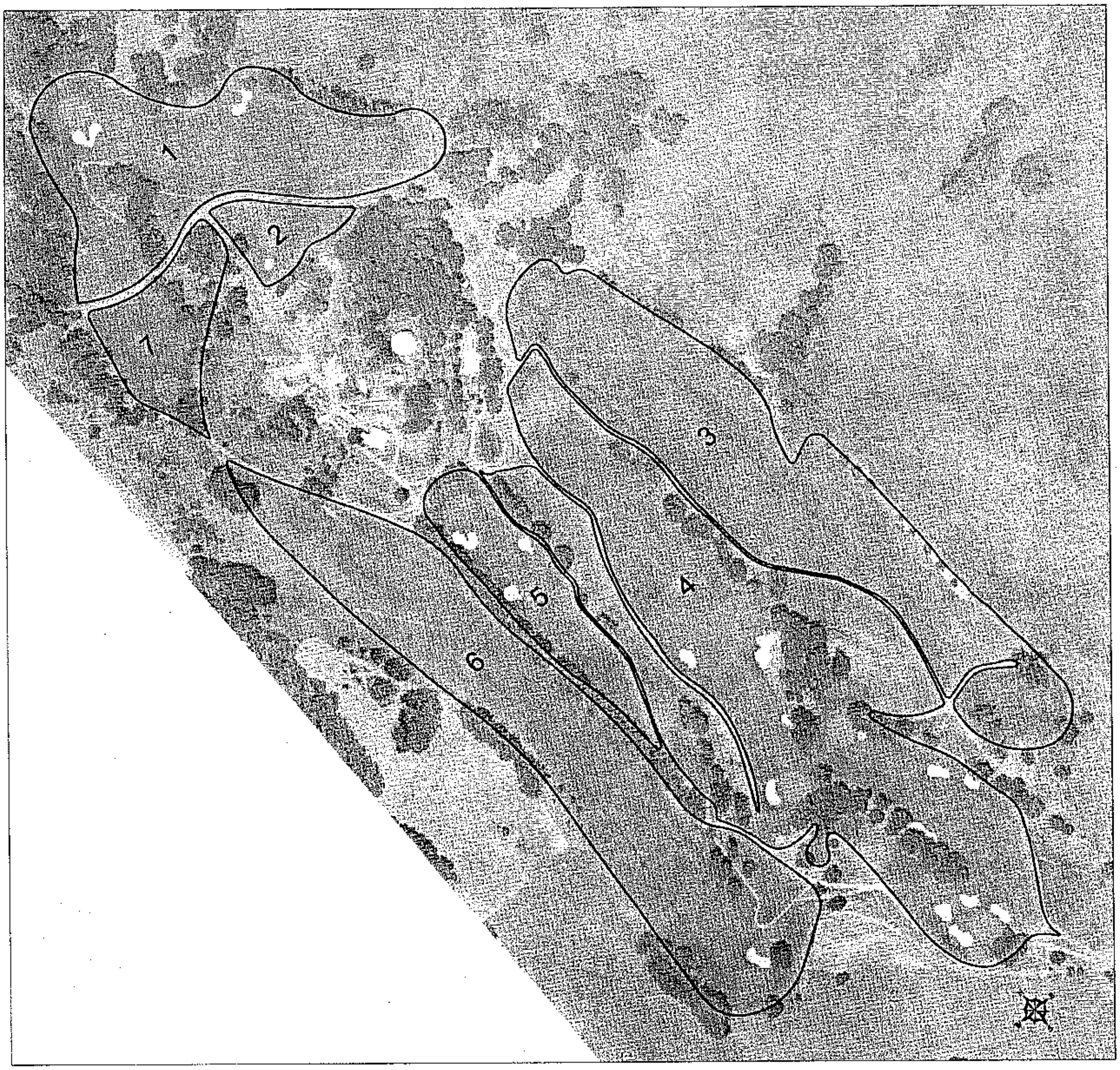
Total: 2.7 ac corrected

A - #306



Old Adobe Sch. Total: 6.6 ac Scale: 1"=200'

G-#73



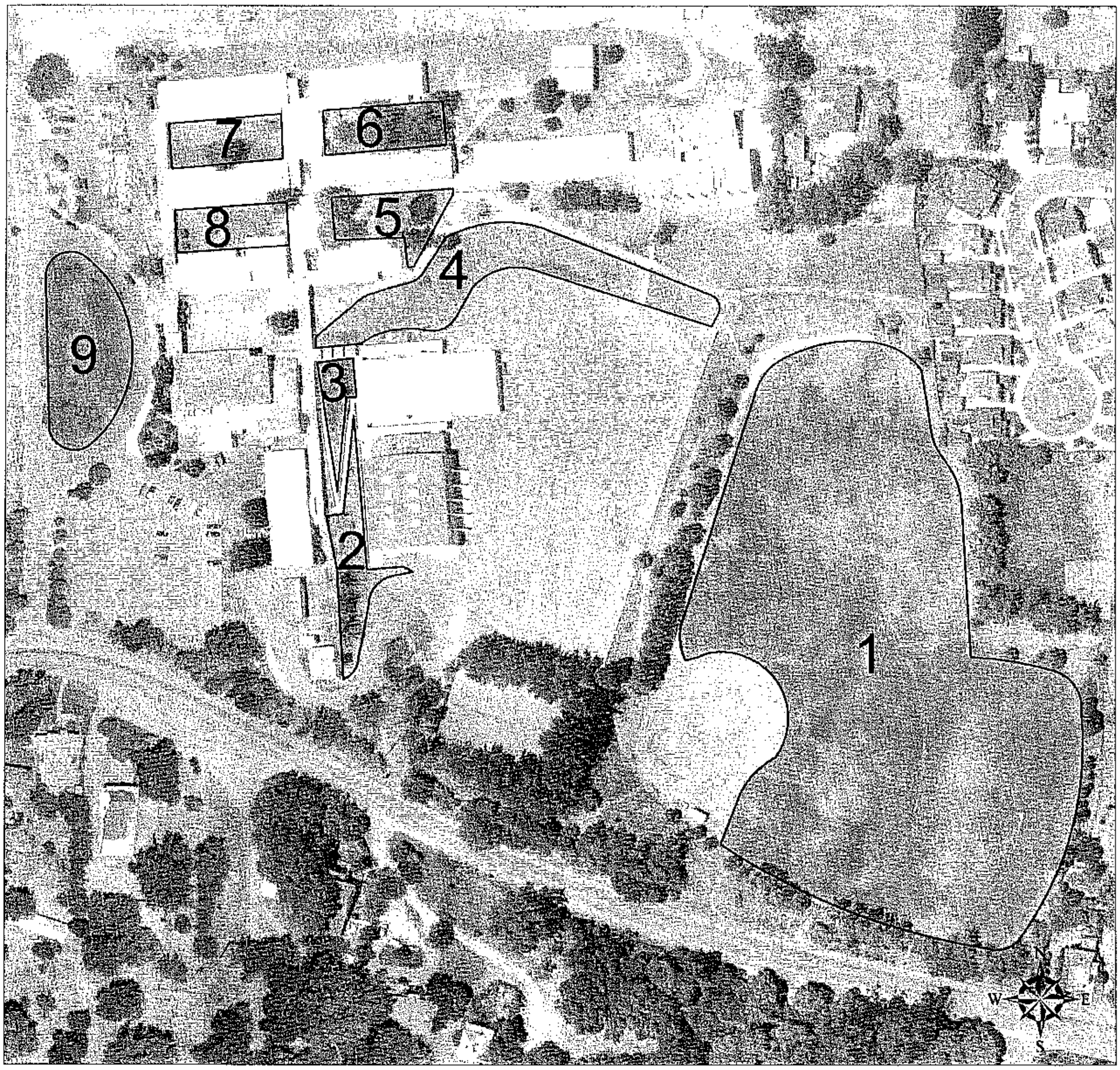
Petaluma Golf Course

Scale: 1" =400'

1) 6.0 ac
2) 0.8 ac
3) 8.6 ac
4) 14.7 ac
5) 2.2 ac
6) 9.0 ac
7) 1.8 ac

Total: 43.1 ac

E-#75



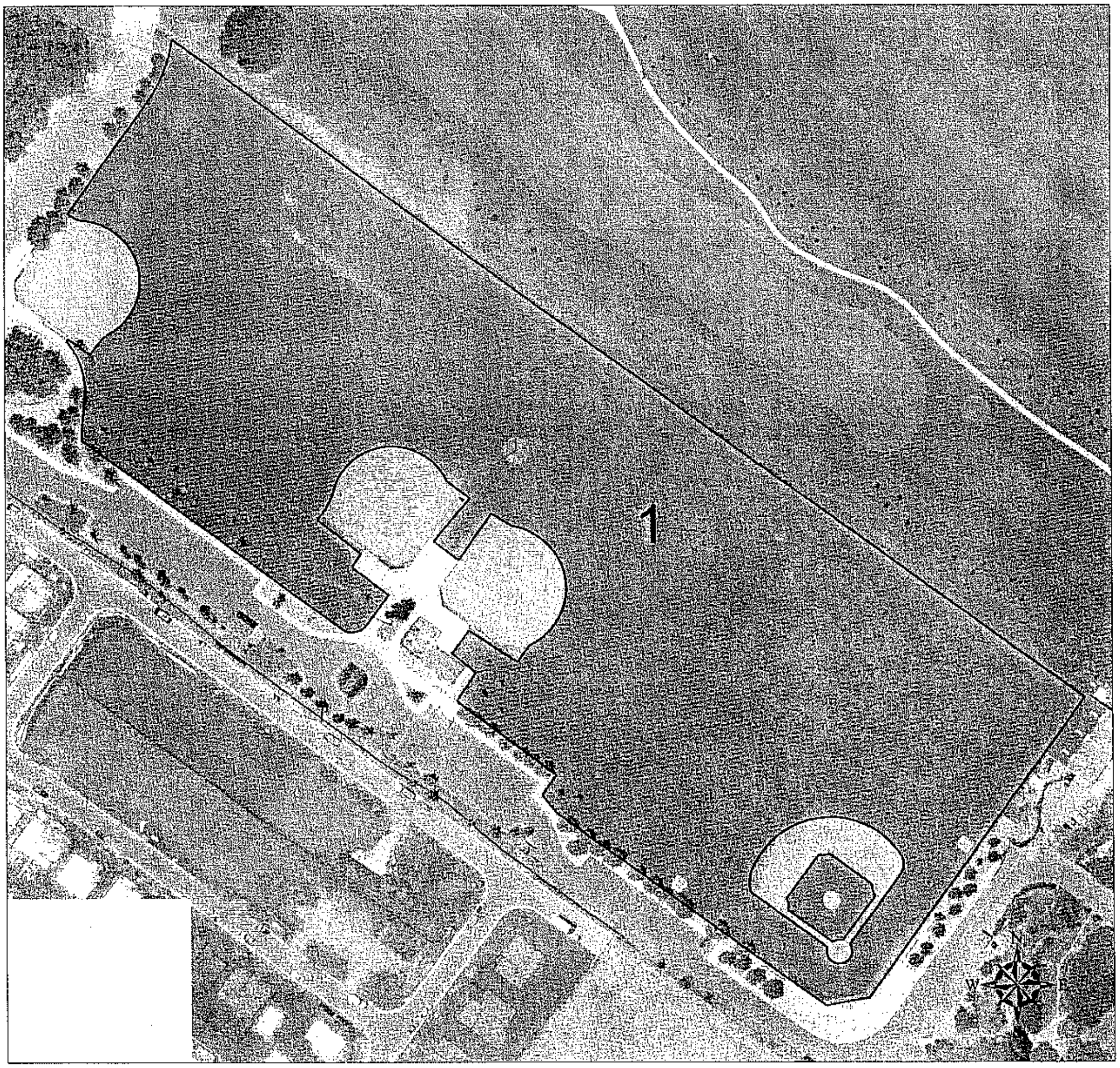
Petaluma Jr. High

Scale: 1" =200'

1) 4.6 ac
2) 0.2 ac
3) 0.1 ac
4) 0.5 ac
5) 0.2 ac
6) 0.2 ac
7) 02 ac
8) 0.2 ac
9) 0.4 ac

Total: 6.6 ac

A-#24



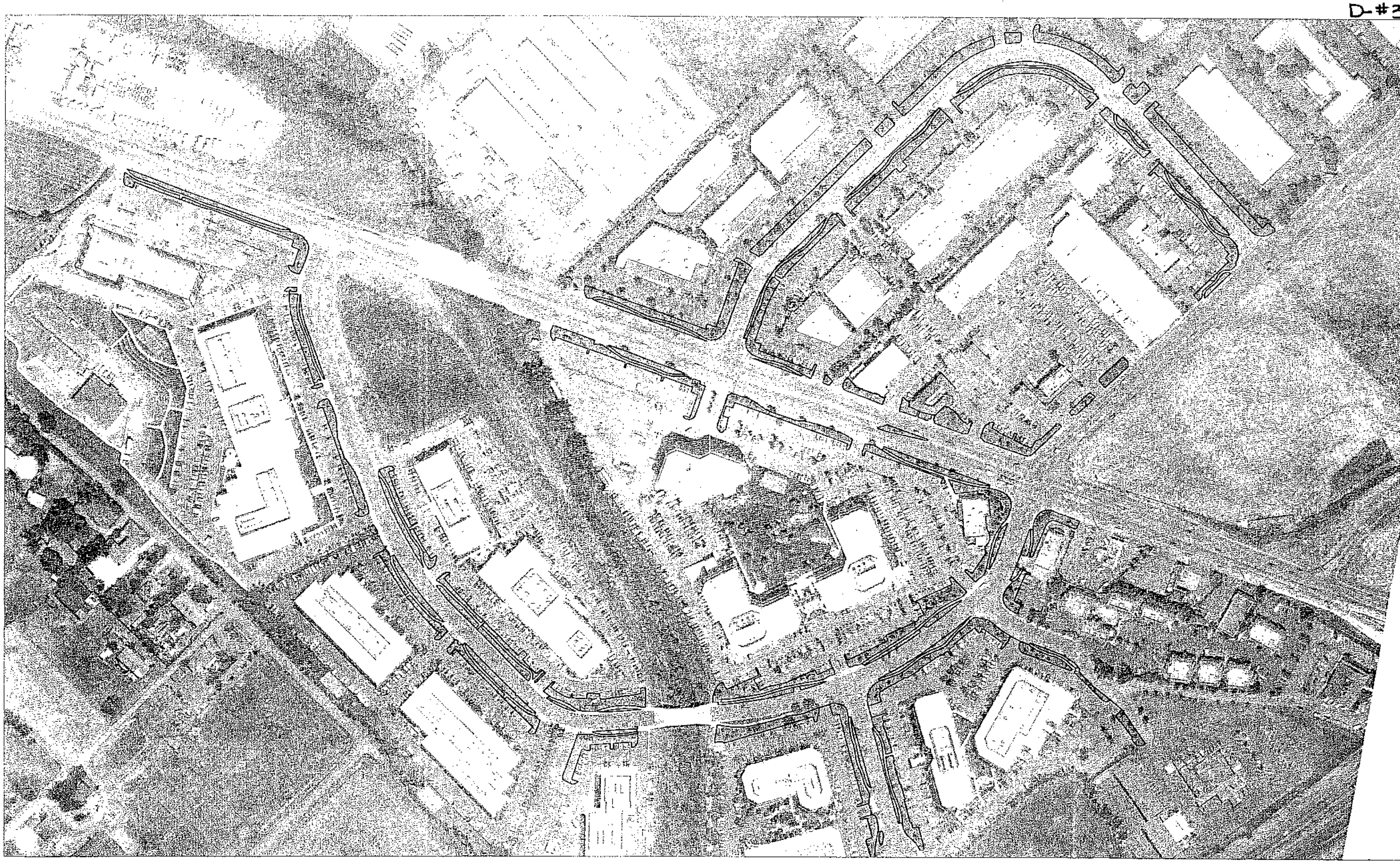
Prince Park

Scale: 1" =200'

1) 11.1 ac

Total: 11.1 ac

D-#301

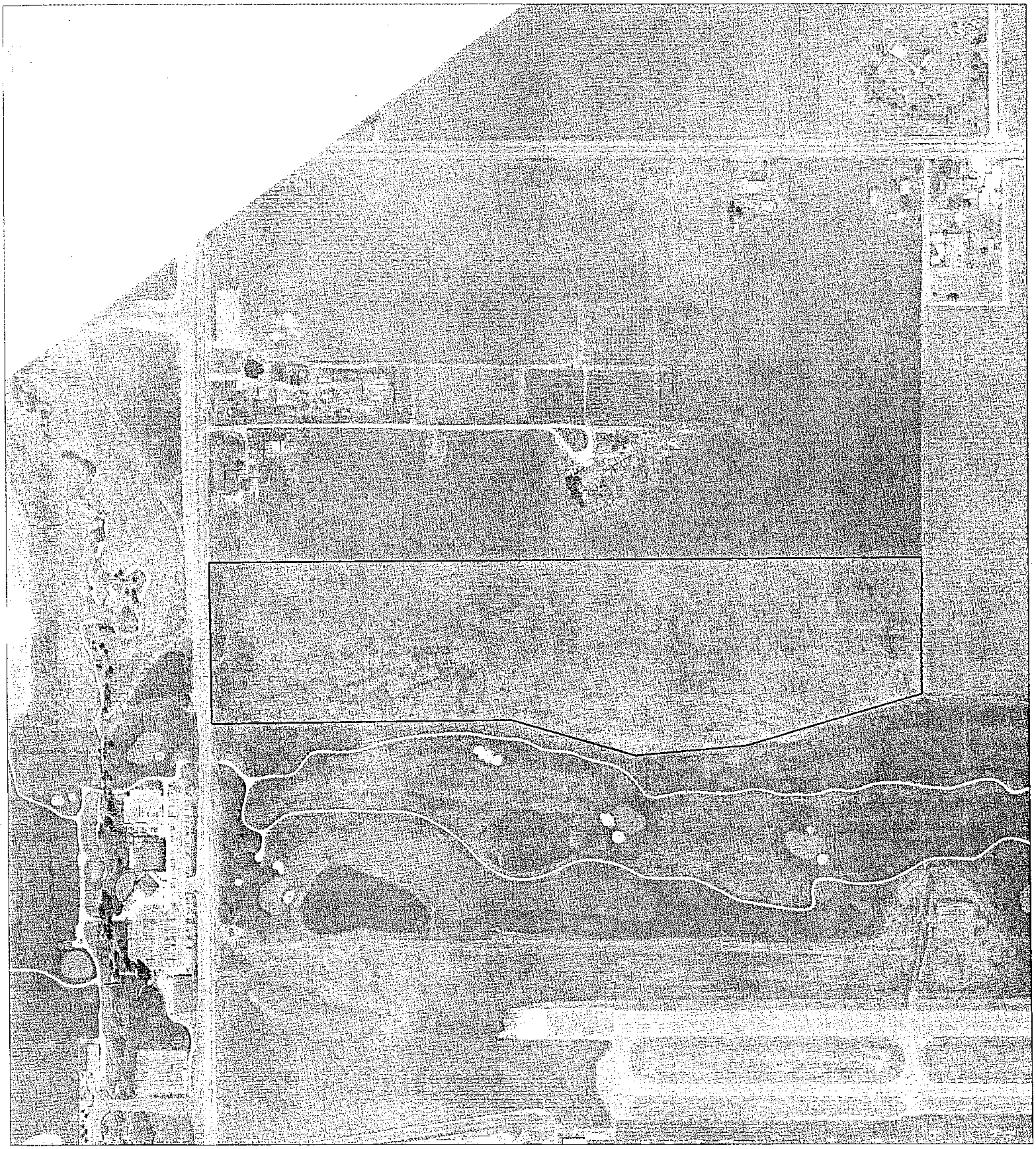


Redwood Business Park I, II, & III

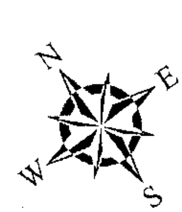
Total: 5.9 ac

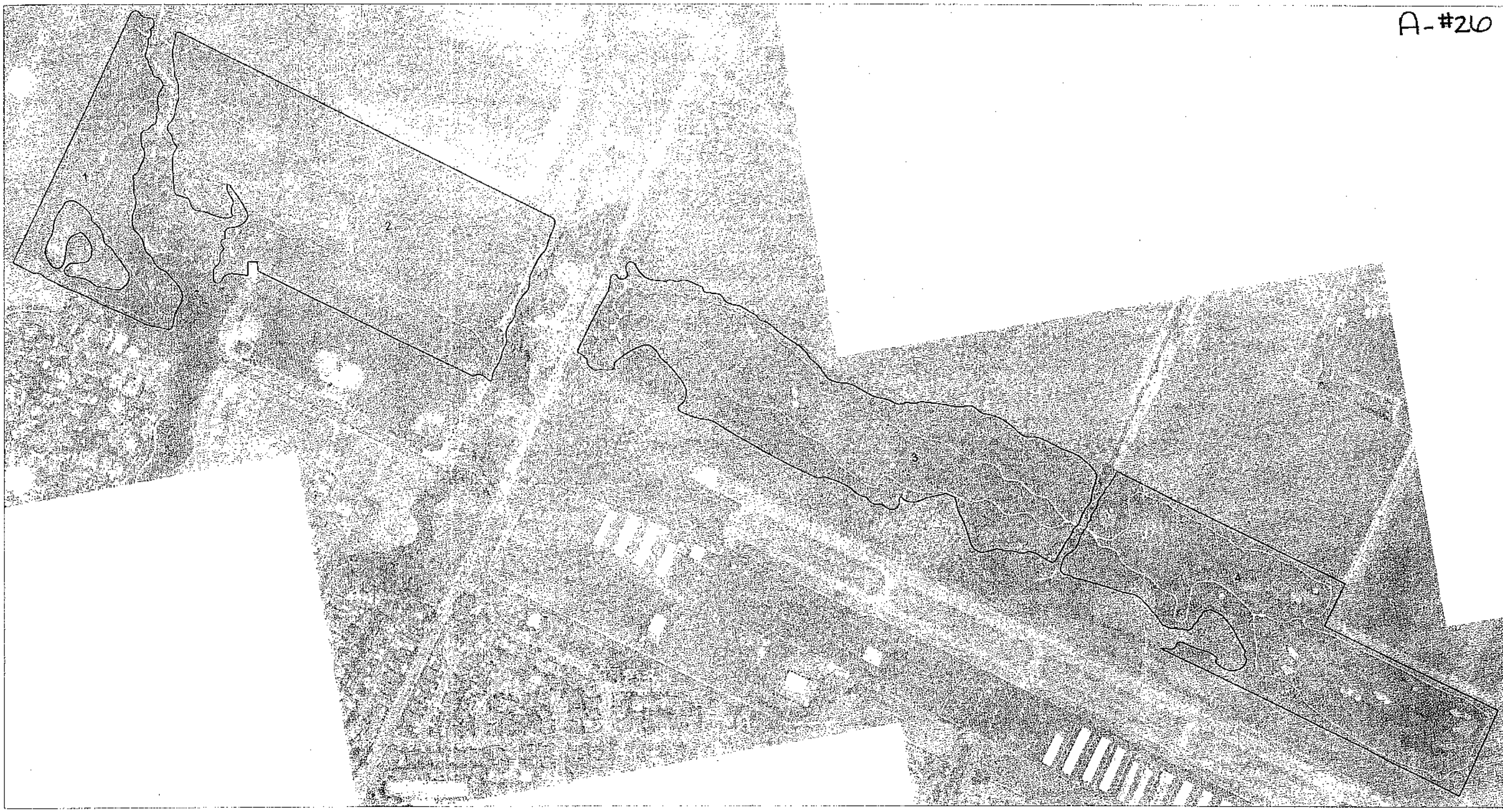
Scale: N.T.S.

A-#25



RESA 25 ac ✓ 18 ac Irrigated Scale: 1" =400'





Rooster Run

1) 13.7 ac 2) 45.0 ac

3) 36.3 ac 4) 31.4ac

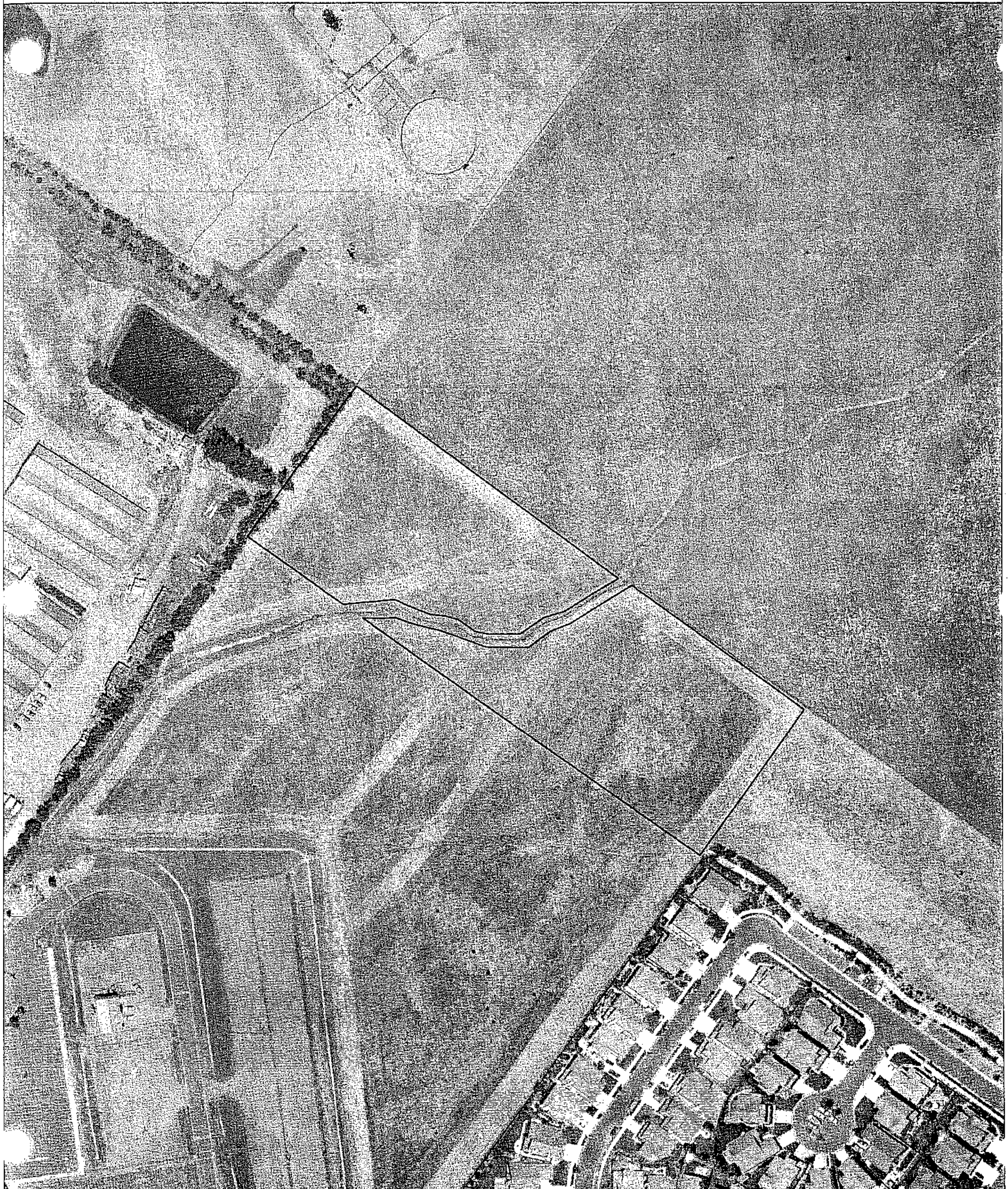
Scale: 1" =500' @
11x17 but reduced
by 64%

Total: 126.4 ac

C-#28

Sonoma Mtn Elem. Sch. Turf Total: 2.7 ac Scale: 1"=200'

C-#303



SRJC Open Space Total: 5.4 ac Scale: 1"=200'

✓ Santa Rosa Junior College - Phase II

E-#309

S. McDowell Street Scape Total: 0.08 ac Scale: 1"=200'

C-#30

Sunrise Park

Scale: 1" =300'

7/2003

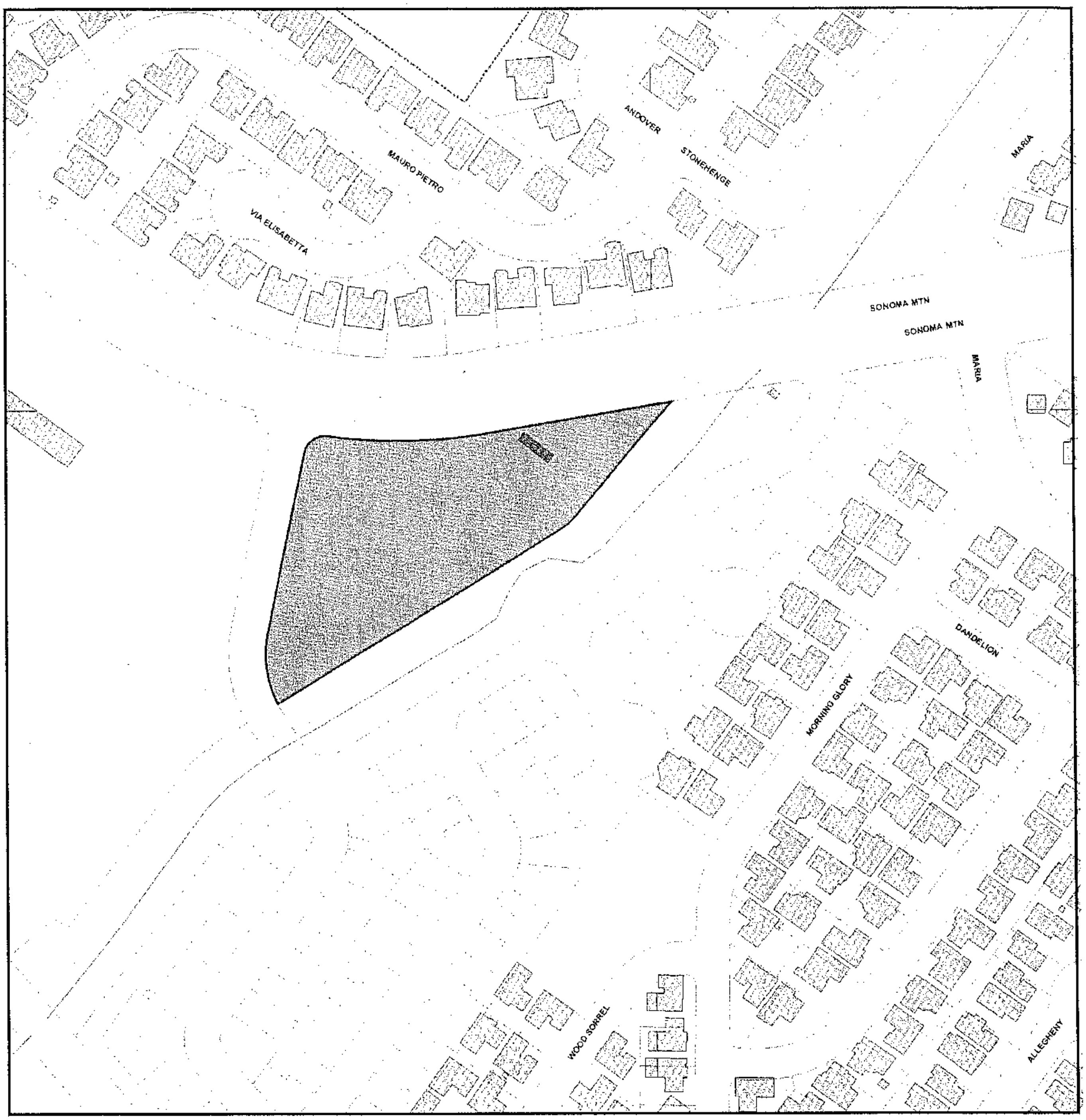
1) 1.5 ac
2) 0.6 ac

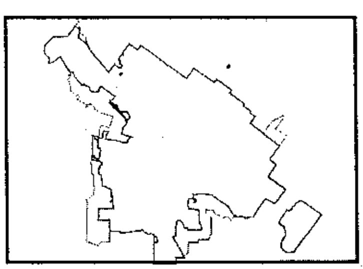
Total: 2.1 ac

C-#300

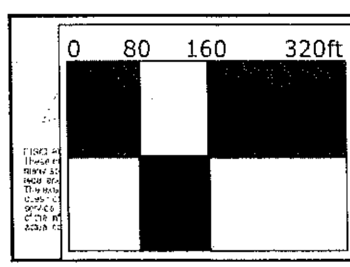
Trun Bridge Park

City of Petaluma, California





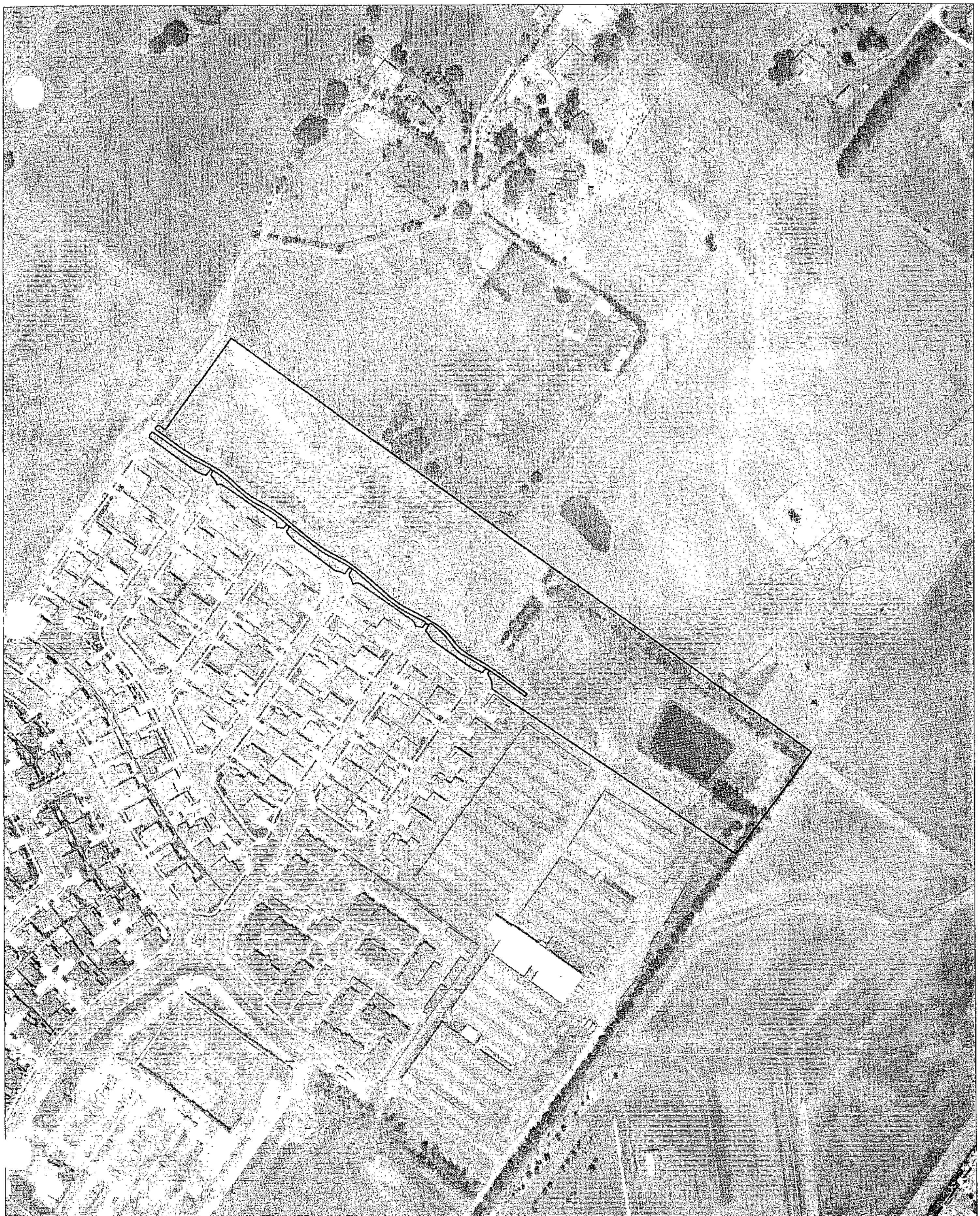
2.3 ac



Printed: 9/1/2003 9:07:37 AM

Powered By GeoSmart.net

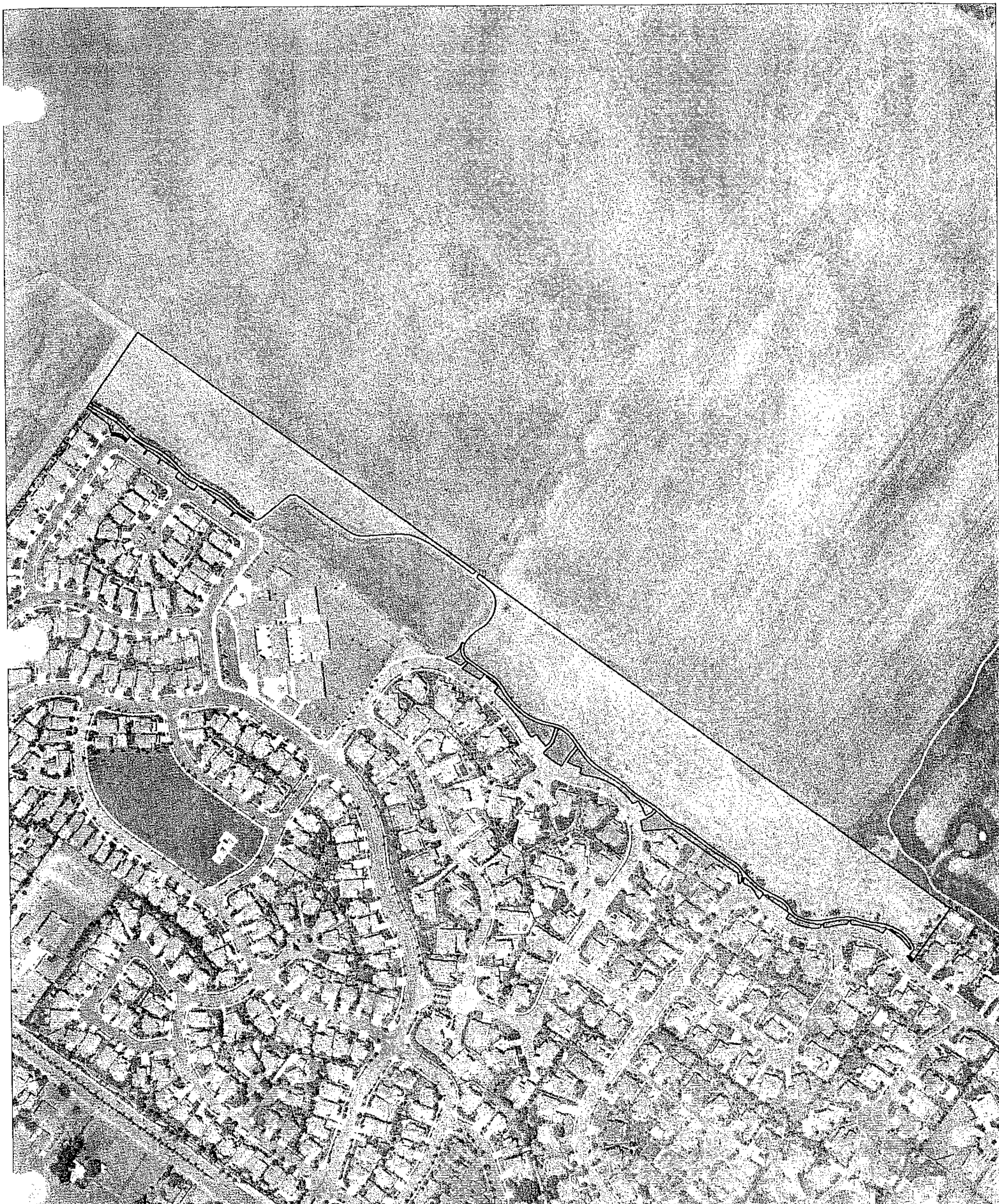
C-#305



Urban Separator North Total: 11.9 ac Scale: 1"=300'

1 of 2

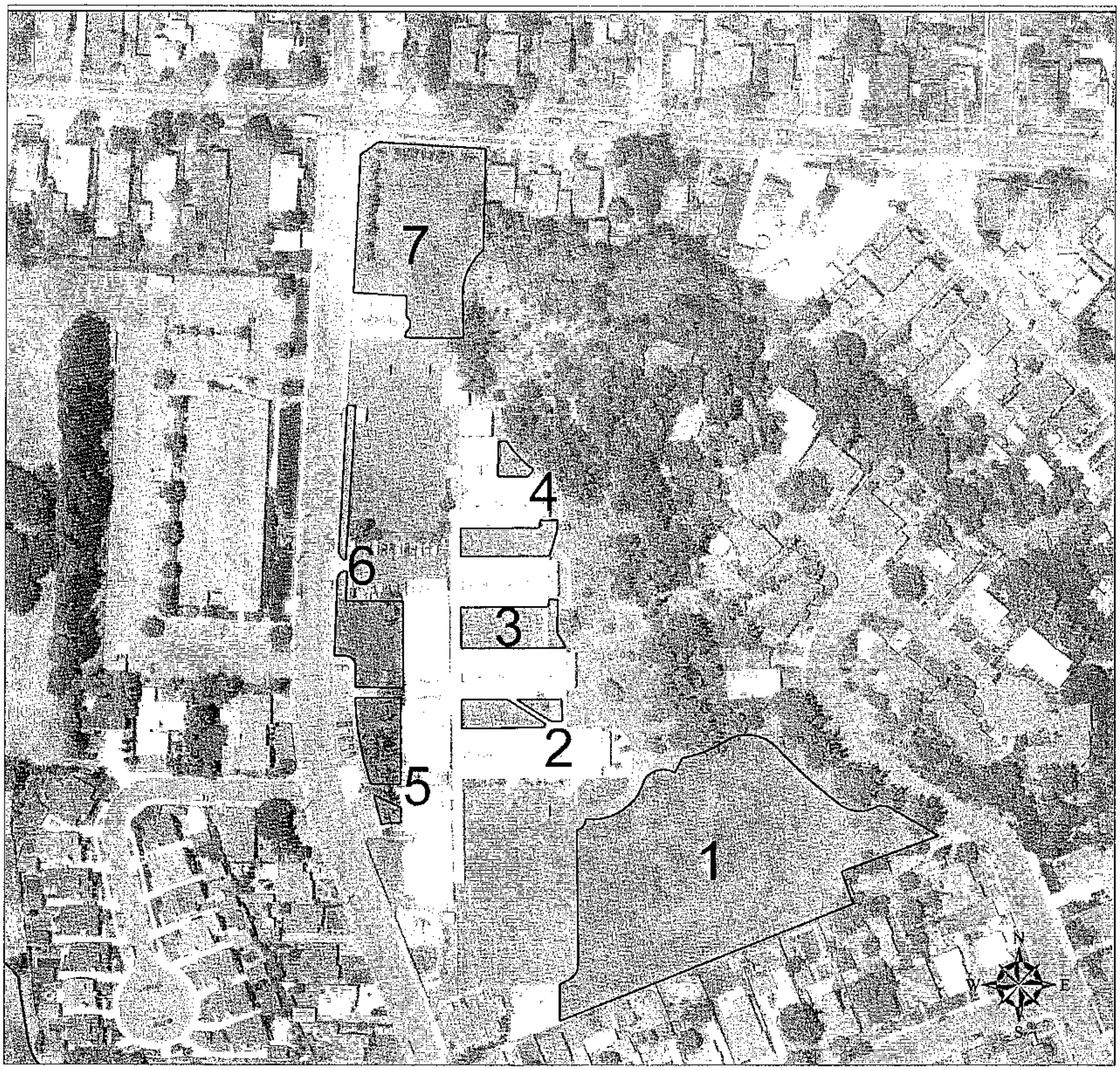
C-#304



Urban Separator ~~North~~ South   Total: 11.4 ac   Scale: 1"=400'

2 of 2

E-#84



Valley Vista Elementary Scale: 1" =200'

1) 1.6 ac
2) 0.8 ac
3) 0.1 ac
4) 0.1 ac
5) 0.1 ac
6) 0.2 ac
7) 0.6 ac

Total: 3.5 ac

Wiseman Park (Extended)

Scale: 1" =200'
@ 11x17 but
reduced to 64%.

Total: 19.4 ac

APPENDIX G

POTENTIAL RECYCLED WATER USER WATER USAGE DATA

APPENDIX G

POTENTIAL RECYCLED WATER USAGE DATA

Water demands for potential water users were estimated as outline in Section III of this master plan. Since numerous potential tertiary recycled water customers are current City of Petaluma potable water customers, two years of water usage data for several users was gathered from past meter reading records.

As described in Section III, actual water meter data for Rooster Run Golf Course and Petaluma Golf Course were used to develop demands for computer modeling. All other meter reading records gathered were for turf users such as parks, school, and open space. Although much of the meter reading data analyzed was reasonable for irrigation of turf, a factor of 1 MG/acre or 3.069 acre-ft/acre was used as described in Section III for all turf users rather than the actual meter readings data obtained since many values seemed inconsistent for irrigation of turf. High readings could be attributed to current potable water meters providing water for other uses in addition to irrigation use. Low readings could be attributed to additional water meters serving the area for which data was not provided. When inconsistent water use from meter readings per acre irrigated was encountered, the City verified the actual irrigated acreage, as outline in Appendix F – Potential Recycled Water User Irrigated Acreage. As mentioned above, actual data for Rooster Run and Petaluma Golf courses were used since the data seemed reasonable and it was confirmed that one water meter is dedicated to irrigation at each facility.

Water meter reading data provided by the City of Petaluma is attached, as well as a comparison between the demand data used for master planning versus the demand data developed based on the meter reading data provided.

					Current Source of Water				Potential Source of Water									
#	Customer		Description	Total Irrigated Acres	User Type	City Water	Secondary Effluent	Private Well	Not Irrigated	Secondary Effluent	Recycled Water	Total Irrigation Season Use (mg/yr)	Avg. Irrigation Daily Use (mg/day)	Max. Monthly Demand* (mg/mo)	Max. Daily Demand (mg/day)	Max. Hour (gpm)	Consumption per acre (mg/acre)	Consumption per acre (acre*ft/acre)
26	Rooster Run****	E-1,2	Golf Course	126.4	G	X					X	138.34	0.646	25.200	0.966	671	1.094	3.359
				126.4								138.34	0.646	25.200	0.966	671	1.094	3.359
16	Lucchesi Park	D-3	Park	13.1	T	X					X	13.10	0.061	3.557	0.136	253	1.000	3.069
				13.1								14.21	0.066	3.530	0.135	251	1.085	3.329
73	Petaluma Golf Course (9 hole)****	F-4	Golf Course	43.1	G	X					X	33.43	0.156	6.000	0.230	160	0.776	2.380
				43.1								33.43	0.156	6.000	0.230	160	0.776	2.380
74	Petaluma High *	D-5	School	10.6	T	X					X	10.60	0.050	2.878	0.110	204	1.000	3.069
				10.6								10.79	0.050	3.790	0.145	269	1.018	3.124
75	Petaluma Junior High***	C,D-5	School	6.6	T	X					X	6.60	0.031	1.792	0.069	127	1.000	3.069
				6.6								3.23	0.015	0.760	0.029	54	0.489	1.502
6	Casa Grande High School	F-3	School	23.5	T	X					X	23.50	0.110	6.381	0.245	453	1.000	3.069
				23.5								24.85	0.116	5.230	0.200	371	1.057	3.245
32	Wiseman Park***	E-1,2	Park	19.4	T	X					X	19.40	0.091	5.268	0.202	374	1.000	3.069
				19.4								12.68	0.059	2.300	0.088	163	0.654	2.006
24	Prince Park	D-1,2	Park	11.1	T	X					X	11.10	0.052	3.014	0.116	214	1.000	3.069
				11.1								9.54	0.045	1.670	0.064	119	0.859	2.638
84	Valley Vista Elementary	C,D-5	School	3.5	T	X					X	3.50	0.016	0.950	0.036	67	1.000	3.069
				3.5								2.79	0.013	0.67	0.026	48	0.797	2.446
54	La Tercera Park	E,F-3	Park	2.8	T	X					X	2.80	0.013	0.760	0.029	54	1.000	3.069
				2.8								2.34	0.011	0.620	0.024	44	0.836	2.565
17	McDowell Park***	E-3	Park	5.3	T	X					X	5.30	0.025	1.439	0.055	102	1.000	3.069
				5.3								1.56	0.007	0.320	0.012	23	0.294	0.903
65	Miwok Park and School**	F-3,4	School	6.9	T	X					X	6.90	0.032	1.874	0.072	133	1.000	3.069
				6.9								2.35	0.011	0.41	0.016	29	0.341	1.045
45	Del Oro Park	F-3	Park	3.5	T	X					X	3.50	0.016	0.950	0.036	67	1.000	3.069
				3.5								2.86	0.013	0.52	0.020	37	0.817	2.508
10	Eagle Park	D-2	Park	2.9	T	X					X	2.90	0.014	0.787	0.030	56	1.000	3.069
				2.9								3.33	0.016	0.63	0.024	45	1.148	3.524
2	Airport*****	E-2	Open Space	2.3	T	X		X			X	2.30	0.011	0.625	0.024	44	1.000	3.069
				2.3								4.95	0.023	1.11	0.043	79	2.152	6.605
113	Grant Park	E-5	Park	0.98	T	X					X	0.98	0.005	0.266	0.010	19	1.000	3.069
				0.98								0.98	0.005	0.266	0.010	19	1.000	3.069
106	Walnut Park	D-4,5	Park	1.4	T	X					X	1.40	0.007	0.380	0.015	27	1.000	3.069
				1.4								1.23	0.006	0.23	0.009	16	0.879	2.696
105	Wickersham Park	E-4,5	Park	2	T	X					X	2.00	0.009	0.543	0.021	39	1.000	3.069
				2								1.71	0.008	0.34	0.013	24	0.855	2.624
63	McNear Park	D-5	Park	4.8	T	X		X			X	4.80	0.022	1.303	0.050	93	1.000	3.069
				4.8								3.62	0.017	0.69	0.026	49	0.754	2.314
66	Oak Hill Park***	C,D-4	Park	2.7	T	X					X	2.70	0.013	0.733	0.028	52	1.000	3.069
				2.7								0.8	0.004	0.24	0.009	17	0.296	0.909
104	Country Club Open Space***	E-5	Open Space	2.4	T	X					X	2.40	0.011	0.652	0.025	46	1.000	3.069
				2.4								0.53	0.002	0.1	0.004	7	0.221	0.678
30	Sunrise Park	C-2	Park	2.1	T	X					X	2.10	0.010	0.570	0.022	40	1.000	3.069
				2.1								2.48	0.012	0.43	0.016	31	1.181	3.624
60	McDowell Meadow Park*****	C-2	Park	0.8	T	X					X	0.80	0.004	0.217	0.008	15	1.000	3.069
				0.8								3.85	0.018	0.68	0.026	48	4.813	14.769

* All meter readings not included due to poor data
** School meters not included/provided.
*** Insufficient meters provided based on acres provided
**** Actual water data was used for golf courses
***** Water data provided is too great for acres provided

8/7/2003

Potable Water Users for Recycle Master Plan
Large Users

Name	Dedicated Meter?	Meter Size	Date	Consumption 100 ft^3	Consumption MG
Rooster Run Golf Course	Yes	6 inch	4/8/03	3412	2552176
			2/11/03	3985	2980780
			12/10/02	23965	17925820
			10/8/02	64227	48041796
			8/8/02	67391	50408468
			6/10/02	29281	21902188
			4/3/02	2103	1573044
			2/7/02	187	139876
			12/5/01	22327	16700596
			10/4/01	60647	45363956
			8/8/01	58652	43871696
			6/6/01	43728	32708544
			4/3/01	3594	2688312
			2/6/01	6582	4923336
			12/7/00	22405	16758940
			10/10/00	54075	40448100
			8/4/00	62924	47067152
			6/5/00	25160	18819680
			4/7/00	0	0
Lucchesi Park	Yes	4 inch	4/8/03	0	0
End of Court Madison Entrance			2/11/03	0	0
			12/10/02	51	38148
			10/8/02	149	111452
			8/8/02	5940	4443120
			6/10/02	1822	1362856
			4/3/02	22	16456
			2/7/02	2610	1952280
			12/5/01	166	124168
			10/4/01	383	286484
			8/8/01	5940	4443120
			6/6/01	3969	2968812
			4/3/01	45	33660
Lucchesi on Maria	Yes	2 inch	6/5/03	289	216172
Account No. 008104			4/8/03	150	112200
			2/27/03	0	0
New Meter Installed			2/26/03	0	0
			2/11/03	1	748
			12/10/02	471	352308
			10/8/02	1231	920788
			8/8/02	1903	1423444
			6/10/02	744	556512
			4/3/02	189	141372
			2/7/02	17	12716
			12/5/01	3	2244
			10/4/01	0	0
			8/8/01	0	0
			6/6/01	0	0
			4/3/01	0	0
			2/6/01	0	0
Behind Sign	Yes	2 inch	6/5/03	220	164560
Account No. 008371			4/8/03	85	63580
			2/11/03	0	0
			12/10/02	306	228888
			10/8/02	849	635052
			8/8/02	1213	907324
			6/10/02	144	107712
			4/3/02	1	748
			2/7/02	0	0

			12/5/01	206	154088
			10/4/01	567	424116
			8/8/01	565	422620
			6/6/01	573	428604
			4/3/01	2	1496
			2/6/01	2	1496
			12/7/00	180	134640
			10/10/00	511	382228
Lucchesi-Maria at Monroe	Yes	2 inch	6/5/03	571	427108
Account No. 008105			4/8/03	64	47872
New Meter Installed			2/27/03	0	0
			2/26/03	20	14960
			2/11/03	39	29172
			12/10/02	199	148852
			10/8/02	494	369512
			8/8/02	569	425612
			6/10/02	367	274516
			4/3/02	10	7480
			2/7/02	8	5984
			12/5/01	239	178772
			10/4/01	443	331364
			8/8/01	606	453288
			6/6/01	383	286484
			4/3/01	28	20944
			2/6/01	9	6732
No Lucchesi Park Under the Sign	Yes	2 inch	6/5/03	96	71808
Account No. 0080373			4/8/03	71	53108
			2/11/03	85	63580
			12/10/02	80	59840
			10/8/02	103	77044
			8/8/02	102	76296
			6/10/02	93	69564
			4/3/02	76	56848
			2/7/02	89	66572
			12/5/01	84	62832
			10/4/01	94	70312
			8/8/01	87	65076
			6/6/01	109	81532
			4/3/01	60	44880
			2/6/01	81	60588
			12/7/00	70	52360
			10/10/00	77	57596
Pet Golf and Country Club	Not Sure	3 inch	3/27/03	379	283492
Golf Course by Small Tank	Not another acct.		1/30/03	546	408408
	in database		11/21/02	6175	4618900
			9/24/02	13627	10192996
			7/17/02	12933	9673884
			5/21/02	5415	4050420
A new meter was installed at this point			4/10/02	0	0
			4/9/02	679	507892
			3/26/02	394	294712
			1/25/02	272	203456
			11/27/01	5679	4247892
			9/21/01	12320	9215360
			7/26/01	16048	12003904
			5/17/01	7508	5615984
			3/21/01	121	90508
Pet High School	Not Sure	4 inch	3/27/03	564	421872
Pet High on Webster St.	Not another acct.		1/30/03	829	620092
	in database		11/21/03	855	639540
			9/24/03	11050	8265400

			7/17/02	4431	3314388
			5/21/02	3306	2472888
			3/26/02	990	740520
			1/26/02	0	0
			1/25/02	516	385968
			11/27/01	2664	1992672
			9/21/01	4333	3241084
			7/26/01	4809	3597132
			5/17/01	2275	1701700
			3/21/01	1698	1270104
Pet Jr High	Not Sure two	6 inch	3/27/03	0	0
Account Num 006629-000	accounts		1/30/03	26	19448
			1/8/03	870	650760
			11/21/02	158	118184
			9/24/02	2044	1528912
			7/17/02	1057	790636
			5/21/02	724	541552
			3/26/02	29	21692
			1/25/02	128	95744
			11/27/01	901	673948
			9/21/01	1942	1452616
			7/26/01	1520	1136960
			5/17/01	282	210936
			3/21/01	201	150348
Pet Jr High	Not Sure two	6 inch	3/27/03	58	43384
Account Num 006630-000	accounts		1/30/03	68	50864
			11/21/02	194	145112
			9/24/02	317	237116
			7/17/02	192	143616
			5/21/02	0	0
			3/26/02	990	740520
			1/26/02	0	0
			1/25/02	111	83028
			11/27/01	823	615604
			9/21/01	1504	1124992
			7/26/01	1081	808588
			5/17/01	451	337348
			3/21/01	169	126412
Casa Grande High	Not Sure only one	4 inch	3/27/03	100	74800
	Account No.		1/30/03	175	130900
			11/21/03	6438	4815624
			9/24/02	13471	10076308
			7/17/02	8532	6381936
			5/21/02	5309	3971132
			3/26/02	190	142120
			1/25/02	161	120428
			11/27/01	5552	4152896
			9/21/01	11783	8813684
			7/26/01	13993	10466764
			5/17/01	5235	3915780
			3/21/01	334	249832
Wiseman Airport Park	Yes	2 inch	4/29/03	142	106216
Acct No. 016075			2/27/03	0	0
			12/18/02	207	154836
			10/28/02	1157	865436
			8/23/02	1595	1193060
			6/25/02	1115	834020
			4/23/02	43	32164
			2/27/02	1	748
			12/13/01	73	54604
			10/29/01	1280	957440

			8/27/01	1334	997832
			6/27/01	1443	1079364
			4/19/01	235	175780
			2/27/01	0	0
			12/21/00	97	72556
			10/26/00	1085	811580
			8/28/00	1202	899096
			6/22/00	895	669460
Appaloosa Circle Account No. 016034	Yes	1.5 Inch	4/29/03	5	3740
			2/27/03	0	0
			12/18/02	15	11220
			10/28/02	61	45628
			8/23/02	61	45628
			6/25/02	54	40392
			4/23/02	9	6732
			2/27/02	1	748
			12/13/01	17	12716
			10/29/01	128	95744
			8/27/01	68	50864
			6/27/01	122	91256
			4/19/01	38	28424
			2/27/01	0	0
			12/21/00	28	20944
			10/26/00	151	112948
			8/28/00	90	67320
			6/22/00	29	21692
Wiseman X-ST FM 2126 St. Augusti Account No. 016074	Yes	2 inch	4/29/03	472	353056
			2/27/03	0	0
			12/18/02	264	197472
			10/28/02	1897	1418956
			8/23/02	2764	2067472
			6/25/02	1869	1398012
			4/23/02	577	431596
			2/27/02	1	748
			12/13/01	135	100980
			10/29/01	2403	1797444
			8/27/01	2676	2001648
			6/27/01	2111	1579028
			4/19/01	348	260304
			2/27/01	0	0
			12/21/00	220	164560
			10/26/00	1758	1314984
			8/28/00	2222	1662056
			6/22/00	1849	1383052
Caulfield Lane Account No.015972	Yes	1.5 Inch	4/29/03	196	146608
			2/27/03	218	163064
			12/18/02	230	172040
			10/28/02	1144	855712
			8/23/02	1443	1079364
			6/25/02	1118	836264
			4/23/02	31	23188
			2/27/02	52	38896
			12/13/01	318	237864
			10/29/01	1621	1212508
			8/27/01	1276	954448
			6/27/01	1067	798116
			4/19/01	141	105468
			2/27/01	1	748
			12/21/00	162	121176
			10/26/00	880	658240
			8/28/00	1035	774180

			6/22/00	1238	926024
Prince Park North Irrigation Account No. 24389	Yes	4 inch	4/8/03	46	34408
			2/11/03	0	0
			12/10/02	971	726308
			10/8/02	4299	3215652
			8/8/02	4452	3330096
			6/10/02	2430	1817640
			4/3/02	243	181764
			2/7/02	6	4488
			12/5/01	1322	988856
			10/4/01	10358	7747784
		new meter	8/21/01	243000	181764000
Valley Vista Elementary School Account No. 006634	Yes	2 inch	5/27/03	299	223652
			3/27/03	0	0
			1/30/03	48	35904
		new meter	11/23/02	0	0
			11/22/02	5	3740
			11/21/02	865	647020
			9/24/02	1042	779416
			7/17/02	1019	762212
			5/21/02	683	510884
			3/26/02	1	748
			1/25/02	0	0
			11/27/01	599	448052
			9/21/01	1188	888624
			7/26/01	1767	1321716
			5/17/01	657	491436
			3/21/01	1	748
			1/25/01	0	0
			11/20/00	381	284988
			9/25/00	1422	1063656

Faigrounds Account No. 000596000	I don't think so inside Main Ent on the Right	1 inch	5/7/03	18	13464
			3/5/03	24	17952
			1/9/03	68	50864
			11/13/02	81	60588
			9/10/02	62	46376
			7/2/02	69	51612
			5/2/02	60	44880
			3/7/02	95	71060
			1/9/02	69	51612
			11/8/01	57	42636
			9/6/01	227	169796
			7/9/01	124	92752
			5/3/01	8	5984
	new meter		3/31/01	0	0
			3/30/01	13	9724
			3/6/01	60	44880
			1/11/01	70	52360
			11/6/00	81	60588
			9/6/00	36	26928
			7/3/00	44	32912
			5/3/00	124	92752
			2/28/00	77	57596
			12/27/99	25	18700
Fairgrounds - continued Acct No. 000597-000	I don't think so By Restrooms	2 inch	5/7/03	19	14212
			3/5/03	14	10472
			1/9/03	7	5236
			11/13/02	39	29172

			9/10/02	48	35904
			7/2/02	146	109208
			5/2/02	28	20944
			3/7/02	19	14212
			1/9/02	92	68816
			11/8/01	32	23936
			9/6/01	40	29920
			7/9/01	117	87516
			5/3/01	88	65824
			3/6/01	51	38148
			1/11/01	24	17952
			11/6/00	51	38148
			9/6/00	46	34408
			7/3/00	123	92004
			5/3/00	29	21692
			2/28/00	25	18700
			12/27/99	15	11220
			11/3/99	63	47124
			9/2/99	44	32912
			7/7/99	157	117436
			5/6/99	21	15708
			3/5/99	22	16456
Fairgrounds - continued	I don't think so	1.5 inch	5/7/03	61	45628
Account No. 000598000			3/5/03	46	34408
			1/9/03	24	17952
			11/13/02	108	80784
			9/10/02	39	29172
	Meter changed		7/4/02	0	0
			7/3/02	4	2992
			7/2/02	151	112948
			5/2/02	134	100232
			3/7/02	239	178772
			1/9/02	7	5236
			11/8/01	293	219164
			9/6/01	76	56848
			7/9/01	186	139128
			5/3/01	125	93500
			3/6/01	49	36652
			1/11/01	38	28424
			11/6/00	54	40392
			9/6/00	36	26928
			7/3/00	107	80036
			5/3/00	34	25432
			2/28/00	0	0
			12/27/99	0	0
			11/3/99	38	28424
			9/2/99	82	61336
			7/7/99	67	50116
			5/6/99	36	26928
			3/5/99	6	4488
			1/7/99	8	5984
Fairgrounds - continued	I don't think so	2 inch	5/7/03	10	7480
Account No. 000600-000			3/5/03	8	5984
			1/9/03	10	7480
			11/13/02	8	5984
			9/10/02	13	9724
			7/2/02	36	26928
			5/2/02	7	5236
			3/7/02	9	6732
			1/9/02	10	6732
			11/8/01	10	7480

			9/6/01	10	7480
			7/9/01	33	7480
			5/3/01	0	24684
			3/6/01	0	0
			1/11/01	0	0
			11/6/00	44	0
			9/6/00	30	32912
			7/3/00	33	22440
			5/3/00	12	24684
			2/28/00	18	8976
			12/27/99	9	13464
			11/3/99	14	6732
			9/2/99	12	10472
			7/7/99	47	8976
			5/6/99	10	35156
			3/5/99	13	7480
			1/7/99	8	9724
Fairgrounds - continued	I don't think so	2 inch	5/7/03	25	5984
Account No. 000601-000			3/5/03	4	18700
			1/9/03	3	2992
			11/13/02	43	2244
			9/10/02	46	32164
			7/2/02	47	34408
			5/2/02	37	35156
			3/7/02	1	27676
			1/9/02	8	748
			11/8/01	33	5984
			9/6/01	58	24684
			7/9/01	68	43384
			5/3/01	26	50864
			3/6/01	2	19448
			1/11/01	14	1496
			11/6/00	50	10472
			9/6/00	60	37400
			7/3/00	76	44880
			5/3/00	56	56848
			2/28/00	6	41888
			12/27/99	6	4488
			11/3/99	44	4488
			9/2/99	53	32912
			7/7/99	94	39644
			5/6/99	26	70312
			3/5/99	1	19448
			1/7/99	7	748
Fairgrounds - continued	I don't think so	1.5 inch	5/7/03	1	5236
			3/5/03	1	748
			1/9/03	0	748
			11/13/02	16	0
			9/10/02	32	11968
			7/2/02	66	23936
			5/2/02	6	49368
			3/7/02	13	4488
			1/9/02	1	9724
			11/8/01	10	748
			9/6/01	20	7480
			7/9/01	61	14960
			5/3/01	4	45628
			3/6/01	14	2992
			1/11/01	20	10472
			11/6/00	27	14960
			9/6/00	49	20196

			7/3/00	72	36652
			5/3/00	2	53856
			2/28/00	0	1496
			12/27/99	5	0
			11/3/99	31	3740
			9/2/99	22	23188
			7/7/99	83	16456
			5/6/99	6	62084
			3/5/99	0	4488
			1/7/99	1	0
Fairgrounds - continued	I don't think so	2 inch	5/7/03	0	748
Account No. 000604-000			3/5/03	23	0
			1/9/03	0	17204
			11/13/02	21	0
			9/10/02	25	15708
			7/2/02	44	18700
			5/2/02	3	32912
			3/7/02	0	2244
			1/9/02	2	0
			11/8/01	21	1496
			9/6/01	19	15708
			7/9/01	68	14212
			5/3/01	5	50864
			3/6/01	3	3740
			1/11/01	0	2244
			11/6/00	3	0
			9/6/00	25	2244
			7/3/00	60	18700
			5/3/00	7	44880
			2/28/00	0	5236
			12/27/99	1	0
			11/3/99	54	748
			9/2/99	4	40392
			7/7/99	47	2992
			5/6/99	1	35156
			3/5/99	2	748
			1/7/99	1	1496
Fairgrounds - continued	I don't think so	2 inch	5/7/03	63	748
Account No. 000605-000			3/5/03	49	47124
			1/9/03	67	36652
			11/13/02	92	50116
			9/10/02	38	68816
	New Meter Installed		7/26/02	0	28424
			7/25/03	24	0
			7/2/02	146	17952
			5/2/02	36	109208
			3/7/02	64	26928
			1/9/02	9	47872
			11/8/01	154	6732
			9/6/01	262	115192
			7/9/01	293	195976
			5/3/01	272	219164
			3/6/01	0	203456
			1/11/01	181	0
			11/6/00	213	135388
			9/6/00	226	159324
			7/3/00	369	169048
			5/3/00	163	276012
			2/28/00	151	121924
			12/27/99	144	112948
			11/3/99	73	107712

9/2/99	42	54604
7/7/99	113	31416
5/6/99	329	84524
3/5/99	299	246092
1/7/99	293	223652

Potable Water Users for Recycle Master Plan
Smaller Users

Name	Dedicated Meter?	Meter Size	Date	Consumption 100 ft^3	Consumption MG
Catholic Cemetery	Yes	1.5 Inch	6/5/03	76	56848
Account No. 007663			4/8/03	2	1496
Also listed as Magnolia Cemetery			2/11/03	12	8976
			12/10/02	224	167552
			10/8/02	536	400928
			8/8/02	484	362032
			6/10/02	184	137632
			4/12/02	0	0
New Meter			4/11/02	0	0
			4/3/02	6	4488
			2/7/02	3	2244
			12/5/01	221	165308
			10/4/01	464	347072
			8/8/01	470	351560
			6/6/01	392	293216
			4/3/01	4	2992
			2/6/01	7	5236
			12/7/02	131	97988
			10/10/02	489	365772
			8/4/00	463	346324
			6/5/00	236	176528
			4/7/00	3	2244
Tim Tomasini Cemetery		5/8 Inch	6/5/03	14	10472
Account No. 007660			4/8/03	11	8228
			2/11/03	19	14212
			12/10/02	11	8228
			10/8/02	42	31416
			8/8/02	36	26928
			6/10/02	24	17952
			4/3/02	35	26180
			2/7/02	81	60588
			12/5/01	62	46376
			10/4/01	71	53108
			8/8/01	61	45628
			6/6/01	87	65076
			4/3/01	73	54604
			2/6/01	100	74800
			12/7/00	67	50116
			10/10/00	67	50116
Calvary Cemetary			6/5/03	0	0
Meter #091190144			4/8/03	0	0
			2/11/03	1	748
			12/10/02	0	0
			10/8/02	0	0
			8/8/02	0	0
			6/10/02	0	0
			4/3/02	0	0
			2/7/02	0	0
			12/5/01	0	0
			10/4/01	0	0
			8/8/01	1	748
			6/6/01	0	0
			4/3/01	0	0
			2/6/01	0	0
			12/7/00	0	0
			10/10/00	0	0
Cypress Hill Memorial Park (Cemetary)			6/5/03	5	3740
Meter # 7566552			4/8/03	3	2244
			2/11/03	6	4488
			12/10/02	2	1496
			10/8/02	0	0
			8/8/02	44	32912
			6/10/02	11	8228
			4/3/02	0	0
			2/7/02	15	11220
			12/5/01	36	26928
			10/4/01	27	20196
			8/8/01	9	6732
			6/6/01	6	4488
			4/3/01	4	2992
			2/6/01	5	3740
			12/7/00	4	2992

			10/10/00	4	2992
La Tercera Park	Yes	2 inch	4/15/03	0	0
Account No. 012179			2/18/03	1	748
			12/12/02	232	173536
			10/16/02	814	608872
			8/13/02	1408	1053184
			6/12/02	358	267784
			4/11/02	0	0
			2/19/02	0	0
			12/10/01	114	85272
			10/11/01	1912	1430176
			8/15/01	15	11220
			6/12/01	974	728552
			4/10/01	0	0
			2/14/01	0	0
			12/7/00	1	748
			11/4/00	0	0
McDowell Park-Ball Field Right Meter		2 inch	6/5/03	185	138380
Account No. 008450	Yes		4/8/03	1	748
			2/11/03	0	0
			12/10/02	292	218416
			10/8/02	665	497420
			8/8/02	921	688908
			6/10/02	505	377740
			4/3/02	4	2992
			2/7/02	2	1496
			12/5/01	232	173536
			10/4/01	724	541552
			8/8/01	869	650012
			6/6/01	619	463012
			4/3/01	18	13464
			2/6/01	0	0
New Meter			1/17/01	0	0
			1/16/01	137	102476
			12/7/02	59	44132
			10/10/02	0	0
			8/4/00	784	586432
			6/5/00	377	281996
			4/7/00	0	0
McDow Park Left Meter	Yes	2 inch	6/5/03	207	154836
Customer # 008447			4/8/03	39	29172
Meter # 022252669			2/11/03	27	20196
			12/10/02	263	196724
			10/8/02	593	443564
			8/8/02	854	638792
			6/10/02	466	348568
			4/3/02	0	0
			2/7/02	0	0
			12/5/01	218	163064
			10/4/01	689	515372
			8/8/01	842	629816
			6/6/01	612	457776
			4/3/01	13	9724
			2/6/01	5	3740
			12/7/00	216	161568
			10/10/00	697	521356
			8/4/00	839	627572
			6/5/00	322	240856
			4/7/00	0	0
			1/27/00	7	5236
			11/24/99	189	141372
Miwok Park	Yes	2 inch	4/15/03	0	0
Account No. 011719			2/18/03	0	0
			12/12/02	190	142120
			10/16/02	751	561748
			8/13/02	1159	866932
			6/12/02	760	568480
			4/11/02	0	0
			2/19/02	0	0
			12/10/01	135	100980
			10/11/01	743	555764
			8/15/01	1051	786148
			6/12/01	1046	782408
			4/10/01	2	1496
			2/14/01	0	0

			12/7/00	92	68816
			11/4/00	799	597652
Del Oro Park Account No. 013765	Yes	2 inch	4/29/03	0	0
			2/27/03	0	0
			2/18/02	28	20944
			10/28/02	994	743512
			8/23/02	1380	1032240
			6/25/02	863	645524
			4/23/02	2	1496
			2/27/02	0	0
			12/13/01	165	123420
			10/29/01	800	598400
			8/27/01	1389	1038972
			6/27/01	1287	962676
			4/19/01	40	29920
			2/27/01	0	0
			12/21/00	118	88264
			10/26/00	804	601392
			8/28/00	1313	982124
McDowell Meadow Park Account No. 015233 Located at Morning Glory Drive and Wood Sorrell Drive Meter # 37020732	Yes	2 inch	4/29/03	0	0
			2/27/03	0	0
			2/18/02	24	17952
			10/28/02	332	248336
			8/23/02	430	321640
			6/25/02	308	230384
			4/23/02	4	2992
			2/27/02	0	0
			12/13/01	18	13464
			10/29/01	365	273020
			8/27/01	571	427108
			6/27/01	530	396440
			4/19/01	13	9724
			2/27/01	0	0
			12/21/00	34	25432
			10/26/00	347	259556
			8/28/00	369	276012
Eagle Park Account No. 017451	Yes	2 inch	5/7/03	0	0
			3/5/03	0	0
			1/9/03	0	0
			11/13/03	1239	926772
			8/23/02	1612	1205776
			6/25/02	1239	926772
			4/23/02	25	18700
			2/27/02	0	0
			12/13/01	85	63580
			10/29/01	1120	837760
			8/27/01	1514	1132472
			6/27/01	1757	1314236
			4/19/01	3	2244
			2/27/01	2	1496
			12/21/00	25	18700
			10/26/00	959	717332
			8/28/00	1549	1158652
			6/22/00	829	620092
Airport Irrigation Account No. 024388	Yes	4 inch	6/5/03	283	211684
			4/8/03	80	59840
			2/11/03	4	2992
			12/10/02	2736	2046528
			10/8/02	2974	2224552
			8/8/02	2776	2076448
			6/10/02	36	26928
			4/3/02	0	0
			2/7/02	4	2992
			12/5/01	1278	955944
			10/4/01	4972	3719056
New Meter - no other data			8/21/03	18230	13636040
Kenilworth Park Account No. 000645	Yes	2 inch	5/7/03	10	7480
			3/5/03	1	748
			1/9/03	63	47124
			11/13/03	355	265540
			9/10/02	582	435336
			7/2/02	448	335104
			5/2/02	39	29172
			3/7/02	5	3740
			1/9/02	27	20196

			11/8/01	338	252824
			9/6/01	600	448800
New Meter			7/11/01	0	0
			7/10/01	0	0
			7/9/01	555	415140
			5/3/01	44	32912
			3/6/01	2	1496
			1/11/01	3	2244
			11/6/00	334	249832
Walnut Park	Yes	2 inch	5/7/03	68	50864
Account No. 001346			3/5/03	14	10472
			1/9/03	12	8976
			11/13/03	497	371756
			9/10/02	700	523600
			7/2/02	501	374748
			5/2/02	74	55352
			3/7/02	16	11968
			1/9/02	12	8976
			11/8/01	282	210936
			9/6/01	505	377740
			7/9/01	512	382976
			5/3/01	89	66572
			3/6/01	16	11968
			1/11/01	27	20196
			11/6/00	318	237864
			9/6/00	483	361284
			7/3/00	376	281248
Wickersham Park	Yes	2 inch	5/7/03	9	6732
Account No. 001574			3/5/03	0	0
			1/9/03	0	0
			11/13/03	466	348568
			9/10/02	885	661980
			7/2/02	557	416636
			5/2/02	103	77044
			3/7/02	0	0
			1/9/02	0	0
			11/8/01	503	376244
			9/6/01	803	600644
			7/9/01	944	706112
			5/4/01	0	0
			5/3/01	537	401676
			3/6/01	0	0
			1/11/01	0	0
			11/6/00	873	653004
			9/6/00	735	549780
			7/3/00	640	478720
McNear Park	Yes	2 inch	5/13/03	18	13464
Also Has a Well			3/17/03	9	6732
Account No. 002899			1/16/03	6	4488
			11/13/02	949	709852
			9/11/02	2409	1801932
			7/9/02	1339	1001572
			5/9/02	240	179520
			3/13/02	23	17204
			1/17/02	0	0
			11/13/01	573	428604
			9/12/01	1435	1073380
			7/17/01	1811	1354628
			5/9/01	148	110704
			3/13/01	9	6732
			1/18/01	4	2992
			11/9/00	500	374000
			9/14/00	1313	982124
			7/17/00	985	736780
			5/10/00	96	71808
Westridge Park	Yes	2 inch	4/15/03	8	5984
Account No. 012757			2/18/03	1	748
			12/12/02	58	43384
			10/16/02	205	153340
			8/13/02	306	228888
			6/12/02	303	226644
			4/11/02	4	2992
			2/19/02	0	0
			12/10/01	48	35904
			10/11/01	278	207944

			8/15/01	424	317152
			6/12/01	178	133144
			4/10/01	10	7480
			2/14/01	7	5236
			12/7/00	17	12716
			11/4/00	147	109956
Westridge Open Space	Yes	2 inch	4/15/03	0	0
Account No. 012794			2/18/03	0	0
			12/12/02	46	34408
			10/16/02	37	27676
			8/13/02	71	53108
			6/12/02	172	128656
			4/11/02	42	31416
			2/19/02	0	0
			12/10/01	6	4488
			10/11/01	13	9724
			8/15/01	25	18700
			6/12/01	21	15708
			4/10/01	0	0
			2/14/01	2	1496
			12/7/00	7	5236
			11/4/00	11	8228
Oak Hill Park	Yes	2 inch	5/13/03	46	34408
Account No. 004140			3/17/03	3	2244
			1/16/03	3	2244
			11/13/02	479	358292
			9/11/02	256	191488
			7/9/02	285	213180
			5/9/02	101	75548
			3/13/02	31	23188
			1/17/02	0	0
			11/13/01	174	130152
			9/12/01	307	229636
			7/17/01	393	293964
			5/9/01	0	0
			3/13/01	0	0
			1/18/01	0	0
			11/9/00	0	0
			9/14/00	0	0
			7/17/00	1023	765204
			5/10/00	0	0
Grant Park	Yes	2 inch	5/27/03	67	50116
Account No. 005941			3/27/03	7	5236
			1/30/03	5	3740
			11/21/02	0	0
			9/24/02	748	559504
			7/17/02	241	180268
			5/21/02	109	81532
			3/26/02	0	0
			1/25/02	0	0
			11/27/01	109	81532
			9/21/01	452	338096
			7/26/01	588	439824
			5/17/01	120	89760
			3/21/01	0	0
			1/25/01	100	74800
			11/20/00	72	53856
			9/25/00	313	234124
			7/24/00	328	245344
Country Club Park?	Yes?	1.5 Inch	5/27/03	109	81532
Account No. 006053			3/27/03	2	1496
			1/30/03	0	0
			11/21/02	187	139876
			9/24/02	274	204952
			7/17/02	99	74052
			5/21/02	102	76296
			3/26/02	27	20196
			1/25/02	15	11220
			11/27/01	218	163064
			9/21/01	215	160820
			7/26/01	241	180268
			5/17/01	222	166056
			3/21/01	0	0
			1/25/01	0	0
			11/20/00	151	112948

			9/25/00	242	181016
			7/24/00	279	208692
Sunrise Park	Yes	2 inch	4/29/03	0	0
Account No. 013679			2/27/03	0	0
			2/18/02	52	38896
			10/28/02	931	696388
			8/23/02	1047	783156
			6/25/02	585	437580
			4/23/02	0	0
			2/27/02	0	0
			12/13/01	176	131648
			10/29/01	868	649264
			8/27/01	1252	936496
			6/27/01	1159	866932
			4/19/01	15	11220
			2/27/01	0	0
			12/21/00	80	59840
			10/26/00	908	679184
			8/28/00	1096	819808
Glennbrook Park	Yes	2 inch	6/25/03	484	362032
Meter # 090783460			4/29/03	0	0
			2/27/03	0	0
			12/18/02	26	19448
			10/28/02	860	643280
			8/23/02	1256	939488
			6/25/02	827	618596
			4/23/02	37	27676
			2/27/02	1	748
			12/13/01	54	40392
			10/29/01	946	707608
			8/27/01	1309	979132
			6/27/01	1487	1112276
			4/19/01	25	18700
			2/27/01	0	0
			12/21/00	66	49368
			10/26/00	632	472736
			5/28/00	1199	896852
			6/22/00	433	323884
			4/24/00	86	64328
			2/22/00	17	12716
			12/20/99	172	128656
			10/29/99	756	565488
			8/26/99	1305	976140
Meadow Park	Yes	2 inch	4/29/03	56	41888
Account No. 015409			2/27/03	2	1496
On Morning Glory and Wood Sorrell			2/18/02	88	65824
Meter # 37020732			10/28/02	1203	899844
			8/23/02	1934	1446632
			6/25/02	1259	941732
			4/23/02	3	2244
			2/27/02	1	748
			12/13/01	189	141372
			10/29/01	1331	995588
			8/27/01	1702	1273096
			6/27/01	1615	1208020
			4/19/01	37	27676
			2/27/01	0	0
			12/21/00	121	90508
			10/26/00	1379	1031492
			8/28/00	1255	938740

APPENDIX H

RECYCLED WATER PROVIDER SURVEY

APPENDIX H

RECYCLED WATER PROVIDER SURVEY

As part of the recycled water master planning process, Dodson Engineers and City of Petaluma staff visited three agencies who currently provide recycled water. These three agencies include the City of Santa Rosa, Novato Sanitary District, and Monterey Regional Water Pollution Control Agency (MRWPCA). These agencies were hand selected due to the specifics of their water recycling programs. Survey forms were completed and supplemental information gathered. These materials are attached for reference, as well as a blank recycled water provider survey form.

These site visits were very instrumental in understanding how other agencies have approached issues such as the use of City owned land, system storage, public education and outreach, agricultural customers, and recycled water charges/payments.

RECYCLED WATER PROVIDER
SURVEY FORM

Survey Conducted By:___________________________

Date: ___________________________

Facility:

Name:___________________________

Location:___________________________

Contact Name:___________________________

Phone Number:___________________________

Water Production:

Annual Amount:___________________________

Amount Recycled vs. Discharged (if applicable):___________________________

Acres Irrigation:___________________________

Irrigation Season Length:___________________________

Water Quality:

Secondary Effluent YES / NO ___

If YES, % of Total Recycled Water:___________________________

Title 22 Unrestricted Use YES / NO

If YES, % of Total Recycled Water:___________________________

Any Quality Issues from Customers? ___________________________

Customer Type:

Potable Offset:

Parks/Business Parks:___________________________

Schools:___________________________

HOAs:___________________________

Golf Courses:___________________________

Industry:___________________________

Agricultural:

Crop Type(s):___________________________

Facilities Owned by Agency at Customer Locations:___________________________

____

City/Agency Owned Land:______________________________

Quantity:__________ Acres

Management Practices (Rental, etc.):__________

Type of Irrigation System:______________________________

Water Balance:

Zero Discharge Requirement: YES / NO

If YES, how do you handle annual fluctuations with storage and demand?

____

System Requirements:

Number of Pump Stations:______________________________

Number of System Storage:______________________________

Pressure (min) at User:______________________________

Any Issues/Advice:______________________________

____

____

Revenue:

Initial Facilities: ______________________________

Water Rates/Charges: ______________________________

Future:

What is plan for future as wastewater production increases?

____

____

____

____

CITY OF SANTA ROSA

RECYCLED WATER PROVIDER
SURVEY FORM

Survey Conducted By: Dana Hunt, G. S. Dodson & Associates/Margaret Orr, City of Petaluma

Date: 6/25/2003

Facility:

Name: City of Santa Rosa

Location: 69 Stony Circle, Santa Rosa, CA 95401

Contact Name: Daniel Carlson

Phone Number: (707) 543-3944

Water Production:

Annual Amount: 7,382 MG (2002), ADWF ≤20 MGD (Peak Day Demand = 35 MGD)

Amount Recycled vs. Discharged (if applicable): 50/50 100% Recycled summer, 100% discharge in winter (restriction that discharge cannot exceed 5% of Russian River Capacity. Problem in dry winter + issues with regulations on temp, copper and DO). See Geyser Recharge project below.

Acres Irrigation: 6,360 acres (573 urban/1,500 City owned/4,000 Ag includes some vineyards. Use 1/6th of dairy).

Irrigation Season Length: March-November (March 2.8%, April 1.7%, May-Oct 92%, November 3.8%)

Water Quality:

Secondary Effluent NO

Title 22 Unrestricted Use YES

If YES, % of Total Recycled Water: 100%

Any Quality Issues from Customers? Salt, boron, algae

Customer Type:

Potable Offset: (573 acres out of 6,360 acres) irrigate at night.

Parks/Business Parks: Yes

Schools: Yes

HOAs: Yes

Golf Courses: Yes 72 holes (only fill at night due to high daytime demands on system)

Industry: None (concern w/open storage)

Agricultural: (4,000 acres out of 6,360 acres) Irrigate in day.

Crop Type(s): Mainly pasture/hay

Facilities Owned by Agency at Customer Locations: None, they pay them ≅ $100/acre. Most Ag customers have portable irrigation systems. Agency owns and operates pump station at property.

City/Agency Owned Land: 1,500 acres out of 6,036 acres (need 20% of irrigated land)

Quantity: 1,500 Acres

Management Practices (Rental, etc.): Rent at $40±/acre (varies per grid) and no charge for water. Very happy with Ag users. Use lots of water. Rent in 80-acre grids (have 20 grids). 6-8 different renters. Lease in bid process. Must plant high water crop.

Type of Irrigation System: Fixed with sprinklers. City maintains system, including heads. Hire summer temp employees for this work. Do not allow cows on City owned land. 1) ruins land with high water, 2) over graze, 3) waste. Allow sheep. They are good. Must rotate their location, but w/tertiary they can drink it and be irrigated. Most land no animals and grow hay. Are guaranteed 2 cuts. Takes 3 weeks to cut, 1 to dry, 1 to cut, and 1 to haul. Need to work w/farmers so they all don't cut same week. (Can get 4-5 cuts if not restricted)

Water Balance:

Zero Discharge Requirement: YES (May 15-Oct 1)

If YES, how do you handle annual fluctuations with storage and demand?

Very tricky to balance. Need the City owned land w/strict language in rental contracts and control of irrigation system. Appx 20% of irrigated land is City owned. Can generally irrigate about 20% extra and not cause problems to land or other issues. It will impact crops yield. Secondly, need flexible contracts with Ag (non-vineyard) users. Try to have storage full on June 1 and empty on September 1. In September, supply = demand.

System Requirements:

Number of Pump Stations: 5 + own small pump stations on private property.

Number of System Storage: 17 (1,800 MG) all open ponds. (Do not recommend small single customer reservoirs.Lots of issues w/water balance.

Pressure (min) at User: On site pump stations = 110 psi (about 60 or 70 at furthest sprinkler).

Any Issues/Advice: Small reservoirs difficult to operate unless only filled in spring. Difficult at end of year. Work with users!

Revenue:

Initial Facilities: Clean Water Grant (95%).

Water Rates/Charges: City owned land renters get free water, Ag customers get paid ≅ $100/acre/year, but must use 18 inches/acre to get any money. Want them to use 25 inches. Urban users pay ($163,000 revenue from 573 acres) w/20 year contracts (no ordinance). Year 1 free but no complaining allowed and responsible for making their system work. Year 2-25%, Year 3-50%, Year 4-20 to 75%. Can change rates every 5 years. Cost based on their alternative cost. Potable or well. Submit info on well total cost over 20 years. One vineyard pays $10/acre-foot, which is cost of pumping. They had a well issue.

Future:

What is plan for future as wastewater production increases?

Geyser Recharge Project (see below).

Other:

Public Relations:

Never had one issue. Head of Sonoma State College is highly supportive. They use 40% of urban water.

Farmers/Crops:

Do not make mistake that ranchers are farmers. Not interested in farming. Can't compete with Valley. In past few years the new generations have take over some. This has resulted in 1) new crops (use less water), 2) Went out of business, 3) Vineyard (6 times less water). Would really like more Ag (dairy) customers. Really important to partner with Ag customers.

Obtaining City Owned Land:

Land worth $10,000-$15,000 per area. No one wants to hear that their land is only worth this much. The City had to condemn land to get it. It was terrible PR. No one wanted their water or wanted to rent their land. Don't get land all together, make it easy for rancher next door to cross the street, etc.

<u>Recycled Water Permit</u>:

Need to inspect every site 2 times/day to make sure no broken sprinklers, ponding, runoff, etc.

<u>Geyser Recharge Project</u>:

Will be going to Geyser Recharge Project 40 miles away. They need winter and summer water. Pipe runs through 30 miles of Ag land. Hope to pick up users on the way. Helps Russian River discharge issue. Does not think Petaluma has winter discharge issue. Will need 4 billion gallons/year.

Subject: Payment to Ag customers/ Update 2
From: Dana Hunt <dhunt@dodsonforwater.com>
Date: Mon, 23 Feb 2004 11:53:33 -0800
To: "Orr, Margaret" <morr@ci.petaluma.ca.us>, "Ban, Mike" <mban@ci.petaluma.ca.us>
CC: "Eckerson, Dean" <deckerson@ci.petaluma.ca.us>, "Tuft, Pamela" <ptuft@ci.petaluma.ca.us>, "simmons, Steve" <ssimmons@ci.petaluma.ca.us>

Margaret and Mike,

I talked with Dan Carlson today. Payment to Ag Customers.
He said what Mike thought was the case. They do provide other incentives rather than cash payments. The only other incentive is the barn thing. 10 dairy farmers have this incentive. All incentives together total approximately $100/acre. They are not in addition. He said that they have a partnership with the farmers and that it is very important. It is important to work with them and understand their needs and concerns and work with them to deal with them. He said they have a person that deals with the ag people and works with them to help them. This is how the barn program came to be. (FYI, the City's cost are approximately $50/ acre internally to deal with this program/partnership. (In your case you will have 193 ag acres associated with ag customers that pay - that equates to $9,650/year.)) We have placed $75,000/y in admin for the program). They have meeting with ag people 2 times per year and all ag people attend to discuss their issues. The dairy farmers have had problems with manure. Manure from cows in the winter (when it is unusable) was running off land and getting into the water. The local water board was coming down on them. The City works with the ag people to help them deal with this manure management problem and other regulatory agency issues. This is how the barn thing came about. (1998-2000) The City simply acted like a bank. They gave them loans that placed leans on their land. The loan payments are made out of the $100/acre rather than giving the payment to the ag people. If the loan is less then the payment then they get some payment to make up the balance. They had to come up with a dairy management plan and submit the plan for review. Then they went out and got bids for the barn to house the cows in the winter, etc.... The City did nothing that a bank would not do. If they stop taking water then they have to pay off the loan. A lean is against their land. Their thought is that they need to work with the ag people to find a way to help them deal with their issues so they don't want to stop farming. The farmers did not have the capital to build barns so they wanted to stop farming to deal with the manure issue. Of the dairy farmers, 10 took the barn deal and a few stopped farming. This is the only non-cash incentive program and it only deals with dairy farmers. They also mentioned that the ag people like secondary more than tertiary since it provides nutrients. They find it more valuable. Only about 15% of their farmers have converted to better crops if given better water. Hope this helps. Dana

Dana Hunt wrote:

> Margaret,
> I just stepped out for a second and Dan called back. He left a message saying that they pay the ag people based on the amount of water they use based on the contracts that I have. The more water they use they more money they get, but they have to use a minimum or they get no money. He said that the City's program is based on the contracts and results in approximately payments of $100/ acre for ag land. They pay everyone based on the amount of the water they use and don't pay anyone $100/ acre, but when you average them all out it comes to the $100/acre. It seems to me that in order for them to make $100/acre, they need to use a lot of water. I called him back and left another message which asked if they provide other incentives in addition to the payment or instead of it. I will let you know what I find out. Based on the Santa Rosa contracts, I can help you if you want me to provide you with $/acre-in per acre which will result in approximately $200/acre to your ag people. Dana
>
> Dana Hunt wrote:
>
> > Margaret,

I have a call into Dan Carlson to discuss the issue of any additional incentives which may be provided to their ag customers. I wanted to remind you/ clarify one thing that I realized. You are currently paying your ag customers $210/ acre-ft which equates to $611/ acre. The City of Santa Rosa per Dan Carson pays their ag customers $100/ acre. The $200/ acre value that was used in the recycled water master plan for the cost analysis was a result of conversations at our User Group Meeting No.2. where it was decided that you didn't want to reduce payment to your ag customers as low as Santa Rosa's $100/acre. The minutes say that you will plan to step them down from $210/acre-ft ($600/acre) to $200/acre between now and 2007. I know you are working on those contracts, but I am not sure what you are planning to do. You may want to look at Dan's contracts since they have good provisions to ensure that the Ag people irrigate the land. They don't pay anything unless they use a certain amount of water. I was looking at the contracts and based on my calculation, they are not even paying $100/acre. It calculated between $66 and $75 / acre and it clearly states that it includes all compensation. I will let you know what I find out when I talk to Dan, but I don't think your ag people should think that they are getting a worse deal than Santa Rosa if they get $200/ acre. However, a decrease from $611/acre to $200/acre wouldn't make anyone happy. If you need any numbers, etc... from me for your contracts, etc... let me know. Dana

--
Dana Hunt, P.E.
Vice President
Dodson Engineers, Inc.
165 Lennon Lane, Suite 105
Walnut Creek, CA 94598
Phone: (925) 937-3440
Fax: (925) 937-3450
www.dodsonforwater.com

CITY FARM LEASE

LEASE AGREEMENT

This Lease Agreement is made on 9/18, 1995, by the CITY of SANTA ROSA, as Lessor (CITY) and ANGELO DOTTI, as Lessee (LESSEE).

1. **PREMISES**

CITY leases to LESSEE and LESSEE leases from CITY, on the terms and conditions set forth in this Lease Agreement, the real property with appurtenances (premises), situated in Sonoma County, State of California, and described as a portion of the parcel of land known as Brown Farm consisting of Irrigation Grid No.'s 4 8, 9 and 12 through 14 as shown on Exhibit "A" attached hereto and hereby incorporated into this Lease Agreement, containing 99 acres more or less.

2. **IRRIGATION OF RECLAIMED WASTEWATER**

LESSEE understands, acknowledges and agrees that the CITY has a right to irrigate, on a continuing basis, reclaimed wastewater from its Wastewater Treatment Plants onto the premises, which is the subject of this Lease Agreement. LESSEE'S use of the premises shall at all times be subject to this right of irrigation of reclaimed wastewater by CITY. CITY may irrigate reclaimed wastewater upon the said premises at any time, at any place and in any amount that the CITY deems necessary to the operation of its reclaimed wastewater irrigation system.

3. **TERM**

The term of this Lease Agreement is for a period of 10 years commencing on September 1, 1995 and terminating on August 31, 2005.

4. **RENT**

LESSEE shall pay to CITY an annual rent on a per acre basis at $32.50 per acre. The LESSEE shall pay the annual rent in two equal payments of $1,608.75 which will be due by May 1 and November 1 of every year. The annual rent value will be reviewed at three-year intervals during the term of this Lease Agreement. Any changes in the annual rent rate shall be determined jointly between the CITY and the LESSEE. Changes in the rental rate will be based on the current market value of similar agricultural lands in Sonoma County.

5. **OBLIGATIONS OF CITY**

A. The CITY shall apply the reclaimed wastewater at no cost to the LESSEE.

B. The CITY shall provide surface drainage of the premises as deemed adequate by the Irrigation Coordinator.

C. The CITY shall provide general maintenance on sprinklers, roads and boundary fences as deemed adequate by the Irrigation Coordinator.

6. IRRIGATION COORDINATOR

CITY'S Irrigation Coordinator shall manage all of CITY'S farms. The Irrigation Coordinator shall establish reclaimed wastewater application schedules and be responsible for applying the reclaimed wastewater. He shall also, when deemed necessary by the CITY, establish farming operation schedules for crop planting, crop harvesting and removal from farm, field cleanup and broken sprinkler repair that must be followed by LESSEE. The purpose of establishing these farming operation schedules is to minimize irrigation system downtime so that application of the reclaimed wastewater can be optimized.

7. DAMAGE TO CROPS

LESSEE recognizes that CITY shall have the right to overapply and/or underapply reclaimed wastewater on the premises. CITY shall reimburse LESSEE for actual damage to crops caused by application of less than 2 acre-feet per acre of a total of reclaimed water plus fresh water, or caused by, or resulting from, continued application of reclaimed wastewater during periods in which Irrigation Coordinator has scheduled planting or harvesting of said crops as set forth in Paragraph 6. In no event shall there be any reimbursement for crop damage which occurs after September 5 of any year or is caused by natural precipitation. Reimbursement shall be only for the degree of damage incurred and only if the LESSEE was given no opportunity to properly harvest or plant the crop prior to continued reclaimed wastewater application.

The existence and degree of damage shall be determined jointly between CITY and LESSEE. If agreement cannot be reached within 2 days of occurrence of claimed crop damage, the parties shall agree upon a generally accepted expert in livestock forage who shall be consulted. If the parties cannot agree upon said expert, said expert shall be chosen by the Sonoma County Farm Advisor. Said expert's opinion of damage will be final and binding on both parties. The fee of said expert will be evenly divided between the CITY and the LESSEE. The value of the damaged crop shall be based on the value of grass hay as indicated by the most current publication of market values by the California Crop and Livestock Marketing Service.

LESSEE agrees to establish a program to monitor the quality and quantity of each cutting of each crop, which shall be used to develop the basis for determining degree of crop damage. The program shall be developed jointly by the LESSEE and the Irrigation Coordinator for the benefit of both parties and the cost shall be shared equally by the LESSEE and the CITY.

8. <u>OBLIGATIONS OF THE LESSEE</u>

A) LESSEE shall not permit or allow the premises to be used for any purposes other than CITY'S irrigation of reclaimed wastewater and LESSEE'S agricultural uses permitted under this Lease Agreement. If a perennial pasture mix is used, the stand shall be reestablished at least every fourth year. The crop must be established and growing during the winter months. All irrigation grid areas on the premises shall be cropped in this manner every year during the term of this Agreement, except there shall be no farming at any time within the drip line of any oak tree growing in the irrigation grids.

B) LESSEE shall not permit or allow farm animals of any kind to be present or remain upon area of the premises used as reclaimed wastewater irrigation sites, unless the LESSEE has received prior written permission from the CITY.

C) LESSEE shall comply with farming operation schedules established by CITY'S Irrigation Coordinator. If Irrigation Coordinator determines, at his sole determination, that LESSEE will not be able to meet the schedule for an operation, resulting in a significant impact on CITY'S ability to irrigate reclaimed wastewater, CITY may contract or otherwise arrange to have said operation performed. In such event, CITY may either take possession of the crop cutting involved, including the first cutting from a crop that is planted under said circumstances, or bill the LESSEE for the entire cost of performing said operation. LESSEE agrees that the exercise of either option by the CITY for any one occurrence does not set a precedent for subsequent occurrences. If the CITY elects to bill the LESSEE for the cost of said operation, the crop cutting remains the property of the LESSEE and the LESSEE agrees to pay said cost within 30 days of receipt of billing.

The intent of this obligation of the LESSEE is to ensure that the farming operations are completed in a timely manner so that the CITY can be assured of the maximum practical irrigation capacity of the premises. It is not the intent of the CITY that the LESSEE will depend on the CITY to regularly perform LESSEE'S farming operations. Therefore, the LESSEE understands and agrees that if the CITY is required by necessity to use the above-described procedure for 1) more than two times in any one year, or 2) more than on a total of four irrigation grids in any one year, or 3) more than five times in any consecutive 5-year period, the CITY may terminate this Lease Agreement.

D) LESSEE shall harvest and remove all crops produced, including any damaged crops, and remove said crops from the CITY'S farm in a timely manner.

E) LESSEE shall repair all broken sprinklers and/or risers within 24 hours after completion of any farming operation on an irrigation grid in which any sprinkler(s) and/or riser(s) is broken, with materials supplied by the CITY. Such repair shall be completed within 24 hours after testing for further breaks has been performed by CITY.

F) LESSEE shall pay for all services, products or materials furnished or delivered to the premises in connection with LESSEE'S use, operation and maintenance thereof.

G) LESSEE shall not permit or allow himself or anyone else to damage or interfere in any way with CITY'S operation and maintenance of its reclaimed wastewater irrigation works and facilities, including, but not limited to, ponds, pumps, valves, pipelines and sprinklers situated on the premises, or the operations thereof in relation to the premises.

H) LESSEE shall not permit or allow the CITY'S reclaimed wastewater to be used in any manner which violates State Health regulations. In this connection, LESSEE'S attention is directed to the regulations contained in Title 22, Division 4 of the California Administrative Code, which LESSEE acknowledges he has read and knows the contents thereof.

9. <u>TAXES</u>

LESSEE recognizes that this lease may create a possessory interest subject to property taxation and that LESSEE may be subject to the payment of property taxes levied on such interest (Revenue and Taxation Code section 107.6). LESSEE shall pay, before delinquency, all taxes, assessments, license fees and other charges (hereinafter referred to as "taxes") that are levied or assessed during the term against LESSEE'S leasehold interest in personal property installed or located in or upon the premises and any such taxes measured by the value of CITY'S interest in the premises. Upon CITY'S demand, LESSEE shall furnish CITY with satisfactory evidence of any such tax payments. If any taxes are levied against CITY or if, as a consequence of this lease, CITY incurs a tax obligation greater than or in addition to that which would be borne by CITY in the absence of this lease, LESSEE, upon demand of CITY, shall immediately reimburse CITY for the sum of taxes so levied against or borne by CITY.

10. NO ASSIGNMENT

LESSEE shall not assign or encumber its interests in this lease or the premises nor may LESSEE assign or sublease any or all parts of the premises, without first obtaining written permission from CITY. In agreeing to this clause the parties recognize that the premises are public property and it is in the public interest to preserve for CITY the right to choose any and all persons who obtain a leasehold interest in the premises or any part thereof. The parties further recognize that the rent agreed to in this Lease Agreement may become less than fair market rent at any time during said lease and CITY preserves the right to negotiate a higher rent in such circumstances. In addition, CITY must preserve the right of not becoming obligated for relocation benefits by proper notification to persons who obtained a leasehold interest in the premises. For these reasons CITY reserves the right to arbitrarily refuse to allow any and all assignments, encumbrances and subleases, and LESSEE agrees to such reservation.

11. LESSEE'S INSPECTION OF PREMISES AND CONDITION UPON TERMINATION

LESSEE acknowledges that LESSEE has inspected the premises and does hereby accept the premises as being in good and satisfactory order, condition and repair. LESSEE agrees that upon termination of this Lease Agreement for any reason, including the expiration of its term, LESSEE shall surrender the premises to CITY in the same good condition as received, reasonable wear and tear, or damage by fire, or act of God excepted.

12. NO WASTE

LESSEE shall not commit or permit others to commit any waste or a nuisance or other act on the premises that could disturb the quiet enjoyment of CITY or others on reserved areas of the premises, farm or adjacent properties.

13. INDEMNITY

LESSEE shall indemnify, defend, and hold CITY, its offers, contractors, agents and employees harmless against all loss, damage, expense and liability resulting from:

A) Any injury or death of any person or persons including, but not limited to, employees, officers, contractors, or agents of CITY or LESSEE, which occurs for any reason while such person or persons are in or upon the premises, or which results, directly or indirectly, in whole or in part, from the condition of the premises or LESSEE'S use, acts or omissions, on, upon or with respect to the premises during the term of this Lease Agreement regardless of any allegations of negligence, whether active or passive, or other misconduct of CITY.

B) Any injury, damage or destruction of property of CITY or property of LESSEE, or property of any other person, including crops, equipment or any other property, real or personal, arising, directly or indirectly or in whole or in part, out of or in any way connected with, the condition of the premises, or with any act or omission by LESSEE in its use of the premises during the term of this Lease Agreement regardless of any allegations of negligence, whether active or passive, or other misconduct of CITY.

The defense provided by LESSEE shall include the payment of all costs and expenses, including attorney's fees, incurred in connection therewith.

14. <u>INSURANCE</u>

In addition to the above, LESSEE shall also, during the term of this Lease Agreement, have in effect insurance covering the premises and LESSEE'S use thereof in the following amounts and coverage:

A) Comprehensive general liability, personal injury, property damage and product liability insurance in an amount of not less than $1,000,000.

B) Workers compensation insurance as required by law.

LESSEE shall furnish to CITY a certificate issued by LESSEE'S insurer(s) showing the above minimum insurance is in effect, and that CITY is an additional insured as to insurance specified in (A). Said certificate shall contain a statement that the insurance evidenced thereby may not be canceled, terminated or diminished in amount without 30 days' prior notice thereof having been given and actually received by the City Clerk of the City of

Santa Rosa.

15. ALTERATIONS

LESSEE shall not make, or permit to be made, alterations on or to the premises without first obtaining CITY'S written consent. Additions to, or alterations of the premises shall become at once a part of the real property and belong to CITY. LESSEE shall keep the premises free from any liens arising out of any work performed for, materials furnished to or obligations incurred by LESSEE.

16. INSPECTION

LESSEE shall permit CITY and CITY'S contractors and employees, at any time, to enter the premises for the purposes of inspection for compliance with the terms of this Lease Agreement and for the exercise of CITY'S rights of irrigation of reclaimed wastewater upon the premises, the posting of notices and for all other lawful purposes. LESSEE shall supply CITY with keys and any other instruments necessary to allow CITY'S entry on the premises.

17. TERMINATION

If LESSEE breaches this Lease Agreement or any condition or term hereof, CITY shall have, in addition to all other rights or remedies allowed by law, the right to terminate this Lease Agreement, the right of re-entry after having given LESSEE three days' notice, and the right to take possession of all crops, harvested or unharvested, and to remove all persons and property from the premises; CITY may store the personal property removed in a public warehouse or elsewhere at LESSEE'S expense and for his account. CITY, at its election, will become the owner of all crops of which it has so taken possession, without being obligated to compensate LESSEE for them. Upon LESSEE'S default and failure to cure within 3 days after notice, CITY may terminate this Lease Agreement.

If during the term the premises are totally or partially destroyed, or if during the term CITY must, for any reason, reduce or terminate the reclaimed wastewater irrigation program, CITY may terminate this Lease Agreement upon 90 days' notice to LESSEE.

The above rights of CITY shall be concurrent and cumulative and are in addition to, and not derogation of, all other rights and remedies available to CITY.

Nothing contained in this Lease Agreement, and no security or guaranty of the LESSEE that CITY holds, now or in the future, under this Lease Agreement, shall in any way constitute a bar or defense to an action by CITY in unlawful detainer or for recovery of the premises.

18. NOTICES

Any notice required or permitted to be given to either party by the other shall be in writing and shall be served either personally or by registered or certified mail addressed as follows:

CITY:

Miles Ferris
Director of Utilities
City of Santa Rosa
69 Stony Circle
Santa Rosa, CA 95401

LESSEE:

Angelo Dotti
5915 1040 Irwin Lane
Santa Rosa, CA 95401

19. CONDEMNATION

In the event all or part of the leased premises is taken or acquired for public use by condemnation or threat thereof, this lease shall terminate. LESSEE shall assert no claim for loss of bonus value of this lease or any other claim except for goodwill.

20. NO WAIVER

No delay or omission in the exercise of any right or remedy of CITY shall impair the future exercise of such right or remedy, nor shall such delay or omission be construed as a waiver of such right or remedy.

21. GENERAL CONDITIONS

A) Time is of the essence for performance of each provision of this lease.

B) This lease shall be construed and interpreted in accordance with the laws of the State of California.

C) This lease contains all the agreements of the parties with regard to the premises and cannot be enlarged, modified or changed in any respect except by written agreement between the parties.

D) The unenforceability, invalidity or illegality of any provision of this agreement shall not render the other provisions unenforceable, invalid or illegal.

E) The captions of this lease shall have no effect on interpretation of this lease or any part thereof.

F) The covenants and conditions herein contained shall, subject to the provisions as to assignment, apply to and bind the heirs, successors, executors, administrators and assigns of all of the parties hereto; and all of the parties hereto shall be jointly and severally liable hereunder.

22. APPROVAL BY CITY COUNCIL

This lease shall not be effective for any purpose whatsoever until it is approved by resolution of the City Council and executed by the Mayor. By the granting of this lease, the City Council is not obligating itself, the City of Santa Rosa, its officers or agents, with regard to any other discretionary action relating to development or operation of said premises. Such discretionary actions include, but are not limited to, the granting of rezonings, variances, use permits, environmental clearances or any other governmental agency approval which are required by law.

23. POSSESSION

If CITY, for any reason whatsoever, cannot deliver possession of the said premises to LESSEE at the commencement of the said term, as hereinbefore specified, this lease shall not be void or voidable, nor shall CITY be liable to LESSEE for any loss or damage resulting therefrom; but in that event there shall be a proportionate deduction of rent covering the period between the commencement of the said term and the time when CITY can deliver possession.

IN WITNESS WHEREOF, the CITY and LESSEE have executed this Lease Agreement as of the date and year first above written.

CITY:

CITY OF SANTA ROSA,
A Municipal Corporation

By: Sharon Carroll

LESSEE:

Dotti Bros
by Angelo Dotti

ATTEST:

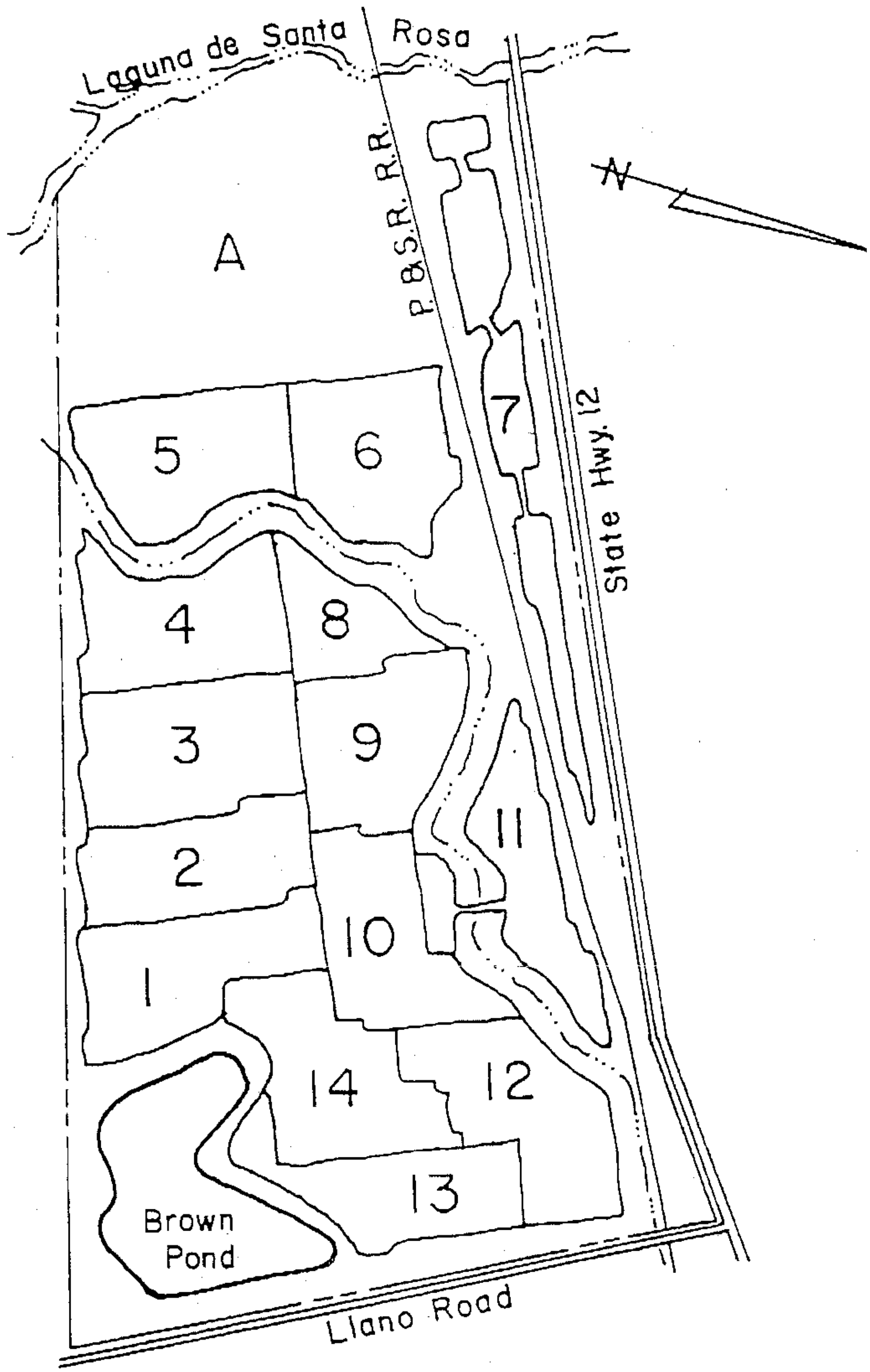
Gayle Peterson
City Clerk

APPROVED AS TO FORM:

DC 12/7/98
City Attorney

(lease.dotti)

Exhibit A



BROWN IRRIGATION GRIDS

SCALE: 1" = 1000' ±

TWO-PARTY AGREEMENT — Farmer w/ incentives

This agreement is made on ________________, _____, by the CITY OF SANTA ROSA, a municipal corporation, (CITY) and ____(USER).

1. RECITALS

USER owns or operates approximately __________ acres of real property identified as Assessor's Parcel Nos. ____________, ______________, ____________, ____________, ____________, ____________, ____________, more particularly described in Exhibit A attached, which is used for agricultural purposes.

CITY owns and operates certain wastewater treatment plants that generate tertiary treated wastewater that CITY must dispose of on agricultural land during certain times of the year.

2. TERM

The term of this Agreement is for a period of approximately five (5) years commencing on ____________________, 199__, and terminating on _______________, 200__. USER and CITY also agree that, at the option of the CITY, this Agreement can be extended in whole years up to a maximum of two (2) years. To exercise this option, CITY shall notify USER in writing by ______________, 200___, of CITY's intention to do so. If said option is implemented, all conditions of the Agreement shall be in effect for the entire extension period.

3. LAND FOR RECLAIMED WASTEWATER DISPOSAL

USER agrees to use CITY's reclaimed wastewater on certain acres of land, herein called "committed acreage." It is understood that the committed acreage can change from year to year depending on the USER's then-current operations. CITY and USER agree to jointly determine the committed acreage by April 15 of each year for that year and shall prepare and sign an amendment to this Agreement stating the committed acreage for that year. The intent is that USER shall include in his committed acreage all land that he intends to actually irrigate that year.

4. DELIVERY AND APPLICATION OF RECLAIMED WASTEWATER

CITY shall deliver reclaimed wastewater into the USER's irrigation system at no cost to the USER. USER agrees to take, accept, and apply the reclaimed wastewater to the committed acreage at no cost to CITY, except that, CITY shall pay directly for all energy used for application of reclaimed wastewater.

USER agrees to accept and apply a minimum of eighteen (18) acre-inches per acre per year for the entire committed acreage and further agrees and commits to expend reasonable effort to apply greater than this minimum amount, to the extent that such application is compatible with good farming practices relative to the cropping program followed on USER's farm, consistent with runoff, ponding and environmental restrictions, and not harmful to the crop.

USER understands that the normal reclaimed wastewater delivery and application period is May 15 to September 30. To meet certain operational criteria established by the North Coast Regional Water Quality Control Board, it may be necessary to apply reclaimed wastewater to land at times between October 1 and May 14. USER agrees, when requested by CITY, to accept and apply reclaimed wastewater during this period so long as such application is not harmful to USER's cropping program and is consistent with runoff, ponding and environmental restrictions.

5. LIMITATIONS PRECLUDING DELIVERY OF RECLAIMED WASTEWATER

Notwithstanding the requirements for CITY to deliver reclaimed wastewater as stated in Section 4 of this Agreement, both parties recognize and agree that such delivery of reclaimed wastewater may at times be precluded for reasons beyond the control of CITY. In this respect, CITY shall be required to deliver reclaimed wastewater as stated in Section 4 of this Agreement unless said delivery is prevented by a cause outside the control of CITY, including, but not limited to, shortage of wastewater, malfunction of CITY's system, temporary imbalance of the reclaimed wastewater in the various storage ponds, or by order of a governmental regulatory authority.

6. ON-FARM IRRIGATION SYSTEM

CITY shall provide for USER'S use during the term of this Agreement, at no cost to USER, an irrigation system for the portion of USER'S committed acreage that is not presently served by USER'S existing irrigation system. This system is to be operational within a 90-day period after Agreement is signed by both parties.

Such irrigation system may include electric service, pump(s), meters, and portable and non-portable sprinkler equipment as listed in the addendum. USER agrees to exercise all reasonable care to protect the irrigation system from damage or loss and shall perform all normal maintenance on the irrigation system in a timely manner to keep it in good working order such that reclaimed wastewater application can be assured with a minimum interruption. CITY shall provide assistance for initial layout of irrigation equipment. Upon termination of this Agreement or prior to each winter season when irrigation equipment may be damaged by storms or floods, USER shall collect and neatly stack all portable irrigation equipment in one location accessible for easy pickup or inventory by CITY.

7. <u>PERMISSION TO ENTER</u>

USER agrees to allow CITY to install or remove any necessary pumps, electric service, meters, appurtenances, and portable irrigation equipment on land controlled by USER and intended for reclaimed wastewater irrigation. In addition, USER hereby grants CITY, acting through its duly authorized employees, agents, representatives, or contractors, reasonable access to USER's property to do any necessary work associated with installation of equipment required by this Agreement, meter reading, verification of reclaimed wastewater use, or any other monitoring of reclaimed wastewater-related activity on said property. When entering USER's property, CITY shall interfere as little as possible with USER's other operations and land usages of the property.

8. <u>RECLAIMED WASTEWATER USE INCENTIVE PROGRAMS</u>

CITY shall establish three incentive programs to ensure that USER will maximize the acceptance and use of reclaimed wastewater. The payments made to USER under these incentive programs shall constitute full compensation for USER'S cooperation in receiving and using the reclaimed wastewater. The incentive programs shall be as follows:

(a) <u>Incentive Program 1.</u> CITY shall pay USER $2.14 per acre-inch (27,152 gallons) per acre applied to the committed acreage in each calendar year. The dollar amount shall change by the percent change in the California minimum wage as instituted by the California State Legislature from time to time, and any such change shall become effective on the next normal meter reading date following the date of change. To qualify for payment under Incentive Program 1, USER shall receive and apply a minimum of 18 acre-inches per acre on the committed acreage in the calendar year. Each year, CITY shall make the first payment within 30 days after USER has applied the first 18 acre-inches per acre and monthly thereafter for subsequent unit applications during the remainder of the year.

(b) Incentive Program 2. CITY shall pay USER an annual stipend for the dedication of the committed acreage to the use of reclaimed wastewater. This stipend shall be $1.67 per acre-inch (27,152 gallons) of reclaimed water applied to committed acreage for the first 26 acre-inches and $2.57 per acre-inch for all additional reclaimed water applied to the committed acreage. USER understands that no payment shall be made under Incentive Program 2 if a minimum of 18 acre-inches per acre on the committed acreage is not applied in the calendar year. The timing of the payment shall be the same as for Incentive Program 1.

(c) Incentive Program 3. If USER applies the reclaimed wastewater on a portion or all of the committed acreage using USER'S own irrigation system, CITY shall pay USER $1.40 per acre-inch (27,152 gallons) per acre per year applied to that portion of the committed acreage served by USER'S own irrigation system. If a portion of the committed acreage is served by a combination of CITY-supplied and USER'S own irrigation systems, CITY, in conjunction with USER, shall reasonably and fairly determine the portion of the committed acreage that shall be eligible for participation in Incentive Program 3. This determination shall be made each year by April 15 and incorporated into the amendment to this Agreement discussed previously in Section 3. CITY shall pay the monthly amount due USER under Incentive Program 3 by the 30th of each month for the reclaimed wastewater applied during the previous approximate monthly period.

9. OTHER OPERATING FARMERS

USER recognizes and understands that CITY is obligated to deliver reclaimed wastewater to other cooperating farmers. City shall endeavor to supply reclaimed wastewater to USER so that the maximum amount can be used by USER, and, in the event of shortage for any reason, to be equitable between USER and all other cooperating farmers, as reasonably determined by CITY, in supplying reclaimed wastewater. CITY intends that delivery of reclaimed wastewater to the cooperating farmers shall have preference, when reasonably possible, over delivery to CITY-owned land. However, CITY cannot assure uninterrupted supply of reclaimed wastewater to USER.

10. RECLAIMED WASTEWATER QUALITY

The reclaimed wastewater delivered to USER by CITY shall be of a quality that is in accordance with the regulations and guidelines of the North Coast Regional Water Quality Control Board, the California Department of Health Services, and the Sonoma County Department of Public Health. USER shall not allow the reclaimed wastewater to be used in violation of any law, ordinance now in effect or hereafter enacted or adopted. USER's attention is directed to the regulations contained in the California Administrative Code, Title 22, Division 4, which USER acknowledges that he has read and is familiar with its content, and shall comply with the parts of said regulations that are pertinent to USER's use of the reclaimed wastewater.

11. RECLAIMED WASTEWATER APPLICATION RESTRICTIONS

USER shall not apply reclaimed wastewater within fifty (50) feet of any well located on USER's or neighboring properties. USER shall not allow reclaimed wastewater to run off from the application area into depressions or drainageways leading off of USER's property and shall not allow excessive ponding of reclaimed wastewater on USER's property causing recurring vector problems. If USER allows runoff of reclaimed wastewater to leave USER's property because of lack of reasonable agricultural practices and monitoring of system during application, or excessive ponding resulting in recurring vector problems, or if USER does not observe the property boundary and well buffers, or if USER does not abide by the restrictions in the Environmental Assessment Report, CITY may immediately curtail reclaimed wastewater delivery, notify USER of such infraction in writing and, if USER does not rectify the infraction within two (2) days after notice, CITY may terminate this Agreement.

12. TAXES

USER recognizes that this Agreement may create a possessory interest subject to property taxation and that USER may be subject to the payment of property taxes levied on such interest (Revenue and Taxation Code Section 107.6). USER shall pay, before delinquency, all taxes, assessments, license fees, and other charges (hereinafter referred to as "taxes") that are levied or assessed during the term against USER's interest in personal property installed or located in or upon USER's premises and any such taxes measured by the value of CITY's interest in such personal property. Upon CITY's demand, USER shall furnish CITY with satisfactory evidence of any such tax payments. If any taxes are levied against CITY or if, as a consequence of this Agreement, CITY incurs a tax obligation greater than, or in addition to, that which would be borne by CITY in the absence of this Agreement, USER, upon demand of CITY, shall immediately reimburse CITY for the sum of taxes so levied against or borne by CITY.

13. GENERAL CONDITIONS

(a) This Agreement shall be construed and interpreted in accordance with the laws of the State of California.

(b) This Agreement contains all agreements of the parties with regard to the subject of the Agreement and cannot be enlarged, modified, or changed in any respect except by written agreement between the parties.

(c) The unenforceability, invalidity, or illegality of any provision of this Agreement shall not render the other provisions unenforceable, invalid, or illegal, but the parties shall negotiate as to the effect of said unenforceability, invalidity, or illegality on the rights and obligations of the parties.

(d) The captions of the Agreement shall have no effect on interpretation of this Agreement or any part thereof.

(e) This Agreement shall be binding on the heirs, successors, lessees, sublessees, assigns, and transferees of USER's.

14. TERMINATION

Should one party breach any of the terms and conditions in this Agreement, written notice of such breach shall be given to the other party. If reasonable steps toward correcting the breaching conditions are not taken within five (5) days from such notice, the other party may, in addition to any remedies provided by this Agreement or by law, terminate this Agreement on ten (10) days written notice to the breaching party.

15. INTENTION

USER understands and acknowledges that CITY is legally required to dispose of reclaimed wastewater on land and is not permitted to release it into the Russian River watershed during certain times of the year. Therefore, CITY is relying on a good-faith performance of USER in accepting and using reclaimed wastewater. If USER, as reasonably determined by CITY, fails to accept and dispose of the reclaimed wastewater as agreed herein, USER and CITY agree that CITY will suffer irreparable harm and will not be adequately compensated by money damages for said harm. The Parties agree the CITY may obtain an injunction compelling specific performance of this Agreement together with such other relief as may be allowed by law.

16. NOTICES AND AMENDMENTS

Any notice or amendment to this Agreement necessary to be given to either party by the other shall be in writing. Both parties agree that any such notice or amendment shall be effective when signed by the City of Santa Rosa, Director of Utilities and/or USER, as appropriate, and deposited, postage paid, in the U.S. Mail addressed as follows:

CITY:	USER:
Director of Utilities	______________________
City of Santa Rosa	______________________
69 Stony Circle	______________________
Santa Rosa, CA 95401	______________________

IN WITNESS WHEREOF, CITY and USER have executed this Agreement as of the date and year first written above.

CITY:

CITY OF SANTA ROSA,
A Municipal Corporation

By:______________________________

USER:

(print name)____________________

By:______________________________

____

Tax or SS Number________________

ATTEST:

____
City Clerk

APPROVED AS TO FORM:

____
City Attorney

(Agreement.two-party)
(April 1999)

USER AGREEMENT - For paying urban customer

THIS AGREEMENT is made this ____ day of ______________, 1995 by the CITY OF SANTA ROSA (CITY) and ______________ (USER).

RECITALS

A. CITY has constructed and operates facilities at its Subregional Water Pollution Control Facility that will generate reclaimed water of satisfactory quality for use in irrigating landscaped areas with unrestricted public access.

B. USER owns, operates and maintains certain landscaped areas that USER desires to irrigate with reclaimed water supplied by CITY. The reclaimed water will replace fresh water for landscape irrigation and will allow CITY and USER to conserve fresh water.

AGREEMENT

CITY and USER agree as follows:

1. TERM

The term of this Agreement is 20 years commencing on the date of this Agreement and terminating on ______________, 2015, unless terminated earlier under Section 15 of this Agreement.

2. AREA OF USE (SITE)

USER shall use reclaimed water supplied by CITY on a total of approximately 3 acres (Site). The location of the Site is described in Exhibit A.

3. DELIVERY OF RECLAIMED WATER

(a) CITY shall deliver reclaimed water into USER's irrigation system at normal sprinkler operating pressure for irrigation by USER. The actual delivery rate will vary depending on the demand of USER's system.

(b) Delivery shall be controlled by a valve station located on USER's property.

4. LIMITATIONS PRECLUDING DELIVERY OF RECLAIMED WATER

(a) Notwithstanding the requirements for CITY to deliver reclaimed water as stated in Section 3 of this Agreement, delivery of reclaimed water may at times be precluded for reasons beyond the reasonable control of CITY. CITY shall be required to deliver reclaimed water as set forth in Section 3 of this Agreement unless delivery is prevented by causes outside the reasonable control of CITY including, but not limited to, acts of God, insufficient reclaimed water supply at the point of delivery to USER, malfunction of CITY's treatment or distribution systems, acts of a third party, or order of a governmental regulatory authority.

(b) If reclaimed water delivery is interrupted for more than 48 hours, CITY shall connect USERS's irrigation system to USER's back-up supply. If USER does not have a back-up supply and was originally connected to the City of Rohnert Park potable water system, CITY shall reconnect USER's irrigation system to that potable water system. If reclaimed water delivery is interrupted as described in this Section 4, USER agrees to return to reclaimed water use as soon as CITY is able to resume delivery and CITY has reconnected USER's irrigation system to the reclaimed water system.

(c) If reclaimed water delivery is interrupted, and USER's irrigation system is disconnected from the reclaimed water system, USER shall pay for the full cost of all water used from the alternate supply.

5. <u>RECEIPT AND APPLICATION OF RECLAIMED WATER</u>

(a) This Section shall become effective as soon as CITY is able to deliver reclaimed water to the Site. The limitations on use contained in Subsections 5(b) and 5(c) shall not be applicable if, for any reason, CITY is unable to deliver reclaimed water to the Site, and shall be only applicable to the extent that CITY is able to deliver reclaimed water to USER.

(b) USER agrees to receive, accept and apply reclaimed water supplied by CITY during the term of this Agreement for use for irrigation of USER's landscaped areas at no cost to CITY. USER shall make no other use of the reclaimed water. USER shall control and be responsible for the application of reclaimed water to the Site in accordance with all applicable laws, statutes, rules, regulations and guidelines, including those promulgated by the California Department of Health Services (DHS) and the North Coast Regional Water Quality Control Board (RWQCB). USER agrees to use only reclaimed water for the irrigation for all landscaped areas on the Site identified in Section 2 of this Agreement, except for portions of the Site and/or landscaped areas where application of the reclaimed water is prohibited by any law, statute, rule, regulation, or guidelines governing the use of reclaimed water.

(c) The primary period for application of reclaimed water shall be between 8:00 p.m. and 7:00 a.m. If application is made during any other period of time, USER shall continue to be responsible for controlling the use to minimize public contact with the reclaimed water.

(d) USER agrees that any agreement it may have with a third party for the management of the Site shall not in any way relieve USER of the requirements, terms and conditions of this AGREEMENT. USER shall be responsible to the CITY for the safe use of reclaimed water by USER and the third party. Should USER's agreement with the third party provide for USER to be compensated by third party for supplying reclaimed water to Site, USER agrees it will charge the third party only its actual costs in providing reclaimed water to Site.

6. QUALITY OF RECLAIMED WATER

The reclaimed water delivered to USER by CITY shall be of a quality satisfactory for irrigation of landscape areas with unrestricted public access in accordance with Title 22, Division 4 of the California Code of Regulations and the regulations and guidelines of the RWQCB, DHS and the Sonoma County Department of Environmental Health (SCDEH).

7. RECLAIMED WATER USE REQUIREMENTS

The use of reclaimed water is regulated by the RWQCB, DHS and the SCDEH. Some, but not all, of the requirements for use of reclaimed water are contained in attached Exhibit B. USER shall abide by all laws, statutes, rules, regulations or guidelines governing reclaimed water use of which USER is notified by CITY, whether or not set forth in Exhibit B.

8. RECLAIMED WATER SUPERVISOR

(a) USER shall designate an individual as USER's Reclaimed Water Supervisor who shall be USER's coordinator and direct contact person between CITY and USER. USER agrees that the Reclaimed Water Supervisor shall be responsible for the proper operation of USER's reclaimed water system, implementing the requirements of this Agreement relative to the onsite use of reclaimed water, monitoring of USER's reclaimed water system for prevention of potential hazards, and coordination with CITY and the regulatory agencies, when necessary. CITY shall assist in the training of USER's Reclaimed Water Supervisor.

(b) USER shall inform CITY of the name, position and phone number of USER's Reclaimed Water Supervisor approximately 2 months prior to startup of USER's reclaimed water system and shall promptly inform CITY of any change of designated Reclaimed Water Supervisor and/or phone number during the term of this Agreement.

9. <u>ONSITE FACILITY MODIFICATIONS</u>

(a) Modifications to existing onsite facilities will be required to conform to the special reclaimed water use requirements identified in Section 7 of this Agreement. All modifications to existing onsite facilities described in Subsection 9(b) shall be the responsibility of CITY. All modification to existing onsite facilitied described in Subsection 9(c) shall be the responsibility of USER.

(b) CITY shall install the following facilities on the USER's site in accordance with the reuse site drawings attached in Exhibit C:

(1) Reclaimed water meter(s), as required to monitor the reclaimed water deliveries made to USER.

(2) Pipeline necessary to connect CITY's reclaimed water system to USER's irrgation system. USER grants CITY a temporary easement for the construction of the pipeline. CITY shall restore the easement to its normal condition following construction work performed within the easement.

(3) Quick-couplers where it is necessary to change from a different type of existing device.

(4) Necessary drinking fountain relocations and drinking fountain barriers.

(5) Backflow preventions device(s) on the site potable water system.

(c) USER shall perform all work and shall be responsible for all costs of construction, operation, and maintenance of all other onsite modifications that are not specifically the responsibility of CITY as stated in Subsection 9(b) and any other modifications desired by USER. Such other modifications may include, but are not limited to:

(1) Placing of appropriate signs on the site that warn USER's employees and the public of the use of reclaimed water on the site.

(2) Marking all solenoid valve boxes that are on the reclaimed water system. Marking shall be by placing an appropriate purple tag on the existing valve box lid or by providing a new purple lid.

(d) CITY shall be responsible for the ongoing maintenance, repair and replacement of the reclaimed water meter and all facilities upstream from the meter. USER shall be responsible for the ongoing maintenance, repair, and replacement of all reclaimed water system facilties downstream from the meter and all initial and ongoing onsite management and operation of USER's reclaimed water system to ensure meeting CITY's and regulatory agencies' requirements for use of the reclaimed water as stated in Section 7.

(e) The installation, modification or construction of new facilities performed by USER on USER's onsite irrigation system shall be in accordance with all applicable laws, statutes, rules, regulations and guidelines, including those promulgated by DHS, RWQCB and SCDEH pertaining to nonpotable water systems including, but not limited to, the proper marking of piping, valves, valve boxes, controllers and all other components to differentiate them from onsite potable water facilities.

10. RECORD DRAWINGS

At the completion of all onsite modifications and changes conducted by CITY to USER's reclaimed water and potable water systems, CITY shall provide USER with record drawings showing the modifications and changes made by CITY on USER's site(s). USER shall provide CITY with record drawings each time USER modifies or changes USER's water systems on the site during the term of this agreement. The record drawings shall show the locations of all pipelines, controllers, valves, fountains, buildings, structures, property boundaries, wells and any other features known or considered to be important to the onsite use of reclaimed water.

11. PRICE OF RECLAIMED WATER

Beginning on the date reclaimed water irrigation commences, USER shall pay CITY for reclaimed water according to the following schedule:

(a)
- First 12 months - no payment to CITY.
- Second 12 months - 25% of USER's then-current alternate water cost.
- Third 12 months - 50% of USER's then-current alternate water cost.

- Fourth 12 months and all subsequent years - 75% of USER's then-current alternate water cost.

(b) "Alternate water costs" is defined as USER's total costs for irrigation water in the absence of CITY's reclaimed water. This cost shall be the cost of water from the City of Rohnert Park, or other potable water system, on the annual anniversary date of this Agreement.

(c) CITY shall read the reclaimed water meter(s) approximately monthly consistent with CITY's normal meter reading schedule for billing purposes and shall bill USER for the total quantity delivered during the billing period in accordance with CITY's standard billing practices. USER may periodically review CITY's meter readings if desired. USER agrees to pay CITY within 20 days of receipt of City's bill.

12. <u>PERMISSION TO ENTER</u>

USER agrees to allow CITY, DHS, RWQCB and SCDEH, acting through their duly authorized employees, agents, representatives or contractors, access at reasonable times to enter the Site for the purpose of observing construction or modification of reclaimed water facilities, for maintaining CITY-installed facilities, for meter reading, and for observing and verifying that USER is operating its reclaimed water facilities and is using the reclaimed water in a proper manner and in accordance with the reclaimed water use requirements stated in Sections 4 and 7 of this Agreement, the rules, regulations, guidelines and requirements of any regulatory agency, and all other provisions of law. When entering USER's premises, CITY or the regulatory agencies shall not interfere with USERS's operations and use of the premises.

13. <u>GENERAL CONDITIONS</u>

(a) This Agreement shall be construed and interpreted in accordance with the laws of the State of California, and venue shall be in the State courts in the County of Sonoma.

(b) This Agreement contains all agreements of the parties with regard to the subject of this Agreement and cannot be enlarged, modified or changed in any respect except by written agreement between the parties.

(c) The unenforceability, invalidity or illegality of any provision of this Agreement shall not render the other provisions unenforceable, invalid or illegal, but the parties shall negotiate as to the effect of said unenforceability, invalidity or illegality on the rights and obligations of the parties.

(d) The captions, titles and headings in this Agreement shall have no effect on the interpretation of this Agreement or any part thereof.

(e) This Agreement shall be binding on the heirs, successors, lessees, sublessees, assigns and transferees of the parties.

14. <u>TERMINATION</u>

(a) Should one party breach any of the terms and conditions in this Agreement, written notice of such breach shall be given to the breaching party by the other party. If reasonable steps toward correcting the breaching conditions are not taken within 5 days from such notice, the other party may, in addition to any remedies provided in this Agreement and/or by law, terminate this Agreement on 30 days' written notice to the breaching party.

(b) In addition, CITY may terminate this Agreement immediately if:

(1) CITY, at its sole determination, is or will be unable to deliver properly and adequately treated reclaimed water to USER for any reason whatsoever for a period greater than 30 days.

(2) The RWQCB changes CITY'S discharge requirements for irrigation of landscaped areas to a more stringent level and CITY determines it cannot reasonably meet the new requirements.

(3) CITY is ordered to cease delivery of reclaimed water to USER by a governmental authority.

(4) CITY and USER are unable to agree on the alternate water cost as required in Section 11 of this Agreement.

c) USER may terminate this Agreement on 30 days' written notice to CITY if the land use on USER'S entire reclaimed water application area(s) is changed and no landscaped area remains to be irrigated. USER understands and agrees that USER must use reclaimed water for irrigation of all allowable landscaped areas on USER'S Site identified in Section 2 of this Agreement.

15. EFFECT OF TERMINATION

a) If this Agreement is terminated by CITY, under Subsection 14(b) above, or by USER under Subsection 14(c) above, CITY shall be responsible for the restoration of the facilities disconnected from irrigation water service at the time CITY began providing reclaimed water at no cost to USER. In this event, USER shall perform all work deemed to be actually necessary by CITY to effect such restoration of irrigation water service, and CITY shall reimburse USER for said work provided CITY has given prior written approval and authorization for such work.

b) If this Agreement is terminated by CITY under Subsection 14(a) above, or either party under Subsection 14(b)(4) above, any restoration of fresh water service to USER'S water irrigation system that is desired by USER shall be the responsibility of USER and shall be at no cost to CITY.

16. NOTICES

Any notices necessary to be given by either party to the other relative to this Agreement shall be in writing. Both parties agree that any such notice shall be effective when personally delivered or deposited, postage paid, in the U.S. Mail addressed as follows:

CITY:	USER:
Director of Utilities City of Santa Rosa Municipal Services Center 69 Stony Circle Santa Rosa, CA 95401	Parker Compumotor Attn: Susanne Fisher 5500 Business Park Drive Rohnert Park, CA 94928

Notice from the CITY shall be signed by the Director of Utilities or the director's designee.

17. RECORDATION

Either party to this Agreement may record a Memorandum of Agreement which gives constructive notice of this Agreement to future owners, lessees and other occupants of the Site and requires that they comply with the terms and conditions of this Agreement.

IN WITNESS WHEREOF, CITY and USER have executed this Agreement as of the date and year first written above.

CITY OF SANTA ROSA
A Municipal Corporation

Mayor

ATTEST:

City Clerk

USER:

Parker Compumotor

By:

APPROVED AS TO CONTENT:

Director of Utilities

APPROVED AS TO FORM:

City Attorney

EXHIBIT A

LOCATION OF APPLICATION AREAS

The location(s) of USER's application area(s), the aggregate of which shall be known as USER's Site, is (are) as follows:

Application Site Name	**Application Site Street Address**	**Approximate Irrigation Area (Acres)**

or

EXHIBIT B

SPECIAL RECLAIMED WATER USE REQUIREMENTS

The following use requirements are intended to satisfy the California Department of Health Services Guidelines for Use of Reclaimed Water.

1. Runoff of reclaimed water and spray shall be minimized.

2. Signs shall be provided to inform the public that reclaimed water is being used.

3. Site shall be managed so that public contact with reclaimed water shall be minimized.

4. Reclaimed water piping, controllers, valves, etc., shall be marked to differentiate the reclaimed water facilities from the potable water facilities.

5. Reclaimed water valves, outlets, quick couplers and sprinklers shall be of a type, or secured in a manner, that permits operation only by USER'S authorized personnel.

6. There shall be no hose bibs connected to the reclaimed water system.

7. For new construction, in accordance with DHS requirements, there shall be at least a 10-foot horizontal and 1-foot vertical separation between all pipelines transporting reclaimed water and those transporting potable water, with the potable water pipeline above the reclaimed water pipeline.

8. An air-gap separation or reduced-pressure-principle device shall be provided at all potable water service connections to reclaimed water use areas. There shall be no connection between potable water supply and reclaimed water piping. Supplementing reclaimed water with any other source shall not be allowed except through an air-gap separation.

9. Drinking water facilities shall be protected from reclaimed water spray.

10. There shall be no reclaimed water irrigation or impoundment within 50 feet of any well for domestic supply.

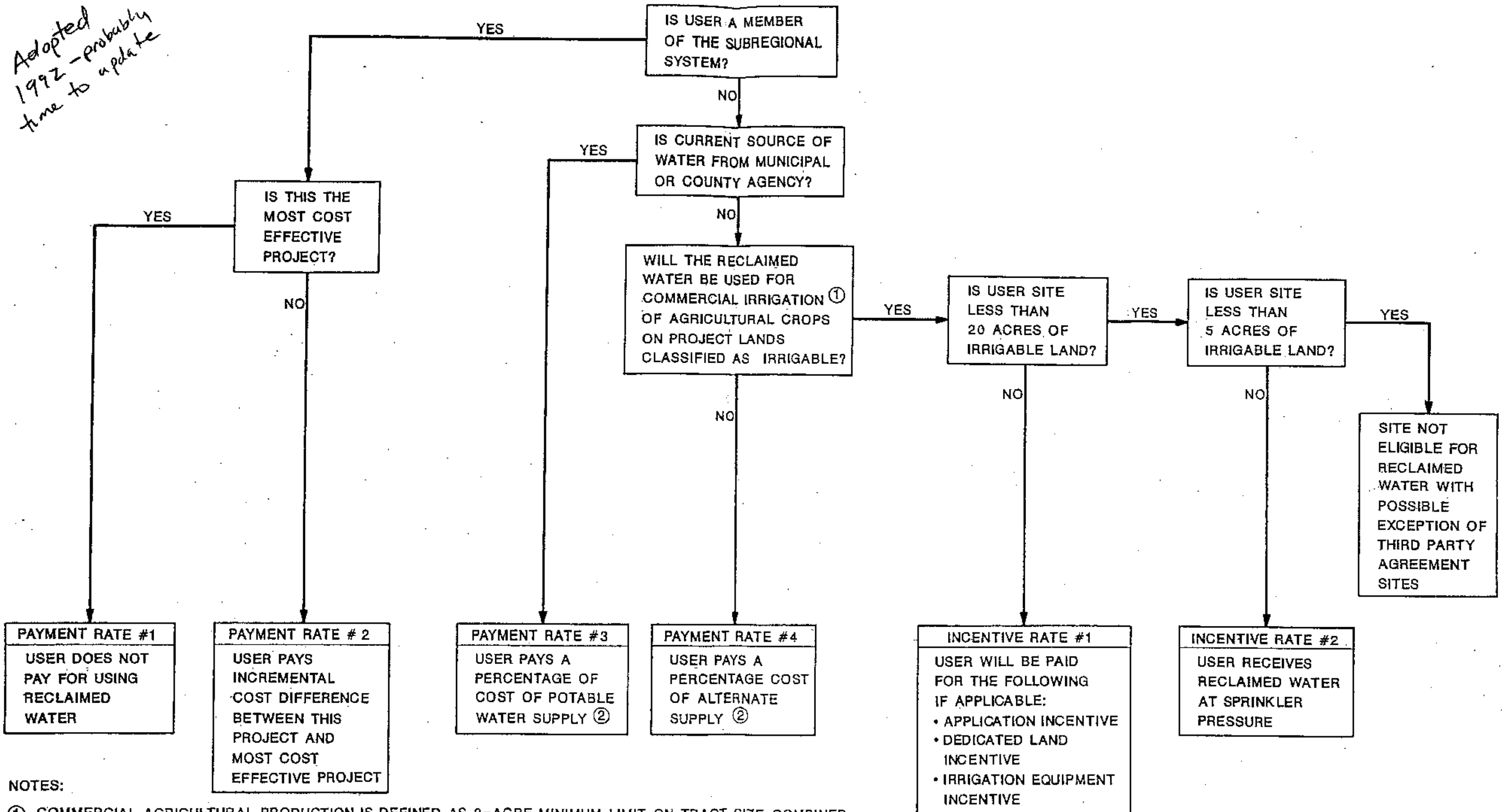
11. Adequate measures shall be taken to minimize ponding and to prevent breeding of mosquitoes of public health significance.

12. Inspection, supervision and employee training shall be provided by USER to assure safe and proper operation of the reclaimed water system.

EXHIBIT C

REUSE SITE DRAWINGS

Adopted 1992 - probably time to update



NOTES:

① COMMERCIAL AGRICULTURAL PRODUCTION IS DEFINED AS 2-ACRE MINIMUM LIMIT ON TRACT SIZE COMBINED WITH A GROSS ANNUAL SALES VALUE OF NOT LESS THAN $5,000 FOR ACREAGES BETWEEN 2 AND 10 ACRES.

② USER WILL PAY A PERCENTAGE OF POTABLE OR ALTERNATE SUPPLY ACCORDING TO THE FOLLOWING SCHEDULE:

- 1ST YEAR–NO COST
- 2ND YEAR–25%
- 3RD YEAR–50%
- SUBSEQUENT YEARS–75%

FIGURE 3-1

RECLAIMED WATER PRICING POLICY FLOWCHART

SFO19445.8A

CH2M HILL

Our current policy - pages 7 & 8 are the key -

SANTA ROSA SUBREGIONAL RECLAMATION SYSTEM
AGRICULTURAL AND URBAN RECYCLED WATER REUSE PROGRAM
July 30, 2002

BACKGROUND

The City of Santa Rosa is the managing partner of the Santa Rosa Subregional Reclamation System, which receives wastewater from the Cities of Cotati, Rohnert Park, Santa Rosa, and Sebastopol, and the South Park County Sanitation District. The system also accepts septic waste from users throughout Sonoma County. The wastewater is treated at the Laguna Wastewater Treatment Plant to a tertiary level, including filtration and ultra-violet light disinfection. The recycled water produced is approved by the California Department of Health Services for, among other things, full body contact recreational uses; irrigation of pasture, parks, school playgrounds, and golf courses; irrigation of food crops throughout the growing cycle; and consumption by dairy cows and other livestock.

The Subregional System currently irrigates a combination of agricultural and urban areas amounting to over 6400 acres of land, including all of the types of irrigation listed above. This is one of the largest and longest standing recycled water irrigation systems in the United States. All of the recycled water produced during the summer months, and all of the water the system is capable of storing in the winter months, is committed to the users of this current reuse system. The remaining water processed in the winter months is discharged to the Laguna de Santa Rosa and Santa Rosa Creek, which flow into the Russian River, and ultimately to the Pacific Ocean.

Beginning in 2003, water will also be transported to The Geysers for injection into steam wells for the production of geothermal electricity. Pursuant to an agreement with Calpine, operator of the steam field and power plants, an average of 11 million gallons per day will be committed for this use. The agreement provides some degree of flexibility in the timing of the delivery of water, thereby assisting with the balance of water for irrigation needs.

Even with all of the reuse of recycled water by the Subregional System, there still remains more than 7000 acre feet of water that will be discharged in an average weather year, and all of that water could be put to other uses. This additional water is only available during the winter; therefore, any future summer uses must be accompanied by storage in equivalent volumes. It is this additional recycled water that this reuse program is intended to address.

PURPOSE OF THE PROGRAM

The purpose of this program is to identify opportunities for future reuse of recycled water, describe the amount of water that may be available for future uses, and discuss potential agricultural and urban uses. Included in this document are the policies and commitments of the Santa Rosa City Council and Board of Public Utilities (BPU), as well as the criteria that will be used for evaluating potential projects. Finally, included is the process that will be followed in evaluating potential projects. As this program is implemented, it will result in the beneficial reuse of recycled water that would otherwise be discharged through the Laguna de Santa Rosa and Santa Rosa Creek, to the Russian River.

OPPORTUNITIES

The opportunity exists for future reuse projects in various regions of Sonoma County. First, there is a large network of pipelines and storage reservoirs included in the existing irrigation system, reaching from Santa Rosa to Sebastopol and from Rohnert Park/Cotati to north of River Road. A limited amount of capacity remains in some of these pipelines, at certain times of the year, that could serve other projects. There is also some capacity that would allow for delivery of water to new storage reservoirs during the winter months.

In addition to the existing system, the pipeline to The Geysers is being sized to allow for water, that would otherwise be discharged to the Laguna de Santa Rosa and Santa Rosa Creek, to be carried north for future reuse opportunities. To the extent that storage is made available, or winter water uses are identified, water in excess of that delivered to The Geysers could be made available for future reuse.

The combination of the existing system and the new pipeline will provide opportunities for future reuse of recycled water throughout a large portion of Sonoma County, but will require proper environmental documentation.

FUNDS AVAILABLE

The Board of Public Utilities and City Council have approved $30 million in the 1999-2000 Capital Improvement Program (CIP) budget to assist with future reuse projects. Of that amount, the majority is being used to increase the pipe size and pumping facilities from the Laguna Treatment Plant to the Alexander Valley to accommodate future reuse projects. Also, a project to deliver recycled water to a small golf driving range west of Cotati was approved under this program. The remaining amount will be available for the BPU and City Council to allocate for future reuse projects.

If other agencies connect to the pipeline and add recycled water for additional irrigation projects, the funds derived from those agencies will be allocated as determined by the BPU and City Council. The City may also pursue grant funding to increase the amount available for future reuse projects.

WATER AVAILABLE FOR FUTURE REUSE

The amount of water produced by the Subregional System varies according to weather. Flow through the system increases during periods of heavy rain, and lowest flows are experienced during drought years. This creates a degree of uncertainty over the reliability of delivery. Table 1 shows the water balance of the system, including amounts of water available for future reuse in various weather years at build-out of the Subregional System partner agencies. As the Table indicates, during an average precipitation year 3,700 million gallons of water would be available for future reuse; however, in a very low precipitation year (95^{th} percentile dry year) only 2,400 million gallons would be available.

Table 1
Annual Water Balance
(million gallons/year at build-out)

Year Type	Inflow	Existing Irrigation	Geysers Recharge	River Discharge or Future Reuse
Dry	8,600	2,200	4,000	2,400
Average	9,900	2,200	4,000	3,700
Wet	11,500	2,200	4,000	5,300

Table 1 described the water balance at build-out of the Subregional System, including water available for future reuse; however, since potential projects could be proposed at any time, there is a need to know what water may be available from the present to build-out. Table 2 shows a comparison of the amounts of water available at start-up of the Geysers project and at build-out of the partner entities of the Subregional System. The exact timing of growth cannot be specifically projected; therefore, it could be assumed that there will be a straightline increase from start-up to build-out over the next fifteen years to twenty years.

Table 2
Volume of Water Available for Future Reuse
(million gallons/year)

Year Type	At Start-up	At Build-out
Dry	1,300	2,400
Average	2,700	3,700
Wet	4,200	5,300

POTENTIAL AGRICULTURAL LAND THAT COULD BE IRRIGATED

The following maps indicate some of the lands that could be irrigated with recycled water. Limited water availability will allow only a small portion of the depicted lands to be irrigated with recycled water from the Subregional System; therefore, this is presented only to illustrate the wide range of possibilities in various parts of the county. Also, this is not intended to indicate a willingness or desire on the part of any particular grower to use recycled water.

The Long-term Wastewater Project Environmental Impact Report evaluated potential irrigation projects in the Sebastopol area, the Rohnert Park/Petaluma/Lakeville areas (South County), and the Two Rock/Bloomfield/Valley Ford areas (West County). These areas are depicted on the map shown in Figure 1.

The Sebastopol area, as evaluated in the Long-term Project EIR, identified approximately 2,200 acres that could be irrigated, primarily consisting of apple orchards, along with other potential uses.

The South County region evaluated in the Long-term EIR included a mix of pasture, hay, vineyard, and vegetables. The EIR identified a need for 3,800 acres in this area for the long-term project; however, there is a potential for more acreage, depending on how far south and east potential projects were proposed.

Finally, the West County region evaluated in the Long-term EIR consisted primarily of dairies which would have used recycled water to irrigate, pasture and silage crops. The amount of land deemed necessary in this area for the long-term project was 6,200 acres; however, as in the South County, potentially more land could be irrigated.

Figure 1

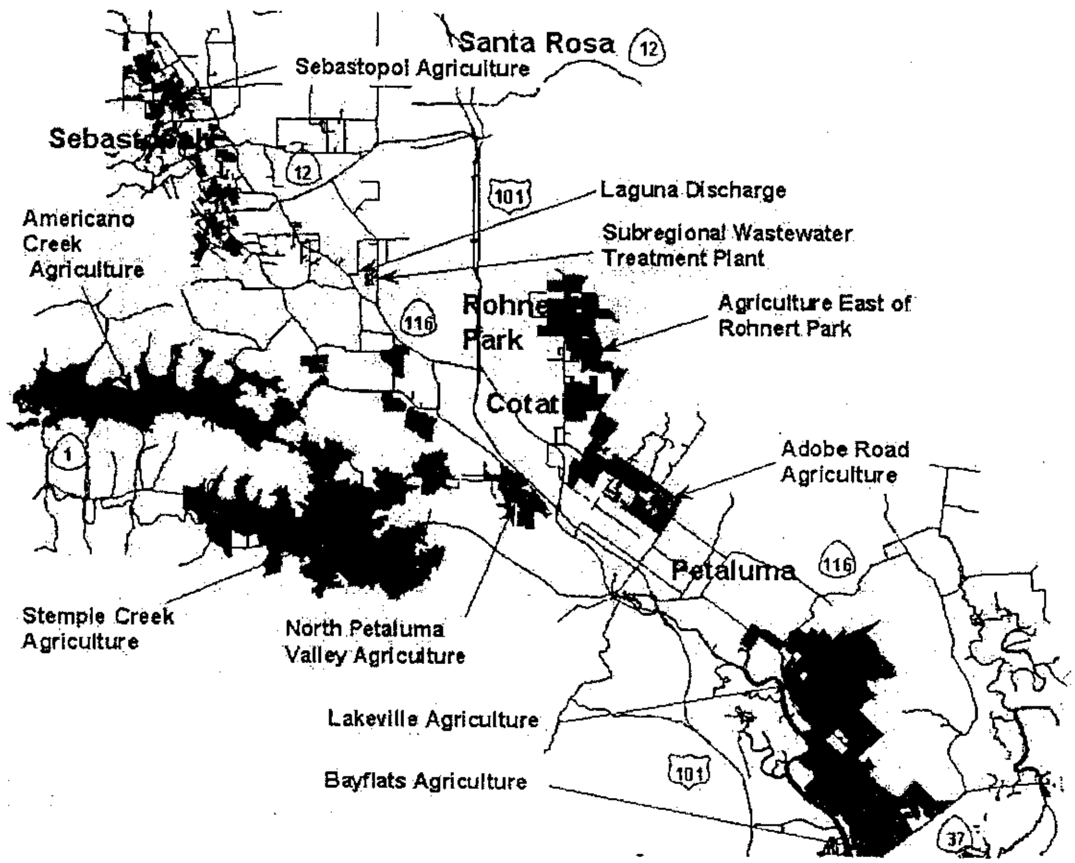
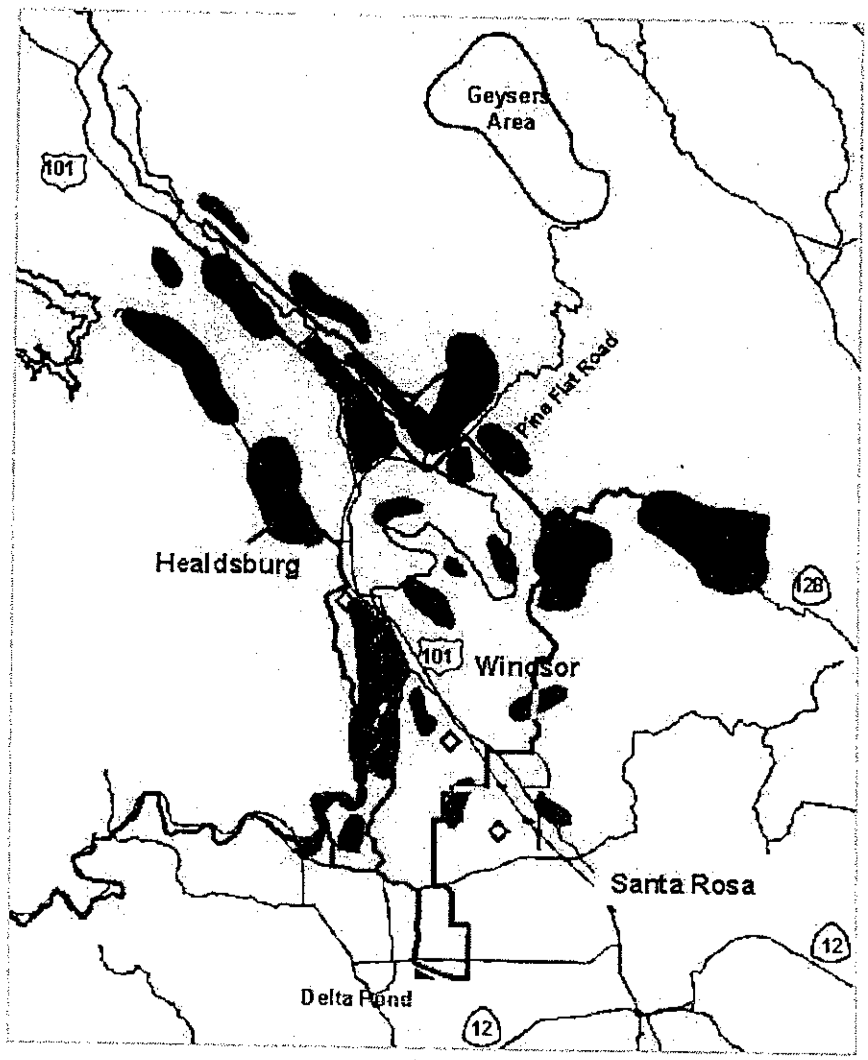


Figure 2 shows the land that could be irrigated in the area of the Geysers pipeline. This includes approximately 19,000 acres of primarily vineyards or potential vineyards.

The total number of acres discussed in the four areas above are far in excess of what could be irrigated with the amount of excess water from the Santa Rosa Subregional Reclamation System, as indicated in Tables 1 and 2 above. Therefore, this information is presented to give examples of the geographic areas where potential future reuse might occur. There are also other wastewater treatment plants in the county that could provide recycled water future reuse in some of the areas discussed in this document.

Figure 2



POTENTIAL FOR URBAN REUSE

The long-term wastewater project environmental impact report certified in June, 1997 included two urban irrigation projects. First, the Bennett Valley system considered irrigation of the Bennett Valley Golf Course, Galvin Park, Montgomery High School, Doyle Park, the Sonoma County Fairgrounds, and other facilities along that alignment. The Fountaingrove system would irrigate the Fountaingrove Country Club, the Fountaingrove Business Park, and other facilities along that pipeline.

In addition to the projects considered in the long-term study program, parks, school grounds, and other urban landscaping could be irrigated with recycled water. In some cases, this could directly replace potable water currently being used for those purposes. Also, recycled water may be used for commercial and/or industrial purposes, such as processing and manufacturing. Again, some of these uses could directly replace potable water with recycled water.

POLICIES AND COMMITMENTS FOR THE USE OF RECLAIMED WATER

In adopting this program, the Santa Rosa Board of Public Utilities and City Council have approved the following policies and commitments regarding the use of recycled water:

1. System capacity will be maximized to allow for future reuse of water produced in excess of current system and Geysers requirements.

2. All excess water not committed under contract will be made available for future conforming reuse projects, subject to confirmed reuse and storage availability.

3. Connection of other public agencies to the Geysers pipeline for reuse purposes will be considered and evaluated as capacity is available. If the excess capacity paid for from the irrigation fund is used to accommodate water from other agencies, funds paid by those agencies will be returned to the irrigation fund.

4. The Subregional system may provide financial assistance for future reuse projects, based on the criteria stated below.

5. Future bond sales may include funding to support facilities for future irrigation projects.

CRITERIA FOR EVALUATING FUTURE REUSE PROJECTS

As potential projects are proposed, the following criteria will be used to help evaluate the feasibility of projects.

1. Proximity of proposed project to existing and/or future pipelines having capacity to deliver water, expansion potential, and proximity to urban boundaries

2. Portion of project cost borne by project proponent, and Subregional Reclamation System cost/benefit relationship

3. Impact on future domestic water supplies, including priority for urban reuse projects that will replace the use of potable water

4. Consideration of who operates and manages the project

The Subregional System is committed to making the best possible use of recycled water; therefore, the Board of Public Utilities and City Council may also consider other factors in evaluating potential projects if the result will be the most beneficial reuse of this resource.

PROCESS FOR EVALUATING POTENTIAL PROJECTS

1. Initial Review by City Staff

The project proponent will present its conceptual project to the Utilities Capital Projects Coordinator, who will facilitate initial review by City staff. Staff will evaluate the proposed project using the policies and criteria listed above, and will give its initial reactions to the project proponent.

2. Conceptual Review by Board of Public Utilities

The BPU will give the project proponent its reactions to the proposed project. This will allow the proponent to determine whether or not to proceed with the project, or to make modifications based on feedback received. This preliminary review is intended to prevent costly project development and design activities prior to receiving some indication about the feasibility of the project.

3. Further Project Development by Project Proponent

Following conceptual review by the BPU, the project proponent may make modifications to the project, or more fully develop the proposal for formal consideration by the BPU.

4. Detailed Review by City Staff

Once the project proposal has been fully developed, staff will review the proposal in detail. Based on information presented by the project proponent, and utilizing independent data, staff will prepare a cost/benefit analysis. Staff will also prepare findings listing the project benefits related to the evaluation criteria listed above.

5. Formal Presentation to Board of Public Utilities

When the project proposal is fully developed, it will be presented to the BPU for its formal action. The BPU may approve the proposal, reject the proposal, or ask that modifications be made. The BPU will also make funding recommendations to the City Council.

6. Formal Presentation to City Council

Following BPU action on the proposed project, the City Council will consider funding the project.

Notwithstanding the formal steps outlined above, the Board of Public Utilities and City Council will be kept informed of project proposals when they are presented and as they are being developed. This may be in the form of written memoranda or oral reports at meetings of the BPU and City Council, and their sub-committees.

NOVATO SANITARY DISTRICT

RECYCLED WATER PROVIDER SURVEY FORM

Survey Conducted By: Dana Hunt, G. S. Dodson & Associates/Margaret Orr, City of Petaluma

Date: 6/25/2003

Facility:

Name: Novato Sanitary District

Location: 695 Delong Avenue #100, Novato, CA 94945

Contact Name: Beverly James, 500 Davidson Street

Phone Number: (415) 892-1694

Water Production:

Amount: 5.5 mgd ADWF (Plant Design = 6.0 mgd)

Amount Recycled vs. Discharged (if applicable): 100% Recycled (May - October).

Acres Irrigated: 800

Irrigation Season Length: June - September/October (cannot irrigate until hay is cut. Must be cut by June 1st per contract.

Water Quality:

Secondary Effluent YES

If YES, % of Total Recycled Water: 100%

Title 22 Unrestricted Use: None at this time, but doing a project with North Marin Water District to build 1/2 MGD plant to irrigate a golf course. Paid for by golf course. Part of their agreement.

Any Quality Issues from Customers? NO

Customer Type:

Potable Offset: Potable offset customers will be North Marin Water District Customers, Novato District will operate tertiary facilities, but not directly working with customers. No potable. (Urban) customers at this time. Working to provide tertiary to golf course.

Parks/Business Parks: None

Schools: None

HOAs: None

Golf Courses: Working with North Marin Water District to add one.

Industry: None

Agricultural: All recycled currently goes to agricultural land. (City owned).

Crop Type(s): Hay, cattle (must be removed in winter).

Facilities Owned by Agency at Customer Locations: District owns all lands. Owners ≅ 200 acres and long term lease with County Flood Control District for ≅ 600 acres. All land is then rented to farmers (2) on 4 year leases. All land has District owned fixed sprinklers (15,000 heads), fences, gates, troughs, plus supply potable was for cow drinking. All above ground maintained by farmer (Copy of lease was submitted).

District Owned Land: 100% (25% owned/ 75% long term lease)

Quantity: 800 Acres

Management Practices (Rental, etc.): Rental, 4 years leases (1998-October 2003.

Type of Irrigation System: Fixed sprinklers. (Extreme maintenance issue). Problem with breakage from cows and cutting hay.

Water Balance:

Zero Discharge Requirement: YES

If YES, how do you handle annual fluctuations with storage and demand? Have flexible contract. Issue is too much water if anything. Have storage ponds prior to pump station.

System Requirements:

Number of Pump Stations: 1 (VFDs). No operation problems since irrigation systems handled by District.

Number of System Storage: None

Pressure (min) at User: Enough to operate sprinklers on site. All irrigation owned and operated by District.

Any Issues/Advice: No fixed irrigation. Have irrigation system, fence, etc. Designed by Agricultural Engineer. Have soil evaluated. Work with farmer by he has no control over system. Farmers are responsible to move cattle.

Revenue:

Initial Facilities: System Paid for by 1995 Clean Water Grant.

Water Rates/Charges: No charge for recycled water, farmers pay for potable and rent land for $100/acre.

Future:

What is plan for future as wastewater production increases?

Wastewater is not expected to increase. City has no growth. New upgrade for plants underway. (Ignacio & Novato) are being designed since very old facilities. Will have tertiary of 0.5 mgd to serve a golf course (Stone Tree Golf Course) by North Marin Water District. The tertiary plant cost less to serve golf course than obtaining more potable water supply. Are interested in going to Napa Salt March. If so need all tertiary. At that point they would like to serve more Urban users, too.

Other:

Napa Salt Marsh:

This would require discharge year round of tertiary to salt marsh. Project would only require flow for 15 years. After that, new customers would be needed. Other customers would not require winter water.

Discharge Restrictions:

Novato can discharge in May, September/October but very strict discharge requirements which can't really be met.

Agency Owned Land Issues:

Responsible for run off and ponding of water. They operate drainage pump stations and must guard against mosquito problems. So try not to over irrigate. Over irrigation would also ruin the land. Cows in wing would also ruin land.

Other Crops:

No one seems to want to grow other crops. Short growing season.

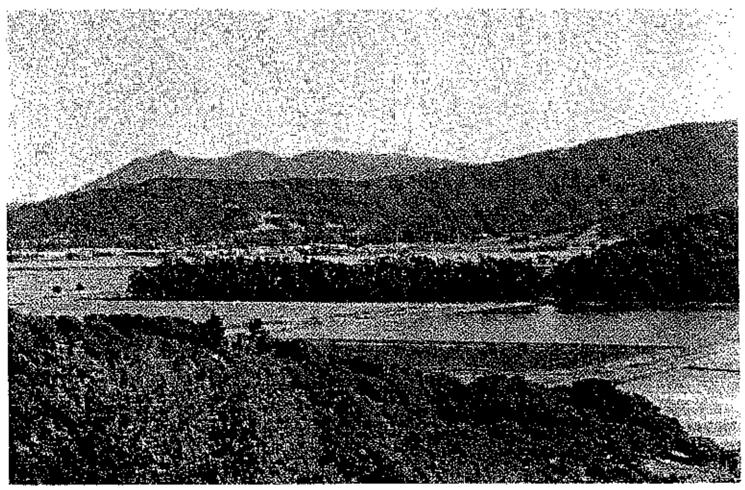
Labor Requirements to District:

Need 5 people during irrigation season (and prior) to repair system, etc. Responsible for everything except heads. Clean drainage ditches every 5 years as Capital Project. Cost ≅ $200,000 to $300,000. Also need to repair levees.

NOVATO SANIT

Wastewater Reclamation Program

10 Years of Conservation and Environmental Protection



Introduction

San Francisco Bay is an important natural resource for all Northern Californians. The Bay is essential to both the economy and quality of life of Novato and its neighboring communities. For over ten years, the Novato Sanitary District has operated an award-winning wastewater reclamation program that helps protect the health of the bay while enhancing local agriculture and wildlife. Since 1985, the District has reused billions of gallons of water produced at its municipal wastewater treatment plants to irrigate farmland and to provide freshwater habitat for birds and other wildlife. This decade of water reclamation has established the District as a Bay Area leader in the beneficial reuse of one of California's most limited and valued resources: water.

Service Area

The Novato Sanitary District treats the municipal wastewater generated by over 50,000 people residing in the City of Novato and surrounding areas.

District Facilities

The District operates two wastewater treatment plants. The Novato Plant serves the northern two-thirds of the District's service area. The Ignacio Plant serves the southern third.

Each treatment plant goes beyond Federal secondary treatment standards and provides tertiary treatment (secondary treatment followed by ammonia removal and filtration). The combined flow from the two plants is discharged through an outfall pipe into the near-shore waters of San Francisco Bay. During the summer months, however, the treated wastewater is reclaimed and reused for beneficial purposes on District-controlled land. (See Map of District Facilities on overleaf)

A Decade of Wastewater Reclamation

Agricultural Irrigation

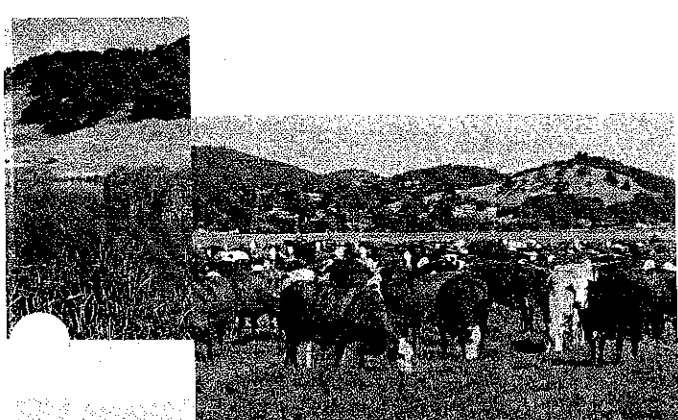
Under the District's wastewater reclamation program, farmland that once lay fallow during the dry season has been transformed into irrigated pasture for grazing cattle. From May to October, the District supplies an average of 5 million gallons per day of highly treated effluent from its treatment plants to irrigate 820 acres of farmland at three sites. A secondary benefit of using reclaimed water to irrigate this land is that trace amounts of nitrogen and phosphorus in the water provide fertilizing nutrients to soils that are otherwise of poor quality.

Wildlife Enhancement

A specially constructed wildlife pond — supplied with reclaimed water from Novato's treatment plants — supports a variety of wildlife and aquatic plants. The pond serves as a 15-acre preserve for waterfowl, migrant birds, and several species of animals native to Marin County.

An Award Winning Program

In 1987, the District's Wastewater Reclamation Project received the Grand Award for Engineering Excellence from the American Consulting Engineers' Council. The award was based on a national competition among projects in various engineering disciplines.



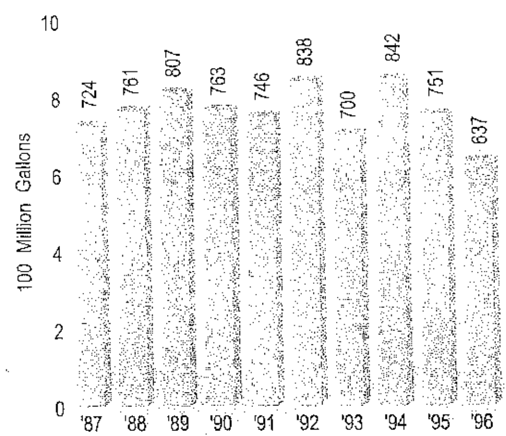
A Decade of Benefits

Conservation of a Limited Resource

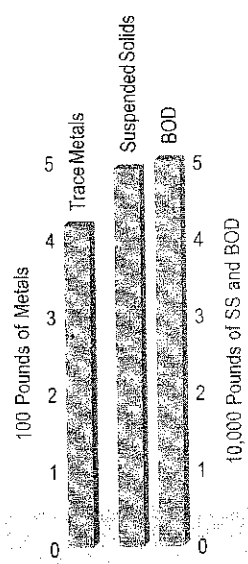
In the first decade of Novato Sanitary District's water reclamation program — 1986 to 1996 — over seven billion gallons of treated wastewater has been reclaimed and reused for local beneficial purposes.

Protection of San Francisco Bay

The District protects San Francisco Bay first by providing wastewater treatment that not only meets, but goes beyond federal government standards. The District's wastewater reclamation program provides a second level of Bay protection. For five months each year, treated wastewater that would otherwise be discharged to the Bay is diverted for use on farmland and in the wildlife pond. The net result of diverting wastewater from the Bay for reclamation is a significant reduction in the pounds of trace metals, suspended solids, and oxygen demanding material that are discharged to San Francisco Bay annually.



Amount of Wastewater Reclaimed Annually



Average Annual Reduction in Pollutant Loads Attributable to the Reclamation Program

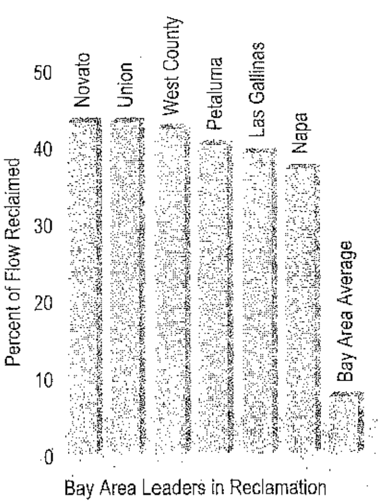
A Significant Investment in Reclamation

In the mid-1980's, the Novato Sanitary District, with the assistance of Federal and State grants, invested $16 million in reclamation facilities for the irrigation project and wildlife pond. In order to make wastewater reclamation a reality, significant quantities of land had to be purchased or leased and numerous facilities had to be constructed. These facilities are necessary to convey the treated wastewater to the reuse sites, store the treated water so that the supply matches the demand, distribute and apply the wastewater to the sites, and collect the drainage.

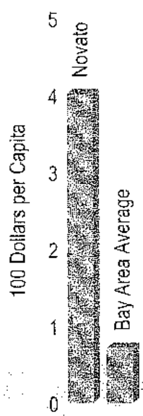
At today's costs, the original investment constitutes a $400 per capita investment in water reclamation. This is nearly six times the Bay Area average ($70 per capita) and is one of the largest per capita investments in the Bay Area.

First Among Bay Area Communities

Over the past ten years, Novato Sanitary District has reclaimed an average of 760 million gallons of treated wastewater per year. This amounts to 43% of the District's average annual dry weather flow, compared to the Bay Area average of 7%. No other Bay Area community has reclaimed a greater percentage of its average annual dry weather flow.



Bay Area Leaders in Reclamation

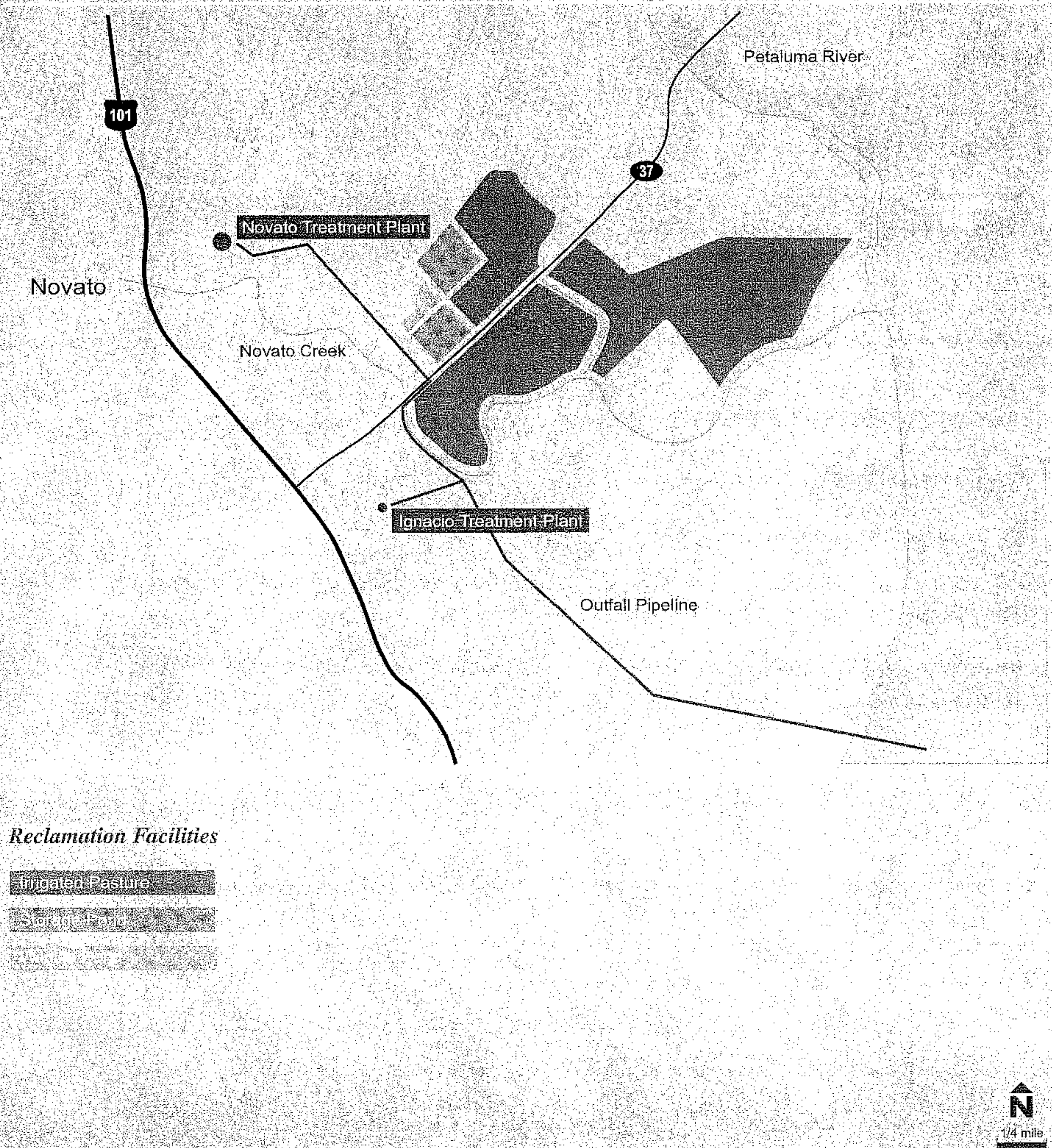


Per Capita Investment in Reclamation

Summary

The Novato Sanitary District's commitment in the mid-1980's to make an unusually large investment in wastewater reclamation facilities has paid significant dividends. This commitment has resulted in the beneficial reuse of 7 billion gallons of water, allowed 820 acres of land which previously lay fallow during the dry season to be used for agricultural purposes, provided habitat for waterfowl and other wildlife, and significantly reduced the amount of wastewater and pollutants that are discharged to the Bay each year. The high per capita investment in reclamation and the resulting high percentage of total wastewater flow that is reclaimed each year has clearly established the District as a Bay Area leader in wastewater reclamation.

Map of District Facilities



Novato Sanitary District

Funding for Wastewater Reclamation Facilities

Novato Sanitary District

12.5% of construction cost
100% of operation and maintenance cost

State Water Resources Control Board

12.5% of construction cost

U.S. Environmental Protection Agency

75% of construction cost

Novato Sanitary District
500 Davidson Street
Novato, CA 94945
(415) 892-1694

RECYCLED
PAPER

Novato Sanitary District
Wastewater Reclamation Facility

PASTURE LEASE - SITES 2 AND 3
C. R. FEDRICK

This lease is made and entered into as of this 10th day of January, 1994, between NOVATO SANITARY DISTRICT, 500 Davidson Street, Novato, CA 94945, hereinafter called "District," and C.R. FEDRICK, P.O. Box 688, Novato, CA 94948, hereinafter called "Rancher";

W I T N E S S E T H:

WHEREAS, District operates a wastewater reclamation facility located on lands owned or leased by District on both sides of State Highway 37 between Novato Creek and Atherton Avenue, Novato, as said project lands are shown on the map entitled, "Novato Sanitary District, Wastewater Reclamation Project, December 21, 1988", a copy of which is attached hereto as Exhibit "A";

WHEREAS, District and Rancher desire to enter into an arrangement whereby Rancher will lease a portion of said reclamation facility for pasture purposes;

NOW, THEREFORE, the parties agree as follows:

1. Description of Property to be Leased. The property involved in this lease, hereinafter called "Ranch", consists of two irrigated pasture sites, comprising a total of approximately 380 acres, located on the north and south sides of State Highway 37, between Novato Creek and Black Point, in the City of Novato. Said Ranch is shown as Sites 2 and 3 on Exhibit "A".

2. Term. The term of this lease shall be for five (5) years, commencing on the date of this agreement and ending October 31, 1998, unless sooner terminated by a breach of the terms and conditions of this lease by Rancher or by an abandonment of the premises by Rancher, or unless the term is extended as provided in Paragraph 21 of this lease. Rancher shall surrender the premises to District immediately upon termination of the lease.

3. Purpose and Possession. The Ranch is hereby leased only for the purpose of dry weather pasturing of beef cattle and/or non-milking dairy animals, and harvesting of pasture grass to be utilized for feeding animals. Rancher shall not use the Ranch for other purposes, and shall not pasture other types of animals on the property, without prior written consent of District. Rancher shall have such use, possession and control of the Ranch as shall be necessary for such purposes subject to the other provisions of this lease.

Rancher shall permit District, its officers, agents and employees, to have access to and to enter the Ranch at all reasonable and necessary times to examine and inspect the pasture and Ranch improvements or for any other purposes reasonably connected with District's interests in the property.

Pasturing of animals during the winter season will not be allowed. Accordingly, Rancher shall not put animals on the Ranch until after April 1st, and shall remove all animals from the property within a few days after the first rains of the winter season. In any event, the animals shall be removed from the pasture by November 1st each year. The exact timing of each year's pasture season shall be approved by the District Manager-Engineer.

4. Rental. Rancher agrees to pay District, as rent for the use of the Ranch, a sum equal to Thirty Eight Thousand Dollars ($38,000.00) per year. However, it is understood that the District intends to lease Site 7 of the reclamation facility, following an open bidding process which is anticipated to be concluded by March 1, 1994. If the District enters into a lease for said Site 7 as a result of this process, it is agreed that the rent for Sites 2 and 3 shall be adjusted to be equivalent to that for Site 7 proportioned on an acreage basis. Rent shall be paid annually, in advance, on or before March 1st, for each of the five years of the lease.

5. Performance Guarantee. Rancher shall pay to District, at the time of execution of this lease agreement, a cash deposit amounting to Ten Thousand Dollars ($10,000.00), to guarantee satisfactory performance of all terms and conditions of this lease. District shall pay Rancher, within thirty (30) days of the expiration of each year of the lease, an amount equivalent to the interest the cash deposit would have earned during that year, assuming it had been invested along with other District funds.

In the event of violation by Rancher of any of the terms and conditions of this lease, District shall notify Rancher in writing of the violation and set forth a reasonable time, considering the nature of the violation, for the Rancher to correct the violation. If the Rancher fails to correct the violation within the time limit specified, District shall have the right to use all or part of the cash performance guarantee to make the necessary corrections.

On termination of this lease, District will return any unused portion of the cash performance guarantee to Rancher.

6. Use of Treated Wastewater. District shall provide treated wastewater for pasture irrigation at no cost to Rancher.

Rancher understands that District is required, by discharge permit conditions established by the California Regional Water Quality Control Board, to utilize all of the treated wastewater processed by the District's Novato and Ignacio Wastewater Treatment Plants for irrigation on the Ranch during the period beginning June 1st and ending August 31st each year. Rancher and District agree to be mutually responsible for working out a suitable irrigation schedule that will meet the needs of the pasture grass and Rancher's animal management requirements, while at the same time resulting in compliance with District's discharge permit conditions. However, it is understood that if a conflict arises between the water needs of the Rancher and water use procedures to meet District's discharge requirements, the procedures necessary to meet discharge requirements shall control.

District will make every reasonable effort to furnish reclaimed water of appropriate quality and in the amounts and at the times necessary to satisfy the pasture grass irrigation demand. However, District shall in no way be liable to Rancher for any damages that he may experience in the event District is unable, for any reason, to furnish water of appropriate quality or quantity.

7. Compliance With Laws and Regulations. Rancher shall comply with all laws, requirements and regulations imposed by regulatory agencies with respect to the use of the Ranch and, particularly, the use of treated wastewater for agricultural operations, including but not limited to the following agencies:

a) California Regional Water Quality Control Board, San Francisco Bay Region
b) State and County Health Departments
c) Marin/Sonoma Mosquito Abatement District

Rancher's attention is specifically directed to Order No. 92-065 of the California Regional Water Quality Control Board, a copy of which is on file in the office of District.

8. Acceptance and Maintenance of Ranch. Rancher hereby certifies that he has made a thorough inspection of the Ranch and accepts the pasture and improvements in the condition existing on the date of this lease. Rancher shall, to the reasonable satisfaction of District, keep and maintain the Ranch pasture and improvements in good condition and substantial repair, and free and clear of rubbish and litter.

On termination of this lease, Rancher shall return possession of the Ranch to District in as good condition as when received, reasonable wear and tear and damage by the elements excepted.

9. Ranching Practices. Rancher shall conduct agricultural operations in a manner consistent with generally accepted good ranching practices and in such manner as to prevent damage to the pasture grass and the Ranch improvements. Rancher shall not over-graze the pasture, and shall keep all animals within the leased areas.

Because of District concerns about damage to the pasture and sprinkler system risers, Rancher shall not "green-chop" the crop without prior written approval of the District Manager-Engineer.

Rancher shall have the right to the winter hay crop. In order to have the pasture clear for irrigation, the Rancher shall be responsible for cutting, drying, baling, and stacking the crop prior to June of each year. Rancher shall be responsible for the ultimate disposal of the baled hay from the storage areas.

In order to ensure that irrigation can take place when needed, and in order to protect the health of the pasture grass, it is important that winter hay cutting, drying, baling and stacking operations be conducted in the shortest possible time. To do this, it is necessary that the Rancher use adequate types and amounts of equipment. Unless otherwise approved by the District Manager-Engineer, as a minimum, the following list of equipment shall be employed: 1 swather, 2 3-wire balers, 1 harrow bed, and 1 tetherer. The equipment shall be kept in good working order at all times. The Rancher shall secure replacement units if the above units cannot be repaired within 24 hours. Hay shall be cut no closer than 3 to 4 inches above ground.

10. Improvements, Repairs, and Alterations. Improvements to the Ranch provided by District include access roads, perimeter fencing and gates, interior pasture parcel fencing, cattle walkways and gates, fresh water cattle troughs, corrals (including rock access roads, fencing, loading chutes, fresh water connections, sick pens, crowding alleys, and squeeze chutes), underground irrigation system, irrigation pump station (off-site), and drainage pump stations. Rancher shall operate, maintain, repair, and replace as necessary, all above ground equipment and improvements within the Ranch, except those specifically provided herein to be operated and maintained by District.

District and Rancher agree to jointly finance installation of wire mesh material (hog wire) on all existing Site 3 fencing that does not already have such material installed. District shall furnish to Rancher the hog wire material and staples, and Rancher shall furnish labor, equipment, and supervision for installation. All installation work shall be performed to the satisfaction of the District Manager-Engineer.

Rancher shall provide at least one person and a vehicle to care for, monitor and maintain all sprinklers on a daily basis on all days when irrigation is in progress. To prevent damage to the pasture, the vehicle used for sprinkler maintenance shall be an all-terrain type with low tire pressure.

Specifications and methods for sprinkler head maintenance and replacement shall be approved by the District Manager-Engineer.

In order to prevent damage to sprinkler heads and risers when the crop is being harvested, and to keep grass and weeds clear from sprinkler spray nozzles, Rancher agrees to have a 6-foot square area around each sprinkler head sprayed to prevent grass and weed growth. Unless an alternate spraying program is approved by the District Manager-Engineer in writing, the required spraying program shall be as follows:

1. Spray with the selective herbicide KERB 50-W between October 15th and November 15th of each year, in strict accordance with the manufacturer's recommendations. Application shall be at the rate of 3 pounds per treated acre. This work shall be done by a Certified Applicator or a person under his/her direct supervision. Since KERB 50-W is a restricted herbicide, its use must be approved by the Marin County Department of Agriculture and a use permit obtained. Animals must be removed from the pasture prior to application and may not graze for 120 days following application, nor may hay be harvested during this period.

2. During this same October-November time period each year, spray with the herbicide ROUNDUP, in strict accordance with the manufacturer's recommendations. Application shall be at the rate of 1 quart per treated acre.

3. Spray with the herbicide ROUNDUP between June 15th and July 15th of each year, in strict accordance with the manufacturer's recommendations. Application shall be at the rate of 1 quart per acre.

The October-November spraying described above has been completed and the June-July spraying will be accomplished by the District in 1994. The District will also spray thistle weeds in all pasture areas once between June 15th and July 15th. Thereafter, Rancher shall be responsible for weed control throughout all pasture areas for the remaining term of the lease.

District shall be responsible for maintaining and repairing all underground horizontal irrigation piping, except that Rancher shall repair at his expense any damage to this piping directly caused by his operations.

District shall also be responsible for operation and maintenance of the irrigation pump station, irrigation valve boxes, irrigation control valves and wiring, the drainage pump stations, and the fresh water animal watering system, exclusive of the watering troughs and risers.

Upon conclusion of each pasture season, Rancher shall reimburse District for the cost of fresh water used for animal watering.

Rancher shall not improve or alter the pasture or any Ranch improvements without the prior written consent of District.

<u>11. Site Drainage.</u> District shall be responsible for drainage ditch maintenance in all pasture areas.

District shall operate and maintain the drainage pump station located on Site 3. This pump station has capacity adequate to remove surface drainage water resulting from a normal year's rainfall. However, it is understood that District will not be responsible for damages suffered by Rancher in the event of flooding of the pasture due to pump station capacity limitations, or due to dike failures or overtopping of the dikes.

12. Mosquito Abatement. District shall be responsible for any ditch maintenance or other requirements of the Marin/Sonoma Mosquito Abatement District in the handling of irrigation or drainage water on the Ranch.

13. Rancher Records and Reports. Rancher shall keep records satisfactory to District regarding tonnage of hay harvested and numbers and types of animals pastured. By December 1st of each year, Rancher shall prepare and submit to District an annual report in a form satisfactory to District, containing the information above described.

14. Security. Rancher shall be responsible for assisting the District with the security of all ranch sites. Pasture gates shall be kept locked at all times to prevent entry of unauthorized persons.

15. Hold Harmless. Rancher hereby indemnifies the District, its officers, agents and employees and shall save it and them harmless from any damage, penalty, fine, judgement or expense suffered, imposed on, assessed to or incurred by them, including attorney's fees and court costs, arising out of Rancher's use and occupancy of the Ranch, and Rancher shall reimburse District, its officers, agents and employees for any damage, penalty, fine, judgement or expense so suffered, imposed, assessed or incurred.

16. Insurance. Rancher shall procure and maintain for the duration of this lease, insurance against claims for injuries to persons or damages to property which may arise from or in connection with Rancher's use and occupancy of the Ranch and the performance of work on the Ranch by Rancher, his agents, representatives, employees, or subcontractors.

Workers' Compensation Insurance: Rancher shall furnish to the District, in triplicate, satisfactory proof that he has taken out full workers' compensation insurance for all persons whom he may employ directly or through subcontractors, in carrying out work contemplated under this lease, in accordance with the "Workers' Compensation and Insurance Act," Division IV of the Labor Code of the State of California and any acts amendatory thereof. Such insurance shall be maintained in full force and effect during the entire term of this lease.

If the Rancher fails to maintain such insurance, the District may take out workers' compensation insurance covering any claims which the District might be liable to pay under the provisions of the Act by reason of any employee of the Rancher being injured or killed, and deduct and retain the amount of the premiums for such insurance from Rancher's deposit.

Public Liability and Property Damage Insurance: Rancher shall take out and maintain during the term of this lease such public liability and property damage insurance as shall protect him and any subcontractor performing work covered by this lease from claims for property damages, which may arise because of the nature of the work or from operations under the lease, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them, even though such damages may not be caused by the negligence of the Rancher or any subcontractor, or anyone employed by either of them.

The public liability and property damage insurance shall have limits no less than:

Comprehensive General Liability: $1,000,000 for bodily injury for each person, and $2,000,000 for each occurrence, $1,000,000 for property damage for each accident or occurrence.

Automobile Liability: $1,000,000 per accident for bodily injury and property damage.

Any deductibles or self-insured retentions must be declared to and approved by the District.

The general liability and automobile liability policies shall cover the District, its officers, officials, employees, agents and volunteers as insureds as respects: liability arising out of activities performed by or on behalf of the Rancher; products and completed operations of the Rancher; premises owned, occupied or used by the Rancher; or automobiles owned, leased, hired or borrowed by the Rancher.

In order to verify coverage, the Rancher shall furnish the District with a certificate or certificates of insurance showing the required coverages and such other proof of insurance as District may request. Said certificate or certificates of insurance shall include a provision to the effect that the insurance company shall notify District at least thirty (30) days in advance of any lapse, cancellation or change in the subject insurance coverage.

17. Breach of Contract. The failure on the part of District or Rancher to take any action by reason of any particular breach of any or all of the terms, covenants and conditions of this agreement shall not be deemed in any way a waiver of any other or subsequent breach of any or all of the covenants or conditions of the agreement.

18. Possessory Interest. Rancher acknowledges that he has been informed that under Section 107 of the Revenue and Taxation

Code of the State of California, the Marin County Assessor is required to place a value on all possessory interests. Possessory interest is defined as the right of a private taxable person or entity to use property owned by a tax-exempt agency for private purposes. A possessory interest tax may, therefore, be levied by the County Assessor on this property against Rancher as of the lien date which is March 1st of each year.

19. Attorney's Fees. In any legal action to enforce any provision of this lease the prevailing party may have and recover from the other party all reasonable costs and expenses incurred therein, including attorney's fees and expenses.

20. Subletting or Assignment. This lease shall be binding upon and shall inure to the benefit of the successors and assigns of the respective parties hereto. However, Rancher shall not sublet the Ranch or any part thereof, nor assign or otherwise transfer this lease or any rights or interest of Rancher hereunder without the advance written consent of District.

21. Extension of Lease. It is agreed that this lease may be extended by mutual agreement of the parties for an additional term of five (5) years at the expiration of the term of this lease, at a rental amount and other terms and conditions to be agreed upon by the parties. The parties shall make the decision on whether or not to extend the lease at least one hundred eighty (180) days before expiration of this lease, and a new agreement for the term of such extension shall be executed, setting forth the terms and conditions of such extension.

* * * * *

IN WITNESS WHEREOF, the parties hereto have executed this lease as of the day and year above stated.

By ______________________
C.R. Fedrick

NOVATO SANITARY DISTRICT,
a public corporation

By ______________________
President

Attest ______________________
Secretary
(SEAL)

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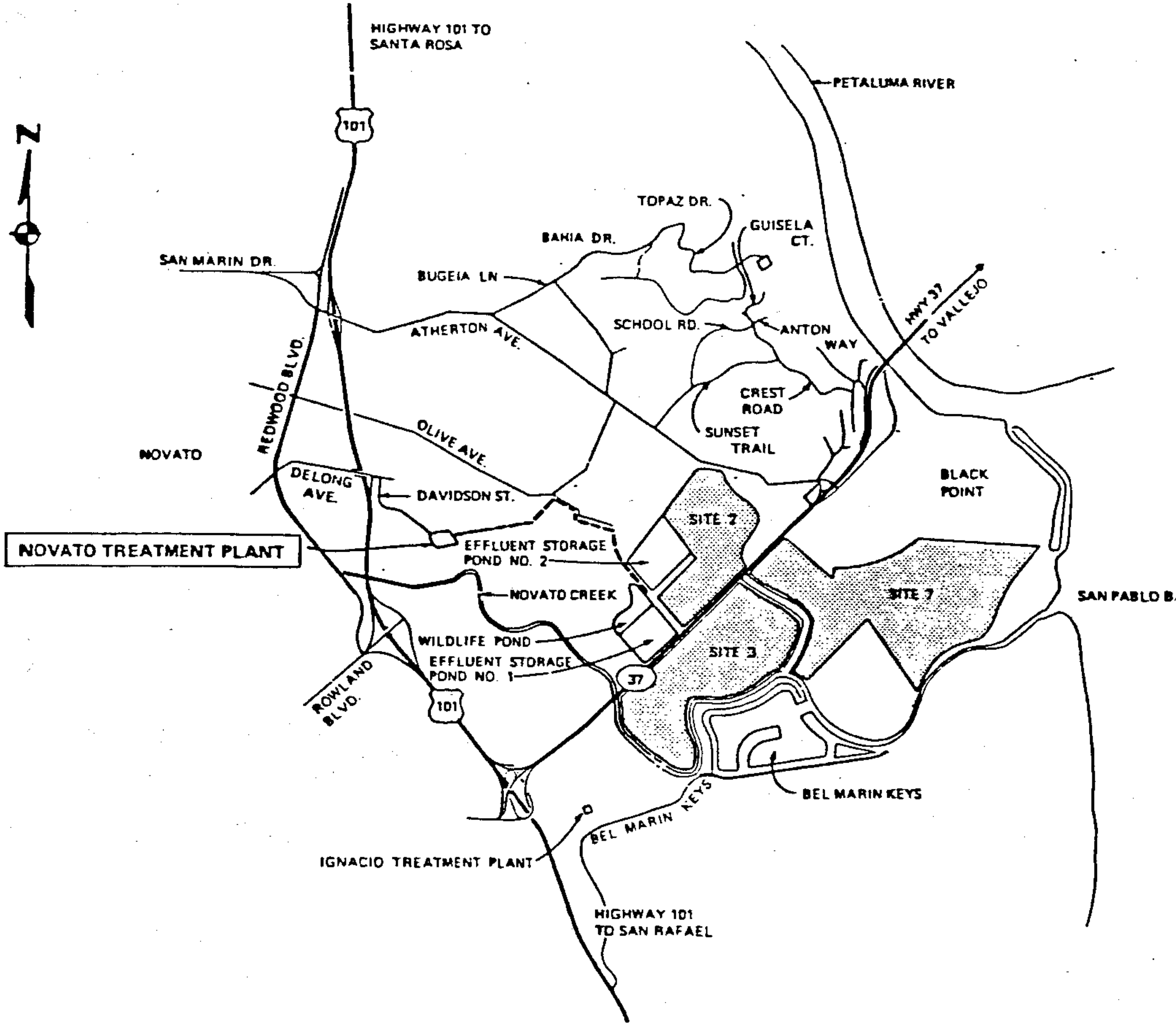


NOVATO SANITARY DISTRICT

WASTEWATER RECLAMATION PROJECT

December 21, 1988

EXHIBIT A

ato Sanitary District

003-04 Budget

Operating Budget - WASTEWATER RECLAMATION/DISPOSAL FACILITIES

Account Number	Item	Budget 2002-03	Expends Thru April	Est. Expend 2002-03	Actual Expend 2002-03	2003-04 Budget Prelim	2003-04 Budget Final
63010	Salaries/Wages	85,119	68,404	82,118		89,920	
63060	Gas, Oil & Fuel	1,200	657	789		1,200	
63091	Software Maint	1,125	0	0		0	
63100	Oper Supplies	7,000	6,709	8,054		8,000	
63101	Oper Chemicals	40,000	20,215	24,268		30,920	
63111	Radio Maint	0	0	0		0	
63115	Sludge Disposal	7,000	12,563	15,082		12,000	
63150	Repairs & Maintenance	78,000	68,641	72,000		78,000	
63151	Unusual Eq Maint	7,500	0	0		7,500	
63155	Sprinkler Spraying	0	0	0		0	
63157	Ditch/Dike Maintenance	200,000	17,316	20,788		0	
63191	Gas & Elect	140,000	114,644	137,628		150,900	
63192	Water - Recl	6,000	6,864	8,240		7,000	
63194	Water - Dechlor	2,000	0	0		2,000	
63200	Other	0	0	0		0	
63201	Permits & Fees	1,200	923	1,108		1,200	
63290	Vehicle Repl	1,200	0	1,200		1,200	
63300	Capital Outlay	0	0	0		0	
Total - RECLAMATION/DISP. FACILITIES		577,344	316,936	371,273	0	389,840	0

UNUSUAL EQUIP MAINT:	Sprinkler Upgrades ($7,500)
PERMITS & FEES:	See page 5A

TODAY 20-Jun-03

2003-04 Budget
Operating Budget - REVENUE SUMMARY

Acct Number	Item	Budget 2002-03	Revenues Thru April	Est Rev 2002-03	Actual Rev 2002-03	2003-04 Budget Prelim	2003-04 Budget Final
41010	Service Chgs	2,965,140	2,733,353	2,965,140		3,376,107	
41020	County Ser Chg Collect Fees	27,700	26,779	26,779		30,529	
41030	Pub Sewer Plan Chk/Insp Fees	12,000	31,903	32,000		12,000	
41040	Conn Permit/ Insp Fees	8,560	27,170	28,000		10,000	
41050	Property Tax Allocation(1)	1,375,000	1,191,828	1,375,000		1,430,000	
41060	Interest Earn	95,000	70,232	80,000		85,000	
41070	Annex Fees Leg/File/Engr	0	0	0		0	
41080	Engr/AdminChgs	75,000	50	75,000		75,000	
41090	Non-Domestic Permit Fees(2)	7,995	5,491	7,995		7,995	
41100	Garbage Franchise Fee	35,000	35,000	35,000		35,000	
41105	AB939 Collector Fees (See Page 22)	209,930	0	209,930		264,378	
41107	Oil/Bev/Tire Grants	38,701	0	38,701		30,676	
41110	Sludge Disp Charges(NMWD)	0	0	0		0	
41130	Ranch Income	82,517	82,517	82,517		82,517	
41140	Other Rev	20,000	18,205	22,500		20,000	
	TOTALS	4,952,543	4,222,528	4,978,562	0	5,459,202	0

(1) Property tax revenue is based on the assumption that total county wide property tax collection will increase approximately 4.0% due to growth.

(2) Includes application fees, permits, and monitoring charges.

APPROPRIATIONS LIMITATION

The appropriations limitation, pursuant to Article XIIIB of the California Constitution, will be determined prior to submission of the final budget in August.

TODAY 20-Jun-03

freshwater will still be needed at the Salt Marsh for habitat management and agricultural irrigation.

Cost

The capital cost to convey NSD effluent to Lakeville Road would be in the range of $1.5 million to $2 million. The shared cost for conveyance from Petaluma to the project would be in the range of $4.5 million to $5 million depending on the cost sharing arrangements with Petaluma and Sonoma Valley.

Permit Issues

Novato would be required to obtain permits related to the installation of a pipeline from the Novato facilities to Petaluma (if involved) or to the project site. SCWA would be responsible for all applicable discharge permits, because discharges would be through their outfalls. The restoration project's permit may state that existing water quality in the Napa River may not be degraded. In terms of salinity, this requirement may limit summer discharges from the marsh area, as ambient water is almost entirely tidal flows from the Bay. SCWA estimates that existing or stricter water quality standards for Bay discharges would be required for the project. Novato would have to provide water to SCWA at this quality. Thus, there is no apparent advantage to NSD for this discharge option in terms of exposure to regulatory requirements.

OCEAN DISCHARGE

The possibility of installing and operating an ocean outfall to discharge treated wastewater was explored. The preliminary findings indicate that this option is not feasible for several reasons.

Location

The outfall would have to be sited north of the Monterey Bay National Marine Sanctuary, the Gulf of the Farallons National Marine Sanctuary, and the Point Reyes National Seashore. Currents tending to advect the discharge plume southwards (towards the Marine Sanctuary) may also require consideration. Finally, the Golden Gate Biosphere Reserve would have to be avoided. The Reserve extends through the central California coastal region from the Bodega Research Reserve in the north to Jasper Ridge in the south. Seaward it extends out from the shore approximately 30 miles to the edge of the Continental Shelf and includes the Farallon Islands. Within San Francisco Bay it includes Angel Island and Alcatraz.

Both the Point Reyes Headland Reserve and Extension and the Farallon Islands have been designated as Areas of Special Biological Significance, where the Ocean Plan prohibits the discharge of waste (even storm water discharges).

Permitting

The California Ocean Plan Amendments, with which this option would have to comply, were adopted by the SWRCB on November 16, 2000. The pertinent amendments include replacing effluent limitations with water quality objectives, adding provisions for compliance, and special protection for special category waters. Discharge limits for ocean outfalls therefore will be generally more stringent than under the previous Plan. In addition, Executive Order 13158

Novato Sanitary District Strategic Plan

TECHNICAL MEMORANDUM No. 5.2
ANALYSIS OF ALTERNATIVE DISCHARGE OPTIONS

INTRODUCTION

The purpose of Technical Memorandum No. 5.2 is to present the findings of an investigation on the feasibility of alternative effluent discharge options for the Novato Sanitary District. The options investigated include the following:

- Santa Rosa Geysers Recharge Project
- Napa River Salt Marsh Restoration Project
- Ocean Discharge

SANTA ROSA GEYSERS RECHARGE PROJECT

Beginning in 2002, the City of Santa Rosa will transmit a portion of its reclaimed, tertiary-treated wastewater from its treatment facility to a geyser steam field, located northeast of Healdsburg. The water will be injected to recharge the geysers steam field, which is currently used as a source for geothermal energy. The total average annual water delivery to the geysers will approach 4,015 million gallons at design capacity, for an average daily delivery of 11 mgd. The geysers project requires a steady flow of water throughout the year, but allows some fluctuation in the short term. Therefore, until Santa Rosa's minimum annual flows increase, a peak monthly delivery of 12.1 mgd will occur from December through February, and a minimum delivery of 9 mgd will occur from July through August (still averaging 11 mgd on an annual basis).

Although the transmission pipeline to the geysers was designed for the amount presently proposed, the pipe capacity is 16.0 mgd. Two other local wastewater dischargers have asked Santa Rosa to consider adding their flows within the available excess capacity: the City of Windsor (0.75-1.5 mgd) and the Sonoma County airport facility (0.5 mgd). At this time both dischargers are developing project EIRs with this option.

The City of Santa Rosa will entertain offers to accept treated wastewater into their geyser pipeline up to the capacity flows, but no cost policy has been developed at this stage. As a point of reference, the geysers project costs are estimated at $132 million. This total implies that the flow unit cost would be in the range of $8.25 million/mgd. The cost to accommodate projected NSD flows of 6.55 to 7.76 mgd, therefore, would be in the range of $54 to $ 64 million not including the cost to convey effluent from NSD to the Geysers Project pipeline. The potential exists to convey NSD effluent to the geysers pipeline via the City of Santa Rosa irrigation pipeline at the southern county boundary. The capacity of this pipeline, which connects downstream to both the geysers pipeline and Santa Rosa irrigation reservoirs, is 40 mgd. However, based on the project capacity of 16.0 mgd stated above, it appears the Geysers Project could not accommodate the total projected flows from NSD, and therefore would not be a feasible option unless only a portion of the NSD flows were discharged to the Geysers Project.

NAPA RIVER SALT MARSH RESTORATION PROJECT

The degradation of fish and wildlife resources associated with the loss of 75 percent of the wetlands in the Napa River Basin has resulted in many species being listed as threatened or endangered. Current efforts to improve the situation involve the restoration of 7,000 acres of former salt production ponds along the lower Napa River to tidal marshes. The pond area is currently owned by the California Department of Fish and Game.

The restoration concept calls for the salt marshes to be reclaimed by flushing with fresh water over a 10-year period. Controlled quantities of imported freshwater will be used to dilute water discharged from the salt marsh into the Napa River any time that the natural freshwater discharge in the Napa River is below "a reasonable threshold rate" (i.e. throughout the majority of the dry season). The most likely, but by no means guaranteed, source of imported freshwater would be tertiary-treated wastewater from nearby municipalities. The US Army Corps of Engineers is currently evaluating alternatives. Project design would include a large on-site basin to provide storage and flow equalization. It is proposed that the reclaimed water supply be coordinated through the Sonoma County Water Agency (SCWA).

Location

The Napa Salt Marsh is located south of the City of Napa, along the western shoreline of the Napa River. The western project boundary is the Napa Slough. The project area extends from the mouth of San Pablo Bay to approximately six miles upstream, as shown in Figure 5.2-1.

Available Capacity for Receiving Discharges

Water needs for the freshwater dilution phase of this project are far greater than available supplies. The SCWA anticipates that all treated wastewater from Napa, Sonoma, Petaluma, and Novato would still be less than needed (on the order of one million acre-feet over approximately ten years). Reclaimed water would have to be pumped from the various treatment plants through conveyance pipelines to the marsh site. Novato would likely only need to extend a conveyance pipeline to the intersection of Lakeville Road and Highway 37, as shown in Figure 5.2-1, where Novato effluent could be combined with Petaluma effluent and the combined flow could be conveyed to Sonoma Valley and subsequently to SCWA for distribution management.

Schedule

Phase I of the feasibility study, initiated in April 1998 with a scheduled completion of April 2000, is still underway with no new completion date estimated. Freshwater will be needed in approximately five years (year 2006) for freshwater dilution of tidal salt marshes and related habitats, although this date is certainly subject to delay. The freshwater dilution process would take approximately ten years, after which time water could still be sent through this pipe network to SCWA for distribution to irrigate agricultural fields. In the long term, a lesser amount of issued on May 26, 2000 calls for steps to reduce pollution and resource exploitation in the ocean, particularly ecologically-sensitive areas. This order has already been employed to maintain low effluent limits for ocean discharge for the City of San Diego.

Other Experience

The City of Santa Rosa, in their 1996 EIR/EIS[1], proposed discharge to the ocean near Salmon Creek, just north of the Gulf of the Farallons Marine Sanctuary, but did not carry this alternative forward. The year-round disposal did not optimize water conservation/reclamation. There were also physical and environmental constraints to outfall construction, involving considerable construction-period disruption to both the marine environment and to coastal areas adjacent to the outfall. Construction of the pipeline to the outfall would have crossed difficult coastal areas, disrupting both dune habitat and narrow residential roads.

The Central Marin Sanitation Agency, located closer to the ocean than Novato, has never seriously considered an ocean outfall, noting that the overwhelming constraints (primarily cost-related) were self-evident. The RWQCB currently knows of no plans or discussions for ocean discharges north of the Golden Gate Bridge.

[1] Santa Rosa Subregional Long-Term Wastewater Project Draft Environmental Impact Report/ Environmental Impact Statement (EIR/EIS), presented in 17 volumes. Completed in July 1996. Managed by Harland Bartholomew and Associates (HBA) under direction of the City of Santa Rosa and the US Army Corps of Engineers.

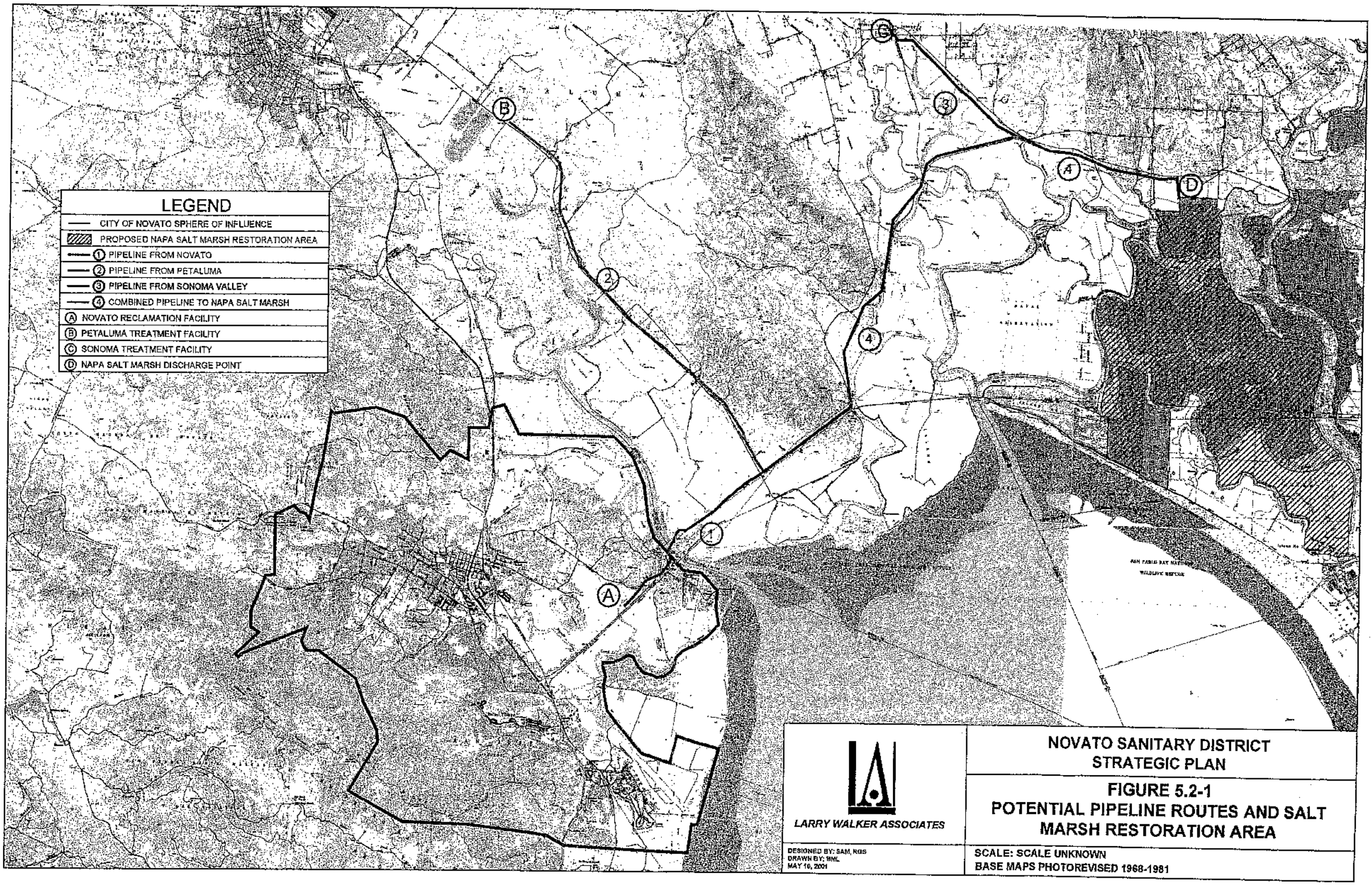


FIGURE 5.2-1
POTENTIAL PIPELINE ROUTES AND SALT MARSH RESTORATION AREA

MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY

RECYCLED WATER PROVIDER
SURVEY FORM

Survey Conducted By: Dana Hunt, G. S. Dodson & Associates

Date: 5/23/2003

Facility:

Name: Monterey Regional Water Pollution Control Agency (MRWPCA)

Location: Marina, CA

Contact Name: Bob Holden

Phone Number: (831) 883-6137

Water Production:

Annual Amount: 21 mgd during irrigation season

Amount Recycled vs. Discharged (if applicable): NONE discharged during irrigation season. Not enough water available for demand.

Acres Irrigation: 12,076 (2/3 recycled + 1/3 well)

Irrigation Season Length: As required (summer)

Water Quality:

Secondary Effluent: NONE

Title 22 Unrestricted Use: 100%

Any Quality Issues from Customers? No. Must account for lower fertilizer use.

Customer Type:

Potable Offset:

Parks/Business Parks: NONE

Schools: NONE

HOAs: NONE

Golf Courses: NONE

Industry: NONE

Agricultural: 100%

Crop Type(s): Artichokes, lettuce, broccoli, cauliflower, celery, strawberries and flowers.

Irrigation Methods:

Furrow/sprinkler 46%, Sprinkler only 32%, and Micro Drip 22%

Irrigation System:

Owned by Growers, including valves at turnouts. District only owns up to meter.

City/Agency Owned Land: NONE

Quantity: NONE Acres

Management Practices (Rental, etc.): N/A

Type of Irrigation System: N/A

Water Balance:

Zero Discharge Requirement: NO

Comments: Can discharge at any time. Recycle all water in summer. Demand exceeds availability. Growers supplement with well water

System Requirements:

Number of Pump Stations: Gravity from WWTP. Have 3 booster stations in system to boost pressure at high demand times.

Number of System Storage: None. Only storage at WWTP = 30 MG

Miles of Pipeline: 48 miles

Supplemental Wells (Private): 21

Monitoring Stations: 9

Turnouts: 112

Customers: 30 (National companies)

Parcels of Lane: 222 (owned by numerous people & leased to Growers @ ≅ $2,500/acre.

Pressure (min) at User: 10 feet of head. In lower areas, get 40-50 psi. Most Growers repump.

Revenue:

Initial Facilities: $30 M (tertiary facilities) + $37 M (distribution system)

Water Rates/Charges: Land assessment. $233.41/acre/year + water delivery charge $16.31/AF. Combined cost ≅ $133/AF.

Future:

What is plan for future as wastewater production increases?

Want to increase amount of water available and perhaps serve golf courses, parks, etc. plus increase supply to Growers. This would require production in winter and storing until summer demand.

Other Issues:

Chlorine Residual:

- Growers wanted chlorine residual 0-20 ppm no effect on crops.
- Have max limit of 8 on chlorine residual at WWTP. ≅ 3 in system.

Tertiary System:

- Not designed to operate below 8 mgd. Turn off below 5 mgd.

Selling Point:

- Drought resistant water source.
- Well water has salt intrusion issues.
- Fertilizer value.

Ag Land:

- $45,000+/acre
- Rents for $2,500/acre.

Interesting Facts:

- Direct connection of recycled water to well water with only a check valve (Grower owned and maintained) between.
- Pipes not labeled "Recycled Water". Only say "Irrigation Water, Not for Drinking". And "No Trespassing" signs at farm roads.
- No Purple Pipe requirement on Growers sites.

Any Issues/Advice:

Work with Growers. Address their concerns. Have PR program to deal with a crisis issue.

Northern California Chapter of WateReuse

May 23, 2003
9:00 a.m. – 2:30 noon

MONTEREY REGIONAL WATER POLLUTION CONTROL AGENCY

AGENDA

I	**Introductions**	***Melanie Richardson,*** *Santa Clara Valley Water District*
II	**Marina Coast Water District Regional Urban Water Augmentation Project**	***Michael Armstrong, General Manager*** *Marina Coast Water District*
III	**WateReuse Association Activities that Provide Benefits to California**	***Wade Miller, Executive Director*** *WateReuse Association*
IV	**Providing Water for the Agricultural Customer**	***Bob Holden*** *Monterey Regional Water Pollution Control Agency*
V	***12:00 – 1:00 Lunch***	
VI	**1:00 – 2:30 Two tours offered concurrently:**	

a. **Tour of the Marina Coast Water District Desalination Plant**

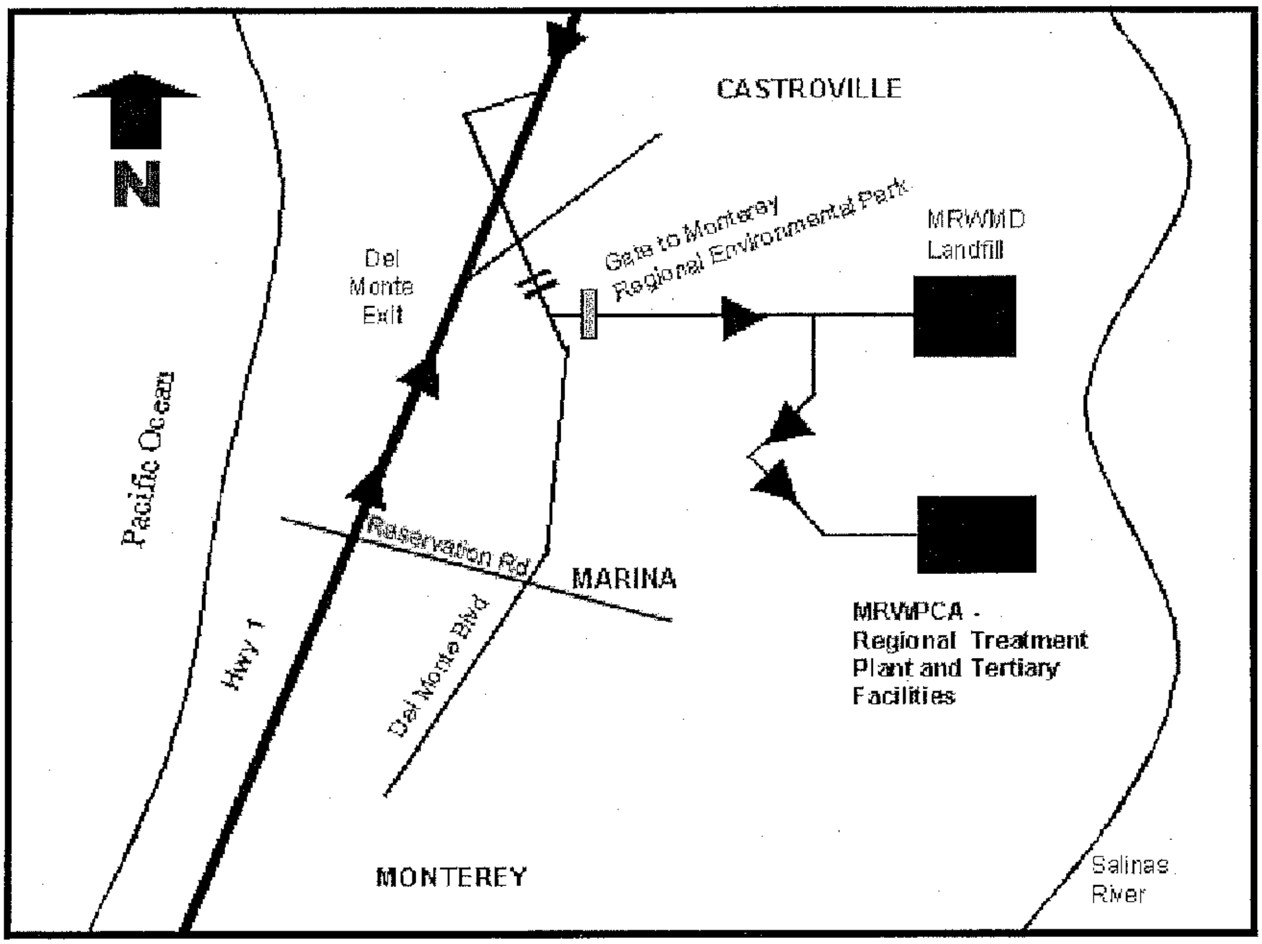
b. **Tour of Monterey Regional Water Pollution Control Agency "Irrigating the Salad Bowl of the World"**

See next page for directions to the Monterey Regional Water Pollution Control Agency.

***** Please Note*****

To improve efficiency and reduce costs, the Chapter would prefer to send announcements by e-mail rather than the US Postal Service. If you received this message and have not provided your e-mail to the chapter, please forward your e-mail address to ***gregb@ddsd.org***.

Driving Directions to the MRWPCA Regional Treatment Plant



If going North on Highway 1, take the Del Monte Boulevard Exit, which is approximately 2 miles north of Marina. At the exit "Stop" sign, take a right, crossing over the railroad tracks. Then, take the first left turn at the gate [designated the "Monterey Regional Environmental Park"]. Travel approximately 1 mile to the "Stop" sign at the landfill weigh station and make a right turn. Follow the road approximately 1/2 mile to the Regional Treatment Plant. Enter through the chain-linked gate. Take the second left turn into the Administration Building parking lot. (Note: The bus turn-around is at the end of this roadway.)

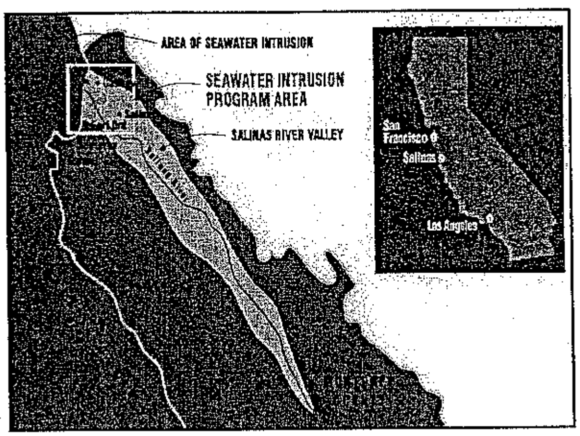
If going South from Highway 101, take Highway 156 to 1, then exit at the Del Monte Boulevard Exit just past Castroville.

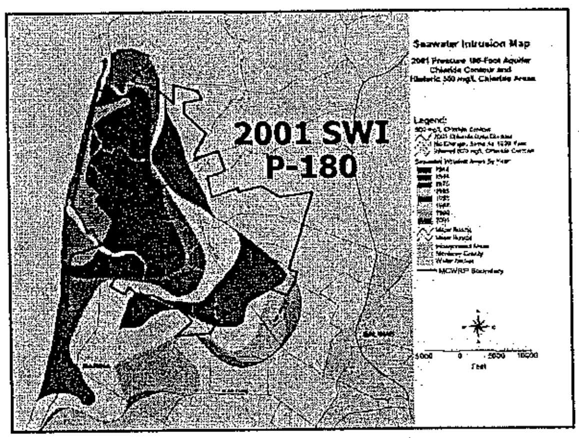
Providing Water for the Agricultural Customer

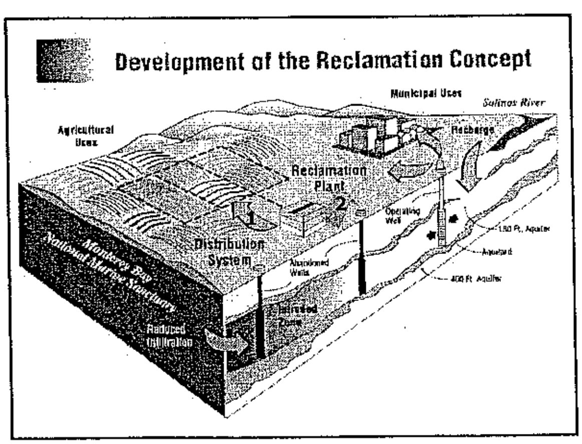
Robert B. Holden
Monterey Regional Water Pollution Control Agency

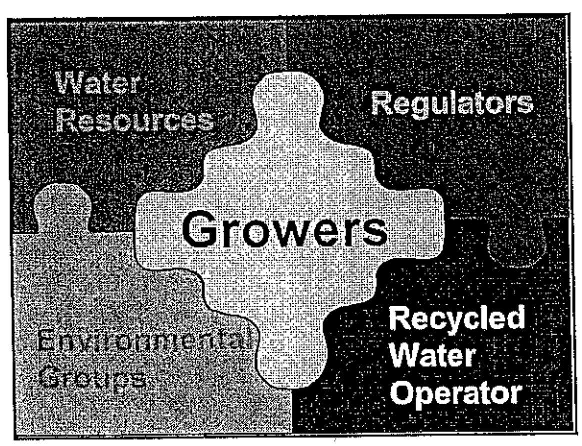
Steps to Satisfying a Customer

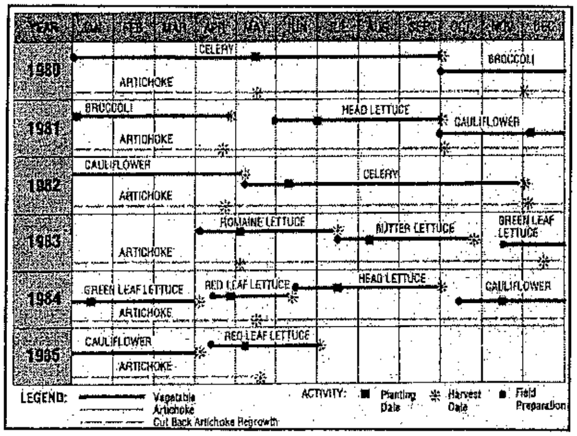
- Know Customer: Who? and What?
- Get Approval to Provide Water
- Give Them Appropriate Water
- Address Their Concerns

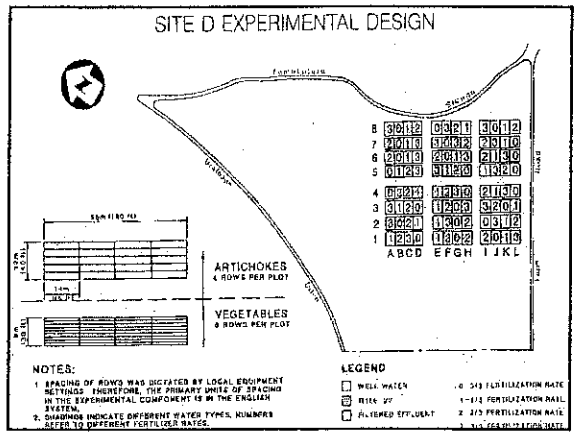










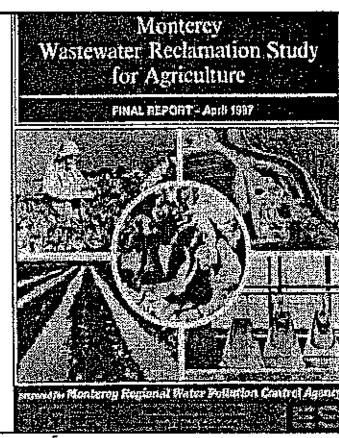


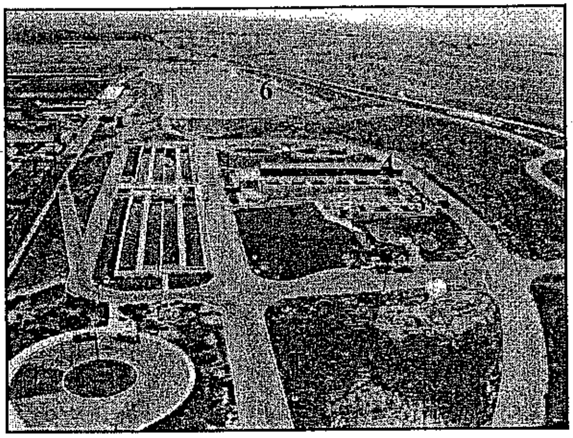
SAMPLING FOR MICROBIAL ANALYSES

Sampling for Virus Assay on Leaves

Monterey Wastewater Reclamation Study for Agriculture (MWRSA)

- No Natural Virus
- Five-Log Removal Polio
- Comparable bacteria
- Quality & Yield Unaffected
- Workers Safe
- Soil Permeability Unaffected
- No Metal Accumulation
- Crop Marketable





Water Quality & Operations Committee

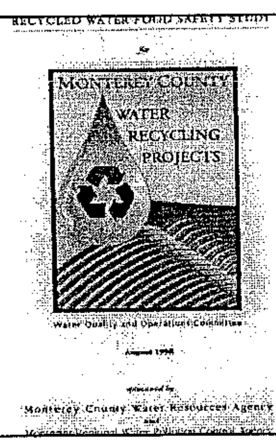
- Growers (6)
- County Health (1)
- MRWPCA (1)
- MCWRA (1)

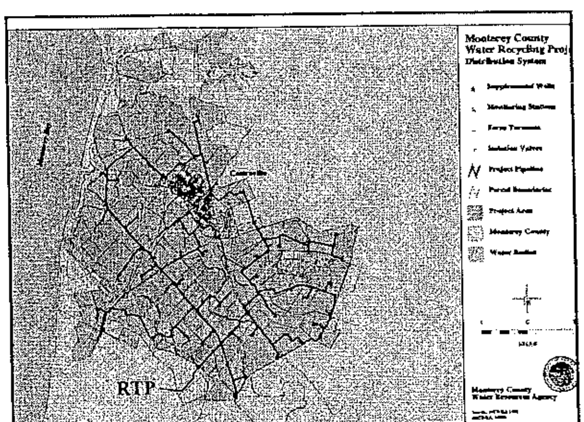
Food Safety 1998

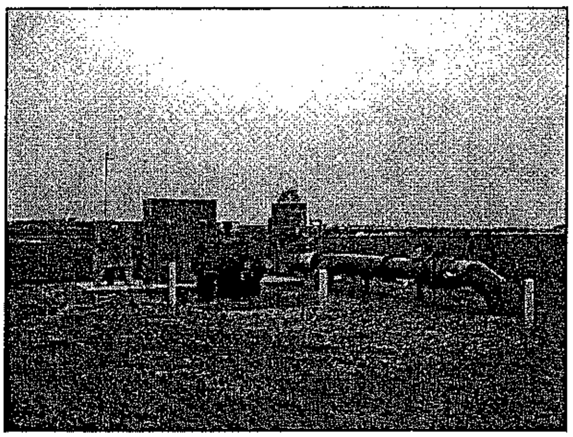
- E. coli 0157:H7
- Legionella
- Cyclospora
- Fecal coliform
- Salmonella
- Cryptosporidium
- Giardia--non-viable

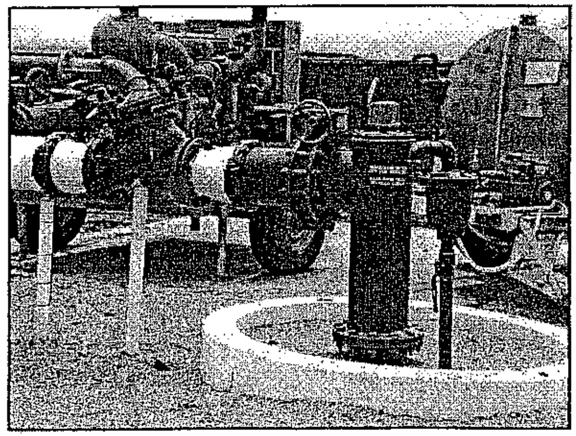
Food Safety Study

- Safe for vegetable irrigation
- Compares favorably with:
  - Recycle Waters
  - Drinking Water Sources



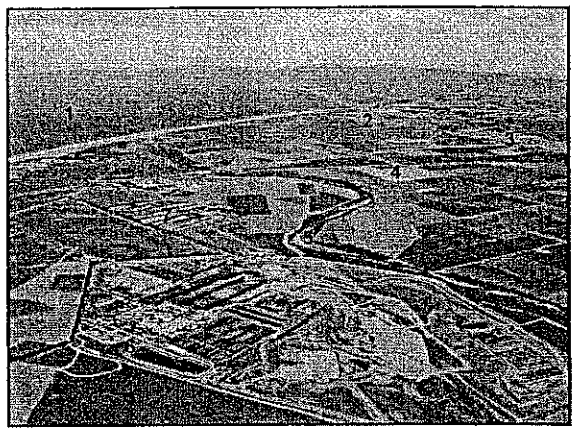






Monterey County Water Recycling Projects

- 48 Miles Pipeline
- 21 Supplemental Wells
- 3 Booster Pump Stations
- 9 Monitoring Stations
- 112 Turnouts
- 222 Parcels of Land (Average 54.4 Acres Each)
- 30 Different Grower Groups
- 12,076 Acres
- Construction Costs $30M Treatment Plant and $37M Distribution System

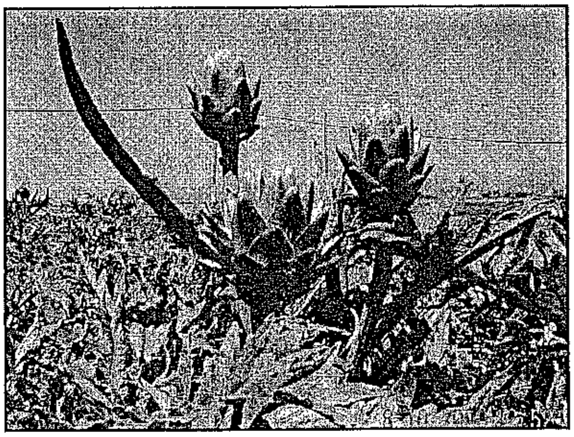


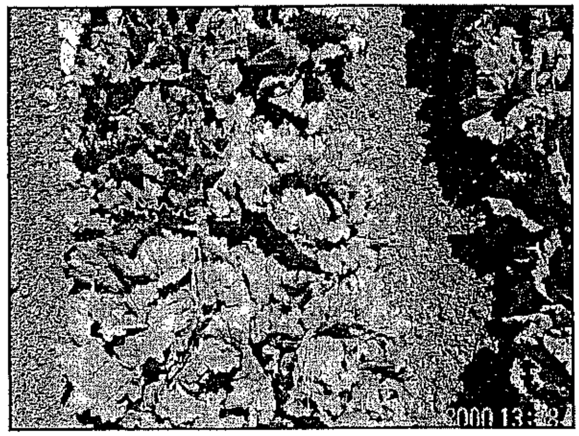
Distribution of Crop Acreage

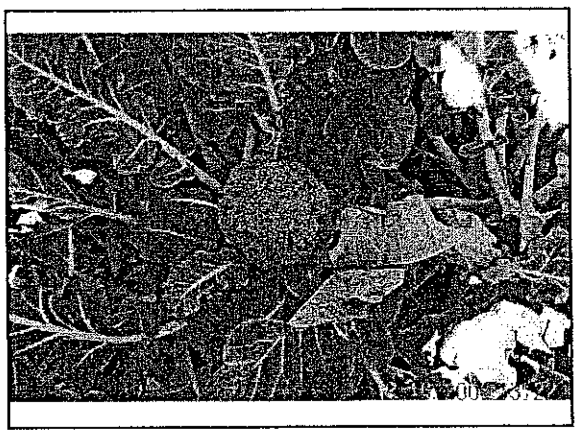
Vegetables	11,201
Strawberries	194
Flowers & Bulbs	76
Wetlands Restoration	12
Greenhouses & Not Farmed	69
Not Using Water	540

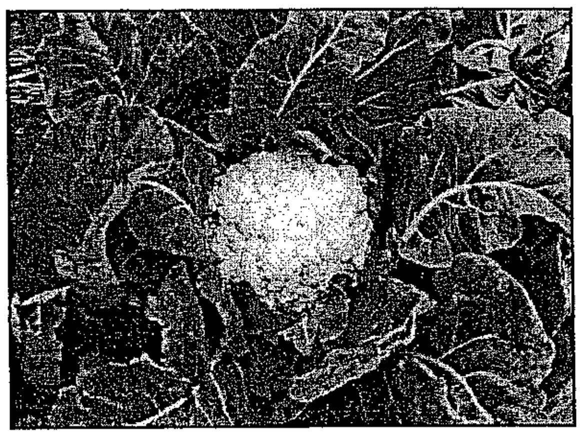
Types of Vegetables Grown 1999

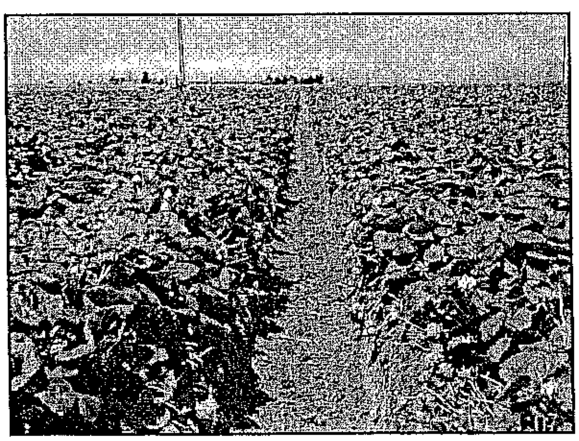
Artichokes	51%
Lettuce	22%
Broccoli	11%
Cauliflower	11%
Celery, etc.	5%





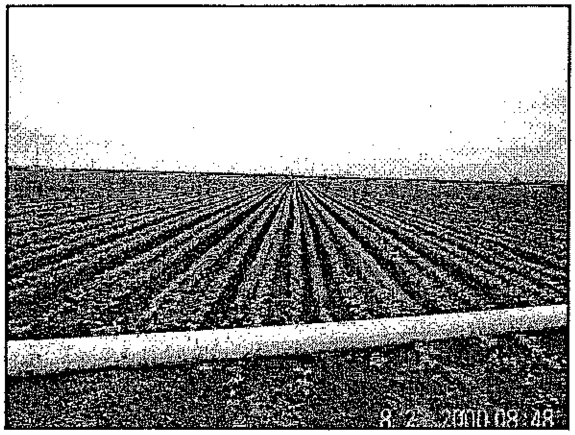


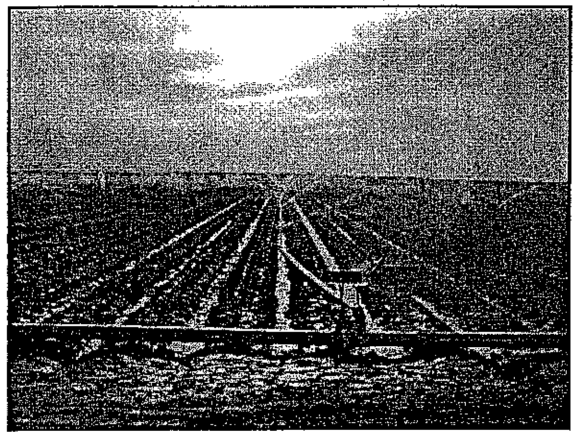


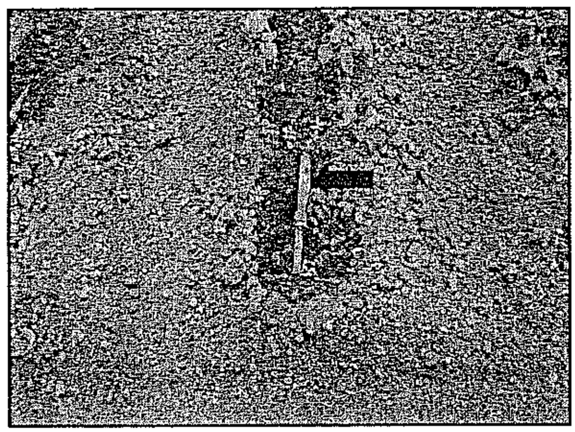


Irrigation Methods

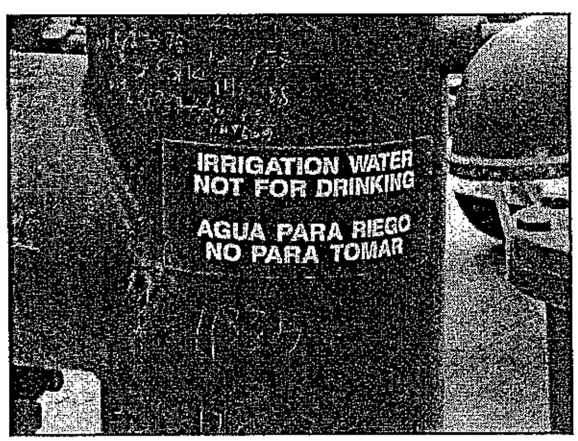
Furrow/Sprinkler	46%
Sprinkler Only	32%
Micro Drip	22%








NO
TRESPASSING
PROHIBIDO
EL PASO


IRRIGATION WATER
NOT FOR DRINKING
AGUA PARA RIEGO
NO PARA TOMAR

Water Quality & Operations Committee

- **Safety**
  - Water Quality
  - Sustainable Agriculture

Water Monitoring

Parameter	Chlorine Contact	Storage Pond	Wells	Turnouts
Total Coliform	Daily	Daily Biweekly	Yearly	Weekly
Fecal Coliform	Daily	Daily Biweekly	Yearly	Weekly
Clostridium perfringens	--	Biweekly	--	--
Pathogens	--	3/ Year	--	--
Chlorine Residual	Continuous	Continuous	--	Continuous M.S.

Pathogen Monitoring Results

Tertiary Recycled Water Pathogen Data

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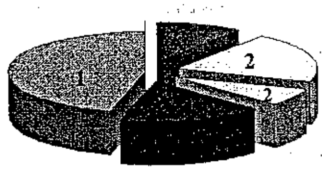
Worker Safety Video

Sodium Source

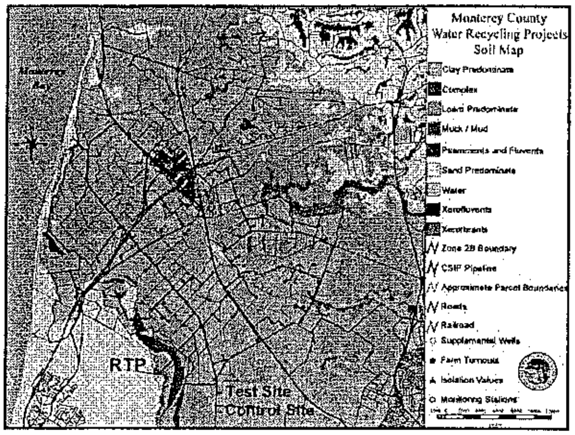


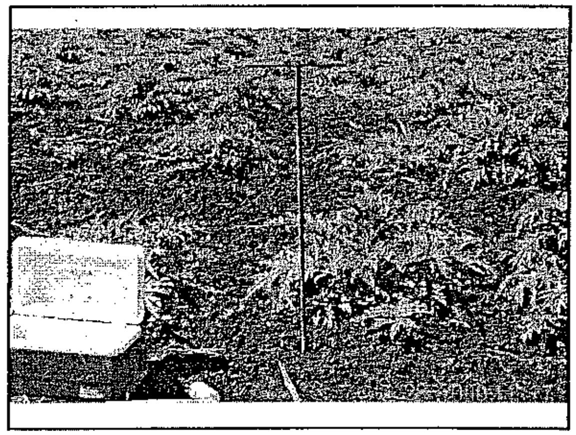
If you use a water softener...

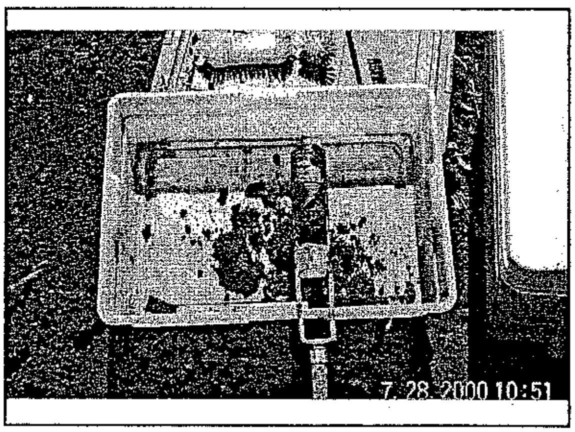
Be Soft on the Environment! Use Potassium

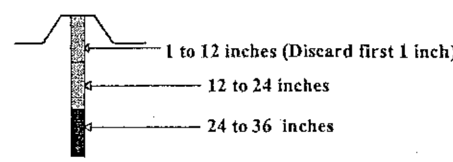
Sodium softener salt is very hard on the plants that are irrigated with recycled water.

If you use a water softener consider using potassium instead of sodium salt. Ask for it next time you shop for softener salt. Improving the quality of recycled water protects our water supply.



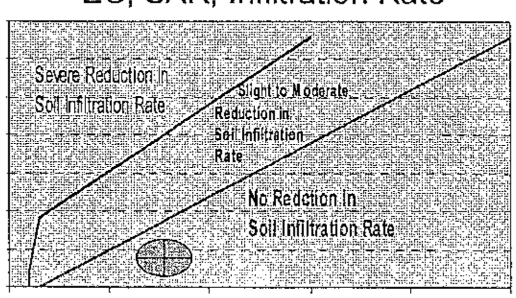




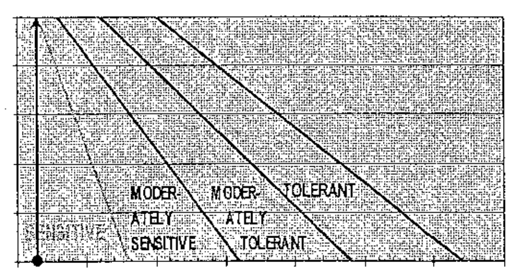


Soil Core Sample Profile

EC, SAR, Infiltration Rate



Sensitivity/Tolerance to Salt

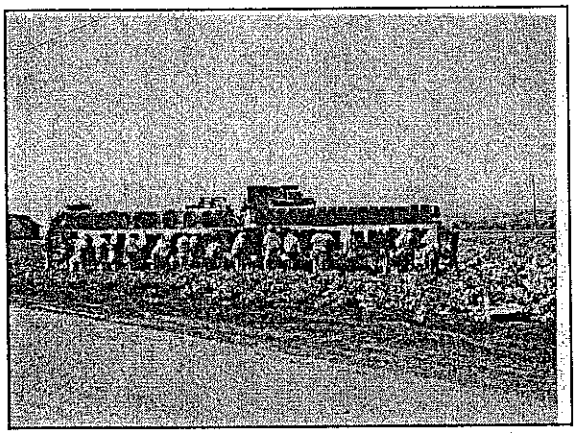


Cost for Water

- Land Assessment $233.41/acre/year
- Water Delivery Charge $16.31/AF
- Combined Cost About $ 133/AF for 2.0 AF/acre. Well water costs $80-$120/AF

Fertilizer Value of Recycled Water

	Pounds per AF Water		
Plant Nutrient	Recycle	Blended	Well
Nitrogen	96	64	1.9
Potassium	61	43	7.6
Phosphorous	7.1	4.7	0.0



MRWPCA

Monterey Regional Water Pollution Control Agency

Proudly Serving You for 30 Years

Click to View the Milestones

MRWPCA serves the wastewater treatment and recycling needs of Del Rey Oaks, Monterey,
Pacific Grove, Salinas, Sand City, Seaside, Boronda, Castroville, Moss Landing, Fort Ord,
Monterey County and Marina, California.

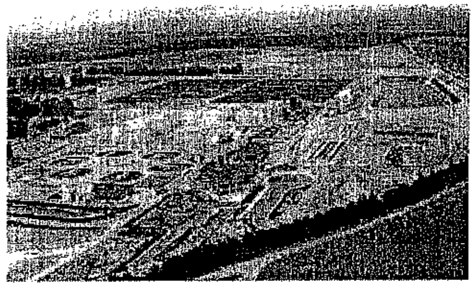
Pay Your Bill Online. For a small convenience fee, you can pay your MRWPCA bill online through Official Payments Corp. (Select "Local" payment and use "1518" for the Jurisdiction code.)

VISA

Water Friendly Gardening Fair, May 29, MPC Farmers' Market. Get the flyer (pdf). Featuring the >Banana Slug String Band.

MRWPCA

The Monterey Regional Water Pollution Control Agency ...

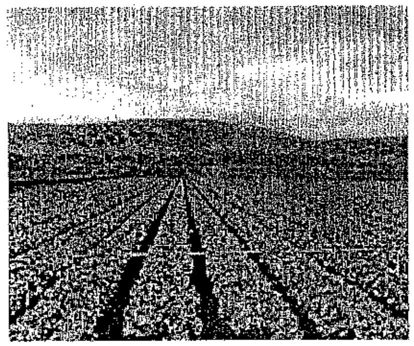


... operates the regional wastewater treatment plant located two miles north of Marina. It also maintains 25 pump stations connected to the treatment plant. MRWPCA member communities are Pacific Grove, Monterey, Del Rey Oaks, Seaside, Sand City, Fort Ord, Marina, Castroville, Moss Landing, Boronda, Salinas and some unincorporated areas in northern Monterey County.

Additionally, MRWPCA operates the water recycling facility at the Regional Treatment Plant and manages the distribution system under contract from the Monterey County Water Resources Agency. The recycling operations provide irrigation water to 12,000 acres of Castroville farmland. Click here for more information on recycling.

View the Water Quality Tables

Slowing Seawater Intrusion



MRWPCA operates the largest water recycling facility in the state designed for food crop irrigation

The primary source for water in Monterey County is from aquifers hundreds of feet below the ground. The reserve is diminishing as the number of farms, businesses and residences have increased. So much water has been removed, in fact, that intruding seawater has come within two miles of Salinas's wells.

In addition to threatening the drinking water supply, seawater intrusion threatens the region's multi-billion dollar agricultural economy.

In the mid 1970s, a group of community leaders began discussing the idea of recycling wastewater. This led to the extensive five-year Monterey Wastewater Reclamation for Agriculture Study that began in 1980. The final results of this research proved that recycled water is safe for the irrigation of crops that are consumed without cooking. Today, this definitive report is used as the standard in countries all over the world.

In 1992, MRWPCA and the Monterey County Water Resources Agency formed a partnership to build two projects: a water recycling facility at the Regional Treatment Plant; and a distribution system including 45 miles of pipeline and 22 supplemental wells. Its objective was to retard the advance of seawater intrusion by supplying irrigation water to nearly 12,000 acres of farmland in

Administrative Offices:
5 Harris Court,
Bldg. D
Monterey, CA
93940

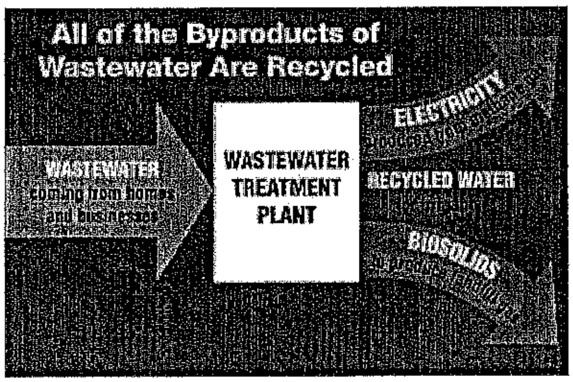
Telephone

Fax

the northern Salinas Valley. This would significantly reduce the draw of water from the undergound aquifers. The $75 million projects were completed in 1997 after three years of construction.

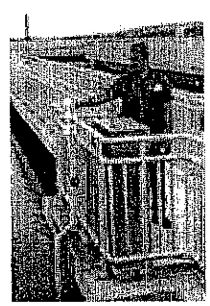
The use of highly treated wastewater to irrigate landscaping has been practiced for years, yet for food crops, it is relatively new. The recycled water facility is capable of producing an average of 29.6 million gallons of recycled water per day. This is the equivalent of one foot of water over 91 acres of land.

In the future, MRWPCA plans to additionally supply recycled water to city parks, roadway landscape and golf courses.



Changing Wastewater into Safe Water

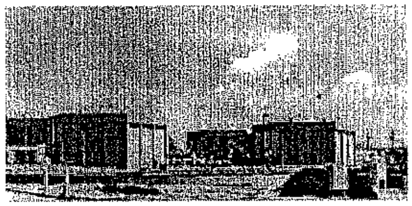
Wastewater entering the Regional Treatment Plant from homes and businesses passes through primary, secondary and tertiary treatments that clarify and extract sediment. Primary treatment consists of gravity separation; secondary treatment utilizes microscopic organisms found naturally in the environment. The tertiary, or recycled water treatment, moves secondary treated wastewater through the water recycling facility where it is further filtered and disinfected.



During the filtration process, treated water filters through a 6-foot bed of coal, sand and gravel in which minute particles are trapped. This is the same as the filtering process performed for drinking water.

The disinfection process destroys bacteria and germs by maintaining a specific chlorine level in the water for two hours. The final product is clear, odorless and safe to use for irrigation.

Technicians perform frequent water quality tests and monitor the system to ensure that safety standards are being maintained.



After treatment, the recycled water is held temporarily in an 80-acre/foot storage pond before it is distributed to farmlands via an underground pipeline system. During the rainy season, when the growers don't need the treated water, it is safely discharged two miles into the Monterey Bay.

Recycled Water Facility
Water Quality Characteristics

These pages have been provided as a informative resource for the Monterey County growers participating in the Castroville Seawater Intrusion Project. All results are listed by Month and Day that sampling took place.

Monterey County Environmental Health Department
Coliform and Clostridium perfringens data

MRWPCA Coliform data

MRWPCA Pathogen Data

MRWPCA Chemical Analysis

All samples are collected at the end of the treatment process and prior to the storage pond.

- Year 2003

Previous years:

- Year 2002
- 09/20/01 to 12/12/01
- 07/18/01 to 09/12/01
- 05/31/01 to 07/10/01
- 03/28/01 to 04/23/01
- 11/30/00 to 03/23/01
- 08/25/00 to 10/26/00
- 06/01/00 to 08/09/00
- 03/22/00 to 05/24/00
- 10/15/99 to 03/07/00
- 08/12/99 to 10/08/99
- 06/30/99 to 08/11/99
- 05/04/99 to 06/23/99
- 02/18/99 to 04/28/99
- 09/16/98 to 02/09/99
- 07/08/98 to 09/16/98
- 05/12/98 to 06/30/98
- 10/31/97 to 01/27/98

1497

Monterey County Environmental Health Department

These data are provided by the Monterey County Environmental Health Department. The County independently sampled and analyzed these data as a comparison and confirmation of the data gathered by MRWPCA. The absence of fecal coliform indicates that E. Coli is not present. Clostridium perfringens is not a pathogen; rather, its size and resistence to chlorine makes it an excellent indicator for pathogen removal efficiency. Questions about these data, sampling techniques, or other issues should be directed to the Monterey County Laboratory Director.

2003 Data

Date	Coliform Storage Pond MPN/100mL		Clostridium perfringens CFU/100mL		Log Removal of Clostridium from Secondary to Pond
	Total	Fecal	Primary	Pond	
05/13/03	<2	<2	61000	<0.03	>6.3
04/29/03	<2	<2	63000	<0.03	>6.3
04/15/03	<2	<2	82000	<0.03	>6.4
04/01/03	<2	<2	21200	<0.03	>5.8
03/18/03	<2	<2	48000	<0.03	>6.2
03/04/03	<2	<2	40000	<0.03	>6.1

- **RECYCLED WATER SAVES CALIFORNIA FARMS**
- **CONTROLLING DUST AND BIOAEROSOLS AT A BIOSOLIDS COMPOSTING FACILITY**

selected articles from the BioCycle Journal of Composting & Organics Recycling, April 2001

RECYCLED WATER SAVES CALIFORNIA FARMS

After studies show no viable microorganisms in tertiary treated wastewater, growers in Salinas Valley now get two-thirds of their agricultural water needs from recycled sources.

RECYCLED water is saving the farm for approximately 75 growers in the Salinas Valley along California's Central Coast. Because their wells were becoming contaminated with seawater, these growers began irrigating their high-value food crops with recycled water from a nearby wastewater treatment plant. The Monterey (California) Regional Water Pollution Control Agency (MRWPCA) began exploring the feasibility of a recycled water project in the 1980s because of seawater intrusion into well water in the Salinas Valley. Seawater intrusion may occur when groundwater is overpumped from wells in coastal communities. The seawater from the ocean then moves inland through the aquifer and causes salinity problems for farmers and others pumping groundwater near the shore. In the Salinas Valley, seawater had intruded almost six miles inland, making the groundwater too salty for either municipal or agricultural use. Through a water recycling project, the MRWPCA hoped to reduce the extent of seawater intrusion, while providing local growers with a source of higher quality irrigation water. In addition, the agency would be able to reduce its discharge of treated wastewater into the nearby Monterey Bay National Marine Sanctuary.

RECYCLED WATER FOR FOOD CROPS

The Salinas Valley is one of the nation's top producers of cold season vegetable crops, such as lettuce and broccoli. While state regulations allow for application of tertiary treated water on agricultural crops, it is usually used on crops for animal fodder or for food crops that will not be eaten raw. Because many of their crops are intended for raw consumption, local growers and health officials were concerned that recycled water might contaminate the produce with pathogens. Consequently, health officials directed the MRWPCA to conduct pathogen studies before they would authorize the project.

MRWPCA conducted an extensive study that would ultimately demonstrate that recycled water is as safe as well water when used to irrigate food crops. Released in 1987, the $8 million dollar study showed no contamination from the pathogens tested, which included viruses and fecal coliform, when recycled water was used on a variety of food crops common to the region, including artichokes, lettuce, broccoli, and cauliflower. State and local regulators soon gave approval for use of MRWPCA's recycled water on food crops. The agency then had the green light to upgrade its plant from a secondary to a tertiary treatment system. While secondary treatment is a biological process resulting in biosolids and clear water, tertiary treatment involves further processing to remove microorganisms and disinfect the water.

CONCERNS OVER "EMERGING PATHOGENS

" As the plant was nearing completion in 1997, farmers who were planning to use the recycled water became concerned that it might be contaminated with what they called "emerging pathogens". These pathogens, which were not included in the 1987 study, included the resistant E. coli 157:H7 strain, Crytosporidium, Giardia, and Salmonella. The growers' fears were fueled by increasing media coverage of food poisoning incidents related to pathogen contaminated produce, such as the 1996 Odwalla incident involving E. coli contaminated apple juice.

In response to these fears, MRWPCA conducted additional studies to test for the presence of the emerging pathogens. The tests found no evidence of viable microorganisms in the tertiary treated water. These results were released in a report in 1998. The MRWPCA also enhanced its treatment and pathogen monitoring program to further assure the growers. In addition, the agency hired a public relations firm to prepare a media response plan to address any potential crop contamination issues that might be linked to their recycled water.

MISSION ACCOMPLISHED

In 1997, the MRWPCA completed the $78 million reclamation project in partnership with the Monterey County Water Resources Agency. Capable of producing 19,500 acre-feet of water per year, the plant now distributes water to 12,000 acres of coastal farmland.

Delivering the recycled water to coastal farms required construction of an extensive distribution system. The system consists of 45 miles of pipeline, 112 connection turnouts, and serves approximately 75 growers. Pumps connected to the pipeline are identified by bright purple paint and dot fields throughout the region. Growers connected to this system receive approximately two-thirds of their agricultural water needs from recycled water, while well water meets their remaining needs.

To date, the farmers using recycled water seem pleased with the quality of the water. The MRWPCA continues to work with the growers to ensure that the recycled water is suitable for agriculture. Because the recycled water contains salts, the MRWPCA periodically tests soil salinity at farms that are using its recycled water. Chlorine levels of 4-6 ppm have not presented a problem for the farmers.

USE IN ORGANIC FARMING

Since distribution of treated water began in 1997, many growers throughout California, especially those who embrace sustainable and organic farming practices, have expressed an interest in using recycled water. Brian McElroy of California Certified Organic Farmers (CCOF), an independent certifying organization of organic farms, addressed the acceptability of recycled water for use on organic farms at the recent Ecological Farming Conference which is held annually near Monterey. Although CCOF has yet to take a formal stance on recycled water, McElroy stated, "The organic and sustainable farming community has an obligation to assess recycled water because organic is about sustainability."

CCOF has been certifying organic growers since 1973 and will now begin certifying under the new federal standards on organic agriculture that came out in December 2000. McElroy has concluded that the new federal standards allow for the use of recycled water by default because they fail to address its use. However, CCOF may require stricter growing conditions than the new federal standards. The CCOF Handbook published in 2000 states that recycled water is acceptable only on nonedible food parts.

For example, drip irrigation of strawberries and lettuce is acceptable. However, sprinkler irrigation of these crops is not allowed. CCOF will likely be revising its handbook in the near future in response to the new federal regulations. McElroy had no definitive answers for growers questioning whether recycled water would be allowed. However, he suggested that oversight of the use of recycled water would be "an enforcement nightmare."

Farmer Lawrence Jaffe expressed frustration at CCOF's current policy. "There should be one standard for water, no matter the source," suggested Jaffe, who farms with recycled water in the grape growing region of Sonoma County in California. He feels that recycled water has proven itself safe and that the stigma lies mainly with farmers since consumers do not generally question the source of irrigation water.

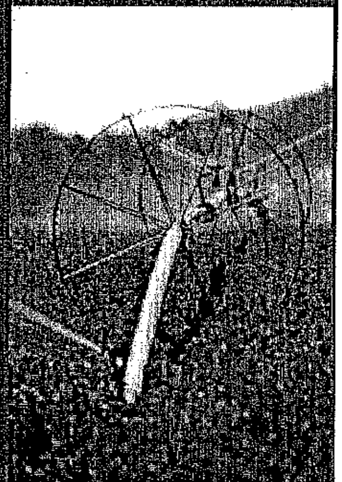
While California has a long history of water supply problems, water recycling programs throughout the state are helping to create a solution. MRWPCA's General Manager, Keith Israel, believes that water recycling will soon become mandated in the not-so-distant future in California. "Water is more scarce than landfill space, and there are laws for mandatory recycling to keep waste out of landfills. I predict there will be mandatory recycling of water in the future."

CONTROLLING DUST AND BIOAEROSOLS AT A BIOSOLIDS COMPOSTING FACILITY

Studies at enclosed Longmont, Colorado project evaluate exposure level of employees. Operational changes reduce dust, endotoxin and A. Fumigatus by 90 percent.

WHEN dealing with public health issues and composting, attention has been predominantly focused on potential exposure from the release of Aspergillus fumigatus (A. fumigatus) from composting facilities. Numerous studies were conducted to assess the level of A. fumigatus spores concentration in the areas surrounding composting facilities and to compare this to the levels of A. fumigatus found in remote areas (areas unrelated to composting facilities). Two early studies — in 1984 and 1987 — focused on worker exposure, but neither study showed any significant worker health problems. Recently, the increase in composting activities, particularly when composting involves the handling of yard trimmings, and the trend towards controlling odors by enclosing facilities, have revived concern for worker exposure to A. fumigatus and other bioaerosols. Although there are no reported cases in the literature of occupational impacts at biosolids composting facilities in the United States, E&A Environmental Consultants, Inc. (E&A) has encountered two cases of employees developing symptoms related to dust. One individual — an employee at a biosolids/municipal solid waste facility (and, incidentally, a heavy smoker) — reported respiratory discomfort at the end of the work week that would improve over the weekend. Symptoms disappeared during his vacations. A second employee at a biosolids/wood chip composting facility developed a rash on the face and scalp. The study reported here was designed for the city of Longmont, Colorado, which wanted to evaluate the level of exposure of employees to dust, endotoxin, and A. fumigatus, and to determine if operational and design changes to the facility could reduce the airborne concentration of these constituents. Longmont has operated a 7.7 dry metric tons/day aerated static pile biosolids composting facility since 1991. The facility consists of a totally enclosed mixing building and a separate, totally enclosed composting/curing and screening building. Dust is a major problem in the facility due to the extremely dry climatic conditions (see sidebar). In this paper, E&A presents data on dust, endotoxin, and A. fumigatus concentrations as related to various activities within the composting facility. Based on these results, operational mitigation measures were recommended, and the impacts of those modifications are reported. Sampling Air Quality Inside Facilities Two air sampling events were conducted to determine facility conditions in winter and summer climates. Air quality parameters included total dust, respirable dust, endotoxin, and A. fumigatus. In addition, eight-stage Marple Multiple Cascade Impactors — which collect particulates in separate size ranges between 0.52 and 21.30 μ — were worn by employees for the entire work shift during the winter monitoring period. Ambient temperatures during the winter ranged from -18°C to -7°C; summer temperatures ranged

Water Recycling



Recycled water is waste water that is treated, filtered and disinfected to Health Department Standards. Recycled water is used to irrigate large landscaped areas (parks, golf courses, and playgrounds) and crops. The use of recycled water reduces the water that is pumped from aquifers. In the Salinas Valley, where aquifers are over pumped, reduced pumping decreases the rate of sea water intrusion.

Throughout California, recycled water is being used for irrigation to conserve our limited water supply. Appproximately 500,000 acre-feet of recycled water was used last year and it is predicited that 1,000,000 acre-feet will be used by the year 2015.

Recycled water is not intended for drinking. All areas using this water must be clearly marked. A separate piping system utilizing purple pipe or purple markings is used to mark areas using recycled water.

The Monterey Regional Water Pollution Control Agency (MRWPCA) operates a large treatment plant located in the County Enviromental Park north of Marina off Del Monte Avenue. This plant will produce 19,500 acre-feet a year of recycled water for irrigation in the Castroville area to fight sea water intrusion. The farmers in this area will be able to reduce pumping from the aquifer and thereby fight sea water intrusion. This plant will provide recycled water for Marina.

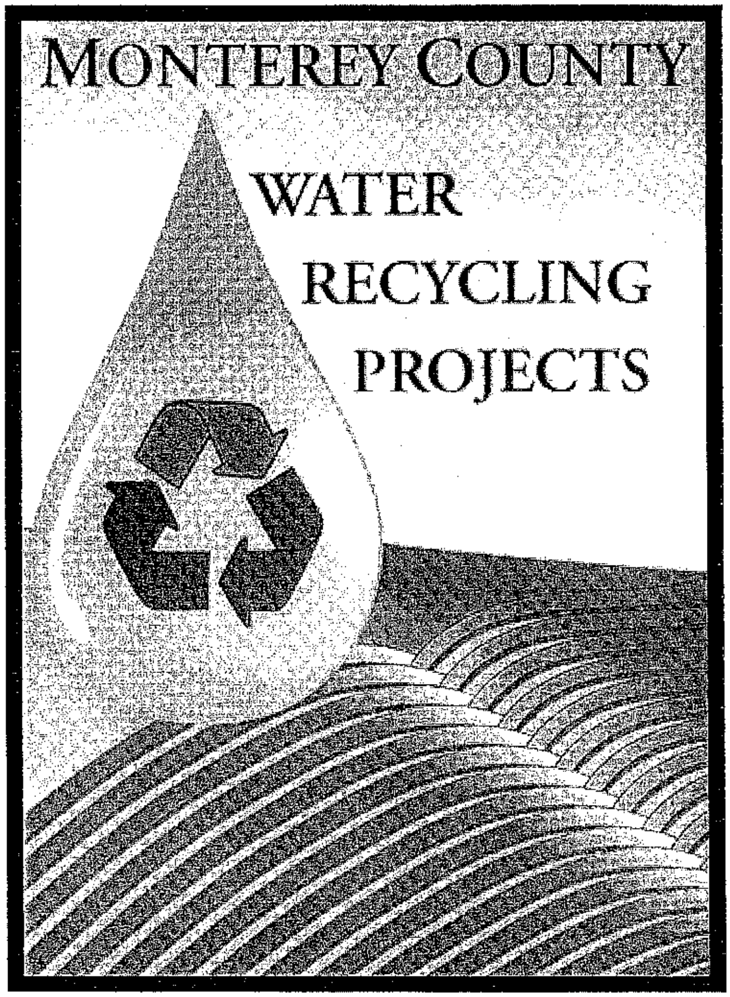
Presently in Marina, Gloria Jean Tate Park is piped for recycled water. The external landscape of the Sea Breeze development at Beach and Marina Drive, the new 7-11, and the Comfort Inn have also been piped for recycled water. Once connection to the MRWPCA recycling facility is made, the District will be able to expand the recycled water distribution system. The environmental review process, which will enable connection to the MRWPCA plant, has already begun.

The golf courses at Pebble Beach have been using recycled water for several years. A study completed by the Monterey Regional Water Pollution Control Agency and participated in by Marina Coast Water District has identified uses of recycled water in the urban areas of Marina, Fort Ord, Seaside, Del Rey Oaks, and to Monterey.

Recycled water will become an essential tool for conserving our water supply. The use of recycled water will grow as we become more adept at using this valuable source of water.

RECYCLED WATER FOOD SAFETY STUDY

for



Water Quality and Operations Committee

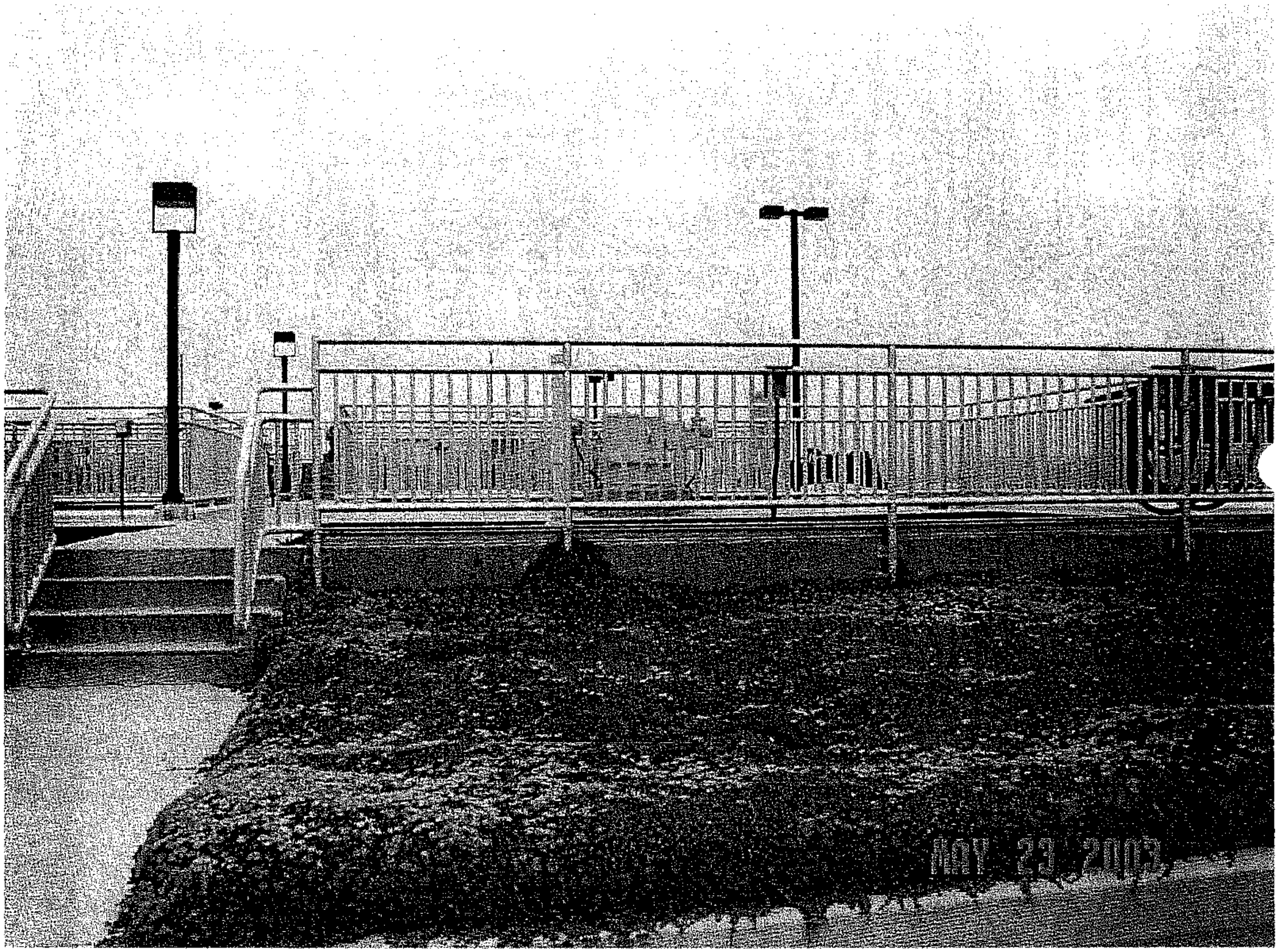
August 1998

sponsored by

Monterey County Water Resources Agency

and

Monterey Regional Water Pollution Control Agency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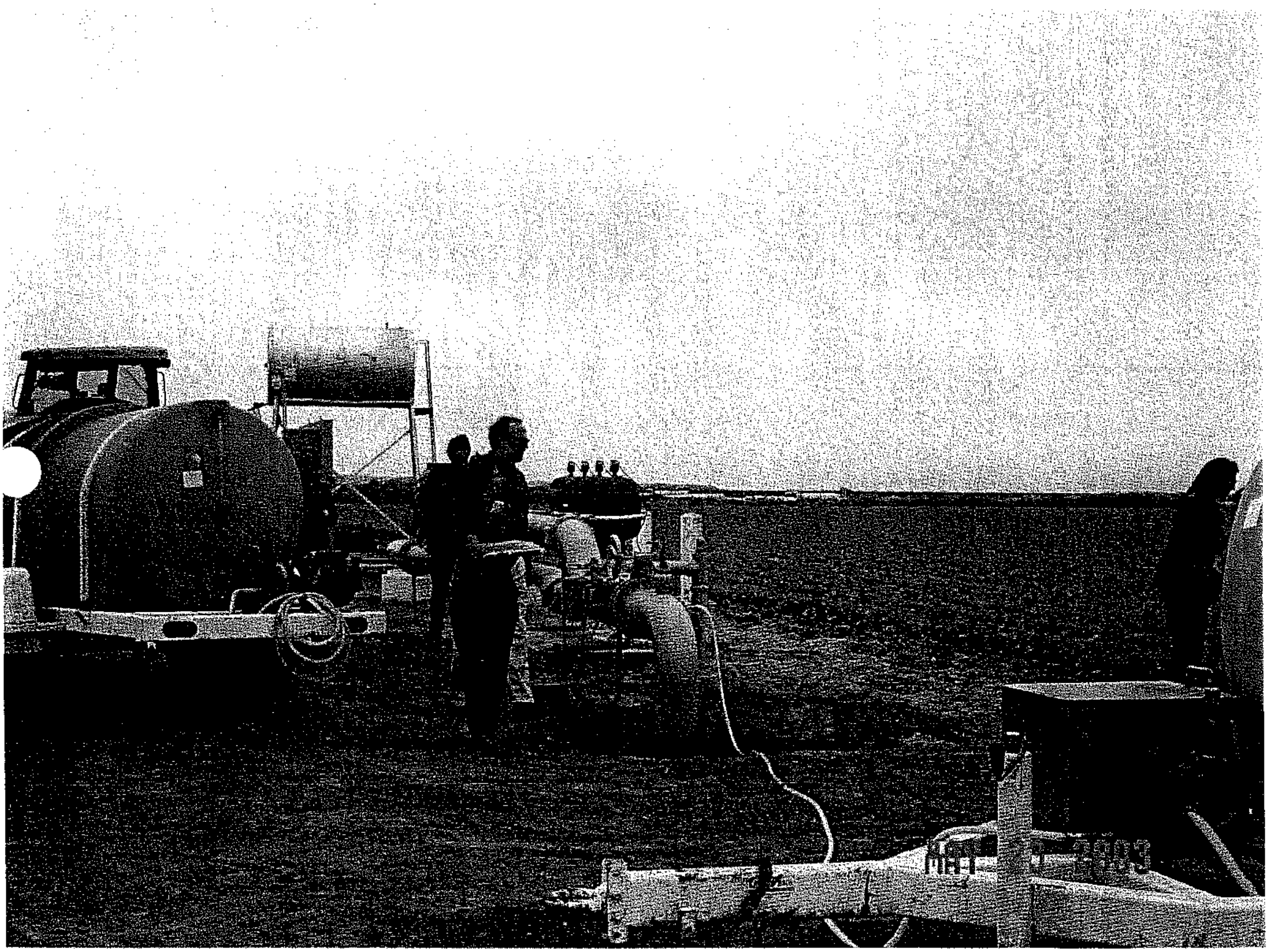

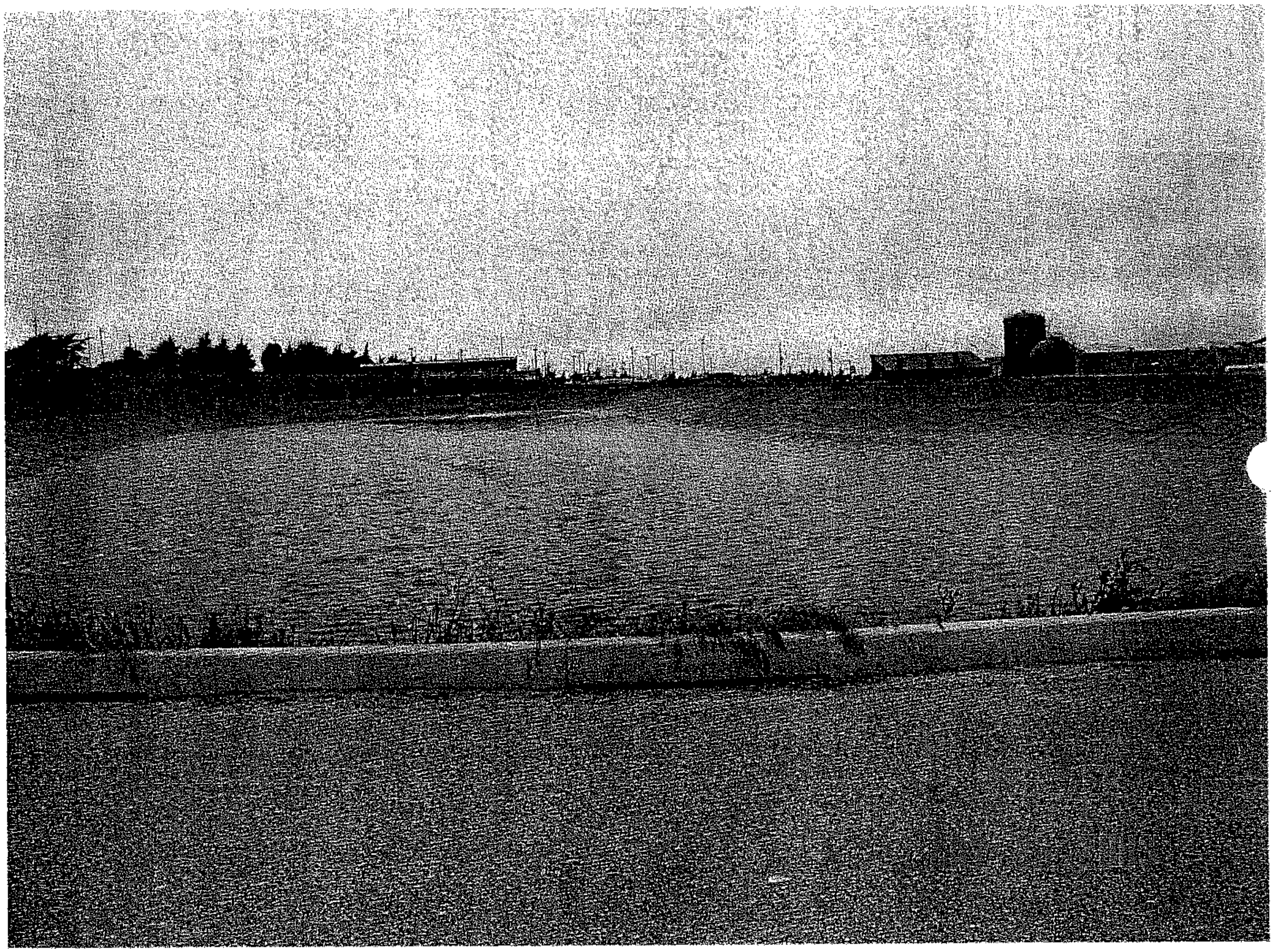

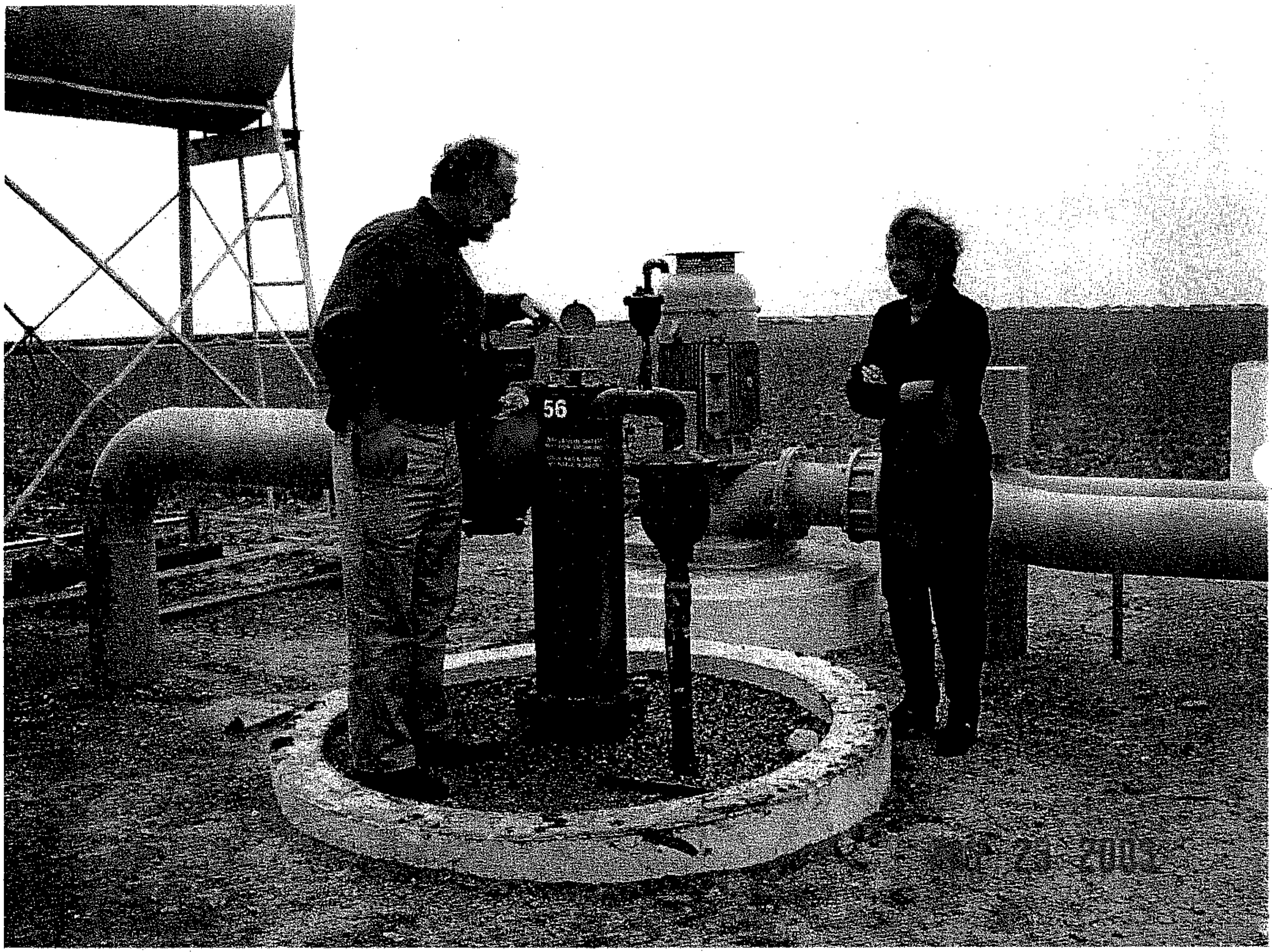
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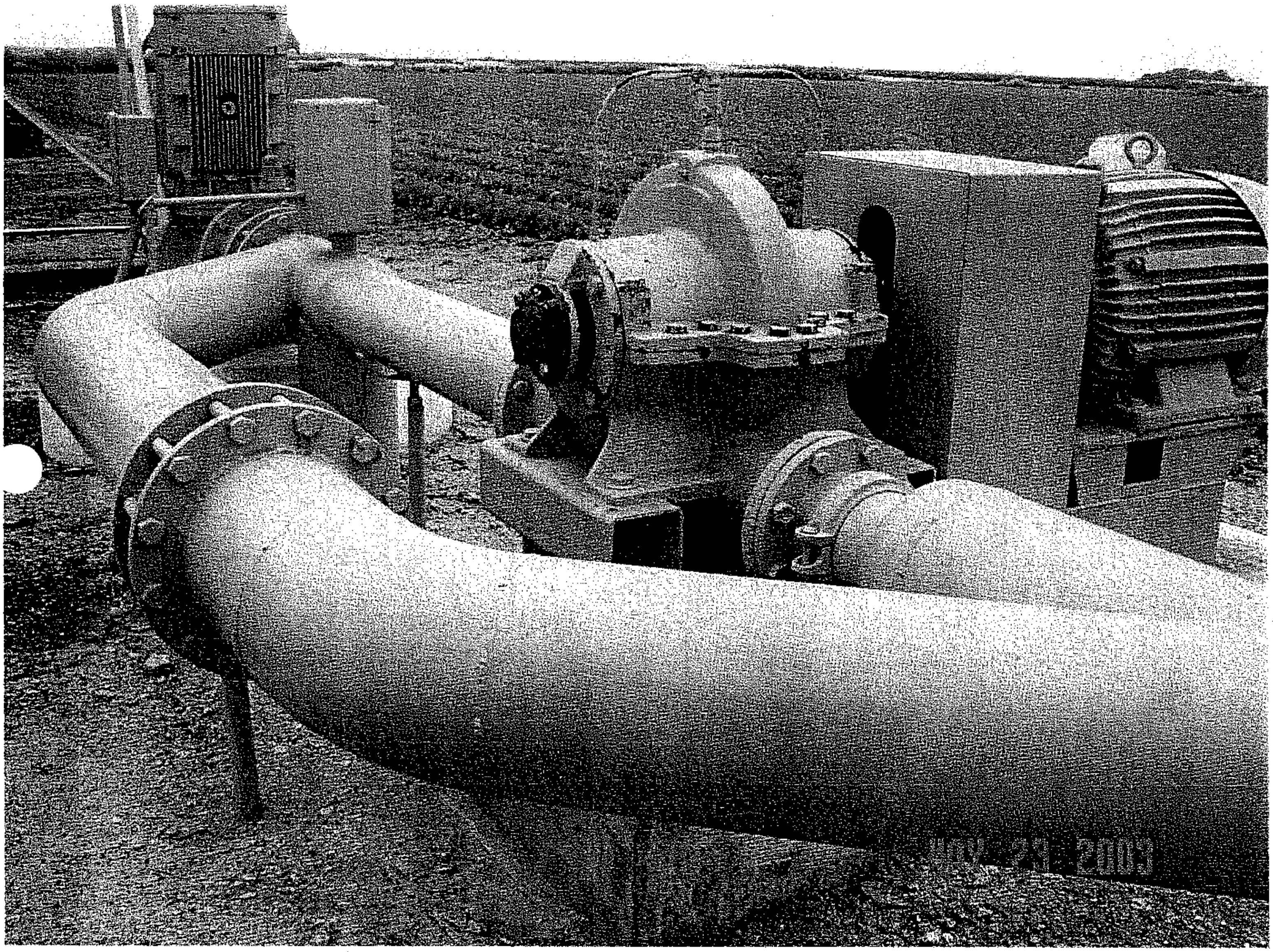

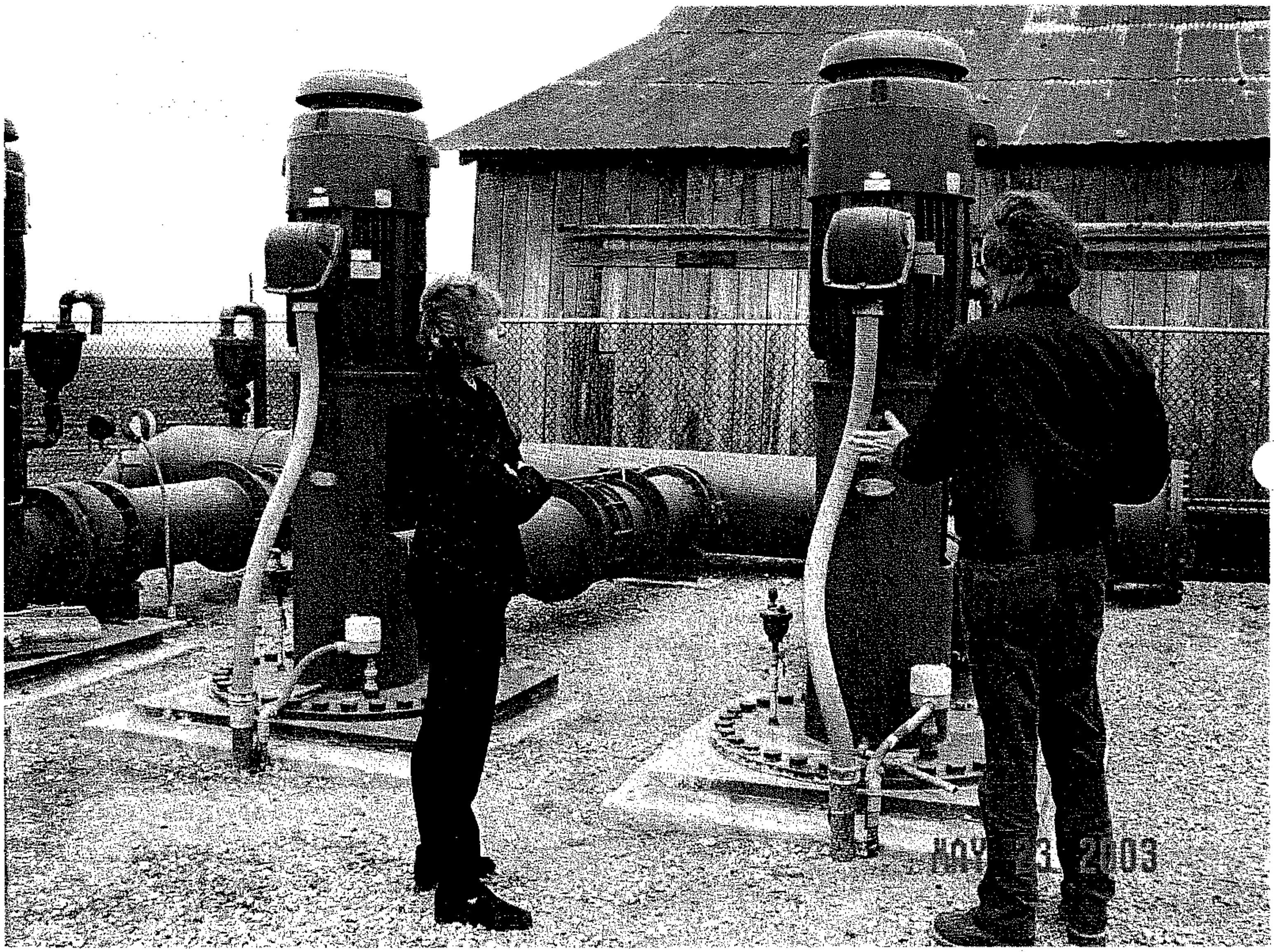

APPENDIX I

POTENTIAL INDUSTRIAL CUSTOMER SURVEY

APPENDIX I

POTENTIAL INDUSTRIAL CUSTOMER SURVEY

During the master planning process, potential recycled water customers were identified. Most customers included agricultural customers, vineyards, golf courses, and turf customers. However, two potential customers identified were industrial customers. These customers included Pomeroy Corporation and Shamrock Materials, Inc. Both companies manufacture concrete construction materials and are located within the city limits on Hopper Street west of highway 101. They both currently use potable water in their manufacturing process.

Unlike other users identified, the water usage by these industries is not based on irrigation use and is required year round. The reliability of the water supply is also more critical since interruptions in water supply would result in production issues. Due to these differences between the industrial users and other users identified, a survey was conducted with both users to better understand their water use schedule, demands, and specific requirements. Upon review of the information gathered, it was determined that it would be feasible to serve these two customers and thus were included in the master planning study as potential customers. A blank potential industrial customer survey form is attached, as well as completed forms for Pomeroy Corporation and Shamrock Materials, Inc. The information gathered from these potential customers was used to construct a specific 24-hour use profile for each user. These profiles are shown in Section III.

POTENTIAL INDUSTRIAL CUSTOMER SURVEY FORM

Survey Conducted By: ______________________________

Date: ______________________________

Potential Customer:

Name: ______________________________

Address: ______________________________

APN#: ______________________________

Phone Number: ______________________________

Contact Person: ______________________________

Interest:

Any concern using tertiary unrestricted use recycled water for non-potable uses? ______________________________

Use:

Potable Uses? ______________________________

Non-Potable Uses? ______________________________

Any plans to expand or reduce usage at future time? ______________________________

____

____

System (On-Site):

Currently Installed System: Combined System for Potable vs. Non-Potable Uses? ______________________________

If combined, would it be difficult to separate systems to be served off separate water meters for potable vs. non-potable uses? ______________________________

Current Source of Water: ______________________________

Non-Potable Water Usage:

Percent of water use that is potable vs. non-potable:

Percent Potable __________ Percent Non-Potable ______________________________

Total for Year: ______________________________ Monthly Use: ______________________________

(Any information for max month/day/hour?)______________________________

____

Hours Per Day (# hours):______________________________________

Time of Day:____

Any changes to usage in different months or throughout the day?__________

____

Sensitivity:

Sensitivity to water levels (If received more or less water, would it impact you significantly?) ______________________________________

If not, could you be flexible? ______________________________________

How flexible? ____

Requirements:

Pressure required at meter for non-potable uses (min)? ____________________

POMEROY CORPORATION

POTENTIAL INDUSTRIAL CUSTOMER
SURVEY FORM

Survey Conducted By: Margaret Orr

Date: August 7, 2003

Potential Customer:

Name: Pomeroy Corporation

Address: 500 Hopper Street, Petaluma, CA

APN#:

Phone Number: 763-1928 / 765-6001

Contact Person: Doyle Bird

Interest:

Any concern using tertiary unrestricted use recycled water for non-potable uses? As long as it would meet state inspection/Caltrans requirements. They are very, very interested if it would mean a cost savings.

Use:

Potable Uses? Rest rooms, etc.

Non-Potable Uses? Batch plant, dust control, steam generators, boiler system.

Any plans to expand or reduce usage at future time? Work goes up/down w/state conditions. Probably max for batch plant 30,000-40,000 gallons/day. Water used in steam generators 6,000 gallons/night. Use a softener system. Boiler system 10,000 gallon holding tank. Boiler at night only. Batch day shift only. Also, a concrete holding tank that could hold recycled water.

System (On-Site):

Currently Installed System: Combined System for Potable vs. Non-Potable Uses? Potable

If combined, would it be difficult to separate systems to be served off separate water meters for potable vs. non-potable uses? No

Current Source of Water: City (Potable)

Non-Potable Water Usage:

They read the meter every day and keep a record.

Percent of water use that is potable vs. non-potable:

Percent Potable ________ Percent Non-Potable________________

Total for Year: ________________________ Monthly Use:________________

(Any information for max month/day/hour?) Max = 50,000-60,000 gal/day. Now = 30,000 gal water used per day, with dust control. This could also be recycled water. Dust control required by City to keep dust down = 10,000 gal/day.

Hours Per Day (# hours): Boilers 4 pm to 1-2 am, batch plant 10 am-4 pm.

Time of Day:____

Any changes to usage in different months or throughout the day? NO. Depends on work requirements. All state work requires water carrying.

Sensitivity:

Sensitivity to water levels (If received more or less water, would it impact you significantly?) Holding tank for boiler could last all night. Batch plant would need water. Possibly need potable as a back up.

If not, could you be flexible? ________________________________

How flexible? ____

Requirements:

Pressure required at meter for non-potable uses (min)? 40 psi same as City water-batch plant goes through its own pressure building system. Never do a maintenance shut down.

SHAMROCK MATERIALS, INC.

APPENDIX J

POTENTIAL SECONDARY EFFLUENT (AGRICULTURAL AND VINEYARD) CUSTOMER SURVEY FORM

APPENDIX J

POTENTIAL SECONDARY EFFLUENT (AGRICULTURAL AND VINEYARD) CUSTOMER SURVEY FORM

A survey form has been developed for use by the City to better understand potential agricultural and vineyard customers within the County. The blank form is attached. This form was not used during the master planning effort since basic information, such as acreage and demand for potential customers could be estimated from aerial/parcel maps and existing customer data having similar water use characteristics.

Since it would not be feasible to serve all agricultural and vineyard customers with recycled water, it was determined that it would be premature to contact the potential customers until the results of the master planning effort were known.

POTENTIAL SECONDARY EFFLUENT CUSTOMER SURVEY FORM (AGRICULTURAL & VINEYARDS)

Survey Conducted By: ______________________________

Date: ______________________________

Potential Customer:

Name: ______________________________

Address: ______________________________

APN#: ______________________________

Phone Number: ______________________________

Interest:

Interest Level: ______________________________

Willing to participate in cost of facilities (off-site) and cost of water?

____

Crop:

Crop Type: ______________________________

Crop Acreage: ______________________________

Any plans to expand or delete acreage at future time? ______________

____

____

Irrigation System (On-Site):

Currently Installed System <u>YES</u> / <u>NO</u>

Type of System: ______________ <u>Permanent</u> / <u>Mobile</u>

Current Source of Water: ______________________________

On-site Storage: <u>YES / NO</u>, Capacity: ______________________________

Water Quality:

Interest in secondary effluent? ______________________________

Any water quality issues/concerns? ______________________________

Would you blend or supplement water? ______________________________

Water Usage:

Total for Season: ______________________ Monthly Use: ______________

(Any records for annual, monthly, max month/day/hour?) ______________

____

Time of Year (list months): ______________________________________

Hours Per Day (# hours irrigate): __________________________________

Time of Day: ____

Any changes to usage during irrigation season? (water more, less, stop watering, etc.) ____

For vineyards only:

Frost Protection:

Time of Year/Duration: ______________________________

Usage: ____

Time of Day: ______________________________________

Irrigation Season:

Time of Year/Duration: ______________________________

Usage: ____

Time of Day: ______________________________________

Fall Watering:

Time of Year/Duration: ______________________________

Usage: ____

Time of Day: ______________________________________

Periods during irrigation season with no watering: ______________

At any time does water come in direct contact with grapes? ________

Sensitivity:

Sensitivity to water levels (If received more or less water, would it impact you significantly?) ____________________________________

If not, could you be flexible? ______________________________

How flexible? ____

Requirements:

Preferred turnout location: ______________________________________

Pressure required at turnout (min)? _______________________________

APPENDIX K

COST TO OBTAIN ADDITIONAL POTABLE WATER SUPPLY

APPENDIX K

COST TO OBTAIN ADDITIONAL POTABLE WATER SUPPLY

The cost to obtain additional potable water supply for the City of Petaluma was not used in the cost analysis for comparison of scenarios, but is essential for planning within the City for future water supply needs. The City has estimated that the cost to obtain additional potable water supply based on Sonoma County Water Agency's alternative to construct a pipeline around Dry Creek and build a treatment plant. This cost is estimated at $1,919/acre-ft in year 2011 plus an additional $400/acre-ft in 2003 dollars for the City to provide the water, which equates to $2,155/acre-ft in 2007 dollars. Since all recycled water scenarios evaluated have an 80 year present worth cost of $600/acre-ft (2007 $s) or less, it is recommended that, if additional potable water supply is needed, potable offset by tertiary recycled water should be implemented prior to obtaining additional sources of potable water.

Subject: SCWA Charges
From: "Ban, Michael" <MBAN@ci.petaluma.ca.us>
Date: Mon, 24 Nov 2003 09:19:35 -0800
To: "Dana Hunt (E-mail)" <dhunt@gsda.com>
CC: "Orr, Margaret" <morr@ci.petaluma.ca.us>, "Simmons, Steve" <SSIMMONS@ci.petaluma.ca.us>

Dana,

Attached is my latest spreadsheet estimating SCWA water charges to the City of Petaluma. The charges reflect the cost of purchased water - not the cost to deliver this water to the City's customers.

There are two factors which could greatly influence the cost of purchased water: 1) Dry Creek Pipeline. The SCWA stores water in Lake Sonoma behind Warm Springs Dam. Water in Lake Sonoma is released into Dry Creek and flows from Dry Creek into the Russian River. Studies conducted by the SCWA and US Army Corps of Engineers indicate that flow velocities in Dry Creek are higher than optimum for salmonid rearing, thus impacting protected species. As a result, the SCWA is considering the construction of a pipeline from Lake Sonoma to the SCWA's intake facilities at Mirabel to bypass the use of Dry Creek as a conduit to the Russian River. 2) The second factor is the amount of water the SCWA can extract from the Russian River. Right now they are limited to 75,000 acre-feet per year. They have applied to increase the amount to 101,000 acre-feet per year. If the SCWA is unable to secure these rights, they may have to build a treatment plant to replicate the treatment action of the Russian River.

The attached spreadsheet considers 3 alternatives: 1) treatment plant and dry creek pipeline, 2) no dry creek pipeline only and no treatment plant, and 3) dry creek pipeline, no treatment plant. Again, the costs for these alternatives are for purchased water only - they do not include the cost to deliver this water to the City's customers. That cost is approximately $400/acre-foot now.

Please call me if you have any questions.

Regards,

Mike

Michael Ban, P.E.
City of Petaluma, California
Department of Water Resources & Conservation

<<estimated petaluma aqueduct charges.xls>>

PIPELINE DEBT SERVICE CALCULATION

Current Pipeline Cost		
Pipeline Cost (Year 2003) =	$	90,000,000.00
Year =		2003
Future Pipeline Cost		
Year		2011
Interval		8
Inflation Rate =		3.50%
Annual Payments =		0
Future Pipeline Cost =		$116,512,813.33
Debt Service		
Interest Rate =		6.00%
Term (years) =		20
Total Annual Debt Service =		$10,332,487.13
Water Sales (AF/yr) =		65000
Charge to meet debt service (per AF) =	$	158.96

TREATMENT PLANT DEBT SERVICE CALCULATION

Treatment Plant Cost =	$	1,000,000,000.00
Term (years) =		20
Interest Rate ($) =		0.06
Principal =		
Debt =		
Total Annual Debt Service =		$82,249,582.05
Water Sales (AF/yr) =		65000
Charge to meet debt service (per AF) =	$	1,265.38

PIPELINE			
Current Pipeline Cost			
Pipeline Cost (year 2001) =	$	32,800,000.00	From SCWA Economic Analysis
Year =		2001	
Future Pipeline Cost			
Year =		2008	
Interval =		7	
Inflation Rate =		3.50%	
Future Pipeline Cost =		$41,730,759.82	
CAPITAL SAVINGS			
Current Capital Savings			
Aqueduct Capital Savings =	$	1,700,000.00	From FY 03-04 SCWA Budget
Year =		2003	
Future Capital Savings			
Year =		2008	
Term (years) =		5	
Interest Rate (%) =		2.50%	Estimated from FY 03-04 SCWA Budget
Annual Payments =		$550,000	From FY 03-04 SCWA Budget
Future Capital Savings =		$4,814,374.65	
Total Cost =		$36,916,385.17	
Term (years) =		20	
Interest Rate ($) =		0.06	
Principal =			
Debt =			
Total Annual Debt Service =		$3,036,357.25	
Petaluma Aqueduct Water Sales (AF/yr) =		33400	
Charge to meet debt service (per AF) =	$	90.91	

Present Value = 32800
Term = 7 years
Inflation = 3.50%

Future Value = ($41,730.76)

Growth Rate = 0.015
Inflation Rate = 0.035

ESTIMATED PETALUMA AQUEDUCT CHARGES

Fiscal Year	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11
Total SCWA Water Sales (AF/yr)	62,118	63,050	63,996	64,955	65,930	66,919	67,923	68,941
Operations and Maintenance Charge (per AF)								
O&M Charge	$336.05	$338.05	$349.86	$362.13	$374.60	$387.92	$401.50	$415.65
Economic Adjustment	$0.00	$11.83	$12.25	$12.67	$13.12	$13.58	$14.05	$14.54
Adjusted O&M Charge	$ 336.05	$349.88	$362.13	$374.80	$387.92	$401.50	$415.65	$430.08
Common Facilities Charge (per AF)								
Wohler-Forestville Pipeline (Collector 6)	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41
Treatment Plant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Dry Creek Pipeline	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41
Aqueduct Capital Charge (WSTSP) (per AF)	$ 40.00	$ 40.00	$ 40.00	$ 40.00	$ 40.00	$ 90.91	$ 90.91	$ 90.91
Storage Facilities Fund Charge (per AF) Kawana Springs Tank #2	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19
Oakmont Pipeline/Kastania SPS/Kastania Tank #2	$ -	$ -	$ -	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50
Total	$ 8.19	$ 8.19	$ 8.19	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69
Total Estimated Imported Water Charge for Petaluma Aqueduct (per AF)								
Scenario 1 (dry creek pipeline + treatment plant)	$ 414.65	$ 426.48	$ 436.73	$ 474.90	$ 488.02	$ 552.51	$ 566.56	$ 581.10
Scenario 2 (no dry creek pipeline, no treatment plant)	$ 414.65	$ 426.48	$ 436.73	$ 474.90	$ 488.02	$ 552.51	$ 566.56	$ 581.10
Scenario 3 (dry creek pipeline, no treatment plant)	$ 414.65	$ 426.48	$ 436.73	$ 474.90	$ 488.02	$ 552.51	$ 566.56	$ 581.10

Fiscal Year	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
Total SCWA Water Sales (AF/yr)	69,975	71,025	72,090	73,172	74,269	75,383	76,514	77,662	78,827	80,009
Operations and Maintenance Charge (per AF)										
O&M Charge	$430.09	$445.15	$460.73	$476.85	$493.54	$510.82	$528.70	$547.20	$566.35	$586.17
Economic Adjustment	$15.05	$15.58	$16.13	$16.69	$17.27	$17.88	$18.50	$19.15	$19.82	$20.52
Adjusted O&M Charge	$445.15	$460.73	$476.85	$493.54	$510.82	$528.70	$547.20	$566.35	$586.17	$606.69
Common Facilities Charge (per AF)										
Wohler-Forestville Pipeline (Collector 6)	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41	$ 28.41
Treatment Plant	$ 1,175.41	$ 1,158.04	$ 1,140.92	$ 1,124.06	$ 1,107.46	$ 1,091.08	$ 1,074.96	$ 1,059.07	$ 1,043.42	$ 1,028.00
Dry Creek Pipeline	$ 147.66	$ 145.48	$ 143.33	$ 141.21	$ 139.12	$ 137.07	$ 135.04	$ 133.04	$ 131.08	$ 129.14
Total	$ 1,351.47	$ 1,331.92	$ 1,312.66	$ 1,293.68	$ 1,274.98	$ 1,256.56	$ 1,238.41	$ 1,220.53	$ 1,202.91	$ 1,185.55
Aqueduct Capital Charge (WSTSP) (per AF)	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91
Storage Facilities Fund Charge (per AF) Kawana Springs Tank #2	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19	$ 8.19
Oakmont Pipeline/Kastania SPS/Kastania Tank #2	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50
Total	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69	$ 31.69
Total Estimated Imported Water Charge for Petaluma Aqueduct (per AF)										
Scenario 1 (dry creek pipeline + treatment plant)	$ 1,919.22	$ 1,915.25	$ 1,912.11	$ 1,909.82	$ 1,908.40	$ 1,907.85	$ 1,908.21	$ 1,909.46	$ 1,911.08	$ 1,914.84
Scenario 2 (no dry creek pipeline, no treatment plant)	$ 596.16	$ 611.74	$ 627.86	$ 644.55	$ 661.83	$ 679.70	$ 698.21	$ 717.36	$ 737.18	$ 757.70
Scenario 3 (dry creek pipeline, no treatment plant)	$ 743.91	$ 767.21	$ 771.19	$ 785.76	$ 800.85	$ 816.77	$ 833.26	$ 850.41	$ 868.26	$ 886.84

Fiscal Year	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	30/31	31/32
Total SCWA Water Sales (AF/yr)	81,209	82,426	83,664	84,919	86,193	87,486	88,798	90,130	91,482	92,854
Operations and Maintenance Charge (per AF)										
O&M Charge	$606.69	$627.92	$649.90	$672.65	$696.19	$720.56	$745.78	$771.88	$798.89	$826.86
Economic Adjustment	$21.23	$21.98	$22.75	$23.54	$24.37	$25.22	$26.10	$27.02	$27.96	$28.94
Adjusted O&M Charge	$627.92	$649.90	$672.65	$696.19	$720.56	$745.78	$771.88	$798.89	$826.86	$855.80
Common Facilities Charge (per AF)										
Wohler-Forestville Pipeline (Collector 6)	$ 28.41	$ 28.41								
Treatment Plant	$ 1,012.81	$ 997.84	$ 983.09	$ 968.57	$ 954.25	$ 940.15	$ 926.26	$ 912.57	$ 899.08	$ 885.78
Dry Creek Pipeline	$ 127.23	$ 125.35	$ 123.50	$ 121.67	$ 119.88	$ 118.11	$ 116.36	$ 114.64	$ 112.95	$ 111.28
Total	$ 1,168.45	$ 1,151.60	$ 1,106.59	$ 1,090.24	$ 1,074.13	$ 1,058.26	$ 1,042.62	$ 1,027.21	$ 1,012.03	$ 997.07
Aqueduct Capital Charge (WSTSP) (per AF)	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91	$ 90.91			
Storage Facilities Fund Charge (per AF) Kawana Springs Tank #2	$ 8.19	$ 8.19								
Oakmont Pipeline/Kastania SPS/Kastania Tank #2	$ 23.50	$ 23.50	$ 23.50	$ 23.50	$ 23.50					
Total	$ 31.69	$ 31.69	$ 23.50	$ 23.50	$ 23.50	$ -	$ -	$ -	$ -	$ -
Total Estimated Imported Water Charge for Petaluma Aqueduct (per AF)										
Scenario 1 (dry creek pipeline + treatment plant)	$ 1,918.97	$ 1,924.10	$ 1,893.85	$ 1,900.84	$ 1,909.10	$ 1,894.94	$ 1,905.40	$ 1,826.10	$ 1,838.88	$ 1,852.87
Scenario 2 (no dry creek pipeline, no treatment plant)	$ 778.93	$ 800.91	$ 787.06	$ 810.80	$ 834.87	$ 836.89	$ 882.79	$ 798.89	$ 828.86	$ 855.80
Scenario 3 (dry creek pipeline, no treatment plant)	$ 906.17	$ 926.26	$ 910.56	$ 932.27	$ 954.84	$ 954.78	$ 979.15	$ 913.64	$ 939.80	$ 967.07

Notes:
1. Based on Dry Creek Pipeline cost of $90M (year 2003) with construction beginning in 2011.
2. Based on treatment plant cost of $1B with construction beginning in 2011.
3. Inflation rate of 3.5%.
4. Interest rate of 6.0% and term of 20 years.

APPENDIX L

CALIFORNIA DEPARTMENT OF HEALTH SERVICES – TITLE 22 ENGINEERING REPORT

APPENDIX L

CALIFORNIA DEPARTMENT OF HEALTH SERVICES – TITLE 22 ENGINEERING REPORT

Prior to production of tertiary (Title 22 Unrestricted Use Water) recycled water and distribution to customers, the City of Petaluma will prepare a Title 22 Engineering Report for the California Department of Health Services. The guidelines for preparing the engineering report are attached.

CITY OF PETALUMA, CALIFORNIA
MEMORANDUM

Department of Water Resources and Conservation, 11 English Street, Petaluma, CA 94952
(707) 778-4304 Fax (707) 776-3635 E-mail:mban@ci.petaluma.ca.us

DATE: December 22, 2003

TO: Margaret Orr

FROM: Michael Ban MB

SUBJECT: Engineering Report for Use of Recycled Water

Per the attached letter to the California Department of Health Services, a Title 22 Engineering Report is not required for use of recycled water at the Rooster Run Golf Course. The DHS has requested that a Title 22 Engineering Report be prepared prior to use of tertiary recycled water produced by the new water recycling facility. Attached for your information is a copy of the guidelines for preparing this report. I would suggest having Dana note this in her master plan and include a copy of the guidelines in the appendix.

We should include preparation of this report in the Fiscal Year 2004-2005 budget.

CITY OF PETALUMA

POST OFFICE BOX 61
PETALUMA, CA 94953-0061

September 29,2003

Robert C. Brownwood P. E.
California Department of Health Services
Drinking Water Field Operations Branch
50 D Street, Suite 200
Santa Rosa, CA 95404

COPY

RE: Phase 1 Recycled Water Pipeline Project

Dear Mr. Brownwood,

This letter confirms the City's understanding that the Department of Health Services requires no further information on the above-referenced project and that the engineering report referenced in the City's letter of July 24, 2003, is not required for this project. The City issued the Notice to Proceed to the contractor on the Phase 1 Recycled Water Pipeline project today, and anticipates construction beginning by the middle of October.

As you know, the City is currently designing a water recycling facility that will produce tertiary recycled water, and that the City intends to use tertiary recycled water for irrigation purposes in accordance with California Title 22. Per the recent telephone request from Erica Wolski of your office, the City will prepare and submit to the Department of Health Services a report on the water recycling facility in support of the use of tertiary recycled water for irrigation purposes. Start-up and testing of the water recycling facility is scheduled for 2008. The use of tertiary recycled water for irrigation purposes would commence shortly thereafter.

Please call me at (707)778-4487 if you have any questions regarding these projects. We look forward to continuing to work with the Department

Sincerely,

Michael J. Ban, P.E., Interim Director
Water Resources & Conservation

xc: Erica Wolski – Department of Health Services
Dean Eckerson
Margaret Orr
Fleming Nguyen
Dana Hunt – GS Dodson & Associates
File 9995 – 17
File 9995 – 30.3

Water Resources & Conservation
11 English Street
Petaluma, CA 94952

Phone (707) 778-4487
Fax (707) 776-3635

E-Mail mban@ci.petaluma.ca.us

STATE OF CALIFORNIA-HEALTH AND HUMAN SERVICES AGENCY GRAY DAVIS, *GOVERNOR*

DEPARTMENT OF HEALTH SERVICES
DIVISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT
DRINKING WATER PROGRAM
RECYCLED WATER UNIT

GUIDELINES FOR THE PREPARATION OF AN ENGINEERING REPORT FOR THE PRODUCTION, DISTRIBUTION AND USE OF RECYCLED WATER

March 2001
(Replaces September 1997 Version)

1.0 INTRODUCTION

The current State of California Water Recycling Criteria (adopted in December 2000) require the submission of an engineering report to the California Regional Water Quality Control Board (RWQCB) and the Department of Health Services (DHS) before recycled water projects are implemented. These reports must also be amended prior to any modification to existing projects. The purpose of an engineering report is to describe the manner by which a project will comply with the Water Recycling Criteria. The Water Recycling Criteria are contained in Sections 60301 through 60355, inclusive, of the California Code of Regulations, Title 22. The Criteria prescribe:

* Recycled water quality and wastewater treatment requirements for the various types of allowed uses,

* Use area requirements pertaining to the actual location of use of the recycled water (including dual plumbed facilities), and

* Reliability features required in the treatment facilities to ensure safe performance.

Section 60323 of the Water Recycling Criteria specifies that the engineering report be prepared by a properly qualified engineer, registered in California and experienced in the field of wastewater treatment.

Recycled water projects vary in complexity. Therefore, reports will vary in content, and the detail presented will depend on the scope of the proposed project and the number and nature of the agencies involved in the production, distribution, and use of the recycled water. The report should contain sufficient information to assure the regulatory agencies that the degree and reliability of treatment is commensurate with the requirements for the proposed use, and that the distribution and use of the recycled water will not create a health hazard or nuisance.

The intent of these guidelines is to provide a framework to assist in developing a comprehensive report which addresses all necessary elements of a proposed or modified project. Such a report is necessary to allow for the required regulatory review and approval of a recycled water project.

References which may assist in addressing various project elements include:

- State of California Water Recycling Criteria (December 2000)
- State of California Regulations Relating to Cross-Connections
- California Waterworks Standards
- California Water Code
- Guidelines for the Distribution of Non-potable Water, (California-Nevada Section-AWWA, 1992)
- Guidelines For The On-Site Retrofit of Facilities Using Disinfected Tertiary Recycled Water (California-Nevada Section-AWWA, 1997)
- Manual of Cross-Connection Control/Procedures and Practices (DOHS)
- Ultraviolet Disinfection - Guidelines for Drinking Water and Water Reuse (NWRI/AWWARF, December 2000)

2.0 RECYCLED WATER PROJECT

The following sections discuss the type of information that should be presented and described in the engineering report. Some sections may be applicable only to certain types of uses.

2.1 General

The report shall identify all agencies or entities that will be involved in the design, treatment, distribution, construction, operation and maintenance of the recycled facilities, including a description of any legal arrangements outlining authorities and responsibilities between the agencies with respect to treatment, distribution and use of recycled water. In areas where more than one agency/entity is involved in the reuse project, a description of arrangements for coordinating all reuse-related activities (e.g. line construction/repairs) shall be provided. An organizational chart may be useful.

2.2 Rules and Regulations

The procedures, restrictions, and other requirements that will be imposed by the distributor and/or user should be described. In multiple projects covered under a Master Permit issued by the Regional Boards where the reuse oversight responsibility is delegated to the distributor and/or user, the requirements and restrictions should be codified into a set of enforceable rules and regulations. The rules and regulations should include a compliance program to be used to protect the public health and prevent cross connections. Describe in the report the adoption of enforceable rules and regulations that cover all of the design and construction, operation and maintenance of the distribution systems and use areas, as well as use area control measures. Provide a description of the organization of the agency or agencies who has the authority to implement and enforce the rules and regulations, and the responsibilities of pertinent personnel involved in the reuse program. Reference to any ordinances, rules of service, contractual arrangements, etc. should be provided.

2.3 Producer - Distributor - User

The producer is the public or private entity that will treat and/or distribute the recycled water used in the project. Where more than one entity is involved in the treatment or distribution of the recycled water, the roles and responsibilities of each entity (i.e. producer, distributor, user) should be described.

2.4 Raw Wastewater

Describe the chemical quality, including ranges with median and 95th percentile values;

Describe the source of the wastewater to be used and the proportion and types of industrial waste, and

Describe all source control programs.

2.5 Treatment Processes

Provide a schematic of the treatment train;

Describe the treatment processes including loading rates and contact times;

All filtration design criteria should be provided (filtration and backwash rates, filter depth and media specifications, etc.). The expected turbidities of the filter influent (prior to the addition of chemicals) and the filter effluent should be stated;

State the chemicals that will be used, the method of mixing, the degree of mixing, the point of application, and the dosages. Also describe the chemical storage and handling facilities, and

Describe the operation and maintenance manuals available.

2.6 Plant Reliability Features

The plant reliability features proposed to comply with Sections 60333 - 60355 of the Water Recycling Criteria should be described in detail. The discussion of each reliability feature should state under what conditions it will be actuated. When alarms are used to indicate system failure, the report should state where the alarm will be received, how the location is staffed, and who will be notified. The report should also state the hours that the plant will be staffed.

2.7 Supplemental Water Supply

The report should describe all supplemental water supplies. The description should include:

* Purpose
* Source
* Quality
* Quantity available
* Cross-connection control and backflow prevention measures

2.8 Monitoring and Reporting

The report should describe the planned monitoring and reporting program, including all monitoring required by the Water Recycling Criteria, and include the frequency and location of sampling. Where continuous analysis and recording equipment is used, the method and frequency of calibration should be stated. All analyses shall be performed by a laboratory approved by the State Department of Health Services.

2.9 Contingency Plan

Section 60323 (c) of the Water Recycling Criteria requires that the engineering report contain a contingency plan designed to prevent inadequately treated wastewater from being delivered to the user. The contingency plan should include:

* A list of conditions which would require an immediate diversion to take place;
* A description of the diversion procedures;
* A description of the diversion area including capacity, holding time and return capabilities;
* A description of plans for activation of supplemental supplies (if applicable);
* A plan for the disposal or treatment of any inadequately treated effluent;
* A description of fail safe features in the event of a power failure, and

  A plan (including methods) for notifying the recycled water user(s), the regional board, the state and local health departments, and other agencies as appropriate, of any treatment failures that could result in the delivery of inadequately treated recycled water to the use area.

3.0 TRANSMISSION AND DISTRIBUTION SYSTEMS

Maps and/or plans showing the location of the transmission facilities and the distribution system layout should be provided. The plans should include the ownership and location of all potable water lines, recycled water lines and sewer lines within the recycled water service area and use area(s).

4.0 USE AREAS

The description of each use area should include:

* The type of land uses;
* The specific type of reuse proposed;

* The party(s) responsible for the distribution and use of the recycled water at the site;

* Identification of other governmental entities which may have regulatory jurisdiction over the re-use site such as the US Department of Agriculture, State Department of Health Services, Food and Drug Branch, the State Department of Health Services, Licensing and Certification Section, etc. These agencies should also be provided with a copy of the Title 22 Engineering Report for review and comment.

* Use area containment measures;

* A map showing:

  -Specific areas of use

  -Areas of public access

  -Surrounding land uses

  -The location and construction details of wells in or within 1000 feet of the use area

  -Location and type of signage

* The degree of potential access by employees or the public;

* For use areas where both potable and recycled water lines exist, a description of the cross-connection control procedures which will be used.

In addition to the general information described above, the following should be provided for the following specific proposed uses:

4.1 Irrigation

-Detailed plans showing all piping networks within the use area including recycled, potable, sewage and others as applicable.

-Description of what will be irrigated (e.g. landscape, specific food crop, etc.);

-Method of irrigation (e.g. spray, flood, or drip);

-The location of domestic water supply facilities in or adjacent to the use area;

-Site containment measures;

-Measures to be taken to minimize ponding;

-The direction of drainage and a description of the area to which the drainage will flow;

-A map and/or description of how the setback distances of Section 60310 will be maintained;

-Protection measures of drinking water fountains and designated outdoor eating areas, if applicable;

-Location and wording of public warning signs,

-The proposed irrigation schedule (if public access is included), and

-Measures to be taken to exclude or minimize public contact.

4.2 Impoundments

-The type of use or activity to be allowed on the impoundment;

-Description of the degree of public access;

-The conditions under which the impoundment can be expected to overflow and the expected frequency, and

-The direction of drainage and a description of the area to which the drainage will flow.

4.3 Cooling

-Type of cooling system (e.g. cooling tower, spray, condenser, etc.);

-Type of biocide to be used, if applicable;

-Type of drift eliminator to be used, if applicable, and

-Potential for employee or public exposure, and mitigative measures to be employed.

4.4 Groundwater Recharge

An assessment of potential impacts the proposal will have on underlying groundwater aquifers. The appropriate information shall be determined through consultation with the Department on a case by case basis.

4.5 Dual Plumbed Use Areas

In accordance with Sections 60313 through 60316 of the Water Recycling Criteria.

4.6 Other Industrial Uses

The appropriate information shall be determined on a case by case basis.

4.7 Use Area Design

The report should discuss how domestic water distribution system shall be protected from the recycled water in accordance with the Regulations Relating to Cross-Connections and the California Waterworks Standards, and how the facilities will be designed to minimize the chance of recycled water leaving the designated use area. Any proposed deviation from the Water Recycling Criteria and necessity therefore, should be discussed in the report.

4.8 Use Area Inspections and Monitoring

The report should describe the use area inspection program. It should identify the locations at the use area where problems are most likely to occur (e.g. ponding, runoff, overspray, cross-connections, etc.) and the personnel in charge of the monitoring and reporting of use area problems.

4.9 Employee Training

The report should describe the training which use area employees will receive to ensure compliance with the Recycled Water Criteria, and identify the entity that will provide the training and its' frequency. The report should also identify any written manuals of practice to be made available to employees.

STATE OF CALIFORNIA–HEALTH AND WELFARE AGENCY GRAY DAVIS, *Governor*

DEPARTMENT OF HEALTH SERVICES
DIVISION OF DRINKING WATER AND ENVIRNOMENTAL MANAGEMENT
TECHNICAL OPERATIONS SECTION
RECYCLED WATER UNIT
1180 Eugenia Place, Suite 200
CARPINTERIA, CALIFORNIA 93013
(805) 566-1326
FAX (805) 745-8196

STATE OF CALIFORNIA DIVISION OF DRINKING WATER AND ENVIRONMENTAL MANAGEMENT

TREATMENT TECHNOLOGY REPORT FOR RECYCLED WATER

April 2003

This document has been developed to serve as a reference source for those seeking information concerning technologies that have been recognized by the California State Department of Health Services (CDHS) as being acceptable for compliance with treatment requirements of the California Recycled Water Criteria. This is a "living" document that will be updated periodically as needed. Readers who find errors or omissions should contact Jeff Stone of the SDHS Recycled Water Unit at jstone1@dhs.ca.gov.

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
DIVISION OF DRINKING WATER
AND
ENVIRONMENTAL MANAGEMENT

TREATMENT TECHNOLOGY REPORT FOR RECYCLED WATER

April 2003

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5. APPENDIX

'A' - California Department of Health Services Requirements for Demonstration of Reduction of Virus and Bacteria by Filtration and Disinfection

State of California
Department of Health Services
Division of Drinking Water

Treatment Technology Report for Recycled Water

April 2003

1. INTRODUCTION

The purpose of this document is to provide general reference information concerning those treatment technologies that are being utilized for meeting the filtration performance and disinfection requirements for compliance with the California Recycled Water Criteria (Title 22, et. seq.). The information contained herein was generated from a review of files and correspondence of the California State Department of Health Services (CDHS), and discussions with Field Operations Branch District Staff, SWRCB Staff, industry representatives and manufacturers. All referenced reports, letters and other documents are on file with the Department's Recycled Water Unit. This reference document may not reflect all treatment technologies in place in California, but will be updated as additional information is obtained.

The California Water Recycling Criteria (adopted December 2000) define Disinfected Tertiary Recycled Water as a wastewater, which has been oxidized and meets the following:

A. Has been coagulated* and passed through natural undisturbed soils or a bed of filter media pursuant to the following:

1. At a rate that does not exceed 5 GPM/ft^2 in mono, dual or mixed media gravity or pressure filtration systems, or does not exceed 2 GPM/ft^2 in traveling bridge automatic backwash filters; and

2. The turbidity does not exceed any of the following; a daily average of 2 NTU, 5 NTU more than 5% of the time within a 24-hour period, and 10 NTU at any time.

*Note: Coagulation may be waived if the filter effluent does not exceed 2 NTU, the filter influent is continuously measured, the filter influent turbidity does not exceed 5 NTU, and automatically activated chemical addition or diversion facilities are provided in the event filter effluent turbidity exceeds 5 NTU.

OR

B. Has been passed through a micro., nano., or R.O. membrane following which the turbidity does not exceed any of the following: 0.2 NTU more than 5% of the time within a 24-hour period and 0.5 NTU at any time.

AND

C. Has been disinfected by either:

1. A chlorine disinfection process that provides a CT of 450 mg-min/l with a modal contact time of not less than 90 minutes based on peak dry weather flow, or

2. A disinfection process that, when combined with filtration, has been demonstrated to achieve 5-log inactivation of virus.

2. GENERAL GUIDANCE

The following guidance is consistent with the Water Recycling Criteria and will serve as the basis for CDHS review and acceptance of treatment technologies for compliance with the filtration and disinfection requirements of the Criteria.

FILTRATION

Filters meeting the definition of "filtered wastewater" under Section 60301.320 (a&b) and those demonstrating equivalency under Section 60320.5 ("Other Methods of Treatment") outlined in the Water Recycling Criteria are allowed the option of either disinfection approach outlined in Section 60301.230 without additional restrictions or requirements.

The Department considers a properly filtered and disinfected recycled water meeting the turbidity performance and coliform requirements outlined in the criteria to be essentially pathogen free. As noted by Asano et al.[1], "To achieve efficient virus removal or inactivation in tertiary treatment, two major criteria must be met: 1) the effluent must be low in suspended solids and turbidity prior to disinfection to prevent shielding of viruses and chlorine demand, and 2) sufficient disinfectant must be applied to the wastewater." Treatment requirements determined necessary to meet the disinfected tertiary - 2.2 criteria outlined in the Criteria include media filtration to reduce turbidity to less than a daily average of 2 NTU or membrane filtration to reduce turbidity to less than a daily average of 0.2 NTU, and disinfection to ensure a minimum CT of 450 milligram-minutes per liter at all times. This treatment scheme is intended to remove solids (including some pathogens) and properly prepare the water for effective disinfection in order to achieve an approximately five-log reduction of virus.

However, with respect to many existing technologies, there has yet to be a demonstrated correlation between turbidity and pathogen concentration. The current turbidity performance standards for media and membrane filtration are based on achievable turbidity performance and do not assure any specific minimum level of pathogen removal. This is a recognized issue in the regulations that needs to be addressed by the Department and the water recycling industry.

Since the Pomona Virus Study[2], biological treatment has introduced additional variables into the picture, as the type of biological treatment can impact the particle size distribution and downstream filter and disinfection performance. However, the integration of these processes, into a process train, are not well understood at this time and must be addressed by industry and regulators. Nevertheless, it remains the intent of the Department to produce an essentially pathogen free effluent by maintaining a 5-log virus removal/inactivation barrier through filtration and disinfection.

Additional information concerning treatment technologies may be found in Appendix A (California Department of Health Services-Reduction of Virus and Bacteria by Filtration and Disinfection, October 2001).

It must be recognized that the Title 22 filtration performance requirements, as outlined under Section 60301.320, must be reliably met by all filtration technologies. It is suggested that recycled water producers develop and implement plant performance optimization plans and make a reasonable effort to minimize effluent turbidity levels. Furthermore, all treatment facilities should be operated in accordance with the manufacturer's recommendations and specific conditions of approval developed by CDHS.

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1. Asano, T.; Tchobanoglous, G.; and Cooper, R.C (1984), "Significance of Coagulation-Flocculation and Filtration Operations in Wastewater Reclamation and reuse", in Symposium Proceedings, The Future of Water Reuse, Water Reuse Symposium III, San Diego, California, August 26-31, 1984. American Waterworks Association Research Foundation.

2. County Sanitation Districts of Los Angeles County (1977), "Pomona Virus Study, Final Report", Prepared for Calif. State Water Resources Control Board, Sacramento, Calif., and USEPA, Washington, D.C

UV DISINFECTION

UV Disinfection Guidelines were published in 1993 by the National Water Research Institute (NWRI). Since that time, the field of ultraviolet disinfection has taken great strides forward. As a result of the progress made in understanding the UV disinfection process, the CDHS and the NWRI agreed that it was time to revise and update the guidelines. NWRI and the American Water Works Association Research Foundation (AWWARF) pooled their resources in order to revise the current guidelines, which now cover water recycling <u>and</u> drinking water UV disinfection applications. As a result of these efforts the *"Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse"* were published by NWRI/AWWARF in December 2000. CDHS endorses these Guidelines and refers to them when evaluating UV disinfection proposals. One major recommendation of the guidelines is that all UV equipment (including previously approved equipment) be tested and validated under these new guidelines before being accepted by the Department. It is believed that existing UV disinfection systems that were properly designed should comply with the elements of the revised guidelines.

The implication of the recommendations contained in the revised guidelines is that even the horizontal low-pressure low intensity UV systems must be validated before they are accepted for a UV disinfection application. Previously accepted UV technologies that were considered to be nonconforming under the 1993 guidelines will also have to be retested using the recommended testing procedure. The UV technologies listed herein include a note indicating whether compliance with the December 2000 guidelines has been demonstrated by the manufacturer.

Agencies that are in the stages of planning or early design have the most flexibility and should be able to require completion of UV validation testing before they accept delivery of the UV equipment. Therefore, the agency can plan and begin the design work around a given UV system, but not allow delivery of equipment until validation testing is completed. This will allow comparison of the UV reactor design to the validation test results in order to ensure adequate sizing and performance of the UV system. This could be done as part of design review process, i.e., while the design is not yet complete.

If the design process has been completed and the contract for equipment has been signed, there will be fewer recourses for the utility. However, the utility can require a demonstration of performance or performance guarantee on the equipment for their own protection.

It is important to note that these are only "guidelines" and are therefore not limiting with respect to alternative approaches a manufacturer or project proponent may propose for consideration on a case-by-case basis. It is possible however that future regulations may be based on these guidelines.

(Continued on next page)

3. FILTRATION TECHNOLOGIES

Granular Media Type Filters

The following technologies have demonstrated their ability to meet the performance objectives of Title 22. The "STATUS" designation gives an indication as to which technologies have been given formal Departmental recognition. For projects proposing a technology which is not listed herein or whose "STATUS" is unknown, a review of the proposal should be conducted by the Recycled Water Unit prior to acceptance.

Dynasand **Status--Accepted**
Parkson Corporation
2727 N.W. 62nd Street
Fort Lauderdale, Florida 33340-8399
(305) 974-6610

Description: Upflow deep bed continuous backwash

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
sand: 40	1.30	1.50

Acceptance / Reference:
- -Listed in the CDHS Direct Filtration Guidelines (1988)
- -Conditional acceptance letter dated 12/1/86 from CDHS
- -Conditions of acceptance include: 1) media design specs. as noted above, 2) complete recycling of filter medium every three to four hours.
- -Letter dated 4/23/97 from the San Francisco District Office to the Sewerage Agency of South Marin
- -Memo dated 7/18/97 from Mike Finn (CDHS) re: two performance studies (S.F. Bureau of water Pollution Control and Sewerage Agency of South Marin)

Comments: Classified as direct filtration.

Installations: Sewerage Agency of Southern Marin (Evaluation outlined in a Pilot Test Final Report for the Agency dated June 1989); San Francisco-Bureau of Water Pollution Control has a pilot unit at the Oceanside WWTP, and others.

WATERLINK SuperSand **Status--Accepted**
Waterlink Separations, Inc.
29850 N. Skokie Hwy. (U.S. 41)
Lake Bluff, Illinois 60044-1192
(847) 473-3700

Description: Upflow deep bed continuous backwash

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
sand: 40	1.30	1.50

Acceptance / Reference:

-Conditional acceptance letter dated 1/14/2000 from CDHS.
-Conditions of acceptance include: 1) media design specs. as noted above, 2) complete recycling of filter medium every three to four hours.

-Note: Waterlink holds the patents for the design of the filter approved as the "DynaSand" marketed by Parkson Corp. under licensing agreements. Master file contains all documentation.

Comments: Classified as direct filtration.

Installations: Proposed for Delta Diablo Sanitation District (Pittsburg, CA), Coachella Valley and Escondido.

WESTECH TECHNASAND **Status--Accepted**
Westech Engineering, Inc.
3625 South West Temple
Salt Lake City, Utah 84119-0068
(801) 265-1000

Description: Upflow deep bed continuous backwash

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
sand: 40	1.30	1.50

Acceptance / Reference:

-Conditional acceptance letter dated 4/5/2002 from CDHS.

-Conditions of acceptance include: 1) media design specs. as noted above, 2) complete recycling of filter medium every three to four hours.

-Note: Mftr. has indicated they will warrant the Technasand Filter to meet Title 22 filtration requirements. Same principle as the Parkson Dynasand. Master file contains all documentation.

Comments: Classified as direct filtration.

Installations: Proposed for Carmel Valley Ranch.

Hydro-Clear **Status--Accepted**
U.S. Filter
Zimpro Environmental, Inc.
301 W. Military Rd.
Rothschild, WI 54474
(715) 359-7211

Description: Shallow pulsed bed filter

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
sand: 10-12	0.45	1.50

Acceptance / Reference:

-Listed in the CDHS Direct Filtration Guidelines (1988)

-Conditional acceptance letter dated 11/17/81 from CDHS.

-Conditions of acceptance include: 1) minimum bed depth of 10-inches of sand with E.S. of 45 mm, 4) at least 6 minutes between pulses and no more than 25 pulses per filter run.

-U.C. Davis Evaluation Report; "Evaluation of the Pulsed-Bed Filter For Wastewater Reclamation in California", 1981.

Comments: Classified as direct filtration

Installations: Moulton Niguel WD, San Luis Obispo, San Clemente, Rancho Murrieta, Fallbrook, and others.

Infilco-Degremont, Inc. **Status--Accepted**
Automatic Backwash (ABW)
P. O. Box 71390
Richmond, Va 23255-1390
(804) 756-7697

Description: shallow bed, traveling bridge

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
sand: 11	0.55	1.50

Acceptance / Reference:
- -Listed in the CDHS Direct Filtration Guidelines (1988)
- -U.C. Davis Evaluation Report; "Evaluation of the Enelco ABW Automatic Backwash Filter For Wastewater Reclamation in California", dated November 1988.

Comments: Loading rate limited to 2 gpm/ft^2; Max. influent turbidity <10 NTU.

Installations: Sacramento County, Sepulveda Water Reclamation, Folsom WWTP, Victor Valley WWRP, LA City-Tillman WRP, Shasta Lake WWTP, and others.

Aqua-Aerobic Systems, Inc. **Status--Accepted**
Automatic backwash filter (AquaABF)
P.O. Box 2026
6306 N. Alpine Road
Rockford, IL 61111
(815) 654-2501

Description: Shallow bed traveling bridge

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
sand: 11	0.55	1.50

Acceptance / Reference:
- -Listed in the CDHS Direct Filtration Guidelines (1988)

-U.C. Davis Evaluation Report entitled "Evaluation of the Aqua-Aerobic Automatic Backwash Filter For Wastewater Reclamation in California" dated July 1986.

Comments: Loading rate limited to 2 gpm/ft^2; Max. influent turbidity <10 NTU.

Installations: None known

Tetra Technologies, Inc. **Status--Accepted**
Tetra-Denit.
1628 Tiburon Blvd.
Tiburon, CA 94920
(1-800-364-4617)

Description: Tetra Deep Bed-Denitrification Filters

Media configuration:

Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
Silica sand: 48-72	2.2	1.35

Acceptance / Reference:
-Conditional acceptance letter signed by M. Kiado (CDHS) re: LADWP dated 3/17/92
-Letter dated 10/6/97 from Parsons Engineering Science regarding LA-Glendale Water Reclamation Plant pilot study.

Comments: Mono-media granular sand; 4-6 foot depth; intended for direct filtration with chemical addition.

Installations: City of Los Angeles (Glendale WWTP), Lake Arrowhead CSD, Padre Dam MWD, Scotts Valley WD.

Centra-flo
Applied Process Technology **Status--Accepted**
35 Wellington Lane
Conroe, Texas 77304
(409) 539-4099

Description: Centra-flo Gravity Sand Filter
Downflow Continuous Wash Filter

Media configuration:

Media Depth (inches)	Effective Size (mm) (graded)	Uniformity Coefficient
sand: 40	0.5 - 3.0	1.50

Acceptance: CDHS letter dated January 6, 1999 for landscape irrigation

Comments: Pilot testing conducted at Union Sanitary District's Alvarado WWTP (1994); loading rate up to 4.4 GPM/ft^2.

Installations: Tejon Ranch Development '99 (I-5 @ Tejon Pass)

Fluidsand
Fluidyne Corporation
2816 West First Street
Cedar Falls, IA 50613
(319) 266-9967

Status--Accepted

Description: Fluidyne Fluidsand Filter
Upflow Continuous Backwash Filter

Media configuration:

	Media Depth (inches)	Effective Size (mm) (graded)	Uniformity Coefficient
silica sand:	40	0.8 - 1.0	1.6

Acceptance / Reference:

-Conditional acceptance letter dated 5/03/2000 from CDHS.
-Conditions of acceptance include: 1) media design specs. as noted above, 2) complete recycling of filter medium every three to four hours.
-Engineering Report dated June 9, 1997 submitted by Questa Engrg. for the Canada Woods Reclamation Facility.

Comments: Classified as direct filtration. Designed for waters containing TSS up to 20 mg/l (per manufacturer); Performance data submitted by the manufacturer demonstrates this technology's ability to comply with the turbidity performance standards. Design and operation conceptually similar to Dynasand.

Installations: Tenaya Lodge located in Fish Camp (Evaluated in a "facilities Review" report by Carollo Engineers dated September 1990). Canada Woods Development ('99) in the Monterey area (without SDHS approval). Castanoa Ranch ('99) in San Mateo County.

Hydrasand **Status--Accepted**

Andritz Ruthner, Inc.
1010 Commercial Blvd. So.
Arlington, Texas 76017
(817) 465-5611

Description: Upflow, continuous wash filter

Acceptance / References:

- -Conditional acceptance letter dated June 23, 2000 from CDHS.
- -Conditions of acceptance include: 1) media design specs. as noted above, 2) complete recycling of filter medium every three to four hours.
- -Report available entitled "Microbial Assessment of the Lanai Auxiliary Reclamation Facility to Produce Wastewater Effluent for Unrestricted, Non-potable Reuse" dated October 1998.

Comments: Mftr. has indicated they will warrant the Hydrasand Filter to meet Title 22 requirements. Same principle as the Parkson DynaSand.

Installations: None in California (proposed for City of Corona), installed in Trumansburg NY and Lanai City, HI.

Volcano ***Status—NOT YET ACCEPTED***

Description: Continuous wash downflow sand filter

Acceptance / References:

- -Documentation of CDHS approval does not exist. The Recycled Water Unit has no technical data on this process.

Comments: Future proposals for use of this filtration technology will require an acceptability assessment prior to approval.

Installations: Boulder Creek G.C. (Santa Cruz County), Sierra Heights WWTP (Santa Clarita), Carmel Valley WWTP, Shelter Cove (Humbolt)

Other Media Type Filters

Fuzzy Filter
Schreiber LLC **Status--Accepted**
100 Schreiber Drive
Trussville, Alabama 35173

Description: "Fuzzy Filter"-compressible plastic filter media
Upflow design

Media configuration:

	Media Depth (inches)	Effective Size (mm)	Uniformity Coefficient
Synthetic: Plastic	30 (variable)	(1.25")	1.50

Media is quasi spherical, highly porous and compressible

Acceptance / Reference:
- -Conditional acceptance letter date February 24, 2003 from CDHS.
- -Conditions of acceptance include: 1) media design specs. as noted above, 2) filtration rate not to exceed 30 gpm/ft^2, 3) all Title 22 installations shall have design changes as outlined by Schreiber in correspondence dated January 21, 2003 (i.e. - backwash with filtered water, wash outlet below filtered outlet, valving position alarms), 4) individual operations plans shall include recommended operational configurations (i.e. percent compression and loading rate) based on secondary quality.
- -Evaluated by U.C. Davis (Report dated September 1996)

Comments: Evaluated at loading rates up to 30 GPM/ft^2; media configuration/porosity/depth varies based on percent compression; water passes through media rather than around media.

Installations: City of Yountville

Membrane Technologies

ZENON
Zenon Environmental Services, Inc.
3239 Dundas Street West
Oakville, Ontario L6M 4B2
(905) 465-3030

Cycle-Let (Thetford) **Status--Accepted**

Description: Membrane ("Ultra") filtration (originally marketed as Thetford Cycle-Let); complete package unit including pretreatment, biological oxidation, membrane ultra-filtration, GAC and U.V.

Acceptance / References:
-CDHS acceptance memorandum to LARWQCB dated November 12, 1993 regarding the Water Gardens Project.
-Report entitled "Evaluation of the Thetford Cycle-Let Reclamation System's Ability to Meet Title 22, prepared by Engineering-Science, dated August 1991.
-Report entitled "Thetford Systems Inc. Cycle-Let Wastewater Treatment and Recycling System - Water Garden Project, Santa Monica, CA" dated July 1993 prepared by CDM

Comments: Membrane approved has average pore size of .005 micron.

Installations: "Water Gardens" (Santa Monica), Sony Music Campus (Santa Monica).

ZeeWeed / Zenogem **Status--Accepted**

Description: Variant of the Cycle-Let, OCP Bio-reactor / Microfiltration process

Acceptance / References:
-Conditional acceptance letter from CDHS dated August 12, 1999
-Draft Final Report "California DHS Certification Testing-for Zenon (ZeeWeed) Membrane" prepared by Montgomery Watson (1/8/99).

Comments: Approval based on use of the "OCP" membranes only. Conditions of approval include: membrane integrity tests required; max. flux of 49.8 GFD.

Installations: Unknown

ZeeWeed 1000 UF **Status--Accepted**

Description: Submerged Hollow Fiber Ultrafiltration Membrane

Acceptance / References:
- -Conditional acceptance letter from CDHS for T-22 compliance dated October 12, 2001
- -Report entitled "California Department of Health Services Certification Testing For Zenon ZeeWeed 1000 Membrane", prepared by Montgomery Watson (June 2001). This report was prepared for demonstrating compliance with the California Surface Water Treatment Rule.

Comments: Approval based on use of the hollow fiber polymer "ZeeWeed 1000 UF Membrane" with a 0.02 micron nominal pore size. Conditions of approval include: max. flux of 30 GFD; max. TMP of -10 psi; membrane integrity tests required.

Installations: Unknown

U. S. Filter / MEMCOR **STATUS--Accepted**
4116 Sorrento Valley Blvd.
San Diego, CA 92121
(619) 445-0578

Memcor Continuous Microfiltration (CMF)

Description: 0.2 micron *Polypropylene* Hollow Fiber Micro-Filtration - Pressure Filtration

Acceptance / References:
- -Conditional acceptance letter from CDHS dated 1/10/2000
- -Approved under the SWTR using 0.2 micron membrane.

Comments: Flux rate not to exceed 0.5 gpm/m^2, transmembrane pressure not to exceed 18 PSI, membrane integrity tests required.

Installations: West Basin MWD, Orange County Water District, City of Livermore, Dublin/San Ramon SD

Memcor Continuous Microfiltration (CMF)

Description: 0.1 micron *Polyvinylidene Fluoride* (PVDF) Hollow Fiber Micro-Filtration - Pressure Filtration

Acceptance / References:
- Conditional acceptance letter from CDHS dated 1/10/2000
- Approved under the SWTR using 0.2 micron membrane.

Comments: Flux rate not to exceed 0.5 gpm/m^2, transmembrane pressure not to exceed 18 PSI, membrane integrity tests required.

Installations: West Basin MWD, Orange County Water District, City of Livermore, Dublin/San Ramon SD

Memcor Continuous Microfiltration Submerged (CMF-S)

Description: 0.2 micron *Polypropylene* Hollow Fiber Micro-Filtration - Submerged/Vacuum Filtration

Acceptance / References:
- Conditional acceptance letter from CDHS dated 1/10/2000

Comments: Flux rate not to exceed 0.5 gpm/m^2, transmembrane pressure not to exceed 18 PSI, membrane integrity tests required.

Installations: Unknown

Memcor Continuous Microfiltration Submerged (CMF-S)

Description: 0.1 micron *Polyvinylidene Fluoride* (PVDF) Hollow Fiber Micro-Filtration - Submerged/Vacuum Filtration

Acceptance / References:

-Conditional acceptance letter from CDHS dated 1/10/2000

Comments: Flux rate not to exceed 0.5 gpm/m^2, transmembrane pressure not to exceed 18 PSI, membrane integrity tests required.

Installations: Unknown

U. S. Filter/Jet Tech Products-Memjet™ **STATUS--Accepted**
1051 Blake
Edwardsville, KS 66111

Description: 0.1 micron *Polyvinylidene Fluoride* (PVDF) Hollow Fiber Micro-Filtration - SBR/Vacuum Filtration

Acceptance / References:
-Conditional acceptance letter from CDHS dated 10/7/2002

Comments: Flux rate not to exceed 25 gfd, transmembrane pressure not to exceed 7.2 PSI, membrane integrity tests required.

Installations: Unknown

PALL Corporation **STATUS -- Accepted**
25 Harbor Park Drive
Port Washington, NY 11050 USA
(516) 484-3600

Description: PVDF Hollow Fiber Microza Microfiltration 0.1 micron (P/N XUSV-5203

Acceptance / References:
-Conditional acceptance letter from CDHS dated 1/10/2000
-Approved for compliance under the SWTR base on report entitled "California Department of Health Services Certification Testing for Pall (Microza) Microfiltration Membrane" prepared by Montgomery-Watson (July 1999).
-Performance study conducted at OCWD Water Factory 21 (SLS Report 7725) "Long-Term Testing of Pall Microza 0.1 um MF System on Secondary Effluent at Water Factory 21, Fountain Valley, CA" (September 23, 1998).

Comments: Flux rate not to exceed 32 GFD, transmembrane pressure not to exceed 25 PSI, membrane integrity tests required.

Installations: Unknown

MITSUBISHI
Mitsubishi International Corp. **STATUS -- Accepted**
333 South Hope Street West, Suite 2500
Los Angeles, CA 90071

Description: Mitsubishi Membrane Bioreactor (MBR)
Sterapore HF 0.4 micron hollow fiber polyethylene

Acceptance / References:
-Conditional acceptance letter from CDHS dated April 23, 2001
-Report entitled "Assessing the Ability of Membrane Bioreactor to Meet Existing Water Reuse Criteria (Mitsubishi Rayon Co., Ltd.)" prepared by Montgomery-Watson (March 2001).

Comments: Flux rate not to exceed 13 GFD; max. operating pressure of -5.8 psi; membrane integrity tests required.

Installations: Unknown

KUBOTA **STATUS -- Accepted**

Description: Kubota Membrane Bioreactor (MBR); Type 510 0.4 micron chlorinated polyethylene flat sheet membrane

Acceptance / References:
-Conditional acceptance letter from CDHS dated March 18, 2003
-Report entitled "Assessing the Ability of the Kubota Membrane Bioreactor to Meet Existing Water Reuse Criteria" prepared by Montgomery-Watson-Harza (February 2003).

Comments: Flux rate not to exceed 20 GFD; max. operating vacuum pressure of <3.0 psi; membrane integrity tests required; turbidity performance limited to Section 60301.320 (b) of the Water Recycling Criteria.

Installations: Unknown

Cloth Filter Technologies

AQUA AEROBIC Systems, Inc. **Status--Accepted**
6306 N. Alpine Rd.
Rockford, IL 61130-0026
(815) 654-2501

Description: **Submerged Cloth-Media Rotating Disk Filter (Utilizing the 102 needle felt fabric)**

Acceptance / References:
- -Conditional acceptance letter from CDHS dated June 29, 2001
- -Report entitled "Evaluation of the Aqua-Aerobic Systems Cloth-Media Disk Filter (CMDF) for Wastewater Recycling Applications in California" prepared by UC Davis (March 2001).
- -Report entitled "Evaluation of Aqua-Aerobics Systems AquaDisk Filter Technology at Orange County Water District, Fountain Valley, California" (February 25, 2000).

Comments: Utilizes the "102 needle felt fabric", operates under vacuum. Conditions of acceptance: loading rate not to exceed 6 gpm/ft^2; technology must be complimented with a disinfection process capable of achieving 5-log virus inactivation in accordance with Section 60301.230 (T-22); acceptance limited to the random woven NF-102 needle felt cloth media having openings ranging from 10 to 30 microns and a thickness of 3.8 mm; influent turbidity not exceed 10 NTU more than 5-percent of the time within a 24-hour period; Operations plan shall specify minimum FTW cycle following high pressure wash based on displacement of two filtrate volumes and effluent turbidity below 2 NTU; scheduled inspections of cloth conditions; ensure adequate sludge wasting; Turbidity performance limited to Section 60301.320(a) of the Water Recycling Criteria.

Installations: None known

Description: **Submerged Cloth-Media Rotating Disk Filter (Utilizing the PA-13 nylon pile fabric)**

Acceptance / References:
- -Conditional acceptance letter from CDHS dated May 6, 2002)

-Report entitled "Use of PA-13 Pile Fabric, Supplement to: Evaluation of the Aqua-Aerobic Systems Cloth-Media Disk Filter (CMDF) for Wastewater Recycling Applications in California" prepared by UC Davis (February 2002).

Comments: Utilizes the "PA-13 nylon pile fabric", operates under vacuum. Conditions of acceptance: loading rate not to exceed 6 gpm/ft^2; technology must be complimented with a disinfection process capable of achieving 5-log virus inactivation in accordance with Section 60301.230 (T-22); acceptance limited to the PA-13 nylon pile fabric (as tested); influent turbidity not exceed 10 NTU more than 5-percent of the time within a 24-hour period; scheduled inspections of cloth conditions; ensure adequate sludge wasting; turbidity performance limited to Section 60301.320(a) of the Water Recycling Criteria.

Installations: None known

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4. DISINFECTION TECHNOLOGIES

Gaseous chlorine or hypochlorite is the most commonly used disinfectant, however alternative technologies are recognized as being acceptable. On-site chlorine generators are also available for industry use.

ULTRAVIOLET

Trojan Technologies, Inc.
3020 Gore Rd.
London, Ontario Canada N5V 4T7

Description: UV 4000 (Medium Pressure) **Status—Accepted***
UV 3000 (Low Pressure/Low Intensity) " **

Acceptance/References:
-Conditional acceptance letter from CDHS dated September 8, 1995 for UV4000.
-"Trojan System UV4000 UV Disinfection Pilot Study. Riverside, California", May 1995
-"Equivalency of the Trojan System UV4000 and System UV3000 in Meeting California Wastewater Reclamation Criteria at Pacifica, California", June 1994
-"Technical Review: Ultraviolet Disinfection of Wastewater to California Wastewater Reclamation Criteria (Title 22,

Division 4, Chapter 3, of the California Code of Regulations) Using Trojan Technologies' System UV4000 (High Intensity UV Lamp Technology", August 1995.

Comments: Acceptance for the UV4000 conditioned on 1) continuous monitoring/recording of filter effluent turbidity (pre UV), daily coliform monitoring (disinfected effluent) and 3) provide UV dose of at least 100 mW-sec/cm^2 under worst operating conditions at peak daily instantaneous flow with a minimum of three banks in operation and a UV dose of at least 140 mW-sec/cm2 with a minimum of four banks in operation, subject to all of the conditions indicated in the NWRI Guidelines.

Installations: City of Pacifica, City of Vallejo, Central Contra Costa S.D., City of Corona, City of San Diego (South Bay WRF), Western Riverside RWF, Olivenhain WD, City of Santa Rosa

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

****Acceptance granted under the December 2000 NWRI/AWWARF Guidelines.**

PCI-Wedeco Environmental Technologies, Inc. Status—Accepted*
One Fairfield Crescent
West Caldwell, NJ 07006

-Specktrotherm 33-TAK UV

Description: (Low pressure/High Intensity)

Acceptance/References
- -Conditional acceptance letter dated 3-31-98 from CDHS and follow-up letter dated 5/21/99 transferring approval from Aquafine to Wedeco).
- -Tested at OCWD as the AWES-Spectrotherm TAK UV System

Comments: Currently marketed as the PCI-Wedeco Spectrotherm 33 TAK UV System. Requires UV dose of 160 mWs/cm^2 at max. week flow, 120 mWs/cm^2 at peak flow (max. day), and an average of $\geq$160 mWs/cm^2 and conform to NWRI Guidelines.

Installations: Leucadia CWD(proposed)

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

Wedeco - Ideal Horizons LCI-20L **Status—Accepted***

Description: (Low pressure/High Intensity)
Model LCI-20L

Acceptance/ References

-Conditional acceptance letter from CDHS dated 2-23-99 for Tejon Ranch.
-Report entitled "Ultraviolet Dose Bioassay of the Ideal Horizons Horizontal Lamp Disinfection System" by HydroQual, Inc. (September 1998).

Comments:

Installations: Tejon Ranch Development (I-5 @ Tejon Pass)

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

Wedeco - Ideal Horizons TAK 55 **Status—Accepted****

Description: (Low pressure/High Intensity/open channel)
TAK 55

Acceptance/References
-Conditional acceptance letter dated 12-4-01 from CDHS.
-Report entitled "Wedeco-Ideal Horizons Low-Pressure, High Intensity Ultraviolet Disinfection System Pilot Study at Orange County Water District" by CH2M Hill (November 2000)

Comments:

Installations: Unknown

****Acceptance granted under the December 2000 NWRI/AWWARF Guidelines.**

Aquionics **Status—Accepted***
Aquionics, Inc.
21 Kenton Lands Rd.
Erlanger, Ky 41018

Description: (Medium Pressure/In-line)

Acceptance/Reference:

-Conditional acceptance letter dated 2-28-00 from CDHS.

-CH2M Hill, "Aquionics Medium Pressure, High-Intensity Ultraviolet Disinfection System Pilot Study at Orange County Water District" by CH2M Hill (May 1999)

Comments:

Installations: Unknown

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

Service Systems International, Ltd. **Status—Accepted***
2800 Ingleton Avenue
Burnaby, B.C. Canada, V5C 6G7

ULTRAGUARD UV System

Description: (Open Channel/Low Pressure/High Intensity/vert. lamp)

Acceptance/Reference:

-Conditional acceptance letter dated 2-1-00 from CDHS.

-Report: Chen, C. L.; El Jacj, Z; Kuo, J., UV Inactivation of Bacteria and Coliphages in Tertiary Effluent Using Low-Pressure High-Intensity Lamps, November 18, 1999, County Sanitation Districts of Los Angeles County.

Comments:

Installations: Unknown

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

Aquaray
Infilco-Degremont
2924 Emerywood Parkway
P.O. Box 71390
Richmond, VA 23255-1390

Aquaray 40 VLS **Status—Accepted***

Description: Vertical lamp/low Pressure/low intensity

Acceptance: Conditional acceptance letter dated 10/24/97 from CDHS

Comments: Evaluation memo dated 4/30/97 from SDHS concerning transmittance restriction be set at >55%.

Installations: Scotts Valley, Town of Windsor, Dublin/San Ramon CSD

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

UltraTech Systems
15 Kay Fries Drive
Stoneypoint, NY 10980

Terminator **Status—Accepted***

Description: Vertical/Low Pressure/Low Intensity

Acceptance/References
- -Conditional acceptance letter dated October 23, 2000 from CDHS
- -Report entitled "Ultraviolet Dose Bioassay of the Ultratech Systems Vertical Lamp Disinfection System (65% Transmittance)" by HydroQual, Inc. (February 2000).

Comments:

Installations: Unknown

***Acceptance granted under the outdated 1993 NWRI Guidelines. Compliance with the NWRI/AWWARF Guidelines has not been demonstrated**

See Appendix A

Alt. Tech. disk - Recycle water Technology listing3-03.doc

APPENDIX A

Recognized Filtration and Disinfection Technologies for Recycled Water

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
REDUCTION OF VIRUS AND BACTERIA BY FILTRATION AND DISINFECTION
(October 2001)

Title 22 of the California Code of Regulations (Recycled Water Criteria) require extensive treatment of wastewater that is to be used for irrigation of parks and playgrounds or for spray irrigation of food crops. Recycled water for such irrigation is to be oxidized, filtered, and disinfected. Section 60301.320 defines filtered wastewater and Section 60301.230 defines disinfected tertiary recycled water. Additionally, Section 60320.5 allows for "other methods of treatment" provided they are found acceptable to the Department.

Treatment equivalent to that stipulated in sections 60301.320 and 60301.230 is prescribed to greatly reduce the concentration of viable enteric viruses in wastewater. Such a reduction makes it very unlikely that a person would contaminate his hands with a virus when touching a surface wet with reclaimed water. Enteric viruses are excreted by individuals with an intestinal virus infection. They can cause incapacitating disease states in susceptible persons. Those disease states include meningitis, hepatitis, and others.

<u>Capability of Treatment That Sections 60301.320 and 60301.230 Cite</u>

The County Sanitation Districts of Los Angeles County (CSDLAC, 1977) determined the capability of treatment that sections 60301.320 and 60301.230 cite, to reduce the concentration of viable virus in activated sludge effluent. CSDLAC added laboratory-cultured poliovirus and 150 milligrams of alum coagulant per liter of the activated sludge effluent and passed it through pilot-scale treatment facilities comprised of a clarifier and a sand filter to meet the turbidity limits that section 60301.320 cites in the definition of filtered wastewater: turbidity shall not exceed 2 turbidity units as a daily average and shall not exceed 5 turbidity units more than five percent of the time. Filter effluent was chlorinated in a chamber with a two-hour theoretical contact period and a 90-minute actual, modal contact period.

Such treatment reduced the concentration of virus plaque-forming units to 1/100,000th of the concentration in wastewater upstream from the filter, when the chlorine residual was at least 5 milligrams per liter and at least sufficient to reduce the concentration of total coliform bacteria to less than 2 per hundred milliliters. Sections 60301.320 and 60301.230 require that disinfection shall limit the concentrations of total coliform bacteria in the effluent so that the median of consecutive daily samples does not exceed 2.2 per hundred milliliters, as determined from the bacteriological results of the last seven days for which analyses have been completed.

<u>Equivalent Treatment By Granular Media Bed Filtration and Disinfection</u>

Section 60320.5 of Title 22 allows the regulatory agency to accept processes other than those that Sections 60301.320 and 60301.230 cite if the applicant demonstrates to the satisfaction of DHS that the other processes will assure an equal degree of treatment. DHS deems other treatment equivalent to that cited in sections 60301.320 and 60301.230 when: (1) a proponent demonstrates that the proposed alternative treatment consistently reduces the concentration of viable virus to a level 1/100,000th of the concentration of seeded virus in influent to the filter; and (2) the proponent will provide reliability features equivalent to those that Title 22 cites, and will comply with all other applicable stipulations of Title 22.

Past demonstrations are sufficient to allow DHS to accept the combination of granular media bed filtration and disinfection of oxidized wastewater as equivalent to treatment that sections 60301.320 and 60301.230 cite, when the following four conditions are obtained:

(1) coagulant is added when the turbidity of the oxidized wastewater (i.e. secondary effluent) exceeds 5 NTU for more than 15 minutes (or exceeds 10 NTU at any time) upstream from the filter;

(2) the turbidity of filter effluent does not exceed a daily average of 2 NTU, 5 NTU more than 5 percent of the time, and 10 NTU at any time;

(3) the concentration of viable total coliform bacteria in the final effluent does not exceed 2.2 per hundred milliliters as a median in samples taken in seven consecutive days, and does not exceed 23 per hundred milliliters in more than one sample in a 30-day period; and

(4) the disinfection process complies with (a) or (b) below:

(a) if chlorination is used it provides a CT (chlorine concentration times modal contact time) value not less than 450 milligram-minutes per liter at all times with a modal contact time at least 90 minutes at the peak daily flow rate; or

(b) if ultraviolet light irradiation is used, the design and operation of the UV light disinfection process complies with the stipulations of the NWRI/AWWARF document cited below under the heading References Cited.

Demonstration With Other Filtration and Disinfection Processes

The particle size distribution (PSD) of secondary sewage treatment effluent filtered by a membrane, cloth, or similar medium will differ significantly from that of effluent of a granular media bed filter, insofar as PSD affects the effectiveness of the downstream disinfection process. The term "size distribution" refers to the number of particles per milliliter in each of several specific ranges of sizes. Polycarbonate membrane laboratory filters with pore sizes of 12, 8, 5, 3, 1, and 0.1 micron can be used (Levine, et al., 1985; NCC, 1984), with minimal equipment requirements. A particle counter can be used to determine PSD for the following size ranges, in microns: 1.2 to 2, 2 to 5, 5 to 10, 10 to 20, 20 to 50, 50 to 100, 100 to 200, and larger than 200 (Stahl et al., 1994).

If a filter other than a granular media bed filter is proposed to be used and the use of reclaimed water requires equivalence with treatment that section 60301.320 or 60301.230 cites, the proponent must undertake a demonstration to show DHS what operating conditions guarantee that the filter and disinfection process will consistently reduce the concentration of virus to 1/100,000th of the virus concentration in wastewater upstream from the filter and limit the concentration of total coliform bacteria to comply with concentrations that sections 60303 and 60313(b) cite. The demonstration will involve operation of the filter and disinfection process under the following conditions:

- the filter receives the type of wastewater from which recycled water is proposed to be produced;

- the range of qualities of wastewater received by the filter includes qualities that are expected to occur when recycled water is produced, and are the most challenging to the effectiveness of the filter and disinfection process (e.g., concentration of suspended solids is at the maximum);

- laboratory-grown viruses are added to the wastewater upstream from the filter;
- samples are taken upstream from the filter and downstream from the disinfection process for determination of numbers of plaque-forming units of virus per volume of sample;
- samples are taken of wastewater upstream and immediately downstream from the filter for determination of concentration of total suspended solids;
- turbidity of the filter effluent is continuously measured by a continuous recording turbidimeter;
- samples of disinfected effluent are taken for determination of the concentration of total coliform bacteria;
- additionally if disinfection is by chlorination, samples are taken of wastewater upstream from the filter for determination of concentration of ammonia and samples of disinfected effluent are taken for determination of concentration of chlorine residual;
- additionally if disinfection is by UV irradiation, fluid transmittance at 254 nm (% T) and flow rate of filter effluent are continuously measured and recorded;
- The greatest appropriate time between backwashes, or other actions that renew filter yield or efficacy, is determined by experiment, with turbidity of filter effluent allowed to range as high as needed for economically practicable treatment (but not to exceed 2 NTU as a daily average, 5 NTU more than 5 percent of the time, or 10 NTU at any time); and

A test run is comprised of one continuous operation between two consecutive backwashes (or other actions that renew filter yield or efficacy). A demonstration shall have at least three test runs during which the quality and/or flow rate of influent to the filter is most challenging for the disinfection process.

Qualities most challenging to UV disinfection might include high concentration of suspended solids, high turbidity and low transmittance. Qualities most challenging to chlorine disinfection might include high concentration of suspended solids, high turbidity and high chlorine demand.

If the proponent wants to propose a CT value or minimum chlorine contact time that differs from that cited above under the heading Equivalent Treatment By Granular Media Bed Filtration and Disinfection, or a UV dose that differs from what the NWRI/AWWARF Guidelines cite, the proponent shall perform as many test runes as necessary to construct a dose-response curve for virus reduction. The curve shall show the required value(s) of such parameters at which the concentration of viable viruses in the disinfected effluent is reduced to 1/100,000TH of the concentration in the influent to the filter.

During each test run, viruses shall be added to wastewater in numbers sufficient to determine whether the concentration in disinfected effluent is less than 1/100,000th of the concentration in wastewater upstream from the filter. The viruses added to wastewater upstream from the filter shall be F-specific bacteriophage MS2, polio virus, or other virus that is at least as resistant to disinfection as polio virus. F-specific bacteriophage MS2 is a strain of a specific type of virus that infects coliform bacteria that is traceable to the American Type Culture Collection (ATCC 15597B1) and is grown on lawns of E. coli (ATCC 15597). Chlorine residual in samples of chlorinated effluent taken for determination of concentrations of virus plaque-forming units and total coliform bacteria shall be neutralized with a reducing agent approved by DHS, when those samples are taken.

The proponent shall submit to DHS a proposed protocol for all work to be undertaken in the demonstration. The proponent will undertake the demonstration only pursuant to a protocol DHS has approved.

The demonstration must identify operating conditions that consistently achieve that virus reduction and compliance with the above-cited limits on the concentration of total coliform bacteria. The regulatory agency will cite those operating conditions and will stipulate that they will be maintained.

The combination of a filtration process and a separate disinfection process provides multiple barriers to limit the concentration of viable viruses somewhat when the other malfunctions. DHS will not accept filtration alone, or disinfection alone, as complying with Title 22.

REFERENCES CITED

Levine, A.D., Tchobanoglous, G., and Asano, T., "characterization of the Size Distribution of Contaminants in Wastewater: Treatment and Reuse Implications," Journal Water Pollution Control Federation, July 1985, pages 805-816.

NCC (Nuclepore Corporation Catalog), "Innovations in Membrane Filtration," Pleasanton, California, 1984.

National Water Research Institute / American Waterworks Association Research Foundation), Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse, December 2000. That document is available for purchase from National Water Research Institute, P.O. Box 20865, Fountain Valley, CA 92728-0865, telephone (714) 378-3278.

Stahl, J.F., Kuo, J.F., Chen, C., and Horvath, R.W., "Evaluation of Four Different Tertiary Filtration Plants for Turbidity Control", presented at 65th Annual Conference of Water Environment Federation, September 20-24, 1992, New Orleans (paper published in November/December 1994 issue of the Journal of the Water Environment Federation).

APPENDIX M

COST SAVINGS TO CITY DUE TO POTABLE OFFSET

APPENDIX M

COST SAVINGS TO CITY DUE TO POTABLE OFFSET

The recommended recycled water program will offset approximately 204 MG of potable water with tertiary recycled water in model area A. 65.9 MG of the 204 MG will occur on land owned by the City. These properties include:

Potential Customer	Annual Water Usage (MG)
Airport (current irrigation)	2.3
Arroyo Park	3.0
Casa Grande High School	23.5
Old Adobe School	6.6
Prince Park	11.1
Wiseman Park (extended)	19.4
	65.9 MG

The remainder of the potable offset that will be accomplished will be attributed to Rooster Run Golf Course.

Potable water billing rates for standard customers was estimated for master planning purposes at $1,000/acre-ft, or $3,069/MG in 2007 dollars. Tertiary recycled water billing rates for current standard potable customers was estimated at 75 percent of potable water billing rates, which equates to $750/acre-ft or $2,302/MG.

The City's budget for purchase of potable water can be reduced by the amount spent on potable water for the 65.9 MG of water to be offset by recycled water. This equates to approximately $3,069/MG * 65.9 MG = $202,247 per year. However, it must be noted that the City will be required to purchase tertiary recycled water for these sites, which will equate to $2,302/MG * 65.9 MG = $151,702/year. The City will realize an annual net savings of $202,247 - $151,702 = $50,545.

In addition, the wastewater treatment facility at Hopper Street will be decommissioned when the new WRF goes on-line in Year 2007. The Hopper Street wastewater treatment plant is one of the City's (City-owned) largest potable water customers. The annual water usage averaged 10.26 MG over the last four years. The Pond Influent Pump Station will remain operational and uses approximately 0.87 MG of potable water. The new reduction in potable water use that will be realized by the City is estimated at 9.39 MG. This will equate to an annual savings of $3,069/MG * 9.39 MG = $28,818/year in the City's budget. The potable offset accomplished by the decommissioning of the Hopper Street wastewater facility was not included within the master plan.

The new WRF will use a substantial amount of tertiary recycled water for its internal operation. This amount of recycled water is estimated to average 0.6 mgd, which equates to an annual water use of 219 MG. If tertiary water is not produced and used for this purpose, the City may expect to spend an additional $3,069/MG * 219 MG = $672,111 per year (in 2007 dollars) for potable water at the WRF.

City of Petaluma
User: mban

Utility Billing
Account History List

Printed: 02/27/04 12:53

Account Number: 008440 000
Customer Name: US FILTER
Customer Address: P O BOX 777
PETALUMA, CA 94953
Home Phone (707) 762-5892 Ext
Business Phone ( ) - Ext

Reference Number 290109007
Owner Name: US FILTER
Service Address: HOPPER ST

Account Status: Active
Connect Date: ?
Final Date: ?

************** Account Balance *************

Balance Due:		Water	Sewer	Sprinkler	Hydrant	Penalty	Deposit	Other	
	4,159.97	4,159.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00

************** Account History **************

********** Meter Information ********

100 ft³

Ave = 13,722 * 100 = ft³ => 10.26 MG

Date	Type	Amount	Description	Water	Sewer	Sprinkler	Hydrant	Penalty	Deposit	Other		Read Dt	Reading	Consumption
02/09/2004	Bil	4,159.97		4,159.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	02/09/2004	83,064	2,181
12/30/2003	Pay	4,308.82		4,308.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12/11/2003	80,883	2,374
12/11/2003	Bil	4,308.82		4,308.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10/08/2003	78,509	1,797
10/28/2003	Pay	3,270.22		3,270.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	08/07/2003	76,712 10888	1,489
10/08/2003	Bil	3,270.22		3,270.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	06/05/2003	75,223	1,558
09/03/2003	Pay	2,715.82		2,715.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	04/08/2003	73,665	1,489
08/07/2003	Bil	2,715.82		2,715.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	02/11/2003	72,176	1,909
07/08/2003	Pay	2,840.02		2,840.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12/10/2002	70,267	2,315
06/05/2003	Bil	2,840.02		2,840.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10/08/2002	67,952	2,132
04/29/2003	Pay	2,715.82		2,715.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	08/08/2002	65,820 15879	3,338
04/08/2003	Bil	2,715.82		2,715.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	06/10/2002	62,482	2,956
03/04/2003	Pay	3,471.82		3,471.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	04/03/2002	59,526	3,229
02/11/2003	Bil	3,471.82		3,471.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	02/07/2002	56,297	3,164
01/07/2003	Pay	4,200.60		4,200.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12/05/2001	53,133	2,077
12/10/2002	Bil	4,200.60		4,200.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10/04/2001	51,056	2,625
10/24/2002	Pay	3,871.20		3,871.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	08/08/2001	48,431 13,798	2,276
10/08/2002	Bil	3,871.20		3,871.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	06/06/2001	46,155	2,026
08/26/2002	Pay	6,042.00		6,042.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	04/03/2001	44,129	1,630
08/08/2002	Bil	6,042.00		6,042.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	02/06/2001	42,499	1,877
07/09/2002	Pay	5,354.40		5,354.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12/07/2000	40,622	2,181
06/11/2002	Bil	5,354.40		5,354.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10/10/2000	38,441	2,360
04/23/2002	Pay	5,845.80		5,845.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	08/04/2000	36,081 14,323	2,775
04/04/2002	Bil	5,845.80		5,845.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	06/05/2000	33,306	2,376
02/25/2002	Pay	5,733.80		5,728.80	0.00	0.00	0.00	5.00	0.00	0.00	0.00	04/07/2000	30,930	2,754
02/07/2002	Bil	5,728.80		5,728.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	01/27/2000	28,176	2,948
01/10/2002	Pay	3,772.20		3,772.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11/24/1999	25,228	3,181
01/10/2002	Adj	5.00	Past Due Charge, Day	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	10/07/1999	22,047	4,640
01/10/2002	Let		Past Due Letter	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	08/05/1999		6,287
12/05/2001	Bil	3,772.20		3,772.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	06/07/1999		5,219
11/01/2001	Pay	4,758.60		4,758.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	04/06/1999		3,550
10/04/2001	Bil	4,758.60		4,758.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	02/04/1999		2,351

City of Petaluma
User: mban

Utility Billing
Account History List

Printed: 02/27/04 12:53

Account Number: 008440 000
Customer Name: US FILTER
Customer Address: P O BOX 777
PETALUMA, CA 94953
Home Phone (707) 762-5892 Ext
Business Phone ( ) - Ext

Reference Number 290109007
Owner Name: US FILTER
Service Address: HOPPER ST

Account Status: Active
Connect Date: ?
Final Date: ?

************** Account Balance *************

Balance Due:		Water	Sewer	Sprinkler	Hydrant	Penalty	Deposit	Other	
	4,159.97	4,159.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00

************** Account History **************

Date	Type	Amount	Description	Water	Sewer	Sprinkler	Hydrant	Penalty	Deposit	Other	
08/20/2001	Pay	4,130.40		4,130.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/08/2001	Bil	4,130.40		4,130.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/18/2001	Pay	2,748.44		2,748.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/06/2001	Bil	2,748.44		2,748.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
05/01/2001	Pay	2,217.80		2,217.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/03/2001	Bil	2,217.80		2,217.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/23/2001	Pay	2,548.78		2,548.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/06/2001	Bil	2,548.78		2,548.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/03/2001	Pay	2,956.14		2,956.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/07/2000	Bil	2,956.14		2,956.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/20/2000	Pay	2,582.40		2,582.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/10/2000	Bil	2,582.40		2,582.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/24/2000	Pay	3,030.60		3,030.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/04/2000	Bil	3,030.60		3,030.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/23/2000	Pay	2,851.32		2,851.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/05/2000	Bil	2,599.68		2,599.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/05/2000	Adj	-5.00	W/O PY	0.00	0.00	0.00	0.00	-5.00	0.00	0.00	0.00
05/16/2000	Adj	5.00	Past Due Charge, Day	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
05/01/2000	Pay	2,504.64		2,504.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/10/2000	Bil	3,007.92		3,007.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/07/2000	Bil	3,217.44		3,217.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/24/2000	Pay	3,469.08		3,469.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/03/2000	Pay	3,469.08		3,469.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/06/1999	Bil	3,469.08		3,469.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/25/1999	PAY	5,044.80	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/20/1999	ADJ		ADJUSTMENT - PENALTY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/18/1999	PAY	6,823.56	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/07/1999	BIL	5,044.80	WATER USAGE CHARGE	5,044.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
09/13/1999	BIL	5.00	PENALTY CHARGE	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00
08/05/1999	BIL	6,823.56	WATER USAGE CHARGE	6,823.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/25/1999	PAY	5,670.12	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

********* Meter Information ********

Read Dt	Reading	Consumption
12/07/1998		
10/06/1998		834
08/06/1998		2,933
06/04/1998		2,816
04/06/1998		2,219
02/09/1998		3,199
12/05/1997		2,594
10/07/1997		3,703
08/07/1997		3,422

City of Petaluma
User: mban

Utility Billing
Account History List

Printed: 02/27/04 12:53

Account Number: 008440 000
Customer Name: US FILTER
Customer Address: P O BOX 777
PETALUMA, CA 94953
Home Phone (707) 762-5892 Ext
Business Phone ( ) - Ext

Reference Number 290109007
Owner Name: US FILTER
Service Address: HOPPER ST

Account Status: Active
Connect Date: ?
Final Date: ?

************** Account Balance *************

Balance Due:	4,159.97	Water	Sewer	Sprinkler	Hydrant	Penalty	Deposit	Other	
		4,159.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00

************** Account History **************

Date	Type	Amount	Description	Water	Sewer	Sprinkler	Hydrant	Penalty	Deposit	Other	
06/07/1999	BIL	5,670.12	WATER USAGE CHARGE	5,670.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/26/1999	PAY	3,867.60	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/06/1999	BIL	3,867.60	WATER USAGE CHARGE	3,867.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/22/1999	PAY	2,572.68	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/04/1999	BIL	2,572.68	WATER USAGE CHARGE	2,572.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/31/1998	PAY	33.60	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/07/1998	BIL	33.60	WATER USAGE CHARGE	33.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/30/1998	PAY	934.32	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/06/1998	BIL	934.32	WATER USAGE CHARGE	934.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/27/1998	PAY	3,201.24	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/06/1998	BIL	3,201.24	WATER USAGE CHARGE	3,201.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/29/1998	PAY	3,074.88	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06/04/1998	BIL	3,074.88	WATER USAGE CHARGE	3,074.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
05/04/1998	PAY	2,430.12	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
04/06/1998	BIL	2,430.12	WATER USAGE CHARGE	2,430.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/23/1998	PAY	3,488.52	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/09/1998	BIL	3,488.52	WATER USAGE CHARGE	3,488.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/26/1997	PAY	2,835.12	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/05/1997	BIL	2,835.12	WATER USAGE CHARGE	2,835.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/27/1997	PAY	4,032.84	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10/07/1997	BIL	4,032.84	WATER USAGE CHARGE	4,032.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/21/1997	PAY	3,729.36	UTILITIES * CASH PAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08/07/1997	BIL	3,729.36	WATER USAGE CHARGE	3,729.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00

********** Meter Information ********

Read Dt	Reading	Consumption

Route Number: 290 Sequence Number: 000014 Serial Number: 070036592

APPENDIX N

EXISTING SECONDARY EFFLUENT SYSTEM - 80 YEAR PRESENT WORTH COST

APPENDIX N

EXISTING SECONDARY EFFLUENT SYSTEM - 80 YEAR PRESENT WORTH COST

Expansion of the existing secondary effluent recycled water system in its present form was not evaluated during the master planning effort since it did not meet two of the four general criteria requirements established for the program.

For reference purposes only, an 80-year present worth cost analysis was performed for expansion of the existing system to meet the recycled water demand requirements at buildout. The cost analysis is shown in Table N-1. The system was assumed to include all current customers plus Rooster Run Golf course and potential customers in model area H. It was assumed that model area H would include agricultural customers rather than city-owned agricultural land, as it has been included within the recommended project.

The cost analysis of the existing system was based on the same assumptions used for all other analysis performed within the master plan. The annualized 80-year present worth cost for the existing system is $1,628 per MG of recycled water supplied.

Continued use/expansion of the existing secondary effluent system has the following disadvantages over the recommended project:

1) Higher 80-year present worth cost (Recommended project 80 year present worth cost equals $1,308 per MG).

2) Does not meet potable offset requirement established (potable offset = 0).

3) Does not meet operational flexibility requirement established.

4) Does not provide for diversification of customer base.

5) Does not meet minimum established delivery pressures for all customers.

Table N-1
COST EVALUATION
Existing System (All Secondary)

Cost	80 Year Present Worth Cost ($)[2]	Capital Cost 2007 ($)[2]	Capital Cost 2047 ($)[2]	Annual Cost Year 1-80 ($/Year)[2]
Capital Costs				
Pump Station Initial - Main	937,000	937,000		
Pump Station Initial - BPS#1	1,138,000	1,138,000		
Pump Station Initial - BPS#2	450,000	450,000		
Pump Station Upgrade - Main	201,000		656,000	
Pump Station Upgrade - BPS#1	264,000		861,000	
Pump Station Upgrade - BPS#2	138,000		450,000	
Reservoir	2,950,000	2,950,000		
New Pipes	2,988,000	2,988,000		
New Valves	110,000	110,000		
New Hydrants	27,000	27,000		
Hydrants- All (Upgrade)	63,000		206,000	
Land[4]	N/A	200,000		
O&M Costs				
Pump Stations	3,262,000			108,000
Pump Station Power	12,412,000			411,000
Reservoirs	302,000			10,000
Pipelines - New	906,000			30,000
Pipelines - Old	2,235,000			74,000
Valves	242,000			8,000
Hydrants	362,000			12,000
Monitoring	2,860,000			95,000
Program Administration[1]	N/A			75,000
Income				
Recycled Water Income[3]	17,474,000			579,000
TOTAL ($)	$49,321,000	$8,800,000	$2,173,000	$1,402,000
Annualized Cost ($/MG)	$1,628			
Annualized Cost ($/Acre-ft)	$530			

[1] Program Administration is estimated at $75,000/year for total recycled water program

[2] All Costs are in Year 2007 Dollars

[3] Agricultural payments use current payment rate of $611/acre or $210/acre-ft

[4] Land cost is for secondary effluent reservoir sites

[5] System is assumed to include Area H (as privately owned land), I, J, Matteri, Karen Vineyard, Adobe Creek (NE), and Rooster Run to achieve 1,000 MG of demand

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