City of Thousand Oaks

Water Master Plan

NOVEMBER 2005

RBF

CITY OF THOUSAND OAKS
WATER MASTER PLAN

Final Report

City of Thousand Oaks

Public Works Director	Mark D. Watkins

RBF Consulting

Project Manager	Michael R. Moore, PE
Project Engineer	Kevin J. Gustorf, PE
Quality Control	Charles A. Marr, PE

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RBF CONSULTING
4880 Santa Rosa Road Suite 170
Camarillo, California 93012-0951

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EXECUTIVE SUMMARY

The City of Thousand Oaks Water Division provides water service to approximately 16,500 service connections across 11,914 acres mostly in Thousand Oaks, Ventura County. This Water Master Plan Report:

- Identifies existing water demand conditions
- Develops future demand projections
- Evaluates and Establishes design and planning criteria
- Develops a hydraulic model of the water system
- Identifies and analyzes system deficiencies at its current and build-out stage and recommends improvements
- Develops a new Capital Improvement Program (CIP) based on evaluating the current CIP and recommendations for system improvement and replacement projects that can be implemented over the next 10 years.

The City Water Division is reliant on imported water from the Calluegas Municipal Water District for potable water supply. Potable water is delivered through 10 turnouts throughout the water system and dispersed into 19 service area zones via gravity, pump stations and pressure reducing stations. Water billing data indicates that the current average day water demand within the water service boundary is about 6,000 gallons per minute (gpm). Based on the calculated peaking factors, the maximum day demand is estimated to be 10,550 gpm and the peak hour demand is estimated to be 18,000 gpm.

The water service area is delineated by adjacent water agencies and topographic constraints. Proposed developments within the water service boundary will occur predominantly in the current vacant lots, including two areas known as Skyline and Upper Kelley Estates/Byrd Properties. Based on current zonings, the build out of the vacant lots and the two sites will increase the current average day water demand of the system by approximately 820 gallons per minute (gpm).

The current City of Thousand Oaks water distribution system was analyzed using a hydraulic model created in the H2OMAP Water modeling software package, developed by MWH Soft, Inc. The distribution system was analyzed based on the current demand conditions and current operational parameters. The system was analyzed to identify deficiencies and/or areas to improve operational efficiency. In addition, the distribution system was evaluated to determine what improvements, if any, would be required to meet the increased demands that are expected with ultimate build out of the City.

The results of the hydraulic analysis of the existing system and the ultimate build-out of the City has identified several projects to be included in the City's Capital Improvement Program. The recommended projects will provide increased storage capacity, supply redundancy, improved water pressure, more efficient system operation and improved water quality.

Currently, the overall operation of the water distribution system is good, which can be attributed to maintaining a steady schedule of upgrades and maintenance throughout the system. As policies and regulations change, upgrades and adjustments to the existing system will be necessary to stay ahead of these changes.

The current Capital Improvement Program (CIP) was reviewed and modified based on the recommended improvements. The capital improvement projects are estimated to cost $15,610,000 over the next 5 years (dollars in 2005 figures).

LIST OF ACRONYMS & ABBREVIATIONS

AMR – Automated Meter Reading

ASL – Above Sea Level

AWWA – American Water Works Association

BPS – Booster Pump Station

CAL-AM – California American Water Company

CCL - Contaminant Candidate List

CCS - Central Control Station

CDCP – Centers for Disease Control Prevention

CFS – Cubic Feet per Second

CIP – Capital Improvement Program

CMMS – Computerized Maintenance Management System

CMWD – Calleguas Municipal Water District

COSCA - Conejo Open Space Conservation Agency

CSTR - Completely Stirred Tank Reaction

DHS – Department of Health Services

DBPR - Disinfection Byproducts Rule

DU – Dwelling Unit

EPA – Environmental Protection Agency

ERP – Emergency Response Plan

ERU – Equivalent Residential Units

GIS – Geographic Information System

GPM – Gallons per Minute

HAA5 - Five Haloacetic Acids

HGL – Hydraulic Grade Line

ISO – Insurance Services Office

LT2ESWTR - Long Term 2 Enhanced Surface Water Treatment Rule

MCL – Maximum Contaminant Level

MG – Million Gallons

MGD – Million Gallons per Day

mg/L – Milligrams per Liter

MRDL - Maximum Residual Disinfectant Level

MSC – Municipal Service Center

NPDWR - National Primary Drinking Water Regulations

O&M – Operation and Maintenance

Pipe Materials:

- AC or ACP – Asbestos Cement Pipe
- CML&C – Cement Mortar Lined and Coated Steel Pipe
- DIP – Ductile Iron Pipe
- PVC – Polyvinyl Chloride
- RCP – Reinforced Concrete Pipe
- STL – Steel Pipe

ppb – Parts per Billion

PRV – Pressure Reducing Valve

PRS – Pressure Reducing Station

PS – Pump Station

RTU – Remote Terminal Unit

SCADA - Supervisory Control and Data Acquisition

SCE – Southern California Edison

SDWA – Safe Drinking Water Act

SMCL - Secondary Maximum Contaminant Level

STL - Steel

TDS – Total Dissolved Solids

TTHM – Total Trihalomethanes

UCMR - Unregulated Contaminant Monitoring Rule

UFC – Uniform Fire Code

UPC – Uniform Plumbing Code

VA – Vulnerability Assessment

VCFD - Ventura County Fire Department

VCPWA - Ventura County Public Works Agency

VFD – Variable Frequency Drive

WQ – Water Quality

I - Introduction

I. INTRODUCTION

A. STUDY AREA

The City of Thousand Oaks (City) began as a small town with shopping centers, schools, an industrial park, and a college. The City was incorporated in 1964. At that time, the total area of the City spanned 9,140 acres (14.28 square miles) and had a population of approximately 20,000 people.

Today, the City has grown to approximately 34,700 acres (56 square miles) with more than 127,000 residents. The City is located in the southern portion of Ventura County, adjacent to the Cities of Camarillo, Moorpark and Simi Valley. Refer to Exhibit I-1 for a Vicinity Map. Currently, five different water purveyors supply water to residents within the City of Thousand Oaks. The four agencies are listed below with the percentage of City residents served in parenthesis:

- City of Thousand Oaks Water Division (40%)
- California American Water Company (44%)
- California Water Service Company (16%)
- Camrosa County Water District (less than 1%)
- Newbury Park Academy Mutual Water Company (less than 1%)

The City of Thousand Oaks Water Division (City Water Division) is a subdivision of the Public Works Department. The Engineering Section is responsible for the planning and engineering of the City's water distribution system, and is located at the City Hall, 2100 Thousand Oaks Boulevard. The Municipal Service Center (MSC) is responsible for the operations and maintenance of the water system. The MSC is located at 1993 Rancho Conejo Boulevard. Exhibit I-2 identifies the City of Thousand Oaks boundary, the water service boundary of the various purveyors and the location of City Hall and the MSC.

The City Water Division provides water service to a population of approximately 50,000 customers, or 40% of the total City of Thousand Oaks population, within approximately 11,914 acres. The City provides water service to a couple small areas of unincorporated Ventura County such as the Rolling Oaks Service Area and the Ventu Park Service Area. The City's Water Division operates and maintains two hydraulically independent water distribution systems, Newbury Park and the main Thousand Oaks area.

The California American Water Company serves approximately 44% of the total population of the City, while the California Water Service Company serves the remaining 16%. The Camrosa County Water District and the Newbury Park Academy Mutual Water District serves a few small areas within the City, less than 1% of the population.

B. CITY HISTORY

In the mid twentieth century, the Conejo Valley was primarily served by several small mutual or private water companies, often set up by the land developers. Prior to 1946, the Thousand Oaks Cooperative Water Association was the water purveyor for the residents in the Conejo Valley area. In an October election of 1946, the residents of Thousand Oaks voted in favor of the formation of the Water Works District #6 (WWD #6). In 1947, in the Old Town area, the WWD #6 was formed under the jurisdiction of the County of Ventura.

In 1953, the people of Ventura County voted in favor of forming the Calleguas Municipal Water District (CMWD) to bring imported water into the Conejo Valley as well as areas in and around Simi Valley, Camarillo, Thousand Oaks and Oxnard. The imported water originated from the Colorado River and was brought to southern California by the Metropolitan Water District (MWD). In 1972, the State Water Project, which conveys water from northern California to southern California, was completed. Today, imported water delivered to Ventura County is almost exclusively from northern California.

In 1958, customer dissatisfaction with the water service received from the WWD #6 led the Ventura County Board of Supervisors to agree to make the WWD #6 autonomous with its own local Board of Directors. Calvin Huettner led the movement towards a local Board and was their first chairman.

During the 1950's and 1960's the Village Water Company, formed by the Janss Corporation, served the Janss Mall and adjacent developments. WWD #6 had opposed the formation of the Village Water Company and consequently an agreement was reached that would not allow the Village Water Company to serve properties easterly of Moorpark Road, with the exception of the Conejo Oaks system. In 1967, the Village Water Company was sold to the California-American Water Company. The formation of the Village Water Company and several other companies prompted the District to compete for new territories, concluding that it would be the only way the District would stay in business as a public system.

Over the years, WWD #6 had acquired several water systems including Burwood Mutual, Waverly Heights Mutual, Ventu Park Mutual, Westgate Estates Mutual and Starlight Ranchos Mutual. In 1963 the Newbury Park System (Kelley Estates/Ventu Park) was annexed, concurrent with a bond issue that placed the first backbone facilities in that area of Thousand Oaks. That same year, the Conejo Valley Water Company was acquired by WWD #6, largely due to customer dissatisfaction with the service provided by the Company. One of the largest acquisitions for the District was the Citizen's Utilities Company in 1966 at a cost of $3,050,000.

The City of Thousand Oaks was incorporated in October 1964. An election by the District voters, held in June 1966, appointed the City Council to sit as the Board of Directors for the WWD #6. The District was then a subsidiary District to the City of Thousand Oaks. The driving force of this change was the District's severe financial troubles and the City Council's willingness to take over the District at a time when the District was faced with numerous problems, financial and otherwise. The financial troubles were so great that the District reached near bankruptcy.

In 1967, Lloyd Cofelt became the first Director of Utilities and subsequently, in 1969 Otto H.W. (Walt) Blumë was hired as the Director of Utilities. A key event in the history of the City's system was the acquisition of service rights to the Lang Ranch area in 1969. The City was able to convince State Legislators that the City should serve the new territory. In July of 1969 the Governor signed legislation authorizing the merger of WWD #6 into the City's Water Department, just as the Lang Ranch area was acquired. With that authorization the City was established as a solid water purveyor.

Some of the last annexations to the City of Thousand Oaks were portions of the City of Westlake Village in 1968 and 1972, with the Westlake Water Company as the water purveyor. Almost ten year later in 1983, California Water Service Company acquired the water system.

The biggest challenges in the early years were the integration of the various acquired systems and the development of a financial program. The debts of the District were taken on by the City and required financial analyses to create a program to provide funds for the needed capital improvement programs. Water rates were gradually increased after numerous financial studies and a plant investment fee was introduced to pay for backbone facilities. Operational economy was introduced and is still monitored closely to this day.

Upon Otto H.W. Blumë's retirement in 1985, Donald H. Nelson was appointed as the Director of Utilities. By then the Water Department's focus shifted from a transitional stage, organizing and

establishing the City as a water purveyor, to a development stage, which would span to the City's ultimate buildout stage.
Water service criteria developed by the City Water Department and used by private purveyors, which dictates that fire flow be provided by gravity flow from storage reservoirs, was a major factor in requiring that new development be located at lower elevations thereby protecting viewsheds of the hillsides and ridgelines.

The new Municipal Service Center was constructed in 1993 and was followed by completion of the Civic Arts Plaza in 1994, the home to current City Hall.

In 1993, the City's Utilities Department and Public Works Department were joined and Donald H. Nelson was appointed as the Director of the new Public Works Department.

During the period of 1985 through February 2005, under the direction of Mr. Nelson, the City excelled to a highly reliable water purveyor with high standards in operating facilities and support facilities. During Don Nelson's appointment new reservoirs were constructed for additional domestic and fire storage, reservoir sites were improved to meet current seismic codes, and pump station facilities were structurally and technologically upgraded and improved to meet current and future needs of the City. The Water Department retired the last remaining bonds in early 1990's and is currently debt free.

In September 2005, Mark D. Watkins was appointed as the new Public Works Director.

In early 1996, The City Council designated the City of Thousand Oaks as the purveyor of all potable water to Seventh Day Adventist (SDA) property, previously served by Academy Mutual Water Company. Groundwater wells were the main source of potable water for SDA property. California-American Water Company (Cal-Am) owns and operates a water system adjacent to SDA property. Currently, Cal-Am is providing water service to costumers within the SDA property pursuant to an Agreement between the City and Cal-Am signed in December of 2000.

Conejo Oaks is an area served currently by Cal-Am. This water service area is an island surrounded by the City's service area. As a result of persistent efforts for years to realign the City's service areas, in December of 2004 the California Public Utilities Commission approved a Settlement Agreement for exchange of the City's Academy (SDA property) service area for Cal-Am's Conejo Oaks service area. The process of this exchange will be transitional and is set for City's operational take over of the Conejo Oaks area by January 1, 2008.

The water system consisted of nine reservoirs at the time City took over the operation of the system in 1969. Currently, a total of sixteen reservoirs, with combined storage capacity of about 35 million gallons, are included in the City's water system, operated and maintained by City staff. Water system improvements are consistent with the Department's Capital Improvement Program. These improvements are identified based on factors such as need for additional capacity and firefighting capabilities, upgrades to keep up with the industry including health, safety and seismic codes, or creating redundancy in the system and thereby enabling the City to provide continuous quality service to its customers during periodic cleaning/inspections and during emergencies. The City's telemetry system provides for remote control and monitoring of the water facilities, and works as an early warning device for any malfunction of the system or possible intrusion and vandalism. The City largely promotes water conservation and where possible uses groundwater for irrigation of City-owned properties and areas within public right of way.

The Water Department presented its first master plan in 1970, which primarily evaluated the transmission mains. The plan has gone through many revisions through the years and has been incorporated into the City's General Plan.

This new Water Master Plan is the first comprehensive master plan prepared by the Water Department. It evaluates the City's current system, and identifies the needed improvements through the City's buildout.

C. PROJECT OBJECTIVE

The City contracted with RBF Consulting to provide the City Water Division with a current Water Master Plan. The purpose of this project is to evaluate current water usage; evaluate future development/redevelopment within the City water service area; create a hydraulic model of the water system; analyze the model and identify system deficiencies; identify operational changes within the system which may result in more efficient operations; assess the condition of existing water facilities; and evaluate future water quality regulations.

The primary goal of the City Water Division is to provide high quality water with adequate pressure to customers for domestic use and for fire protection. This Master Plan Report provides an evaluation of the City's Water System at current and through the City's build-out stages. Recommendations for operational changes and needed improvements are incorporated into a capital improvement program for the next 10 years.

D. PROJECT SCOPE

The scope of work for this project includes several tasks that were directly related to the preparation of this Master Plan Report and several tasks that were indirectly related to the Report. The following primary tasks were directly related to the preparation of the Master Plan Report:

- Develop existing water demands and peaking factors
- Evaluate future development and/or redevelopment within the City's Water Service Area
- Develop projected water demands
- Identify current and future water quality regulations
- Perform a condition assessment on each facility in the water distribution system
- Create a hydraulic model of the water distribution system
- Analyze current water system operation
- Recommend projects to improve City's water system efficiency
- Identify system deficiencies
- Evaluate the current 5-year Capital Improvement Program (CIP)
- Incorporate conclusions of analysis into an updated 10-year CIP.

The following tasks were completed as a part of this project and are referenced and incorporated into this Report:

- Prepare an updated Operations and Maintenance Manual
- Prepare a Geographic Information System (GIS) of the City's water distribution system
- Prepare Atlas Map Field Books of the City's water system
- Evaluate a Computerized Maintenance Management System (CMMS)
- Research the efficiency of Automated Meter Reading (AMR) systems
- Review and evaluate the City's current staffing levels and certifications
- Prepare a Vulnerability Assessment Report
- Prepare an Emergency Response Plan
- Prepare a SCADA Master Plan Report

E. REFERENCE DOCUMENTS

The following documents were used as reference for the preparation of this Water Master Plan Report:

ASL Consultants. Rolling Oaks and Skyline Drive Water Facilities (1991).

ASL Consultants. Service Area Transfer Study – Final Report (Conejo Oaks Area) (1992).

City of Thousand Oaks General Plan – 2000-2005

City of Thousand Oaks. "Old" Operations and Maintenance Manual (1995).

City of Thousand Oaks. Water Design and Construction Standards (1987).

Current 5-year Capital Improvement Program

Kennedy/Jenks/Chilton. Groundwater Utilization for Non-potable Water Demand (1992).

Perliter & Ingalsbe. Master Water Plan for Kelley/Ventu Park Service Area (1990).

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Perliter & Ingalsbe. Revised Master Water Plan for Rolling Oaks Area (1994).

Perliter & Ingalsbe. Revisions to Lang Ranch Master Water Plan (1990).

Perliter & Ingalsbe. Water System Analysis for Pressure Zones Served by Pederson/Willow Lane & Meadows/Tara Reservoirs (1992)

Perliter & Ingalsbe. Wilder-Grissom Water Service Area (1981)

Perliter & Ingalsbe. Pump Station and Reservoir Improvements Preliminary Design Report (2004)

RBF Consulting. SCADA Master Plan Report (2004)

Red Oak Consulting. Vulnerability Assessment (2003)

Red Oak Consulting. Emergency Response Plan (2004)

Red Oak Consulting. "New" Operations and Maintenance Manual (2004)

CITY OF THOUSAND OAKS

VICINITY MAP

EXHIBIT I-1

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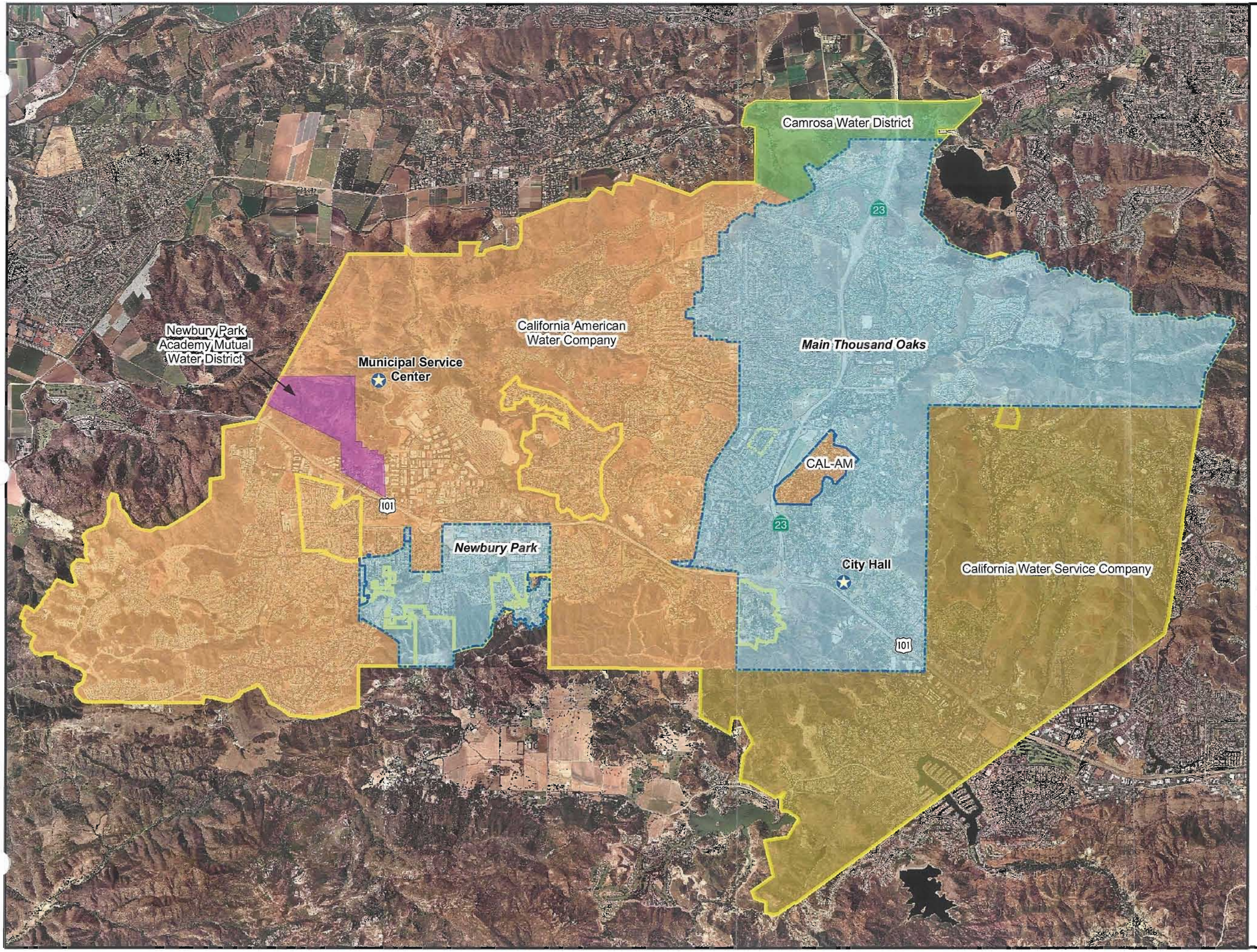
CITY OF THOUSAND OAKS

WATER SERVICE BOUNDARIES



Legend

- City Boundary
- Water Service Boundary

5,000 2,500 0 5,000

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT I-2

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II. LAND USE

The early beginnings of the City of Thousand Oaks consisted primarily of agricultural land and localized shopping centers. Over time, the City has developed into a primarily residential community with various commercial, industrial and institutional areas scattered throughout the City. The change in the land use over time has been a critical factor in planning for the City's water system. Development and preservation of the land is detailed in the City of Thousand Oaks General Plan 2000-2005.

A. GENERAL LOCATION AND TOPOGRAPHY

The City of Thousand Oaks is located in southern California, approximately twelve miles inland from the Pacific Ocean as shown on the Vicinity Map, Exhibit I-1. Thousand Oaks lies on the southeastern border of Ventura County and western border of Los Angeles County, in an area known as the Conejo Valley. Neighboring cities include Simi Valley, Camarillo, Agoura Hills and Westlake Village.

The City water service area ranges in elevation between 620 feet above sea level at the lowest point, to 1490 feet at the highest point. In general, elevations increase traveling west to east. The Santa Monica Mountains at the southern boundary and the "Ring of Open Space" provide a scenic backdrop for the City. Two major freeways intersect the City and help to form a boundary for the City water service areas. Traveling north to south is State Route 23, which runs along the center of the main Thousand Oaks service area. Highway 101 runs in an east-west direction through the City of Thousand Oaks. Highway 101 cuts through the southern side of the main Thousand Oaks service area and delineates the northern boundary for the Newbury Park service area.

Newbury Park is bounded on the south by the mountains and by other water service agencies to the east and west. The main Thousand Oaks service area is bounded by Moorpark Road to the west, Olsen Road to the north, mountains to the south and open space to the east.

The City water service boundaries are shown on Exhibit I-2.

B. EXISTING LAND USE

The City water service area is essentially a built-out community comprised primarily of residential areas. Large commercial areas exist along Erbes Road, Thousand Oaks Boulevard, the 101 Freeway, and portions of Avenida de los Arboles and Moorpark Road. A vast amount of land, over 14,000 acres, is dedicated to open space, which is owned and maintained by the Conejo Open Space Conservation Agency (COSCA).

Existing land use information was compiled from the 2000-2005 General Plan. The various land use types and densities that are located within the City water service area are listed in Table II-1.

Table II-1
Existing Land Use within City Water Service Area

Land Use Type	Density Factor (du/ac)	Area (ac)
High Density Residential	15-30	319.4
Medium Density Residential	4.5-15	1013.8
Low Density Residential	2-4.5	4716.8
Very Low Density Residential	0-2	780.5
Reserve Residential	0-2 (ultimate need)[1]	81.6
Commercial	N/A	890.2
Industrial	N/A	196.4
Institutional	N/A	182.1
Elementary School	N/A	121.0
Intermediate School	N/A	58.4
High School	N/A	8.2
Existing Parks, Golf Courses, Open Space	N/A	2642.7
Proposed Parks and Recreational Area	N/A	57.1
Residential Developable Land	0.2-1.0 (ultimate need)[1]	177.5
Undevelopable Land	N/A	658.2
Undefined	N/A	9.5
TOTAL		**11,913.5**

Refer to Exhibit II-1 at the end of this Section for the Land Use Map. A large scale Land Use Map is available for review at the City Public Work's office.

[1] Ultimate need is defined as the density factor for a land use type in an ultimate future condition.

C. FUTURE LAND USE

It is critical to understand future development, changes in land use and changes in the water service boundary that may occur within the City's water service area. These changes will impact the operation of the City's distribution system. Proper planning for these changes will enable the City to continue to meet demands and provide a quality service to its customers.

Most of the land within the City water service boundary is developed. Anticipated changes in land use will primarily occur through redevelopment of existing land uses and small developments in the various vacant parcels scattered throughout the City. This section will be broken down to describe the anticipated near-term developments and redevelopments, the projected long-term developments and future expansion of the City's water service boundary.

1. Near-Term Developments and Redevelopments

The City of Thousand Oaks Community Development Department compiles proposed and current development projects throughout the entire City in quarterly Development Activity Reports. These projects are considered to be near-term because some level of planning has been completed and the projects are anticipated to be completed within the next 2-3 years (it should be noted that some of the projects identified below may have begun construction or been completed at the time of finalization of this report). The majority of the projects are redevelopments of commercial land and new residential developments. Some of the largest projects anticipated within the City water service boundary are as follows:

- Thousand Oaks Boulevard Commercial Redevelopment
- Newbury Park Road Redevelopment
- Trimark Pacific Homes Condominiums
- Newbury Commercial Redevelopments
- Conejo Recreational Athletic Fields (Irrigation)

2. Long-Term Developments and Redevelopments

The long-term projects are classified as projects expected to occur at some point in the future, but planning stages of the projects has yet to begin. These projects include the anticipated development of all vacant parcels within the City water service boundary.

The vacant parcels that have potential for development encompass approximately 500 acres. The total area of vacant land that can be ultimately developed are summarized by Service Area Zones in Table II-2. Further discussion of the demands generated by the build out of all vacant lands is described in Section IV-C.

Of these undeveloped areas, there are two large clusters of undeveloped lots known as the Skyline Area and the Upper Kelley Estates/Byrd Properties.

Skyline Area

The Skyline Area is located to the east of the existing Rolling Oaks area, and south of the 101 Freeway. The existing terrain is mountainous with elevations above the existing developments in the City. Elevations for the vacant lots in this area range from 950-feet to 1100-feet. The properties in this area are along Conejo Ridge Road, Skyline Drive, and Fairview Road. Two previous studies have evaluated this area, including "Master Water Plan for Rolling Oaks Area," by Perliter & Ingalsbe, 1989 and "Rolling Oaks and Skyline Drive Water Facilities" by ASL Consultants, Inc, 1991. Refer to Exhibit II-3 for a map of the Skyline area.

Skyline Area currently has parcels that are mostly undeveloped, with some existing homes. It has been conservatively approximated that the Skyline area could house 98 single-family residential homes. The Skyline area is zoned primarily for "Very Low Density Residential" and "Low Density Residential". The current system cannot supply to this area. Refer to Section IV-C for future demands required for the Skyline Area.

Upper Kelley Estates

Upper Kelley Estates lies directly south of the Kelley Hydropneumatic Service Area Zone in Newbury Park and consists of 18 lots, which are zoned to be developed into single-family residential housing. Numerous lots in the Upper Kelley Estates area known as Byrd Properties were owned by Mr. John Byrd and in the recent years most have been sold to others. The "Master Water Plan for Kelley/Ventu Park Service Area," by Perliter & Ingalsbe, 1990 and an agreement between John Byrd and the City provide further details on the Upper Kelley Estates. Refer to Exhibit II-4 for a map of the Upper Kelley area.

Upper Kelley Estates are within the City's water service boundary, but the current system cannot supply this area. The topography of the site is very hilly, with increasing elevations in excess of 1400 feet at the southern end of the property; too high to be served by the Kelley Hydropneumatic Pump Station. Currently, two lots on the southern portion of the site are developed, while the remaining lots are vacant.

It is recommended that a Sub-Area Master Plan be completed for both of these areas when plans for development initiate.

The proposed redevelopment areas and the vacant parcels are shown on Exhibit II-2.

3. Future Expansion

The City does not anticipate expanding its service boundary with the exception of the Conejo Oaks area. The Conejo Oaks area, located in the center of the Main Thousand Oaks Service Area, is currently served by the California-American Water Company. An agreement between the City and Cal-Am, approved by the California Public Utilities Commission, allows this area to be incorporated into the City of Thousand Oaks water system by January 1, 2008.

Table II-2
Existing Vacant Lands by Service Zone

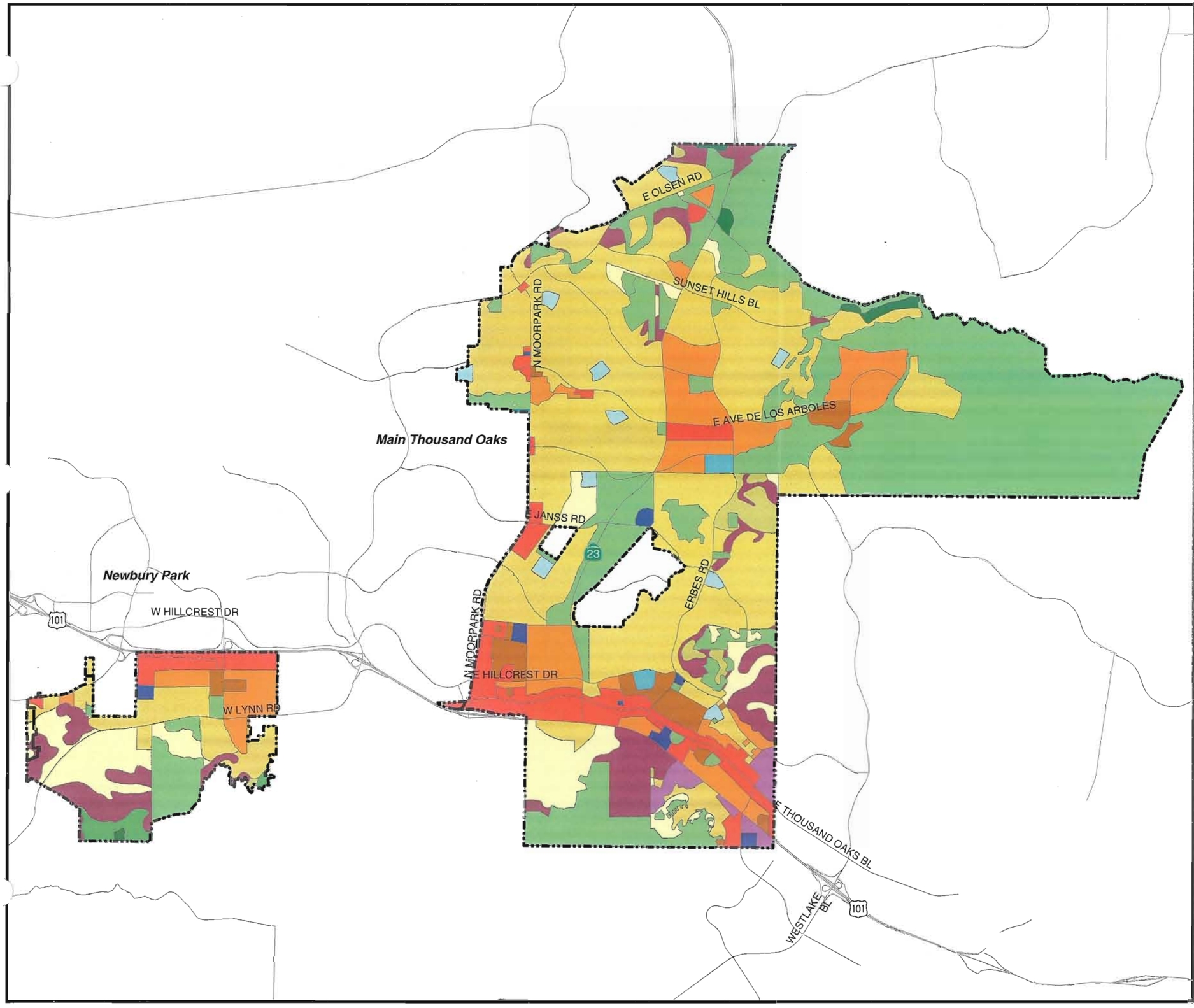
Billing Zone	Service Area Zone	Land Use Type	Acres	Maximum Density (DU/Acre)[2]
NEWBURY PARK				
1	Kelley	Commercial	0.87	-
		Low Density	4.26	4.5
		Medium Density	1.12	15.0
		Very Low Density	16.69	2.0
		Subtotal	**22.95**	
1	Ventu	Commercial	30.84	-
		Park, Golf, Open Space	1.21	-
		High Density	13.06	30.0
		Institutional	5.17	-
		Low Density	21.12	4.5
		Medium Density	2.52	15.0
		Very Low Density	0.92	2.0
		Subtotal	**74.84**	
2	Kelley Hydro	Very Low Density	46.23	2.0
		Park, Golf, Open Space	0.30	-
		Proposed Park and Recreational Area	55.03	-
		Reserve Residential	5.37	2.0
		Subtotal	**106.94**	
2	Ventu Hydro	Park, Golf, Open Space	0.05	-
		Low Density	11.37	4.5
		Proposed Park and Recreational Area	4.40	-
		Residential Developable Land	1.68	1.0
		Very Low Density	0.04	2.0
		Subtotal	**17.54**	
		NEWBURY PARK SUBTOTAL	**222.27**	
MAIN THOUSAND OAKS				
1	Pederson/Willow	Commercial	16.93	-
		Park, Golf, Open Space	0.07	-
		High Density	1.43	30.0
		Low Density	5.69	4.5
		Medium Density	7.76	15.0
		Very Low Density	3.11	2.0
		Subtotal	**34.98**	
2	Freeway/La Granada	Commercial	2.93	-
		Park, Golf, Open Space	6.30	-
		High Density	3.21	-
		Industrial	4.27	-
		Institutional	0.13	-
		Low Density	44.57	4.5
		Medium Density	9.96	15.0
		Very Low Density	28.70	2.0
		Subtotal	**100.07**	

[2] Based on recommended Water Demand Factors as shown in the Section III Design Criteria and Standards, Table III-2.

Billing Zone	Service Area Zone	Land Use Type	Acres	Maximum Density (DU/Acre)[2]
2	Meadows	Commercial	0.64	-
		Park, Golf, Open Space	4.82	-
		Low Density	10.13	4.5
		Very Low Density	0.02	2.0
		Subtotal	**15.60**	
2	Rolling Oaks	Park, Golf, Open Space	0.15	-
		Low Density	0.00	4.5
		Very Low Density	22.72	2.0
		Subtotal	**22.86**	
2	Tara	Park, Golf, Open Space	1.07	-
		Institutional	0.04	-
		Low Density	1.23	4.5
		Medium Density	0.94	15.0
		Residential Developable Land	46.11	1.0
		Very Low Density	1.42	2.0
		Subtotal	**50.81**	
2	Lang/Sunset2	Commercial	0.02	-
		Park, Golf, Open Space	4.89	-
		Low Density	2.36	4.5
		Very Low Density	0.78	2.0
		Subtotal	**8.05**	
2	Wilder	Park, Golf, Open Space	3.31	-
		Low Density	11.89	4.5
		Residential Developable Land	1.86	1.0
		Very Low Density	0.04	2.0
		Subtotal	**17.09**	
3	Grissom	Low Density	3.02	4.5
		Subtotal	**3.02**	
3	Oakbrook/Sunset3	Park, Golf, Open Space	8.29	-
		High Density	1.38	30.0
		Low Density	0.16	4.5
		Residential Developable Land	8.09	1.0
		Very Low Density	5.29	2.0
		Subtotal	**23.20**	
		MAIN THOUSAND OAKS SUBTOTAL	**275.69**	
		CITY WATER SYSTEM TOTAL	**497.96**	

CITY OF THOUSAND OAKS

LAND USE MAP



Landuse	Acres
Very Low Density	714.76
Low Density	3888.84
Medium Density	965.30
High Density	248.97
Commercial	655.90
Industrial	108.06
Institutional	64.20
Elementary School	94.45
Intermediate School	39.14
High School	4.30
Existing Park, Golf, Open Space	3571.50
Proposed Park and Recreational Area	69.44
Reserve	54.57
Residential Developable Land	125.83
Undevelopable Land	676.57
Total Acres	*11281.83*

Water Service Boundary

4,000 2,000 0 4,000

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT II-1

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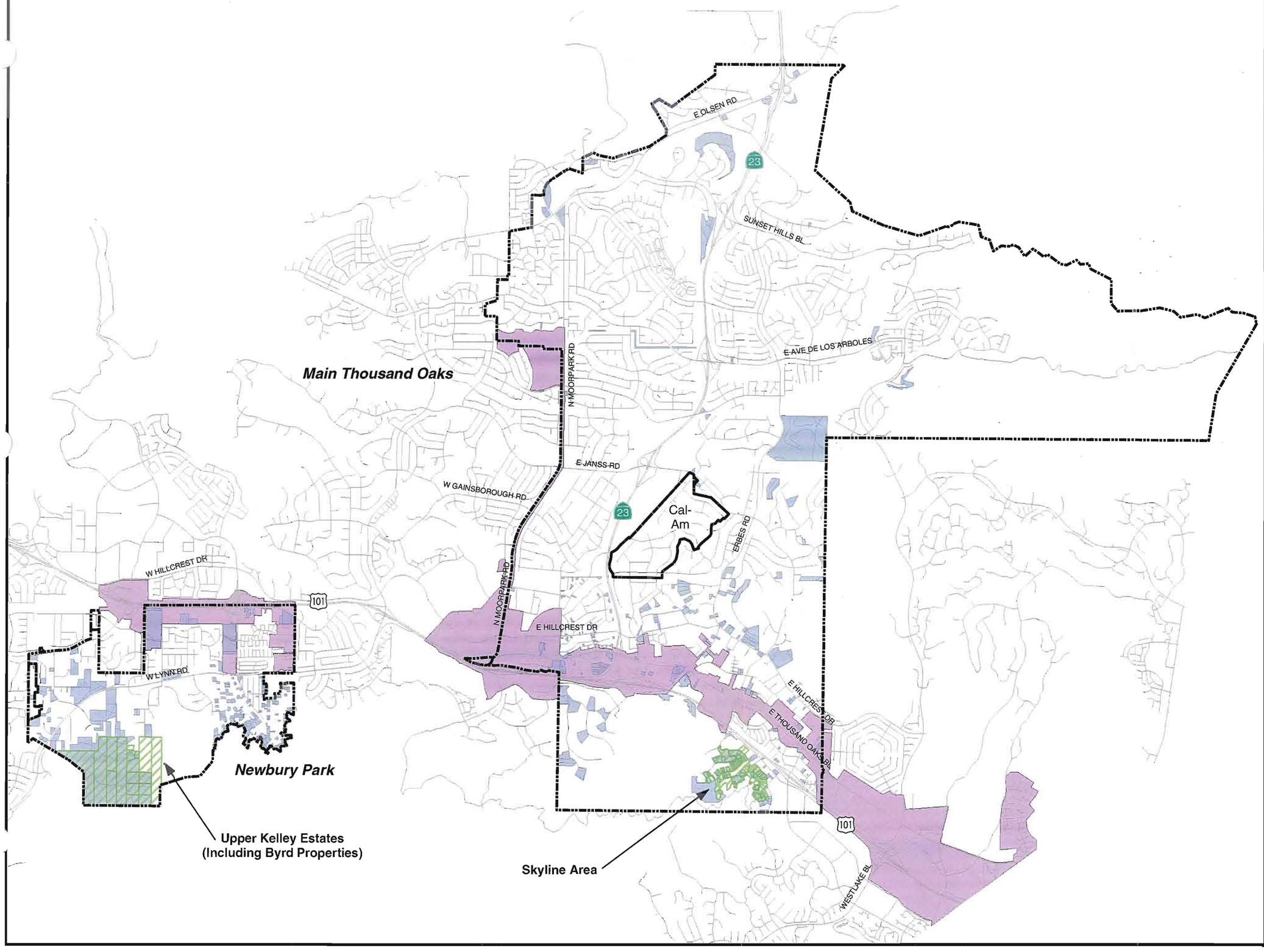
CITY OF THOUSAND OAKS

REDEVELOPMENT AREA



Water Service Boundary
Existing Vacant Lots as of 4/17/2003
Redevelopment Area

Total Vacant Lots	1117
Total Vacant Acreage	933.61

3,500 1,750 0 3,500

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT II-2

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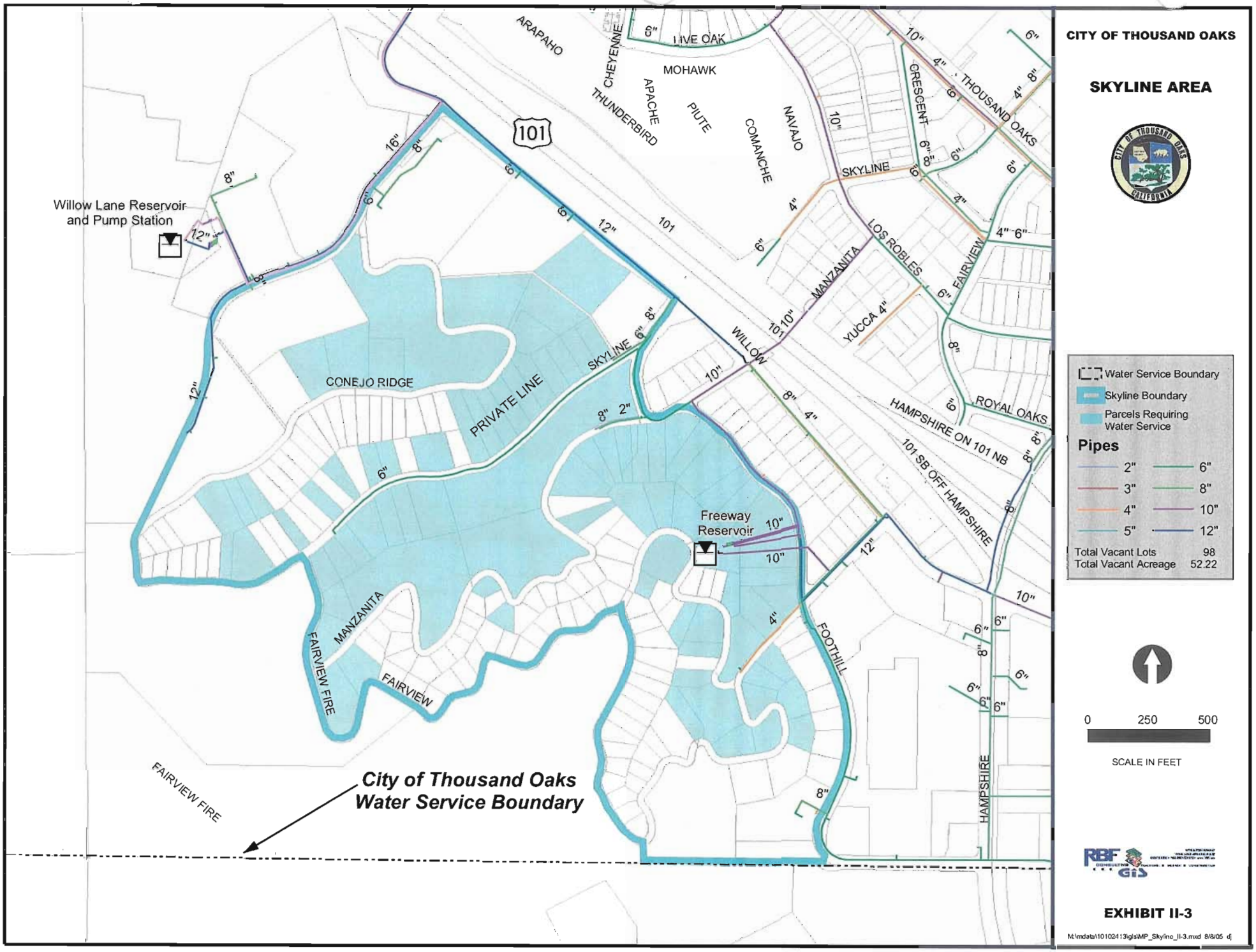
CITY OF THOUSAND OAKS
SKYLINE AREA
Willow Lane Reservoir and Pump Station
Freeway Reservoir
CONEJO RIDGE
PRIVATE LINE
City of Thousand Oaks Water Service Boundary
ARAPAHO
CHEYENNE
LIVE OAK
MOHAWK
APACHE
THUNDERBIRD
PIUTE
COMANCHE
NAVAJO
CRESCENT
THOUSAND OAKS
SKYLINE
LOS ROBLES
MANZANITA
FAIRVIEW
YUCCA
WILLOW
ROYAL OAKS
HAMPSHIRE ON 101 NB
101 SB OFF HAMPSHIRE
FOOTHILL
HAMPSHIRE
FAIRVIEW FIRE
101
Water Service Boundary
Skyline Boundary
Parcels Requiring Water Service
Pipes
2"
3"
4"
5"
6"
8"
10"
12"
Total Vacant Lots 98
Total Vacant Acreage 52.22
0
250
500
SCALE IN FEET
EXHIBIT II-3
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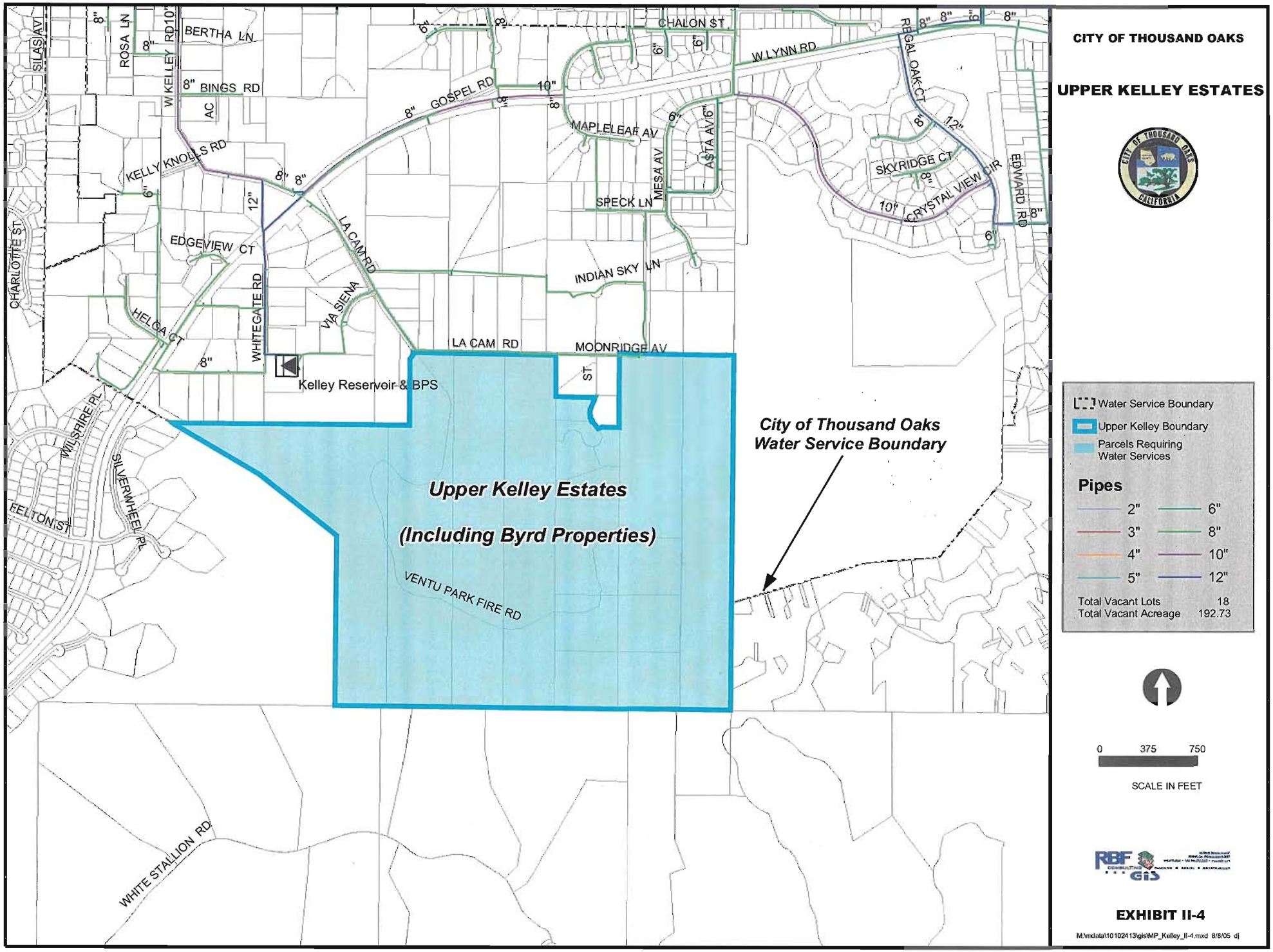

CITY OF THOUSAND OAKS
UPPER KELLEY ESTATES
CHALON ST
W LYNN RD
REGAL OAK CT
SKYRIDGE CT
CRYSTAL VIEW CIR
EDWARD RD
BERTHA LN
W KELLEY RD
BINGS RD
GOSPEL RD
MAPLELEAF AV
ASTA AV
MESA AV
SPECK LN
KELLY KNOLLS RD
EDGEVIEW CT
LA CAM RD
INDIAN SKY LN
VIA SIENA
WHITEGATE RD
HELGA CT
MOONRIDGE AV
Kelley Reservoir & BPS
CHARLOTTE ST
WILSHIRE PL
SILVERWHEEL PL
FELTON ST
VENTU PARK FIRE RD
WHITE STALLION RD
Upper Kelley Estates
(Including Byrd Properties)
City of Thousand Oaks
Water Service Boundary
Water Service Boundary
Upper Kelley Boundary
Parcels Requiring Water Services
Pipes
2"
3"
4"
5"
6"
8"
10"
12"
Total Vacant Lots 18
Total Vacant Acreage 192.73
0 375 750
SCALE IN FEET
RBF CONSULTING
GIS
EXHIBIT II-4
M:\mdata\10102413\gis\MP_Kelley_II-4.mxd 8/8/05 dj

III - Design Criteria and Standards

III. DESIGN CRITERIA AND STANDARDS

As new or replacement facilities are required throughout the City's water service area, those facilities should be planned for and designed per specific criteria in order to provide quality service to their customers. This report evaluates existing City criteria and recommends new criteria, if needed, based on current industry standards.

A. STORAGE CRITERIA

1. Current Criteria

In accordance with the City's 1987 Design and Construction Standards, the total required storage for a service area is the sum of emergency storage and regulatory storage. Emergency storage is identified as the maximum fire flow in the service area for a specified duration (in accordance with Insurance Services Office (ISO), or Ventura County Fire Department). Fire flow requirements will be further discussed in Section III-E. Regulatory storage has been defined as 80% of the maximum day demand

Total Storage	= Regulatory Storage + Emergency Storage
Regulatory Storage	= 80% of Maximum Day Demand
Emergency Storage	= Maximum Fire Flow for specified Duration

2. Recommended Criteria

Based upon our analysis it is recommended that the regulatory storage be increased to require 100% of a maximum day demand. Maximum day demand is defined as the maximum demand a water system will experience over a single 24-hour period in a calendar year. It is recommend that the City adopt the following reservoir storage criteria for all future storage facilities:

Total Storage = 1.0 Max Day Demand + Emergency Storage

Regulatory Storage	= 100% of Maximum Day Demand
Emergency Storage	= Maximum Fire Flow for specified Duration

A comparison of the City's current storage criteria to that of neighboring water purveyors of similar size and similar source of supply indicates that the current City standard is below industry standard. The recommended storage criteria of one maximum day demand plus the critical fire flow will aid the City to better handle and respond to emergencies and catastrophic events, considering that the City of Thousand Oaks relies solely on imported water from the Calleguas Municipal Water District.

The existing City storage capacity was analyzed using the recommended storage criteria, and is discussed in Section VII.

B. PRESSURE AND VELOCITY CRITERIA

1. Pressure

Service pressure is the static pressure at a house or building, available with the service reservoir assumed to be half full. Under peak hour operating conditions, it is recommended that the distribution system maintain service pressures between 45 psi and a maximum pressure of 150 psi. Service pressure above 80 psi will require a pressure regulator as stated in the Uniform Plumbing Code. Any water service pressure above 150 psi will require special approval and either individual pressure regulators or a regulating station on the main line.

Under a fire flow scenario, the minimum allowable residual pressure, or pressure required to meet the maximum day demand and fire flow demand, is 20 psi. Further details will be discussed about fire flow demands in Section III-E.

2. Velocity

In order to minimize head loss and maintain the integrity of pipeline lining, pipelines should be designed to limit internal velocities to the following criteria under the stated demand conditions:

Maximum Day Demand	= 5 fps or less
Peak Hour Demand	= 10 fps or less
Max Day + Fire Flow	= 15 fps or less

Pipe velocities should be a minimum of 1 foot per second (fps) in order to adhere to required water quality regulations and maintain proper circulation throughout the system.

C. WATER DEMAND FACTORS

The City does not currently have published water demand factors for different land use types. For future planning projects, a more detailed list of conservative demand factors is recommended. The following demand factors, listed in Table III-1, are based on industry standards for water purveyors in the Southern California region.

Table III-1
Water Demand Factors

Land Use Description	Density (DU/Acre)	Demand Factor	Unit
High Density Residential	15-30	180	gal/du/day
Medium Density Residential	4.5-15	310	gal/du/day
Low Density Residential	2-4.5	405	gal/du/day
Very Low Density Residential	0-2	440	gal/du/day
Reserve Residential (ultimate need)	0-2	440	gal/du/day
Commercial/Residential (High Density)	15	200	gal/du/day
Commercial	-	130	gal/ksf/day
Industrial	-	60	gal/ksf/day
Institutional	-	45	gal/ksf/day
Elementary School	-	15	gal/ksf/day
Intermediate School	-	15	gal/ksf/day
High School	-	15	gal/ksf/day
Existing Parks, Golf Courses, Open Space	-	3400	gal/ac/day
Proposed Park and Recreation Areas	-	3400	gal/ac/day
Residential Developable Land (ultimate need)	0.2-1.0	440	gal/du/day

D. WATER PEAKING FACTORS

Peaking factors are used to estimate maximum month, maximum day and peak hour demands. These factors, wherever possible, are based on actual water usage. When actual water data is not available, peaking factors are based on typical industry standards for water purveyors in southern California.

1. Average Day

The average day demand was calculated by summing the monthly billing data of each individual meter for Years 2001 and 2002 (provided as a volume) and converting the total yearly volume into an average daily demand. The maximum month, maximum day and peak hour demands are all derived from the average day demand.

2. Maximum Day/Maximum Month

The maximum monthly water demand from the water meter data provided for years 2001 and 2002 occurred in September of 2001 and September of 2002. The maximum monthly demand was divided by the calculated average day demand to determine a maximum month demand factor of 1.60. Actual daily demand data was not available, therefore the maximum day factor was assumed to be 10% higher than the maximum month, resulting in a maximum day factor of 1.75 times the average day demand.

3. Peak Hour

In a primarily residential community, such as Thousand Oaks, the peak hour demand typically occurs in the morning hours between 7 AM and 9 AM. The peaking factor was based on multiplying the maximum day demand by a factor of 1.7[1], resulting in a Peak hour factor of 2.98 or rounded up to 3.00 times the average day demand. The high peak hour was found to be at 7 AM, according to 2001 and 2002 SCADA data of water production and storage data. Section III-E will further discuss the SCADA data provided and how the diurnal curve was generated based on the data.

See Table III-2 for a summary of the peaking factors used in this Report and recommended for use in estimating future water demands.

[1] Based on Southern California Agency Standards including County of Ventura Water Resources Division, City of Santa Barbara Public Works Department, Irvine Ranch Water District, Eastern Municipal Water District.

Table III-2
Water Peaking Factors

Maximum Month	= 1.60 x Average Day
Maximum Day	= 1.75 x Average Day
Peak Hour	= 3.00 x Average Day

E. DIURNAL PATTERN

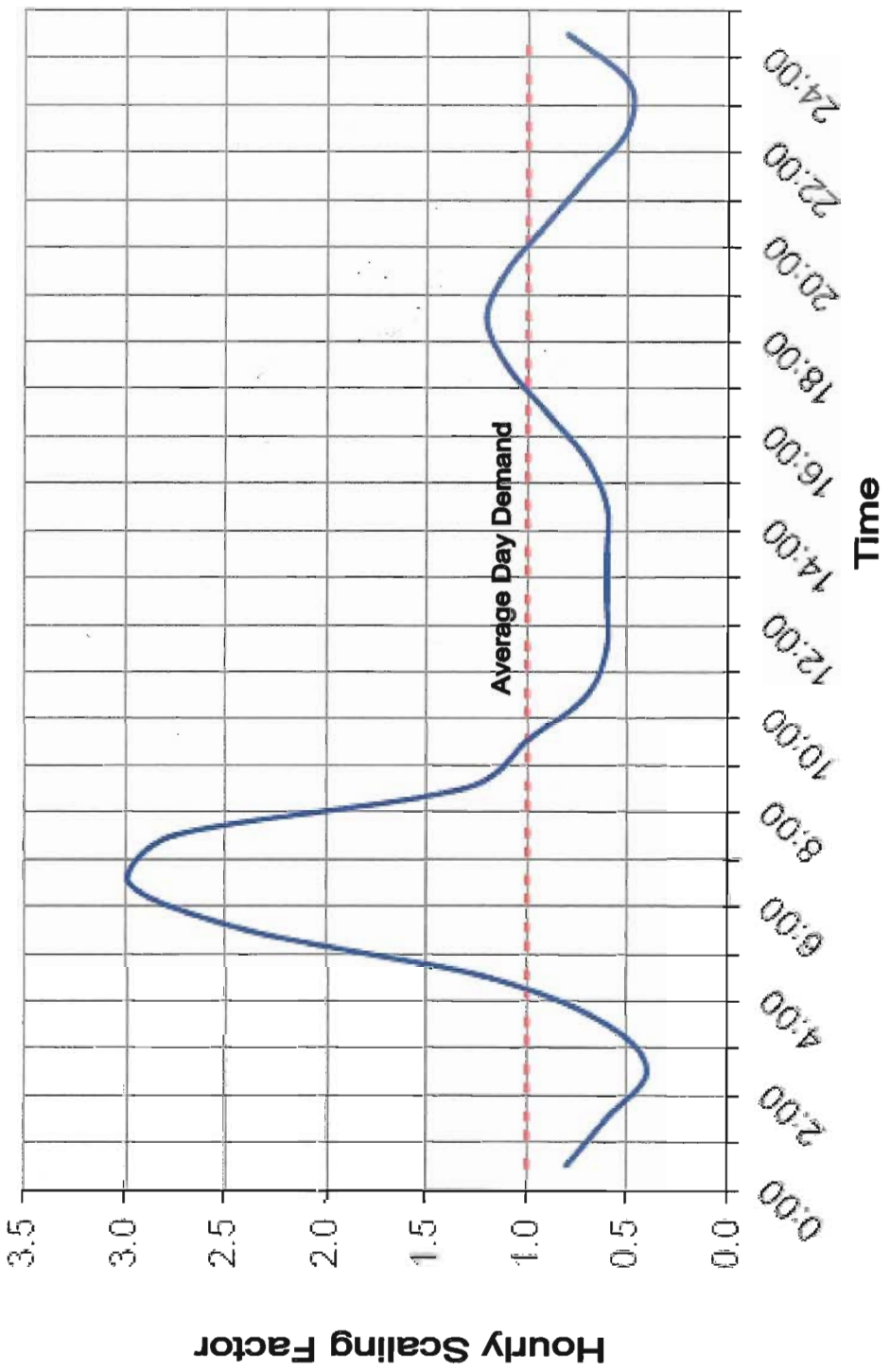
The diurnal pattern is a graphical representation of time-varying demands over a 24-hour period. The diurnal pattern will show the City's changing demands in relation to an average day demand. This pattern was input into the hydraulic model to simulate actual demand fluctuations in the distribution system throughout a normal day. In addition, the pattern will aid the City in timing planned occurrences, such as flushing and temporary shut-downs within the distribution system. SCADA data was used to observe the demands of the system over four different 24-hour periods, two days in the summer and two days in the winter. The dates of data are as follows[2]:

- January 16, 2003,Thursday
- June 10, 2003, Tuesday
- July 22, 2003, Tuesday
- December 8, 2003, Monday

The water production data from each of the turnouts and reservoir storage levels during all four days were used in this analysis. The difference between the total imported volume and the total change in stored reservoir volume equals the total volume consumed. The corresponding diurnal curve for the entire system can be seen as Figure III-1. The average day demands are shown at a factor of 1.0. Generally there is low usage at night and increased usage in the mornings and early evening. There are two peaking times in the City's diurnal pattern, one morning peak at 7 A.M. and one evening peak at 7 P.M.

[2] No daily production or storage data was available prior to 2003.

City of Thousand Oaks
Figure III-1 Diurnal Curve



F. FIRE FLOW REQUIREMENTS

The City generally follows the requirements as established by the Insurance Services Office (ISO), the Ventura County Fire Department, and the Uniform Fire Code (UFC). The water system shall be capable of providing the maximum day demand plus the minimum required fire flow at a single location with a minimum residual pressure of 20 psi. The fire flow may be provided from multiple hydrants provided they are within a specified distance of the structure (as identified in the UFC). An exception to maintaining the minimum pressure requirement is for a fire hydrant located adjacent to a reservoir with no domestic water services between the fire hydrant and the reservoir. Fire flow requirements for specific buildings are identified in the Uniform Fire Code (UFC) Appendix III-A and are based on building square footage and materials of construction. Typical UFC fire flow and durations for various land use types applicable to the City of Thousand Oaks are listed in Table III-3. The duration of a required fire flow of 3,500 gpm or higher are determined by the Fire Department.

Table III-3
Typical Uniform Fire Code Fire Flow Requirements

Land Use Type	Fire Flow (gpm)	Duration (hrs.)
Single Family Residential[3]	1,000 – 1,250	2
Condominiums	1,500 – 2,500	2
Apartments	1,500 – 3,000	2-3
Commercial	1,250 – 4,000	2-4
School/Industrial	4,000 – 6,000	4
-	3,500+	Determined by Fire Department

Buildings equipped with approved fire sprinklers can greatly reduce the required fire flow. The Ventura County Fire Department can provide more specific details of the types of fire sprinklers and their effects on fire flow demands.

[3] Single family residences not exceeding 2 stories in height; VCFD & City of Thousand Oaks PWD Design and Construction Standard 1987

IV - Water Usage

IV. WATER USAGE

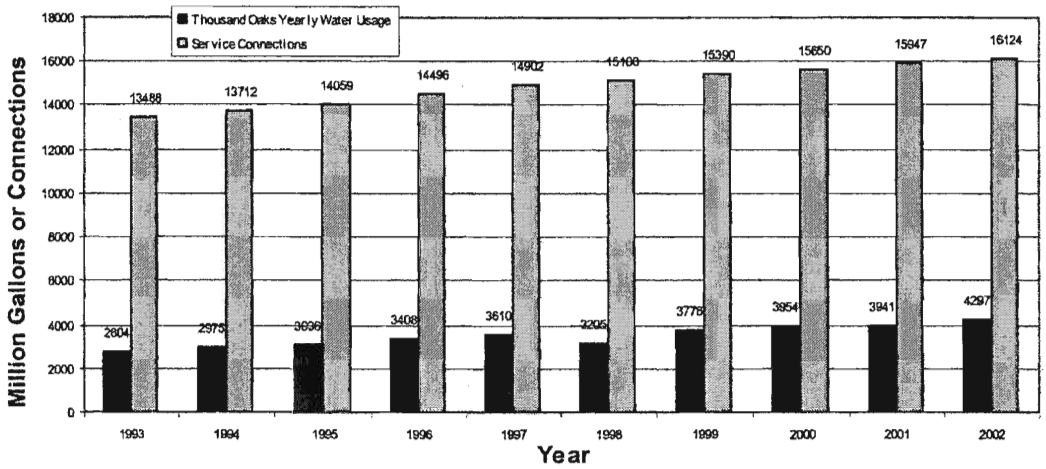
This section will discuss the City's existing water usage trend and the future water usage to be expected at the ultimate build out of the entire service area.

A. HISTORICAL

1. Historical Water Usage

The historical trend of the water usage has fluctuated slightly from year to year, but has generally increased 5% per year. Figure IV-1 shows the historical water usage (including irrigation) and connections from the ten-year period from 1993-2002.

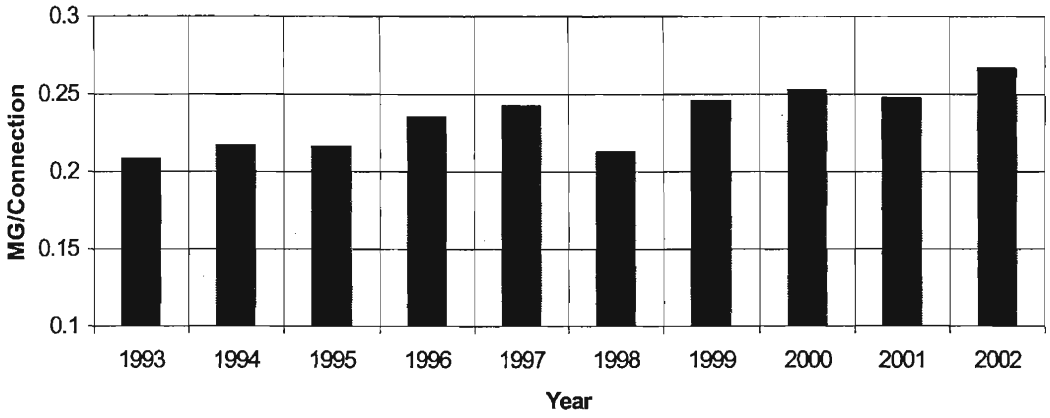
Figure IV- 1
Yearly Water Usage and Service Connections



The water usage per service connection over the same time period has generally increased as well, with the exception of 1998 when El Niño weather patterns produced torrential rainfall. Figure IV-2 illustrates that water usage per connection increased by approximately 60,000 gallons per year per connection. The City of Thousand Oaks General Plan[1] has indicated that the average household size has increased as well during the past several years, from 2.82 persons per household in 1990 to 2.88 persons per household in year 2000.

[1] City of Thousand Oaks. 2000-2002 *General Plan.*

Figure IV-2
Water Usage per Service Connection



2. Historical Demand Factors

An analysis of historical water demands was performed to better understand the City's current water usage trend. The analysis was performed using monthly billing data for the months of January 2001 thru December 2002. The overall service area demand (in hundreds of cubic feet) was evaluated by grouping specified land use types for each water meter to generate water demand factors.

In order to get a better representation of the average water demand factors, the top water users (based on total usage) were not included in the calculations. Including the top water users would inflate the typical customers usage of water in the City and would not produce typical usage for the majority of the customers. The top water users are listed in the following table:

Commercial Users

- All-star Inns
- The Sports Club Co.
- TO Hand Wash
- ARV Assisted Living
- Canyon Country Hospitality Inc.
- Hillcrest Royale
- Lav Care Corp
- Mimi's Cafe

Residential Users

- Wood River Corp/Bilt
- Taherpour, Dr. P
- Mountain Shadow Apartment

Based on historical meter data and land use, typical residential and commercial demand factors were calculated and will be used solely to understand the City's current water usage trend. The City's water users were divided into two categories, Commercial and Residential. For each category, the water usage was then divided by the total acreage that the category covered to obtain an approximate water demand factor. The general residential demand per acre for 2001 and 2002 was calculated to be approximately 1.2 gpm/acre while the average commercial/industrial water usage was calculated to be 2.4 gpm/acre. The water demand factors recommended in the next section better represents the long-term water usage for future planning purposes.

This analysis does not include the irrigation demands within the City of Thousand Oaks, which are met from the wells and an independent distribution system.

B. EXISTING WATER USAGE

1. Meter Data

Monthly water billing records from Years 2001 and 2002 were used to estimate the current water usage within the City water service area. An average of the two complete years was used to estimate current usage, as shown in Table IV-1. Irrigation demands that are met from groundwater supply (not a part of the potable water system) are not included.

Table IV-1
Existing Water Usage

Year	Average Daily	
	(gpm)	(cfs)
2001	5,712	12.73
2002	6,343	14.16
Avg. Year	**6,028**	**13.44**

Based on the historical billing data provided, the land use map and the design criteria discussed in Section III, the existing water demands calculated within each service area zone are shown in Table IV-2. During Years 2001 and 2002, no water conservation plan was implemented.

Table IV-2
Existing Demands per Zone

Billing Zone	Service Area Zone	Average Daily[1] gpm	(cfs)	Maximum Day[2] gpm	(cfs)	Peak Hour[3] gpm	(cfs)
NEWBURY PARK							
1	Kelley	63	(0.14)	112	(0.25)	189	(0.42)
1	Ventu	480	(1.07)	839	(1.87)	1441	(3.21)
2	Kelley Hydro	49	(0.11)	90	(0.2)	148	0(.33)
2	Ventu Hydro	22	(0.05)	36	(0.08)	67	(0.15)
	Subtotal	615	(1.37)	1077	(2.4)	1845	(4.11)
MAIN THOUSAND OAKS							
1	Pederson/Willow	1513	(3.37)	2647	(5.89)	4538	(10.11)
2	Freeway/La Granada	507	(1.13)	888	(1.98)	1522	(3.39)
2	Meadows	471	(1.05)	825	(1.84)	1414	(3.15)
2	Tara	462	(1.03)	809	(1.75)	1387	(3.09)
2	Rolling Oaks	49	(0.11)	86	(0.2)	148	(0.33)
2	Lang/Sunset2	938	(2.09)	1642	(3.66)	2814	(6.27)
2	Reduced Minnecota	13	(0.03)	24	(0.06)	40	(0.09)
2	Wilder	346	(0.77)	605	(1.34)	1037	(2.31)
3	Grissom	85	(0.19)	149	(0.33)	256	(0.57)
3	Northwood Booster	54	(0.12)	94	(0.21)	162	(0.36)
3	Oakbrook/ Sunset3	790	(1.76)	1382	(3.06)	2370	(5.28)
3	Reduced Lang Ranch	126	(0.28)	220	(0.48)	377	(0.84)
3	Reduced Sapra	9	(0.02)	16	(0.03)	27	(0.06)
4	Grissom Hydro	27	(0.06)	47	(0.11)	81	(0.18)
4	Sunset Hydro	22	(0.05)	39	(0.1)	67	(0.15)
	Subtotal	5413	(12.07)	9473	(21.11)	16239	(36.18)
Total		**6028**	(13.44)	**10550**	(23.51)	**18084**	(40.29)

[1] Based on billing data from 2001-2002.

[2] 1.75 x the Average Daily Demand.

[3] 3.00 x the Average Daily Demand.

2. Large Users

The top water users within the City water system were identified based on the January 2001 - December 2002 billing data. These users indicate the largest single points of demand impacting the system, with the exception of fire flows. Table IV-3 summarizes the largest water users within the City's service area, which service area zone they are drawing water from and the amount of water used.

Table IV-3
Top Water Users

Name	Billing Zone	Service Area Zone	Address	Area (acres)	Average Demand (acre-ft/yr)	Average Demand (gpm)
Commercial Users						
All-star Inns (Motel 6)	1	Ventu	1516 Newbury Rd.	4.90	29.46	18.26
The Sports Club Co	2	Freeway/La Granada	2400 Willow Ln.	8.36	30.57	18.95
TO Hand Wash	2	Freeway/La Granada	2725 E. Thousand Oaks Blvd.	0.74	20.91	12.96
A R V Assisted Living	1	Pederson/Willow	405 Hodencamp	1.91	19.10	11.84
Canyon Country Hospitality Inc. (Days Inn)	1	Ventu	1320 Newbury Rd.	2.81	22.07	13.68
Hillcrest Royale	1	Pederson/Willow	190 E. Hillcrest Dr.	1.40	17.39	10.78
Lav Care Corp	2	Tara	3575 N. Moorpark Rd.	6.93	19.14	11.87
Mimi's Café	1	Pederson/Willow	400 N. Moorpark Rd.	1.03	14.11	8.75
Residential Users						
Wood River Corp / Bilt	1	Pederson/Willow	555 Laurie Ln.	8.99	36.80	22.82
Taherpour, Dr P	2	Freeway/La Granada	2222 Los Feliz	2.03	15.19	9.42
Mountain Shadow Apt	1	Kelley	2760 Borchard Rd.	1.97	9.72	6.03
TOTAL				**41.07**	**234.47**	**145.36**

3. Unaccounted for Water

Unaccounted for water was determined by identifying the difference between the water usage volume calculated from meter data and the water purchased from the Calleguas Municipal Water District. An average of the data gathered from 1996-2002 shows that unaccounted for water constituted 4.21% of the total used water. AWWA's Technical and Educational Council conducted a survey, *Survey of State Agency Water Loss Reporting Practices Report*[2], to determine the extent of which state and regional agencies have established programs or policies to assess water loss management. The results of the survey indicated that California Urban Water Conservation Council has set a benchmark to limit unaccounted for water to less than 10% of the total water usage. Based on this standard, the City of Thousand Oaks is within an acceptable range of unaccounted for water. Some potential reasons for unaccounted for water includes water used in operation and maintenance, pipe leaks, reservoir leaks, fire department use, meter error and unmetered water usage. The pipeline replacement program and facility assessment should help identify and reduce unaccounted for water usage. Further analysis of the pipeline replacement program and the facility assessment is discussed in Section X and Section XIII, respectively.

C. FUTURE (ULTIMATE) WATER USAGE

The City's water usage is expected to increase as the vacant parcels within the City's water service boundary are developed. Based on development of the vacant parcels, proposed redevelopment projects and proposed new development projects identified in Section II, the ultimate average day demand is projected to increase by 820 gpm, or 14% of the total current average day usage. The projected demands for the build out of the City and all the parcels are estimated, and do not include the possibility of split parcels or subdivided lots. It is assumed that the water service boundaries will not change. The annexation of the Conejo Oaks area, currently operated by California-American Water Company, will be further evaluated in a future study. It is anticipated that two non-potable water irrigation wells will be abandoned in the near future. Refer to Section V-A.2 for additional information on the existing wells. The abandonment of those wells will increase demands on the domestic water distribution system, however those increases are assumed to be minor and negligible in the overall demand on the system.

[2] American Water Works Association (AWWA). 2002. *Survey of State Agency Water Loss Reporting Practices Report.* p.13.

Refer to Table IV-4 for a summary of the existing and future water demands in the City's service area.

Table IV-4
Summary Existing and Ultimate Demands by Major Service Area

Service Area	Average Day		Maximum Day		Peak Hour	
NEWBURY PARK	**(cfs)**	**(gpm)**	**(cfs)**	**(gpm)**	**(cfs)**	**(gpm)**
Existing Demand	1.37	615	2.40	1,077	4.11	1,845
Future Demand	0.95	425	1.66	744	2.84	1,276
Newbury Park Subtotal	***2.32***	***1,040***	***4.05***	***1,821***	***6.95***	***3,121***
MAIN THOUSAND OAKS						
Existing Demand	12.07	5,413	21.11	9,473	36.18	16,239
Future Demand	0.88	395	1.54	689	2.64	1,180
Main Thousand Oaks Subtotal	***12.95***	***5,808***	***22.66***	***10,162***	***38.82***	***17,419***
ULTIMATE TOTAL	**15.27**	**6,848**	**26.71**	**11,991**	**45.77**	**20,540**

Tables IV-5 and IV-6 provide a detailed breakdown of the future water demands within each service area zone. Table IV-5 shows the detailed list of projected future added demand based on the development of all the vacant areas within the Water Service Boundary. A large part of the future demands are from the Skyline Area and Upper Kelley Estates. Table IV-6 summarizes the existing water demand and ultimate water demand within each service area zone under the three demand conditions.

Table IV-5
Projected Future Demands per Service Area Zone

Billing Zone	Service Area Zone	Land Use Type – Currently Not Developed	Acres	Demand Factor (gpm/acre)	Future Additional Average Day Demand (gpm)
1	Kelly	Commercial	0.87	3.93	3.41
		Low Density	4.26	1.27	5.42
		Medium Density	1.12	3.23	3.63
		Very Low Density	16.69	0.61	10.18
	Subtotal		**22.95**		**22.64**
1	Pederson/Willow	Commercial	16.93	3.93	66.53
		Park, Golf, Open Space	0.07	2.36	0.16
		High Density	1.43	3.75	5.35
		Low Density	5.69	1.27	7.23
		Medium Density	7.76	3.23	25.06
		Very Low Density	3.11	0.61	1.90
	Subtotal		**34.98**		**106.23**
1	Ventu	Commercial	30.84	3.93	121.21
		Park, Golf, Open Space	1.21	2.36	2.87
		High Density	13.06	3.75	48.96
		Institutional	5.17	1.36	7.04
		Low Density	21.12	1.27	26.82
		Medium Density	2.52	3.23	8.13
		Very Low Density	0.92	0.61	0.56
	Subtotal		**74.84**		**215.59**
2	Freeway/La Granada	Commercial	2.93	3.93	11.50
		Park, Golf, Open Space	6.30	2.36	14.88
		High Density	3.21	3.75	12.05
		Industrial	4.27	1.82	7.75
		Institutional	0.13	1.36	0.18
		Low Density	44.57	1.27	56.60
		Medium Density	9.96	3.23	32.18
		Very Low Density	28.70	0.61	17.51
	Subtotal		**100.07**		**152.65**
2	Kelley Hydro	Very Low Density	46.23	0.61	28.20
		Park, Golf, Open Space	0.30	2.36	0.70
		Proposed Park and Recreational Area	55.03	2.36	129.94
		Reserve	5.37	0.61	3.28
	Subtotal		**106.94**		**162.13**
2	Meadows	Commercial	0.64	3.93	2.50
		Park, Golf, Open Space	4.82	2.36	11.37
		Low Density	10.13	1.27	12.86
		Very Low Density	0.02	0.61	0.02
	Subtotal		**15.60**		**26.75**
2	Rolling Oaks	Park, Golf, Open Space	0.15	2.36	0.34
		Low Density	0.00	1.27	0.00
		Very Low Density	22.72	0.61	13.86
	Subtotal		**22.86**		**14.20**
2	Tara	Park, Golf, Open Space	1.07	2.36	2.54
		Institutional	0.04	1.36	0.05

Billing Zone	Service Area Zone	Land Use Type – Currently Not Developed	Acres	Demand Factor (gpm/acre)	Future Additional Average Day Demand (gpm)
		Low Density	1.23	1.27	1.57
		Medium Density	0.94	3.23	3.02
		Residential Developable Land	46.11	0.31	14.09
		Very Low Density	1.42	0.61	0.86
	Subtotal		**50.81**		**22.13**
2	Ventu Hydro	Park, Golf, Open Space	0.05	2.36	0.12
		Low Density	11.37	1.27	14.44
		Proposed Park and Recreational Area	4.40	2.36	10.39
		Residential Developable Land	1.68	0.31	0.51
		Very Low Density	0.04	0.61	0.03
	Subtotal		**17.54**		**25.49**
2	Lang/Sunset2	Commercial	0.02	3.93	0.09
		Park, Golf, Open Space	4.89	2.36	11.54
		Low Density	2.36	1.27	3.00
		Very Low Density	0.78	0.61	0.47
	Subtotal		**8.05**		**15.10**
2	Wilder	Park, Golf, Open Space	3.31	2.36	7.81
		Low Density	10.72	1.27	13.61
		Residential Developable Land	1.86	0.31	0.57
		Very Low Density	0.04	0.61	0.02
	Subtotal		**15.92**		**22.01**
3	Grissom	Low Density	4.19	1.27	5.32
	Subtotal		**4.19**		**5.32**
3	Oakbrook/Sunset3	Park, Golf, Open Space	8.29	2.36	19.57
		High Density	1.38	3.75	5.19
		Low Density	0.16	1.27	0.20
		Residential Developable Land	8.09	0.31	2.47
		Very Low Density	5.29	0.61	3.23
	Subtotal		**23.20**		**30.65**
		TOTAL	**497.96**		**820.89**

Table IV-6
Summary of Existing and Future Water Demand

Billing Zone	Service Area Zone	Existing Average Day[1] (gpm)	Future Average Day Additional (gpm)	Ultimate Average Day Demand (gpm)	Existing Maximum Day[2] (gpm)	Future Maximum Day Additional[2] (gpm)	Ultimate Maximum Day Demand[2] (gpm)	Existing Peak Hour[3] (gpm)	Future Peak Hour Additional[3] (gpm)	Ultimate Peak Hour Demand[3] (gpm)
NEWBURY PARK										
1	Kelley	63	23	85	112	39	151	189	67	256
1	Ventu	480	216	695	839	376	1215	1441	646	2087
2	Kelley Hydro	49	162	211	90	283	373	148	485	633
2	Ventu Hydro	22	25	49	36	46	81	67	78	145
	Subtotal	***615***	***425***	***1,040***	***1,077***	***744***	***1,821***	***1,845***	***1,276***	***3,121***
MAIN THOUSAND OAKS										
1	Pederson/Willow	1513	106	1619	2647	186	2833	4538	318	4856
2	Freeway/La Granada	507	153	660	888	267	1155	1522	458	1979
2	Meadows	471	27	498	825	47	872	1414	81	1495
2	Tara	462	22	484	809	39	848	1387	67	1454
2	Rolling Oaks	49	14	63	86	24	110	148	40	189
2	Lang/Sunset2	938	15	952	1642	24	1666	2814	40	2855
2	Reduced Minnecota	13	-	13	24	-	24	40	-	40
2	Wilder	346	22	368	605	39	644	1037	67	1104
3	Grissom	85	5	90	149	8	157	256	13	269
3	Northwood Booster	54	-	54	94	-	94	162	-	162
3	Oakbrook/Sunset3	790	31	821	1382	55	1437	2370	94	2464
3	Reduced Lang Ranch	126	-	126	220	-	220	377	-	377
3	Reduced Sapra	9	-	9	16	-	16	27	-	27
4	Grissom Hydro	27	-	27	47	-	47	81	-	81
4	Sunset Hydro	22	-	22	39	-	39	67	-	67
	Subtotal	***5,413***	***395***	***5,808***	***9,473***	***689***	***10,162***	***16,239***	***1,180***	***17,419***
	TOTAL	***6,028***	***820***	***6,848***	***10,550***	***1,433***	***11,983***	***18,084***	***2,456***	***20,540***

[1] Based on billing data from 2001-2002
[2] 1.75 x the Average Daily Demand
[3] 3.00 x the Average Daily Demand

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V - Water Supply

V. WATER SUPPLY

The City has access to two sources of water: imported water and groundwater. The Calleguas Municipal Water District (CMWD) delivers imported water to the City. Groundwater is available via the Thousand Oaks Area Groundwater Basin. Due to poor water quality of the groundwater basin, the groundwater is used for irrigation purposes only. The City uses the treated imported water from CMWD to meet all of its' domestic demands. This section identifies the City's existing water supply sources.

A. EXISTING WATER SUPPLY

1. Imported Water

The City of Thousand Oaks has been relying on imported water since it became available in 1963. The City receives imported water from CMWD, a large wholesale water district, which owns and operates a transmission system to convey water to local water retail agencies across an area of approximately 350 square miles. CMWD feeders and laterals, which traverse through the Conejo Valley, provide flow to the City of Thousand Oaks. The imported water is brought into the CMWD distribution through a system connection with Metropolitan Water District of Southern California (MWD), a State water contractor. The CMWD potable water is supplied entirely through the California State Water Project, consisting of high quality water from the Northern California Sierra Mountain Range. Generally, the water is low in total dissolved solids, sulfate, hardness, and iron and manganese.[1] Prior to delivery to CMWD, the imported water is treated at Metropolitan's Jensen Treatment Facility in Granada Hills to ensure that all federal and state water quality standards are met or surpassed. The Jensen Treatment Plant currently treats the water by chlorination. MWD is currently upgrading the plant to use a combination of ozone and hydrogen peroxide - peroxone - as the primary disinfectant.

The City water system has ten (10) turnout connections to the CMWD system, for a total combined maximum rated capacity of 32,250 gpm. All of the turnouts are used regularly and are critical elements to supplying water to the City customers. Of the ten turnouts, seven of them gravity feed directly into City service area zones, while the other three provide suction to a pump station. The ten turnouts are listed in Table V-1 below and shown in Exhibit V-1.

[1] Kennedy/Jenks/Chilton. June 1992. *Feasibility Study of Groundwater Utilization for Nonpotable Water Demands.* p.3.1.

Table V-1
CMWD Turnout Summary

Turnout Name	Location	Rated Capacity (GPM)
NEWBURY PARK		
Ventu Park	1304 Newbury Road	2,000
West Kelley	2770 Borchard Road	2,000
MAIN THOUSAND OAKS		
Del Sol	3235 Erbes Road	5,000
Encino Vista	819 Encino Vista	2,500
Gainsborough	1240 N. Moorpark Road	2,500
Hillcrest Drive	19 E. Hillcrest Drive	2,500
Las Flores	2194 N. Moorpark Road	3,000
Lindero	2106 Erbes Road	6,000
Lone Oak	560 Lone Oak	3,750
Los Arboles	555 E. Avenida de Los Arboles	3,000
	Total	**32,250**

2. Groundwater Supply

The Thousand Oaks Area Groundwater Basin covers approximately 3,110 acres and has an estimated total storage capacity of 130,000 acre-feet, according to the Ventura County Public Works Agency (VCPWA) as last recorded in 2002[2]. The estimated groundwater in storage in 1999 was estimated at 87% full or 113,000 acre-feet[2]. The Ventura County Public Works Agency manages the basin.

The groundwater basin has high iron content and high TDS levels ranging from 1,200 to 2,300 mg/L. TDS levels average at 1,410 mg/L according to the California State Water Resources Board, 2003[2]. The results of high TDS levels are high alkalinity and hardness, which influence taste and quality characteristics. The groundwater does not meet secondary water quality standards and cannot be used as potable water without treatment. The Kennedy/Jenks/Chilton Feasibility Report on the Groundwater Utilization for Nonpotable Water Demands of 1992 stated that the potential recoverable groundwater in the upper 300 to 500 feet of the aquifer is estimated to be between 400,000 and 600,000 acre-feet.

[2] California Department of Water Resources (DWR).2003. *California's Groundwater-Hydrologic Region South Coast-Thousand Oaks Area Groundwater Basin.* Bulletin 118.

The VCPWA operates two wells that are used to monitor the groundwater levels. These monitoring wells yield, on average, 39 gpm. The City of Thousand Oaks owns four (4) groundwater wells throughout the service area, two of which are currently active. The wells are categorized as irrigation wells, meaning the wells are solely intended for pumping groundwater for irrigation. The well names, current status of usage and capacity are listed in Table V-2. Exhibit V-1 shows the locations of the wells.

Table V-2
Well Summary

Well Name	Location	Current Status	Depth (feet)	Capacity (gpm / ac-ft/yr)		Past Usage Acre-ft)
Hillcrest Drive Well	Hillcrest Drive Median, West of Lynn Rd.	Active	475'	100	161	5.5 acre-ft in 2004
Library Well	1401 Janss Road	Inactive	670'	65-75	105-120	-
Los Robles Golf Course Well	Los Robles Golf Course	Active	500'	600	968	35.7 acre-ft in 2004
Old Goebel Well	110 Conejo School Road	Inactive	350'	40	65	-

3. Emergency Interconnections

Interconnections with neighboring water purveyors are also considered a source of supply. Interconnections allow for agencies to share supply and storage in the event of an emergency.

The City maintains one emergency interconnection with a neighboring water purveyor, the California America Water Company. The emergency connection is located at Janss Road and El Monte Drive. This connection is intended for use in an emergency situation to provide water from the City water system to the California American Water Company, Conejo Oaks service area. The City currently does not have any interconnections with neighboring water agencies which provide water into the City's system.

B. FUTURE WATER SUPPLY

A water supply capacity evaluation is described later in this report (Section VIII). This section will briefly describe any planned or proposed projects which may affect the water supply sources for the City.

1. Imported Water

CMWD is in the midst of implementing a capital improvement program aimed at reducing the region's demand for imported water. The focus of their capital improvement program is to expand on recycled water systems and conjunctive-use facilities. A couple of the major CMWD water projects proposed to improve water reliability to the region are the:

- Las Posas Basin Aquifer Storage and Recovery Project – The Las Posas Basin ASR Project will allow for the delivery and storage of large volumes of State water to the CMWD service area during periods of availability. The stored water will later be recovered to meet seasonal, drought and emergency demands. The project will develop up to 300,000 acre-feet of storage in the Las Posas Basin to be injected and recovered by 30 wells. The project will greatly enhance water reliability in the region.
- Conejo Creek Diversion Project – This project proposes to reclaim approximately 14,000 acre-feet per year of highly-treated wastewater effluent from the Conejo Creek. The reclaimed water will be used for agricultural irrigation purposes, thus reducing the demand for imported treated water.
- Simi Valley Pilot Recycled Water Project – The purpose of this project is to develop 250 acre-feet per year of recycled wastewater to be used by the Simi Landfill for dust control, irrigation and other purposes.
- Oak Park/North Ranch Recycled Water Project – The purpose of this project is to deliver 1,200 acre-feet per year of reclaimed water for irrigation of a golf course, parks, and other greenbelt areas that presently use imported water.

2. Groundwater Supply

Currently, the Library and Old Goebel wells are inactive. It is recommended that the City properly abandon each of these facilities per criteria established in the California Well Standards and the American Water Works Association Standards.

Although groundwater is available in the area, the water quality is considered poor and the cost to treat the water to a drinking water standard would be very expensive for the City. It is currently not an economically feasible water supply alternative. It is recommended that the City continue to monitor the water quality of the groundwater and treatment technology to determine if the groundwater will be an economical supply source in the future.

The Calleguas Creek Diversion Project, developed by the City, in conjunction with other governmental entities, is a project that has recently been completed to utilize reclaimed water in the region and reduce overdraft of the groundwater. The project diverts reclaimed water discharged from the Hill Canyon Wastewater Treatment Plant for agricultural reuse on farmlands in the Santa Rosa Valley and the Oxnard Plain. The project has substantial regional benefits in that it will allow downstream water users to reduce groundwater pumping. This will also help reduce groundwater overdraft problems and prevent sea water intrusion in the Oxnard Plain.

3. Emergency Interconnections

Currently, the City does not have any plans to construct emergency interconnections with neighboring water agencies. A potential interconnection project is discussed in the water supply capacity evaluation, Section VIII.

CITY OF THOUSAND OAKS

TURNOUTS & WELL LOCATIONS

Del Sol Turnout
Los Arboles Turnout
Main Thousand Oaks
Las Flores Turnout
Lindero Turnout
Library Well (Out of Service)
Gainsborough Road Turnout
Cal-Am
Encino Vista Turnout
Lone Oak Turnout
Hillcrest Drive Well
Hillcrest Drive Turnout
Los Robles Golf Course Well
Old Goebel Well
Newbury Park
Ventu Park Turnout
West Kelley Turnout
E OLSEN RD
SUNSET HILLS BL
N MOORPARK RD
E AVE DE LOS ARBOLES
E JANSS RD
ERBES RD
E HILLCREST DR
W HILLCREST DR
RCH CONEJO
W LYNN RD
E THOUSAND OAKS BL
WESTLAKE BL
23
101

Legend

- Water Service Boundary
- CMWD Turnouts
- Irrigation Wells

BILLING ZONE - SERVICE AREA ZONES

- Zone 1 - Kelly
- Zone 1 - Pederson/Willow
- Zone 1 - Ventu
- Zone 2 - Freeway/La Granada
- Zone 2 - Kelly Hydro
- Zone 2 - Lang/Sunset2
- Zone 2 - Meadows
- Zone 2 - Reduced Minnecota
- Zone 2 - Rolling Oaks
- Zone 2 - Tara
- Zone 2 - Ventu Hydro
- Zone 2 - Wilder
- Zone 3 - Grissom
- Zone 3 - Northwood Booster
- Zone 3 - Oakbrook/Sunset3
- Zone 3 - Reduced Lang Ranch
- Zone 3 - Reduced Sapra
- Zone 4 - GrissomHydro
- Zone 4 - SunsetHydro
- CAL AM

3,500 1,750 0 3,500

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT V-1

M:\mdata\110102413\gis\MP_Tum-Wells_V-1.mxd 8/9/05 ko

VI - Distribution System

VI. DISTRIBUTION SYSTEM

This section will briefly describe the facilities that comprise the City's existing water distribution system. For further detail on the facilities described herein, refer to the City's Operation and Maintenance Manual (2004).

The City of Thousand Oaks Public Works Department operates and maintains a water distribution system that includes turnouts, reservoirs, pumping stations, interconnections, pressure reducing stations and transmission and distribution pipelines used to meet the potable water demands of its customers. A description of the City's current distribution system and general operation is described below.

A. BILLING ZONES AND SERVICE AREA ZONES

Due to the varying range of surface elevations within the City service area, which requires various levels of pumping, the City has divided their distribution into four (4) billing zones, Zones 1 thru 4. The criteria for creating different billing zones are based on the number of lifts, or times the water must be pumped, to reach the user. The billing zones and equivalent lifts are as follows:

Billing Zone	Lifts
1	0 Lift
2	1 Lift
3	2 Lifts
4	3 Lifts

Within each of these billing zones exist multiple service area zones. The four billing zones are sub-divided into a total of 19 individual service area zones, including hydropneumatic zones, each with a unique hydraulic gradient that provide water service within acceptable operating pressure ranges. Service area zones are defined as areas of service that are supplied by a source (or combination of sources) that provide a constant hydraulic gradient. Service zone boundaries are determined by ground elevations and facility locations. It is a goal of the City to deliver water to its customers at a minimum pressure of 45 psi. For operation purposes, the City does not want pressures in their system to exceed 145 psi. Several zones have similar elevation heads but may be hydraulically independent from

another service area zone. A hydraulic schematic of the City water system is shown on Exhibit VI-1. The service zones boundaries are identified on Exhibit VI-2.

Each service zone is isolated by boundary conditions, such as pumps, pressure reducing stations, reservoirs and normally closed valves. The City's service area is broken into two geographically separate areas, known as Newbury Park and the Main Thousand Oaks area, as shown on Exhibits VI-2, VI-3 and VI-4. Newbury Park contains four service area zones ranging in HGL from 951 feet to 1144 feet. The main Thousand Oaks area encompasses the remaining fifteen service area zones ranging in HGL from 970 feet to 1611 feet. The HGL of each gravity service area zone is based on the mid-water level of the reservoir(s) serving each respective zone. The HGL of the hydropneumatic zones were established based on the design discharge pressure and ground elevation of the hydropneumatic pump station. Table VI-1 lists the hydraulic grade of each service area zone.

Table VI-1
Water Service Area Zones and HGL

Billing Zone	Service Area Zone Name	HGL (Midpoint Level- Feet above sea level)
Newbury Park		
1	Kelley	936
	Ventu	959
2	Kelley Hydro	1132
	Ventu Hydro	1205
Main Thousand Oaks		
1	Pederson/Willow	965
2	Freeway/La Granada	1071
	Meadows	1077
	Tara	1069
	Lang Ranch/Sunset #2	1256
	Reduced Minnecota	1043
	Rolling Oaks	1096
	Wilder	1212
3	Northwood Booster	1137
	Reduced Lang Ranch	1333
	Reduced Sapra	1343
	Grissom	1477
	Oakbrook/Sunset3	1492
4	Grissom Hydro	1611
	Sunset Hydro	1600

The following provides a brief description of each service area zone:

NEWBURY PARK

ZONE 1

Zone 1- Kelley

The Kelley Zone is the western portion of the Newbury Park service area. Water is supplied to this zone from the West Kelley Turnout. The service area zone operates at an HGL of 936 feet. The Kelley Reservoir provides storage for this zone. Water from the Kelley Zone is boosted to supply the Kelley Hydropneumatic Zone. In an emergency condition, if the Kelley Zone loses pressure, the Lynn Road Emergency PRV will open to provide back-up supply from Zone 1 – Ventu.

Zone 1-Ventu

The Ventu Zone is located in the eastern portion of the Newbury Park service area. The Ventu Park Turnout directly supplies the zone. The zone operates at an HGL of 959 feet. As previously mentioned, an emergency pressure-reducing station exists to provide back-up supply to the Kelley Zone. This zone also provides suction to the Ventu Park Hydropneumatic Pump Station, which supplies the Ventu Hydro Zone. In emergency condition, the Lynn Road Emergency PRV can be manually placed in the open position to allow flow from the Kelley Zone. Opening this PRV in an emergency setting will only provide flow to portions of the zone and at lower pressures than what the Ventu system generally receives. The emergency PRV will not be able to refill the Ventu Reservoir.

ZONE 2

Zone 2- Ventu Hydro

The Ventu Hydro Zone is a hydropneumatic zone supplied by the Ventu Zone. The Ventu Hydro Zone is a closed loop system located in the southeast quadrant of the Newbury Park service area. This zone maintains an HGL of approximately 1205 feet. This will provide a static pressure of 45 psi at a finish floor of 1101 feet.

Zone 2-Kelley Hydro

The Kelley Hydro Zone is a hydropneumatic zone supplied by the Kelley Zone. The Kelley Hydro Zone is a closed loop system located in the southwest quadrant of the Newbury Park service area. This zone maintains an HGL of approximately 1132 feet. This will provide a static pressure of 45 psi at a finish floor of 1028 feet.

MAIN THOUSAND OAKS

ZONE 1

Zone 1-Pederson/Willow

The Pederson/Willow Zone spans over the west side of the main Thousand Oaks water service area. This is the largest zone in terms of area and demand. Five different turnouts provide gravity supply to this zone. The Pederson Reservoir and Willow Lane Reservoir provide storage for this zone and have a combined storage capacity of 8.0 MG. The HGL of the zone is 965 feet. Water is boosted from this zone to Zone 2-Rolling Oaks, Zone 2-Tara and Zone 2-Freeway/La Granada.

ZONE 2

Zone 2- Freeway/La Granada

The Freeway/La Granada Zone is located in the southeast corner of the main Thousand Oaks service area. The Freeway and La Granada Reservoirs combine to provide approximately 5.0 MG of storage for the zone at an HGL of 1071 feet. This zone is where many of the Thousand Oaks Boulevard redevelopment projects will occur. The zone is supplied from the Willow Lane Pump Station and the Lone Oak Pump Station.

Zone 2- Meadows

The Meadows Zone is located in the center of the main Thousand Oaks service area and spans to the northwest. The Erbes Road Pump Station supplies the zone. The storage capacity for this zone is 3.42 MG at the Meadows Reservoir. The HGL of the zone is 1077 feet.

Zone 2- Tara

The Tara Zone is located in the center of the main Thousand Oaks service area and spans to the northwest. The Pederson Pump Station supplies the zone. The storage capacity for this zone is 3.96 MG at the Tara Reservoir. The HGL of the zone is 1069 feet.

Zone 2-Rolling Oaks

The Rolling Oaks Zone is located in the southwest corner of the main Thousand Oaks service area. This zone has one reservoir, the Rolling Oaks Reservoir, which provides 0.35 MG of storage at an HGL of 1096 feet. The zone is fed by the Rolling Oaks Pump Station, which takes suction from the Pederson/Willow Zone.

Zone 2- Lang Ranch/Sunset No. 2

The Lang Ranch/Sunset No. 2 Zone is located in the northeastern portion of the water system. Two reservoirs, Sunset No. 2 and Lang Ranch, have a combined storage capacity of 5.92 MG for this zone, at an HGL of 1256 feet. This zone is supplied by the Lindero and Del Sol Turnouts via the Erbes Road Pump Station and Sunset No. 1 Pump Station, respectively. The Lang Ranch/Sunset No. 2 Zone provides water to the Reduced Minnecota Zone via pressure-reduction. An emergency pressure-reducing station, Fountain Crest, provides back-up supply to the zone from the Oakbrook/Sunset No. 3 Zone in the event of pressure loss.

Zone 2- Reduced Minnecota

The Reduced Minnecota Zone is a small area in the northern portion of the water system that is supplied via pressure-reduction from the Lang Ranch/Sunset No. 2 Zone at a HGL of 1043 feet.

Zone 2- Wilder

The Wilder Zone is located on the east side of the water system. Wilder receives water from the Lone Oak Turnout via the Lone Oak Pump Station and stores it in the Wilder Reservoir. The reservoir has a capacity of 0.98 MG and a midlevel HGL of 1212 feet.

ZONE 3

Zone 3-Northwood Booster

The Northwood Booster Zone is a small closed loop system surrounded by the Tara Zone. This zone is supplied from variable frequency drive booster pumps at the Northwood Booster Station, which take suction from the Tara Zone. The HGL in this zone is 1137 feet. This will provide a static pressure of 45 psi at a finish floor of 1033 feet.

Zone 3- Grissom

The Grissom Zone is located just north of the Wilder Zone on the east side of the distribution system. The Wilder Pump Station supplies the zone. The Grissom Zone has two small tanks located at the same site with a combined capacity of 0.43 MG. The HGL of the zone is 1477 feet. From the Grissom Zone water is supplied to the Reduced Sapra Zone via pressure reduction.

Zone 3- Reduced Sapra

The Reduced Sapra Zone is the smallest zone in the City's distribution system in terms of area and demand. The Reduced Sapra Zone is located between the Wilder and Grissom Zone and is fed via pressure-reduction from the Grissom Zone. The HGL of the zone is 1343 feet. In the event this station requires maintenance or isolation, water service will be disrupted to the houses in this zone (Cardiff Circle). . This will provide a static pressure of 45 psi at a finish floor of 1239 feet.

Zone 3- Oakbrook/Sunset No. 3

The Oakbrook/Sunset No. 3 Zone is situated on the east side of the water service area. The zone is supplied from the Los Arboles Pump Station and the Lang Ranch No. 4A Pump Station. Storage for the zone is provided by the Oakbrook and Sunset No. 3 Reservoirs. The reservoirs have a combined capacity of 2.96 MG and provide a midlevel hydraulic gradient of 1492 feet. Three pressure-reducing stations provide supply from this zone to lower zones. The Westlake and Lang Ranch pressure-reducing stations provide supply to the Reduced Lang Ranch Zone. The Fountain Crest pressure-reducing station provides emergency supply to the Lang/Sunset No. 2 Zone.

Zone 3-Reduced Lang Ranch

The Reduced Lang Ranch Zone is located on the east side of the water distribution system. This zone is supplied pressure reduced water from the Oakbrook/Sunset No. 3 Zone. The Westlake and Lang Ranch pressure-reducing stations regulate the hydraulic gradient to the zone to 1333 feet. The Oakbrook/Sunset No. 3 Zone provides storage for the zone.

ZONE 4

Zone 4- Grissom Hydro

The Grissom Hydro Zone is located on the east side of the water service area. The zone is supplied from Grissom Hydropneumatic Pump Station, which takes suction from the Grissom Zone and boosts to an HGL of 1611 feet. The Grissom Hydro Zone is a closed loop system. This will provide a static pressure of 45 psi at a finish floor of 1507 feet.

Zone 4- Sunset Hydro

The Sunset Hydro Zone is a closed loop system that is supplied by the Sunset Hydropneumatic Pump Station, which takes suction from the Oakbrook/Sunset No. 3

Zone. The zone operates at a hydraulic gradient of 1600 feet. This will provide a static pressure of 45 psi at a finish floor of 1496 feet.

B. TURNOUTS

The City distribution system receives 100% of the their potable water supply from ten turnout connections to the CMWD transmission system. Seven of the turnouts are controlled by the City's Central Control Station (CCS), located at the Municipal Service Center, and by a timer located at the site Remote Terminal Unit (RTU). Each of the sites is maintained by CMWD. The Lone Oak, Del Sol and Lindero turnouts, provide supply to the suction side of a pump station, and are operate based on the system demand. The City's turnouts are summarized in Table VI-2.

Table VI-2
Turnout Summary

Turnout Name	Location	Source of Supply	HGL	Capacity (GPM)	Billing Zone - Service Area Zone(s)
NEWBURY PARK					
Ventu Park	1304 Newbury Road	CMWD Newbury Park Lateral 24-inch	1026	2,000	1-Ventu
West Kelley	2720 Borchard Road	CMWD Newbury Park Lateral 24-inch	949	2,000	1-Kelley
MAIN THOUSAND OAKS					
Del Sol	3235 Erbes Road	CMWD Conejo Valley Feeder 48-inch	1037	5,000	2-Lang Ranch/Sunset #2
Encino Vista	819 Encino Vista	CMWD Thousand Oaks Lateral 30-inch	1033	2,500	1-Pederson/Willow
Gainsborough	1240 N. Moorpark Road	CMWD Conejo Valley Feeder 30-inch	1012	2,500	1-Pederson/Willow
Hillcrest Drive	19 E. Hillcrest Drive	CMWD Newbury Park Lateral 24-inch	1016	2,500	1-Pederson/Willow
Las Flores	2194 N. Moorpark Road	CMWD Conejo Valley Feeder 30-inch	1024	3,000	1-Pederson/Willow
Lindero	2106 Erbes Road	CMWD Lindero Feeder 42-inch	1047	6,000	2-Meadows 2-Lang Ranch/Sunset #2
Lone Oak	560 Lone Oak	CMWD Lone Oak Drive Lateral 24-inch	1022	3,750	2-Freeway/La Granada 2-Wilder
Los Arboles	555 E. Avenida de Los Arboles	CMWD Conejo Valley Feeder No. 2; 30-inch	1012	3,000	1-Pederson/Willow

C. RESERVOIRS

The City currently has 16 reservoirs in the distribution system, ranging in storage capacity from 0.35 million gallons (MG) to 5.0 MG, totaling approximately 35.5 MG. The reservoirs provide storage to meet peak demands and emergency storage for fire protection. Reservoir storage should also be utilized to minimize pumping requirements during on-peak energy (SCE) hours. The existing reservoirs are listed in Table VI-3.

Table VI-3
Existing Reservoirs

Reservoir Name	Billing Zone	Service Area Zone	High Water Elevation (feet)	Floor Elevation (feet)	Storage Capacity (MG)
NEWBURY PARK					
Kelley	1	Kelley	951	920	0.55
Ventu	1	Ventu	970	948	3.95
				Subtotal	*4.5*
MAIN THOUSAND OAKS					
Freeway	2	Freeway/La	1085	1055	1.00
Grissom	3	Grissom	1488	1465	0.21
Grissom	3	Grissom	1488	1465	0.22
La	2	Freeway/La	1087	1055	3.97
Lang	2	Lang	1271	1240	4.92
Meadow	2	Meadows	1092	1061	3.42
Oakbroo	3	Oakbrook/Sunset	1502	1480	2.20
Pederso	1	Pederson/Willow	975	954	3.00
Rolling	2	Rolling Oaks	1108	1084	0.35
Sunset	2	Lang	1270	1240	1.00
Sunset	3	Oakbrook/Sunset	1503	1480	0.76
Tara	2	Tara	1084	1053	3.96
Wilder	2	Wilder	1223	1200	0.98
Willow	1	Pederson/Willow	979	957	5.00
				Subtotal	*31.0*
				Total Volume	**35.5**

A brief description of each reservoir is provided below:

NEWBURY PARK

Kelley Reservoir

The Kelley Reservoir is fed from the West Kelley Turnout in the Newbury Park service area of the system. The reservoir provides supply for the Kelley Zone and suction for the Kelley Hydropneumatic Pump Station. The Kelley Reservoir is a 0.55 MG circular, welded-steel tank.

Ventu Park Reservoir

The Ventu Park Reservoir is supplied water from the Ventu Park Turnout, located in the north region of the Newbury Park service area. The reservoir provides service to the Ventu Park Zone and provides suction to the Ventu Hydropneumatic Zone. The Ventu Park Reservoir is a 3.95 MG buried, rectangular, reinforced concrete reservoir. The reservoir has a partition wall down the center, creating two separate chambers within the reservoir.

MAIN THOUSAND OAKS

Freeway Reservoir

The Freeway Reservoir is a 1.0 MG circular welded steel tank located in the center of the Thousand Oaks water service area. The reservoir is filled from the Lone Oak Pump Station and/or the Willow Lane Pump Station. The reservoir operates at the same hydraulic gradient as the La Granada Reservoir.

Grissom No. 1 & No. 2 Reservoir

The Grissom No. 1 and No. 2 Reservoirs are located at the same site and provide storage for the Grissom Zone, the Reduced Sapra Zone and the Grissom Hydropneumatic Zone. The two circular, welded-steel reservoirs are filled by the Wilder Pump Station and have a combined capacity of 0.43 MG.

La Granada Reservoir

The La Granada Reservoir is filled from either the Lone Oak Pump Station and/or the Willow Lane Pump Station. The reservoir provides storage to the Freeway/La Granada Zone. The La Granada Reservoir is a 3.97 MG circular, welded-steel tank that operates at the same HGL as the Freeway Reservoir.

Lang Ranch Reservoir

The Lang Ranch Reservoir is supplied water from the Lindero and Del Sol Turnouts via pumping from the Erbes Road and Sunset No.1 Pump Stations. The 4.92 MG circular, welded-steel reservoir serves the Lang Ranch Zone.

Meadows Reservoir

The Meadows Reservoir is fed from the Erbes Road Pump Station. The 3.42 MG rectangular, concrete reservoir serves the Meadows Zone. The tank has a hopper type bottom.

Oakbrook Reservoir

The Oakbrook Reservoir is filled by the Sunset No. 2 Pump Station, the Lang Ranch Pump Station and/or the Los Arboles Pump Station. The reservoir serves the Oakbrook/Sunset No. 3 Zone and provides suction to the Sunset Hydropneumatic Zone. Oakbrook Reservoir is a 2.2 MG circular, welded-steel tank.

Pederson Reservoir

The Pederson Reservoir is supplied water from several turnouts on the west side of the main Thousand Oaks service area. The Pederson Reservoir receives water from Hillcrest, Gainsborough, Las Flores, Los Arboles and/or Encino Vista Turnout(s). The reservoir serves the Pederson/Willow Zone. Pederson Reservoir is a 3.0 MG rectangular, concrete reservoir. The tank has a hopper type bottom.

Rolling Oaks Reservoir

The Rolling Oaks Reservoir is filled from the Rolling Oaks Pump Station and provides storage to the Rolling Oaks Zone. The reservoir is located in the southern area of the Main Thousand Oaks water service area. The Rolling Oaks Reservoir is a 0.35 MG circular, welded-steel tank.

Sunset No. 2 Reservoir

The Sunset No. 2 Reservoir is filled from the Sunset No. 1 Pump Station and/or the Erbes Road Pump Station and provides service to the Lang Ranch/Sunset No. 2 Zone. The reservoir is located in the northeast side of the main Thousand Oaks water service area. Sunset No. 2 Reservoir is a 1.0 MG circular, welded-steel tank.

Sunset No. 3 Reservoir

The Sunset No. 3 Reservoir is supplied from the Lang Ranch Pump Station, Los Arboles Pump Station and/or the Sunset No. 2 Pump Station. The reservoir supplies the Oakbrook/Sunset No. 3 Zone and is located in the northeast side of the main Thousand Oaks water service area. The reservoir operates at the same hydraulic gradient as the Oakbrook Reservoir. The Sunset No. 3 Reservoir is a 0.76 MG circular, welded-steel tank.

Tara Reservoir

The Tara Reservoir is fed from the Pederson Pump Station. The reservoir provides storage for the Tara Zone and provides suction to the Northwood Booster Zone. The Tara Reservoir is a 3.96 MG circular, welded-steel reservoir.

Wilder Reservoir

The Wilder Reservoir is fed from the Lone Oak Turnout via the Lone Oak Pump Station and supplies water to the Wilder Zone. The Wilder Reservoir is a 0.98 MG circular, welded-steel tank.

Willow Lane Reservoir

The Willow Lane Reservoir is supplied water from the Hillcrest, Gainsborough, Las Flores, Los Arboles and/or Encino Vista Turnout(s). The reservoir provides storage for the Pederson/Willow Zone. The Willow Lane Reservoir is a 5.0 MG circular, welded-steel tank.

D. PUMP STATIONS

The City operates eleven (11) pump stations that supply water to various service area zones within the Main Thousand Oaks area. The Newbury Park area has only hydropneumatic pump stations. The pumps range in type, size and capacity. Pump stations are used to boost water from a lower hydraulic gradient to a higher hydraulic gradient. Pump stations are critical elements of the City's distribution system, moving the source water to the higher elevations. All the pump stations are equipped with an emergency, uninterruptible power supply and a generator connection. Three (3) pump stations are equipped with a diesel engine powered pump, they include Grissom BPS, Kelley BPS, and Ventu BPS.

There is two Variable Frequency Drive (VFD) pump in the City's distribution system, the Northwood Booster Pump Station and Ventu Park Pump Station. These pump stations provide a variable flowrate, which is set to a target discharge pressure.

Table VI-4 summarizes the existing pump stations.

Table VI-4
Existing Pump Stations

Pump Station Name	No. of Pumps	Supply Source/Service Area Zone	Discharge Service Area Zone	Total Capacity (GPM)
Erbes Road	3	Lindero Turnout	Lang/Sunset2	4,000
	1	Lindero Turnout	Meadows	1,650
Lang Ranch 4A	2	Lang/Sunset2	Oakbrook/Sunset3	1,400
Lone Oak	3	Lone Oak Turnout	Freeway/La Granada	1,750
	3	Lone Oak Turnout	Wilder	2,000
Los Arboles	2	Lang/Sunset2	Oakbrook/Sunset3	1,400
Pederson	3	Pederson/Willow	Tara	3,600
Rolling Oaks	2	Pederson/Willow	Rolling Oaks	400
Sunset No. 1	3	Del Sol Turnout	Lang/Sunset2	3,550
Sunset No. 2	2	Lang/Sunset2	Oakbrook/Sunset3	900
Wilder	2	Wilder	Grissom	800
Willow Lane	3	Pederson/Willow	Freeway/La Granada	2,250
Northwood Booster (VFD)	2	Tara	Northwood Booster	1,000
			Total Capacity	**25,150**

Currently, the Sunset No. 2 pump station is not equipped with a generator connection. The implementation of CI-4304 will remedy the issue.

In addition to these pump stations, the City operates and maintains four hydropneumatic pump stations which boost water to closed loop systems at higher hydraulic gradients. The boundary conditions for these pumps are based on a required discharge pressure setting. The four hydropneumatic pump stations are each equipped with diesel powered pumps in the event of lead or lag pump failure. Table VI-5 lists the hydropneumatic pumps within the system.

Table VI-5
Hydropneumatic Pump Stations

Pump Station Name	No. of Pumps	From Source/Service Area Zone	To Service Area Zone	Capacity (gpm)
NEWBURY PARK				
Kelley Road	2	Kelley	Kelley Hydro	1,350
Ventu Park (VFD)	3	Ventu Park	Ventu Hydro	1,300
MAIN THOUSAND OAKS				
Grissom	2	Grissom	Grissom Hydro	1,100
Sunset No.3	2	Oakbrook/Sunset3	Sunset Hydro	1,000

E. PRESSURE REDUCING VALVES/STATIONS

The City operates six (6) pressure-reducing stations, which supply water from a higher pressure gradient to a lower pressure gradient. The pressure reducing stations consist of valves set to maintain a constant downstream pressure. Table VI-6 below shows a summary of the pressure reducing stations.

Table VI-6
Pressure Reducing Stations

Name	Upstream		Downstream		Size
	Service Area Zone	HGL	Service Area Zone	HGL	(in)
Newbury Park					
Lynn Road (E)	Ventu	959'	Kelley	936'	10"
Main Thousand Oaks					
Fountain Crest (E)	Oakbrook/ Sunset 3	1492'	Lang/ Sunset 2	1256'	8"
Lang Ranch	Oakbrook/ Sunset 3	1492'	Reduced Lang Ranch	1333'	4" / 8"
Minnecota Drive	Lang/ Sunset 2	1256'	Reduced Minnecota	1043'	2" / 4"
Sapra Street	Grissom	1477'	Reduced Sapra	1343'	4"
Westlake Blvd.	Oakbrook/ Sunset 3	1492'	Reduced Lang Ranch	1333'	4" / 8"

(E) – Represents Emergency Station

NEWBURY PARK

Lynn Road

The Lynn Road Pressure Reducing Station is used as an emergency connection between the Ventu Zone and the Kelley Zone in the Newbury Park service area. The pressure is set at approximately 65 psi in the event of a pressure loss to the Kelley Zone. Under normal operating conditions the valves are closed due to sufficient downstream pressure.

MAIN THOUSAND OAKS

Fountain Crest

The Fountain Crest Pressure Reducing Station is used as an emergency connection between the Oakbrook/Sunset No. 3 Zone and the Lang Ranch/Sunset No. 2 Zone. The pressure is set at approximately 60 psi in the event of pressure loss to the Lang Ranch/Sunset No. 2 Zone. Under normal operating conditions the valves are closed due to sufficient downstream pressure.

Lang Ranch

The Lang Ranch Pressure Reducing Station consists of two valves in parallel that are used to reduce the hydraulic gradient of the Oakbrook/Sunset No. 3 Zone to the Reduced Lang Ranch Zone. Under normal operating conditions the 4-inch bypass line is not in use and water flows through the 8-inch line.

Minnecota Drive

The Minnecota Drive Pressure Reducing Station consists of two valves in parallel. The valves reduce the hydraulic gradient of the Lang Ranch/Sunset No. 2 Zone to the Reduced Minnecota Zone. Under normal operating conditions, water flows through the 4-inch main line to maintain a constant downstream pressure and the 2-inch bypass line is not in use.

Sapra Street

The Sapra Street Pressure Reducing Station consists of one 4-inch valve located in a vault in the middle Sapra Street. The valve reduces the pressure from the Grissom Zone to the Reduced Sapra Zone. The condition of the vault and the valve are poor and replacement is recommended. The vault should be relocated outside of the road travel way.

Westlake Boulevard

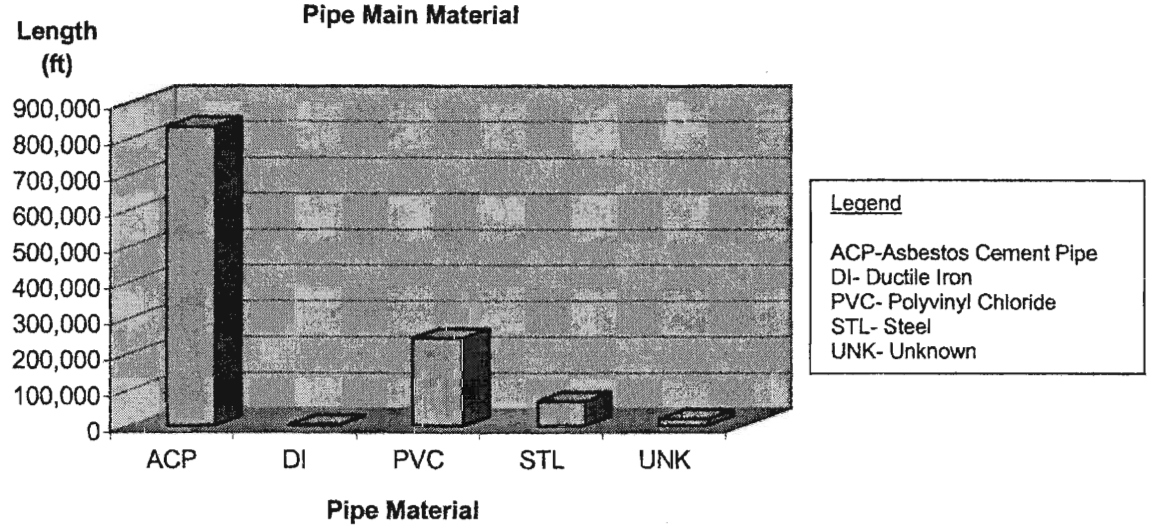
The Westlake Boulevard Pressure Reducing Station consists of two valves in parallel. The valves reduce the pressure from the Oakbrook/Sunset No. 3 Zone to the Reduced Lang Ranch Zone. Under normal operating conditions, water is supplied through the 8-inch line and the pressure-reducing valve maintains a constant downstream pressure, while the 4-inch line is in stand-by.

F. PIPELINES

The City's distribution system is comprised of pipelines ranging in size from 3-inches to 24-inches. The majority of pipelines are 6 and 8-inches in diameter. There are approximately 225 miles of pipeline within the distribution system.

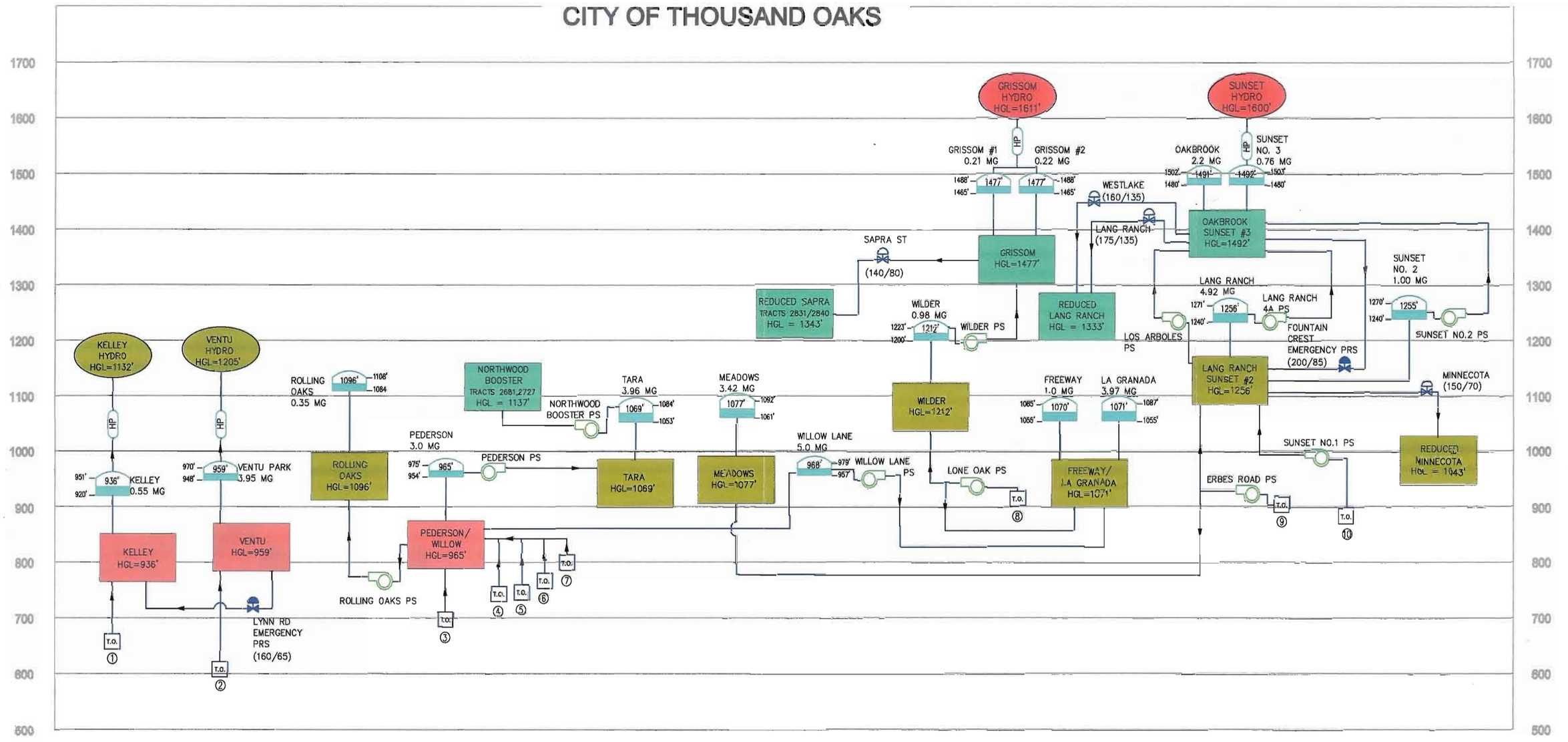
There are several pipe materials that are used in the system. The largest amount of pipe used is Asbestos Cement Pipe (ACP) followed by Polyvinyl Chloride (PVC). Figure VI-1 shows the approximate lineal length of pipe in feet of each pipe material used in the distribution system. Pipes are listed as unknown where records of pipe construction were not found.

Figure VI-1
Pipe Main Material



ACP was commonly used in water distribution construction during the 1960's and 1970's. ACP pipe is known for its' resilience to corrosion and long lasting service life in particular soils. Federal regulations in the late 1970's made ACP pipe fabrication very expensive. The City started using PVC, ductile iron pipe and steel pipe in the late 1970's. The City uses these materials of pipeline for optimal water quality, long service life and for their economical costs. Steel pipe and PVC have indefinite service life depending on the corrosivity of the soils and quality of linings and coatings. Several small portions of the city's distribution system were constructed with ductile iron pipeline. Ductile iron pipeline is generally more expensive and requires an additional dielectric coating in corrosive soils, compared to steel and PVC. Pipelines less than 12-inches in diameter are typically constructed of PVC. Steel is commonly used for pipeline diameters greater than 12-inches.

EXHIBIT VI-1
HYDRAULIC PROFILE
CITY OF THOUSAND OAKS



PUMPING STATION (PS)

PRESSURE REDUCING STATION (PRS)

EMERGENCY CONNECTION, NORMALLY CLOSED PRS

(108/61) (INLET/OUTLET) PRESSURES

HP HYDROPNEUMATIC TANK & PUMP STATION

613' HYDRAULIC GRADE LINE (HGL REPRESENTS MIDLEVEL OF TANK)

T.O. CALLEGUAS MUNICIPAL WATER DISTRICT (CMWD) TURNOUT

HGL' TOP ELEVATION
RESERVOIR
BOTTOM ELEVATION

① WEST KELLEY TURNOUT (ID K8–3000)
② VENTU PARK TURNOUT (ID L10–3000)
③ HILLCREST TURNOUT (ID L14 3100)
④ GAINSBOROUGH TURNOUT (ID N14–3100)
⑤ LAS FLORES TURNOUT (ID Q15–3000)
⑥ LOS ARBOLES TURNOUT (ID R15–3011)
⑦ ENCINO VISTA TURNOUT (ID M15–3100)
⑧ LONE OAK TURNOUT (ID L17–3001)
⑨ LINDERO TURNOUT (ID S10–3100)
⑩ DEL SOL TURNOUT (ID U17–3001)

BILLING ZONES

ZONE 1 (NO LIFT)

ZONE 2 (ONE LIFT)

ZONE 3 (TWO LIFTS)

ZONE 4 (THREE LIFTS)

PREPARED BY:
RBF CONSULTING
PLANNING ■ DESIGN ■ CONSTRUCTION
4980 SANTA ROSA ROAD, SUITE 170
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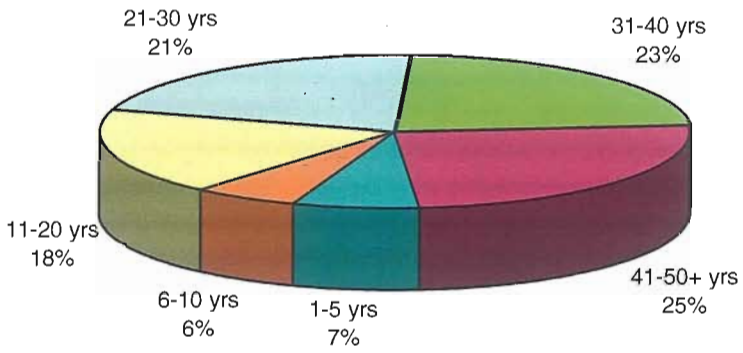
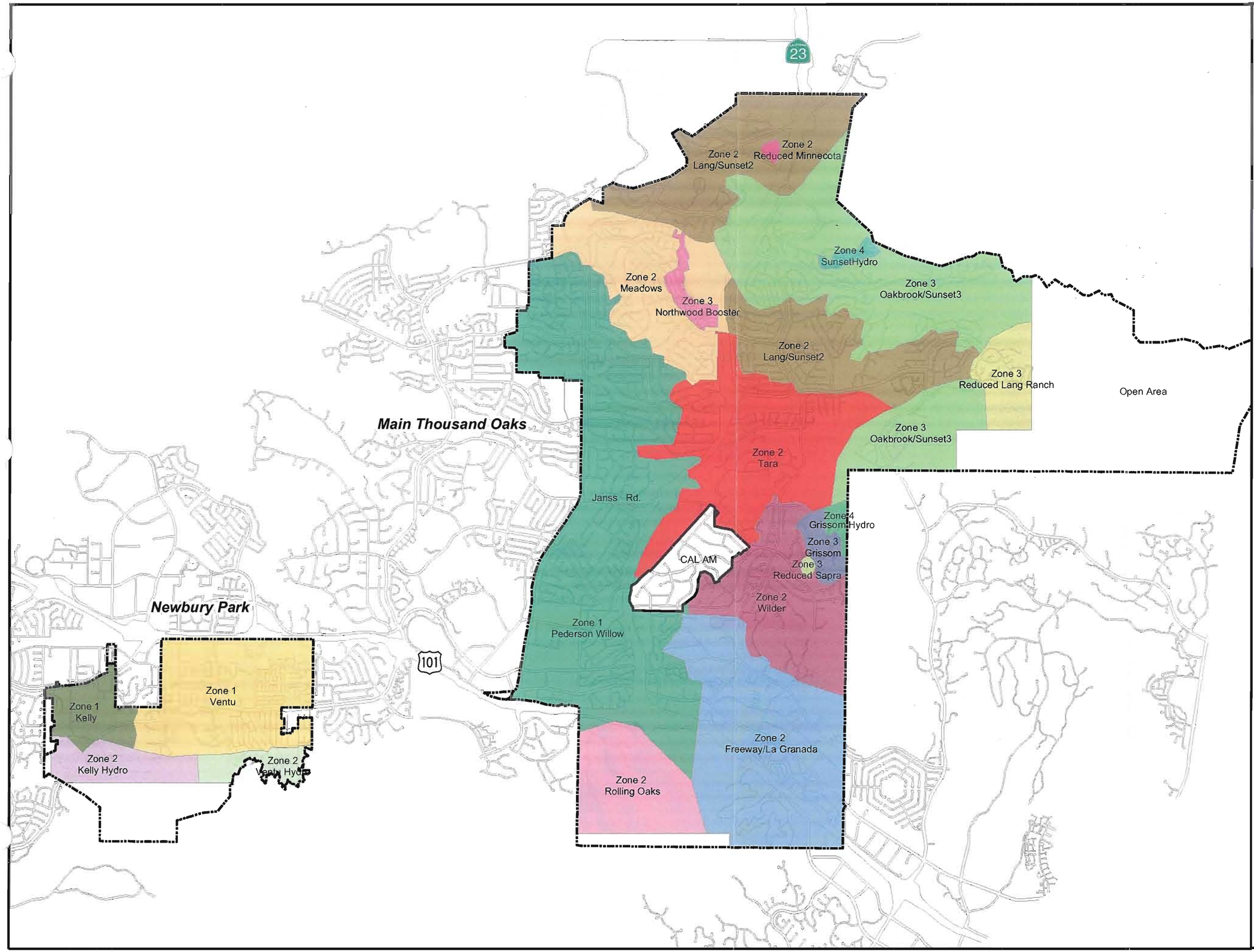
EXHIBIT VI-1

The age of the pipeline in the system varies from 1 to 52 years old. On average, the pipeline age is approximately 27 years old. Figure VI-2 displays the age of pipe and the corresponding percentage of the total City's pipeline.

Figure VI-2
Pipe Age



CITY OF THOUSAND OAKS
BILLING ZONES
SERVICE AREA ZONES



BILLING ZONE - SERVICE AREA ZONE	Hydraulic Grade Line
Zone 1 - Kelly	936'
Zone 1 - Pederson/Willow	965'
Zone 1 - Ventu	959'
Zone 2 - Freeway/La Granada	1071'
Zone 2 - Kelly Hydro	1132'
Zone 2 - Lang/Sunset2	1256'
Zone 2 - Meadows	1077'
Zone 2 - Rolling Oaks	1087'
Zone 2 - Tara	1069'
Zone 2 - Ventu Hydro	1144'
Zone 2 - Reduced Minnecota	1043'
Zone 2 - Wilder	1212'
Zone 3 - Grissom	1477'
Zone 3 - Northwood Booster	1137'
Zone 3 - Oakbrook/Sunset3	1492'
Zone 3 - Reduced Lang Ranch	1333'
Zone 3 - Reduced Sapra	1343'
Zone 4 - GrissomHydro	1611'
Zone 4 - SunsetHydro	1600'
Water Service Boundary	

3,500 1,750 0 3,500

SCALE IN FEET

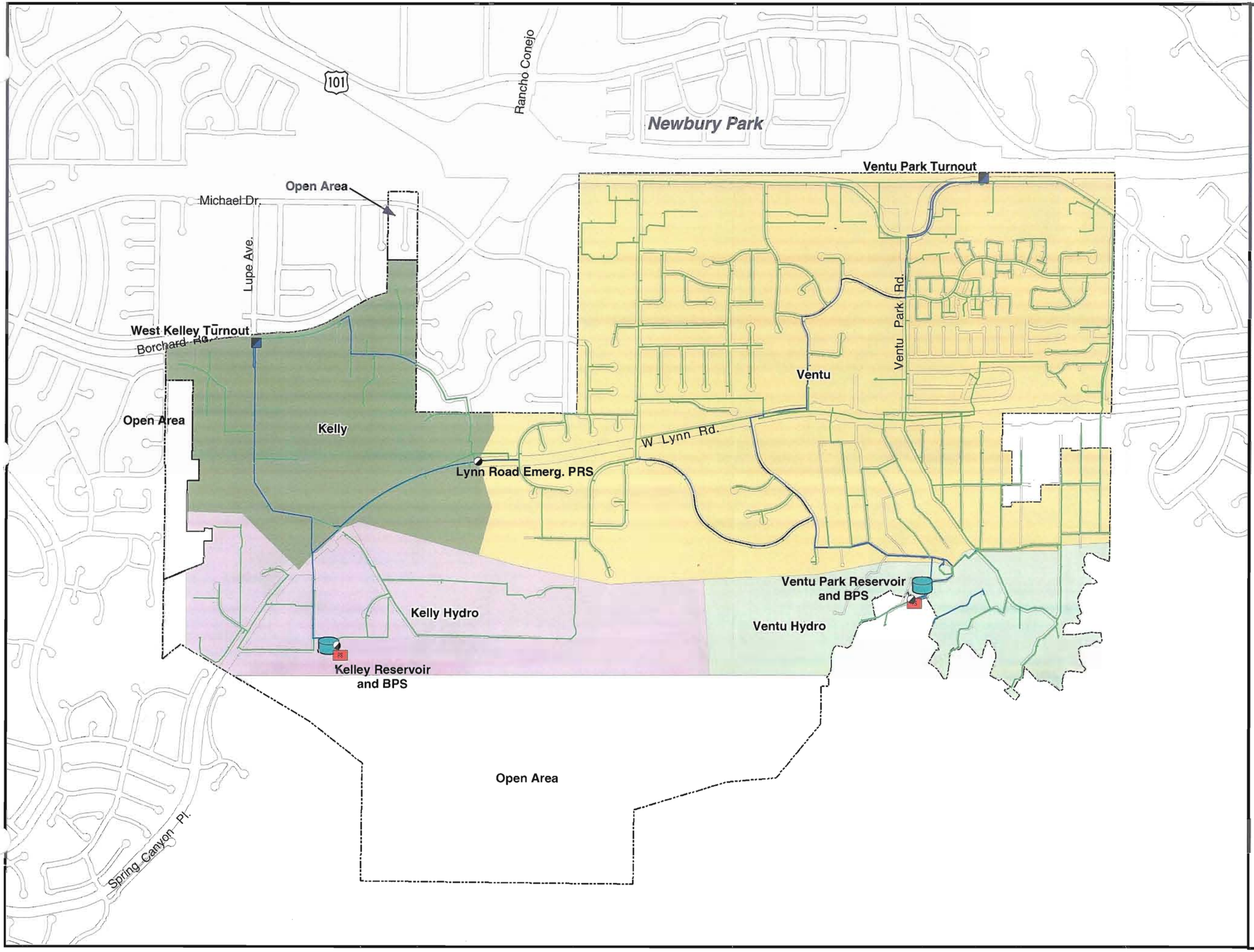
RBF CONSULTING GIS PLANNING DESIGN CONSTRUCTION

EXHIBIT VI-2

M:\Mdata\10102413\gis\MP_Service_Area_Zone_VI-2.mxd 3/1705 ko

CITY OF THOUSAND OAKS

NEWBURY PARK WATER DISTRIBUTION SYSTEM



- Water Service Boundary
- Pressure Reducing Station
- CMWD Turnouts
- Pump Station
- Tanks and Reservoirs

Pipes

- 2" - 8"
- 10" - 18"
- 20" - 24"

1,000 500 0 1,000

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT VI-3

M:\mdata\10102413\gis\MP_WSystem_VI-3new.mxd 3/17/05 ko

CITY OF THOUSAND OAKS

MAIN THOUSAND OAKS WATER DISTRIBUTION SYSTEM

Del Sol Turnout
Minnecota PRS
Sunset No. 1 PS
Sunset No. 2 Reservoir and PS
Sunset No. 3 Reservoir and BPS
Tara Reservoir
Lang Ranch Reservoir and PS
Northwood Booster (VFD)
Los Arboles Turnout
Pederson Reservoir and PS
Westlake Blvd. PRS
Lang Ranch PRS
Fountain Crest Emergency PRS
Los Arboles PS
Las Flores Turnout
Lindero Turnout
Erbes Rd PS
Oakbrook Reservoir
Meadows Reservoir
Grissom Reservoirs and BPS
Wilder Reservoir and PS
Gainsborough Road Turnout
Cal-Am
Sapra Street PRS
Encino Vista Turnout
La Granada Reservoir
Lone Oak Turnout and PS
Hillcrest Drive Turnout
Willow Lane Reservoir and PS
Rolling Oaks Reservoir and PS
Freeway Reservoir

Open Area

Main Thousand Oaks

- Water Service Boundary
- Pressure Reducing Station
- CMWD Turnouts
- Pump Station
- Tanks and Reservoirs

Pipes

- 2" - 8"
- 10" - 18"
- 20" - 24"

Billing Zone - Service Area Zones

- Zone 1 - Kelly
- Zone 1 - Pederson/Willow
- Zone 1 - Ventu
- Zone 2 - Freeway/La Granada
- Zone 2 - Kelly Hydro
- Zone 2 - Lang/Sunset2
- Zone 2 - Meadows
- Zone 2 - Reduced Minnecota
- Zone 2 - Rolling Oaks
- Zone 2 - Tara
- Zone 2 - Ventu Hydro
- Zone 2 - Wilder
- Zone 3 - Grissom
- Zone 3 - Northwood Booster
- Zone 3 - Oakbrook/Sunset3
- Zone 3 - Reduced Lang Ranch
- Zone 3 - Reduced Sapra
- Zone 4 - GrissomHydro
- Zone 4 - SunsetHydro
- CAL AM

3,000 1,500 0 3,000

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT VI-4

M:\mdata\10102413\gis\MP_Wsystem_VI-4.mxd 8/9/05 ko

VII - Reservoir Storage Analysis

VII. RESERVOIR STORAGE ANALYSIS

A. INTRODUCTION

Storage is a critical component of a water distribution system as it provides fire protection and operational flexibility. This section will analyze the City's existing storage capacity and determine if it's adequate to meet the minimum specified criteria based on existing demands and future demands.

B. STORAGE CRITERIA

As discussed in Section III, it is recommended that the City adopt more conservative storage criteria. The existing and recommended storage criteria are as follows:

Operating Storage = Regulatory Storage + Fire Flow Storage

1. Operating storage represents the reservoir volume at the maximum operating level (elevation). The operating level should not be confused with the overflow elevation. The reservoir volume at the overflow elevation is considered the full available storage; however, the City operates their reservoirs at the 'operating level,' a level below that of the overflow elevation. The operating storage is used for analysis purposes.

2. Regulatory storage is based on a certain percentage of the maximum day demand. Under the current (2004) storage criteria, regulatory storage is 80% of the maximum day demand. Under the recommended storage criteria, regulatory storage is 100% of the maximum day demand.

   Current (2004) Regulatory Storage Criteria = 0.8 x Maximum Day Demand
   Recommended Regulatory Storage Criteria = 1.0 x Maximum Day Demand

3. Fire flow storage is the volume necessary to supply the maximum required fire flow in the service area for a specified duration in accordance with the Insurance Services Office (ISO), or Ventura County Fire Department.

C. EXISTING SYSTEM STORAGE EVALUATION

This storage analysis evaluates if the existing reservoirs have adequate storage volume based on both the 2004 criteria and the recommended new criteria. This evaluation will also analyze whether the existing storage capacity is adequate to meet future build-out conditions, excluding the Upper Kelley and Skyline developments.

1. Available Reservoir Storage (Operating Storage)

The available storage within a reservoir assumes a water height equal to the operational level. The operational storage is defined as the volume based on the reservoir's dimensions and the maximum operational water level within the tank. Refer to Table VII-1 for the calculated operational storage within each reservoir.

Table VII-1
Existing Reservoir Storage

Billing Zone	Reservoir Name	Reservoir Diameter (ft)	Operational Level (ft above floor)	Operational Storage (MG)	Overflow Elevation (ft above floor)	Storage at Overflow Level (MG)
Zone 1	Kelley	55	29.50	0.52	31.00	0.55
Zone 1	Pederson	242 x 110 *	18.50	2.67	20.17	3.00
Zone 1	Ventu Park	173 x 173 *	20.50	3.30	22.50	3.75
Zone 1	Willow Lane	192	20.50	4.44	22.00	5.00
Zone 2	Freeway	75	28.50	0.94	30.33	1.00
Zone 2	La Granada	150	28.50	3.77	30.33	4.01
Zone 2	Meadows	150 x 133 *	29.00	3.16	30.75	3.42
Zone 2	Rolling Oaks	51	20.00	0.31	23.33	0.36
Zone 2	Tara	147	29.50	3.74	31.25	3.97
Zone 2	Lang Ranch	165	29.00	4.64	30.75	4.92
Zone 2	Sunset No. 2	75	29.00	0.96	30.33	1.00
Zone 2	Wilder	85	21.50	0.91	23.00	0.98
Zone 3	Grissom No. 1	39	21.00	0.20	23.00	0.22
Zone 3	Grissom No. 2	39	21.00	0.20	23.00	0.22
Zone 3	Oakbrook	130	21.50	2.13	23.00	2.28
Zone 3	Sunset No. 3	75	21.50	0.71	23.00	0.76
TOTAL				**32.6**		**35.5**

* Indicates a rectangular reservoir with a hopper bottom.

The storage analysis evaluates the operational storage within each service area zone. Therefore, service zones that have multiple reservoirs that operate at the same (similar) hydraulic gradient, are combined together for the purposes of this analysis.

2. Required Fire Flow Storage

Fire flow storage requirements are determined by the critical land use located within each service area zone. The critical fire flow is determined based on land uses identified on the Thousand Oaks General Plan map, an assumed building square footage and building type identified in Table A-III-A-1 in the Uniform Fire Code[1].

School or commercial buildings are usually the controlling fire flow in a service area zone. According to conversations with representatives from Ventura County Fire Department and California Division of State Architect (DSA), the standard required fire flow for a school is 4000 gpm for 4 hours.

In the case of the Kelley Service Area Zone, the commercial building controlling the fire flow was found to have a fire sprinkler system, so the required fire flow was reduced (see footnote). Refer to Table VII-2 for the calculated fire flow storage required within each service zone.

[1] The fire flow and duration used in this analysis was taken from Table III-4. It should be noted that most fire flows used in this analysis do not take into account individual buildings with fire sprinkler systems. A fire sprinkler system may reduce the demand required from fire hydrants from 50% to 75%.

Table VII-2
Required Fire Flow Storage

Billing Zone	Service Area Zone	Service Area Land Use*	Fire Flow Requirement** (GPM)	Duration (HRS)	Required Fire Flow Storage (MG)
Zone 1	Kelley	Commercial	1625	3	0.29
Zone 1	Pederson/Willow Lane	Commercial	4000	4	0.96
Zone 1	Ventu Park	Commercial	4000	4	0.96
Zone 2	Freeway/La Granada	Commercial	4000	4	0.96
Zone 2	Meadows	Commercial	4000	4	0.96
Zone 2	Tara	Elementary School	4000	4	0.96
Zone 2	Rolling Oaks	Low Density Residential	1250	2	0.15
Zone 2	Lang Ranch/Sunset No.2	Intermediate School	4000	4	0.96
Zone 2	Wilder	Elementary School	4000	4	0.96
Zone 3	Grissom No. 1/Grissom No.2	Low Density Residential	1250	2	0.15
Zone 3	Oakbrook/Sunset No.3	High Density Residential	3000	3	0.54

*Based on Thousand Oaks General Plan Land Use boundaries, critical land use within service area.

**From UFC Table A-III-A-1, with assumed fire areas.

3. Available Regulatory Storage

The available regulatory storage within each service zone is determined by subtracting the required fire flow storage determined in Table VII-2 from the operational storage determined in Table VII-1. Refer to Table VII-3 for the available regulatory storage.

Table VII-3
Available Regulatory Storage

Billing Zone	Service Area Zone	Operational Storage (MG)	Required Fire Flow Storage (MG)	Available Regulatory Storage (MG)
Zone 1	Kelley	0.52	0.29	0.23
Zone 1	Pederson/Willow Lane	7.11	0.96	6.15
Zone 1	Ventu Park	3.30	0.96	2.34
Zone 2	Freeway/La Granada	4.71	0.96	3.75
Zone 2	Meadows	3.16	0.96	2.20
Zone 2	Tara	3.74	0.96	2.78
Zone 2	Rolling Oaks	0.31	0.15	0.16
Zone 2	Lang Ranch/Sunset No.2	5.60	0.96	4.64
Zone 2	Wilder	0.91	0.96	-0.05
Zone 3	Grissom No. 1/Grissom No.2	0.39	0.15	0.24
Zone 3	Oakbrook/Sunset No.3	2.85	0.54	2.31
TOTAL		***32.60***	***7.79***	

4. Existing Reservoir Capacity Evaluation – Current (2004) Criteria

To determine if a reservoir's storage capacity is adequate or deficient based on the existing water demand, the "required" regulatory storage was subtracted from the "available" regulatory storage (as listed in Table VII-3). The current (2004) City reservoir sizing criteria identifies the "required" regulatory storage as 80% of maximum day demand. Table VII-4 evaluates whether the "available" regulatory storage identified in Table VII-3 is adequate to meet the "required" regulatory storage of 80% maximum day demand.

Table VII-4
Capacity Evaluation – Current (2004) Design Criteria

Billing Zone	Service Area Zone	Available Regulatory Storage (MG)	Existing Maximum Day Demand (GPM)	Required Regulatory Storage (80% of max day demand, MG)	Excess or Deficient Capacity (MG)
Zone 1	Kelley	0.23	100.23	0.12	0.12
Zone 1	Pederson/Willow Lane	6.15	2538.07	2.92	3.23
Zone 1	Ventu Park	2.34	783.27	0.90	1.44
Zone 2	Freeway/La Granada	3.75	887.61	1.02	2.73
Zone 2	Meadows	2.20	831	0.96	1.24
Zone 2	Tara	2.78	786	0.91	1.87
Zone 2	Rolling Oaks	0.16	86.1	0.10	0.06
Zone 2	Lang Ranch/ Sunset No.2	4.64	1642	1.89	2.75
Zone 2	Wilder	-0.05	598.17	0.69	**-0.74**
Zone 3	Grissom No. 1/Grissom No.2	0.24	148.56	0.17	0.07
Zone 3	Oakbrook/Sunset No.3	2.31	1374.06	1.58	0.72

5. Reservoir Capacity Evaluation – Recommended Criteria

The storage capacity for each service area zone was re-evaluated based on the recommended storage criteria, where total storage is defined as one maximum day demand plus the critical fire flow. Table VII-5 evaluates whether the "available" regulatory storage identified in Table VII-3 is adequate to meet the "required" regulatory storage of 100% maximum day demand.

Table VII-5
Capacity Evaluation – Recommended Criteria

Billing Zone	Service Area Zone	Available Regulatory Storage (MG)	Existing Maximum Day Demand (GPM)	Required Regulatory Storage (100% max day demand, MG)	Excess or Deficient Capacity (MG)
Zone 1	Kelley	0.23	100.23	0.14	0.09
Zone 1	Pederson/Willow Lane	6.15	2538.07	3.65	2.50
Zone 1	Ventu Park	2.34	783.27	1.13	1.21
Zone 2	Freeway/La Granada	3.75	887.61	1.28	2.47
Zone 2	Meadows	2.20	831	1.20	1.00
Zone 2	Tara	2.78	786	1.13	1.65
Zone 2	Rolling Oaks	0.16	86.1	0.12	0.03
Zone 2	Lang Ranch/ Sunset No.2	4.64	1642	2.36	2.27
Zone 2	Wilder	-0.05	598.17	0.86	**-0.91**
Zone 3	Grissom No. 1/Grissom No.2	0.24	148.56	0.21	0.03
Zone 3	Oakbrook/Sunset No.3	2.31	1374.06	1.98	0.33

6. Reservoir Capacity Evaluation – Future Demand Requirements

The existing storage capacity was then evaluated based on the projected ultimate demand and the recommended storage criteria. Table VII-6 shows the future excess or deficient storage in each service area zone.

Table VII-6
Capacity Evaluation – Future Demand Storage Requirements

Billing Zone	Service Area Zone	Available Regulatory Storage (MG)	Future Maximum Day Demand (GPM)	Future Required Regulatory Storage (100% max day demand, MG)	Excess or Deficient Capacity (MG)
Zone 1	Kelley	0.23	139.85	0.20	0.03
Zone 1	Pederson/Willow Lane	6.15	2723.97	3.92	2.23
Zone 1	Ventu Park	2.34	1160.55	1.67	0.67
Zone 2	Freeway/La Granada	3.75	1154.74	1.66	2.09
Zone 2	Meadows	2.20	877.81	1.26	0.94
Zone 2	Tara	2.78	824.72	1.19	1.59
Zone 2	Rolling Oaks	0.16	110.95	0.16	0.00
Zone 2	Lang Ranch/ Sunset No.2	4.64	1668.43	2.40	2.23
Zone 2	Wilder	-0.05	639.30	0.92	**-0.97**
Zone 3	Grissom No. 1/Grissom No.2	0.24	155.28	0.22	0.02
Zone 3	Oakbrook/Sunset No.3	2.31	1427.70	2.06	0.25

D. WATER SYSTEM EXPANSION - STORAGE REQUIREMENTS

There are two areas, known as the Skyline Area and Upper Kelley Estates, within the City's service boundary that will require an expansion of the water distribution system when the areas get developed. The existing City distribution system does not extend to either of these proposed areas. Both areas and will require a reservoir to provide the required regulatory and fire flow storage, a pump station to fill the reservoirs, and pipelines to distribute the water.

There is no anticipated date when these developments will be constructed. This Master Plan evaluated preliminary reservoir sizes and HGL's. When more detailed plans are available for the proposed developments, it is recommended that sub-area master plans be prepared for each of these areas to determine the size of the required facilities.

Preliminary calculations, based on the recommended storage criteria and ultimate water demand as detailed in Section IV-C, determined that the following storage facilities are required:

Skyline = 0.25 MG
Upper Kelley Estates = 0.20 MG

E. CONCLUSIONS AND RECOMMENDATIONS

The results of the existing system storage capacity evaluation indicate that the Wilder Service Area Zone is deficient in capacity. Based on the future demands for the Wilder Zone, the zone will require an additional 1.0 MG of storage. An additional reservoir in the Wilder Zone will also provide redundancy in that zone.

Ultimately, two (2) new reservoirs will need to be constructed to accommodate the future Upper Kelley Estates and Skyline Area developments.

The following projects are recommended as a part of this Master Plan Report:

Existing System Storage Improvement

- Construct a 1.0 MG Wilder No. 2 Reservoir to provide storage and redundancy to the Wilder Service Area Zone.

Water System Expansion Storage Improvements

- Construct a 0.20 MG reservoir to meet fire flow requirements and future maximum day demands of the Upper Kelley Estates.
- Construct a 0.25 MG reservoir to meet fire flow requirements and future maximum day demands of the Skyline Area.

VIII - Water Supply Analysis

VIII. WATER SUPPLY ANALYSIS

A. INTRODUCTION

This section evaluates the City's existing imported water supply capacity to determine if it is adequate to meet the future demands of the City. This section will also evaluate some operational changes which may be required to offset proposed billing rate modifications by CMWD.

B. WATER SUPPLY ADEQUACY

Ten turnout connections to the CMWD transmission system provide all of the water supply to the City's distribution system. The hydraulic gradient at the ten turnouts are similar to hydraulic gradients of the City's system. Seven of the turnouts gravity feed directly into the distribution system, while three of the turnouts provide water supply at a lower gradient to City pump stations, which boosts the water to the required hydraulic gradient.

The Public Utilities Commission of the State of California (Section III.4 of General Order 103) states that "the quantity of water delivered to the distribution system should be sufficient to supply adequately, dependably and safely the total requirements of all customers under maximum consumption." Therefore, the criteria established for this analysis is that turnout capacities must be adequate to meet the maximum day demand.

The analysis first established the turnouts (or combination of turnouts) that supply the service area zones. The future maximum day demand for those service area zones was then compared to the rated capacities of the turnouts (or combination of turnouts). A summary of the results of this analysis is shown in Table VIII-1.

Table VIII-1
Water Supply vs. Future Demand by Service Area Zones

Turnout Name	Service Area Zones Supplied from Turnout	Combined Turnout Capacity (GPM)	Combined Service Area Zones Future Maximum Day Demand (GPM)	Turnout Capacity Adequate (Capacity>Demand)
NEWBURY PARK				
West Kelley	Kelley Kelley Hydro	2,000	516	OK
Ventu Park	Ventu Ventu Hydro	2,000	1,302	OK
MAIN THOUSAND OAKS				
Del Sol Lindero	Lang/Sunset 2 Reduced Minnecota Oakbrook/Sunset 3 Reduced Lang Ranch Sunset Hydro	9,000 [1]	3,384	OK
Encino Vista Gainsborough Hillcrest Las Flores Los Arboles Lone Oak	Pederson/Willow Rolling Oaks Tara Freeway/La Granada	15,250	4,950	OK
Lindero	Meadows	2,000 [1]	871	OK
Lone Oak	Wilder Grissom Reduced Sapra Grissom Hydro	2,000	871	OK

[1] The Lindero and Del Sol Turnouts provide supply directly to pump stations. The capacity of the pump stations are less than the rated capacity of the turnouts, therefore the turnouts should never supply the full rated capacity.

The rated capacities of the turnouts are sufficient to meet the future maximum day demands within each service area zone. Further evaluation and analysis indicated that the hydraulic gradient and the capacity of the Ventu Park turnout is adequate to meet the future maximum day demands of both the Kelley service area zones and the Ventu service area zones. If operation of the Lynn Road emergency PRV is converted to a regularly operating valve, the City can supply the entire Newbury Park area from the Ventu Park turnout. This operational change will allow for greater water circulation through the system thus providing better water quality and may have some cost savings due to reduced energy usage.

An additional analysis indicated that there are five turnouts, with a combined capacity of 13,500 gpm that gravity feed into the Pederson/Willow Service Area Zone. The system was evaluated to determine if all five turnouts that feed into the Pederson/Willow zone are required. There is potential to minimize the usage of those turnouts and provide the City with better water circulation, better water quality, reduced energy costs and reduced operations and maintenance man-hours. An analysis determined that the system can meet all flow and pressure requirements under a future maximum day demand condition with the Encino Vista turnout taken off-line. This operational change will allow for greater water circulation through the system, generate some cost savings due to reduced energy usage, allow for easier management of the supply and reduce the operational and maintenance time required for supply facilities.

C. CMWD PEAKING ANALYSIS

Within the next couple of years, CMWD is planning improvements to all of their turnout facilities in order to implement a new billing system for their customers. The proposed billing system will alter the method in which CMWD assess the "Capacity Reservation Charge." Currently, the capacity reservation charge is a fixed fee that is assessed based on the calculated average flow rate used by a member agency (i.e. City of Thousand Oaks) during the peak week of the previous 12-month window. CMWD is currently in the process of upgrading the metering and SCADA capabilities at all of their turnouts in order to be able to continuously monitor flowrates. The proposed billing system will assess the capacity reservation charge based on the peak hour flow rate demanded by the member agency. The proposed billing system is intended to penalize CMWD customers that utilize the CMWD transmission system to meet their peak demands (rather than using their own reservoir storage to meet the peak demands). CMWD is hoping the proposed billing system will minimize the demand fluctuations impacting their system, therefore providing a more reliable system.

The new assessment of the "Capacity Reservation Charge" may result in the City paying a higher fee to CMWD. Peaking off of the CMWD system by using turnouts as the supply source to meet the peak demands, instead of relying on the City's reservoir storage, will result in higher capacity reservation charges imposed by CMWD. Modifying the City's system operation to reduce potential peaking off the CMWD system will not, in turn, increase the energy costs. Therefore, an analysis was conducted, using the hydraulic model, to evaluate if the operation of the City's supply system can be adjusted to minimize the CMWD capacity reservation charge as well as minimize facility operation during times of on-peak energy rates. The hydropneumatic pumps were not included in this analysis because their operation is dependent upon the demand of the service area zone they supply and not the time of

day. The analysis evaluated the system operation during a maximum day demand under the following two alternatives:

Alternative 1: Avoid Turnout Operation during CMWD and SCE Peak Times

This alternative assumes that CMWD will prefer to have their customers adjust the system operation to avoid drawing water during the expected peak time of the day. For this analysis, it is assumed that the CMWD peak windows are from 5-10 AM and 6-10 PM.

The purpose of this alternative is to determine if the City distribution system can adequately meet demands while minimizing turnout operation during the expected CMWD peaking times, 5-10 AM and 6-10 PM. This alternative will also evaluate minimizing the turnout and pump station operation during the on-peak energy time window, 1-5 PM.

Seven of the City's ten turnouts gravity feed directly into the City's distribution system. The gravity fed turnouts provide the City with flexibility to supply water into reservoirs without requiring pumping, thus avoiding SCE peak charges. The remaining three turnouts require boosting from the turnout. In order to maximize the efficiency of the system and minimize the costs to the City, the distribution system's operation must be optimized in the following manner:

- Minimize turnout usage during the proposed CMWD peaking times at all turnouts; 5-10 AM and 6-10 PM
- Minimize pumping during on-peak SCE hours at all pump stations (except hydropneumatic stations); 1-5 PM
- Fill all reservoirs by 5 AM and 1 PM
- Utilize HGL provided by CMWD system

This analysis required utilization of the hydraulic model to determine if the existing distribution system has adequate storage and transmission capacity to meet the future maximum day demands while supply from CMWD was shutdown during the peak CMWD and energy windows. Essentially, all supply was turned off during the peak CMWD windows and all pump stations were turned off during the peak SCE window.

This analysis evaluated whether the reservoirs could be filled during the non-peak windows and whether future maximum day demands could be met from existing storage.

Alternative 2: Draw Constant Flowrate From CMWD Turnouts

This alternative assumes that the City will draw a constant flow rate from the CMWD system in order to benefit the region as a whole. This alternative evaluated whether the City distribution system could operate at a 24-hour constant flow from the CMWD turnouts. The evaluation consisted of simulating the future maximum day demand condition and adjusting the flow rates provided through the turnouts to determine the minimum constant flow required to replenish all reservoirs on a daily basis while meeting demands, maintaining minimum required pressures and adequate emergency storage. The City must monitor its seasonal demands and adjust the constant flow rate from the turnouts in an appropriate manner.

A constant flow rate can be provided at the seven turnouts that gravity feed directly into the City's distribution system. The gravity feed turnouts provide the City with flexibility to operate the turnouts at a constant flow rate without pumping (in case of seasonal demand changes, the City must monitor demands and adjust the flow accordingly). It is difficult to provide a constant flow rate from the three turnouts which provide direct suction to pump stations since the turnouts must supply what the pump station demands. However, since each of these pump stations boost to reservoirs, the reservoirs should be used to meet peak demands and allow for the pumping to be smoothed out over the course of the day but still minimizing usage during the on-peak energy windows. In order to maximize the efficiency of the system and minimize the costs to the City, the distribution system's operation must be optimized in the following manner:

- Set constant flow rates to replenish tanks every day
- Fill tanks at low demand hours
- Utilize HGL provided by CMWD system
- Monitor seasonal demands and adjust turnout flow rates accordingly
- Minimize pump station operation during on-peak energy times, 1-5 PM

Essentially, the combined flow through the turnouts over a 24-hour period should equal the daily demand. The flow rates provided through the seven gravity feed turnouts should be constant over a 24-hour period. The flow rates provided as suction to a pump station should be constant over a 20-hour period (dormant during on-peak energy hours from 1-5 PM).

D. CONCLUSIONS AND RECOMMENDATIONS

1. Water Supply Adequacy Conclusions

The water supply adequacy analysis concluded that the City has adequate capacity at the CMWD turnouts to meet the future maximum day demands and no additional capacity will be required. The analysis also indicated there may be a couple of opportunities to reduce the usage at two of the turnouts under the current and future demand conditions. The analysis indicated that the following two operational changes may provide some cost savings to the City:

- The Ventu Park turnout has the capacity and hydraulic gradient to provide adequate supply to both the Kelley zones and Ventu zones on a continual basis to meet the maximum day demand. In order to supply the Kelley zone from the Ventu zone, the Lynn Road emergency PRV must be converted to a regularly operating valve. The pressure setting will need to be adjusted to ensure adequate filling of the Kelley reservoir. This operational change will allow for greater water circulation through the system thus providing better water quality and may have some cost savings due to reduced energy usage. It is recommended that the City maintain the West Kelley turnout for supply flexibility, future use and emergency use.

- There are five turnouts, with a combined capacity of 13,500 gpm that gravity feed into the Pederson/Willow Service Area Zone. The system was evaluated to determine if all five turnouts that feed into the Pederson/Willow zone are required. There is potential to minimize the usage of those turnouts and provide the City with better water circulation, better water quality, reduced energy costs and reduced operations and maintenance man-hours. An analysis determined that the system can meet all flow and pressure requirements under a future maximum day demand condition with the Encino Vista turnout taken off-line.

2. CMWD Peaking Analysis Conclusions

The basic conclusion of the CMWD peaking analysis is that the City has the operational flexibility within its distribution system (primarily adequate storage) to modify the operation of the supply to reduce peaking off of the CMWD system while minimizing the SCE costs. The conclusions of the two CMWD peaking analysis alternatives are described below:

Alternative 1: Avoid Turnout Operation during CMWD and SCE Peak Times

The City distribution system is capable of meeting the future maximum day demands from storage while supply is shutdown during the peak CMWD window. The system will also have available emergency storage in the reservoirs to provide fire flows. In addition, the City has the operational flexibility to minimize operation of the pump stations during the on-peak energy window as well.

The analysis indicated that under the future maximum day demand, the daily supply provided through the Ventu Park turnout is slightly less than that required to meet the maximum day demand. However, Ventu Park has adequate storage to meet the future maximum day demand.

Refer to the attached Table VIII-3 for a summary of the Alternative 1 analysis.

Alternative 2: Draw Constant Flowrate From CMWD Turnouts

The City distribution system is capable of taking a constant flow rate through the turnouts. The results of the analysis indicate that under the future maximum day demand condition, the City will require a combined constant flow of approximately 13,000 gpm from the turnouts to meet the future maximum day demands and replenish the reservoirs. Refer to the attached Table VIII-3 for a more detailed breakdown of the results of this analysis.

As seasonal demands vary, the constant flow required from CMWD will vary as well. The City's operations department must monitor the seasonal demands and reservoir levels to adjust the supply accordingly. In addition, the City should closely monitor the water levels in all reservoirs to ensure adequate turnover is being accomplished in each reservoir.

3. Recommendations

The following projects and/or operational changes are recommended as a result of this analysis:

- Convert the Lynn Road emergency PRV to a regularly operating valve and adjust the pressure settings to allow filling of the Kelley reservoir. Shut-off the West Kelley turnout and operate the Ventu Park turnout as the sole supply source to the Newbury Park area. Maintain the West Kelley turnout to be used in an emergency condition or as a back up to the Ventu Park turnout. This operational change will improve overall system efficiency, allow for better management of the supply source, reduce energy costs, provide better water circulation, and reduce operations and maintenance time.

- Shut-off the Encino Vista turnout. This operational change will improve overall system efficiency, allow for greater water circulation through the system, generate some cost savings due to reduced energy usage, allow for easier management of the supply and reduce the operational and maintenance time required for supply facilities. The Encino Vista turnout should be maintained for emergency usage.
- The operation of the Lindero, Lone Oak and Del Sol turnouts should be adjusted to minimize operation during the on-peak energy windows. This operational change will reduce the energy costs at the Lone Oak, Erbes Road and Sunset No. 1 pump stations.
- The City should closely monitor the proposed Capacity Reservation Charges to be implemented by CMWD. When CMWD implements the new billing system, the City should adjust the operation of their supply system accordingly to reduce the peaking charges imposed by CMWD.

Table VIII-2
CMWD Peaking Analysis Results - Alternative 1

Turnouts	Turnout Capacity (gpm)	Service Area Zones Fed From Turnout	Future Max Day Demand (gpm)	Future Max Day Demand (gpd)	Turnout Hours of Operation [1]	Max Daily Supply Available (gal)	Is Max Daily Supply > Future Max Day Demand?
Gravity Feed Turnouts							
West Kelley	2,000	Kelley	151	217,440			
		Kelley Hydro	373	537,120			
			524	*754,560*	15	1,800,000	Yes
Ventu Park	2,000	Ventu	1,215	1,749,600			
		Ventu Hydro	81	116,640			
			1,296	*1,866,240*	15	1,800,000	No
Hillcrest	2,500	Pederson/Willow	2,833	4,079,520			
Gainsborough	2,500	Rolling Oaks	110	158,400			
Las Flores	3,000	Tara	848	1,221,120			
Los Arboles	3,000	Northwood Booster	94	135,360			
Encino Vista	2,500	Freeway/La Granada	1,155	1,663,200			
subtotal	*13,500*		*5,040*	*7,257,600*	15	12,150,000	Yes
Pump Station Supply Turnouts							
Lone Oak	3,500	Wilder	644	927,360			
		Grissom	157	226,080			
		Grissom Hydro	47	67,680			
		Reduced Sapra	16	23,040			
subtotal			*864*	*1,244,160*	11	2,310,000	Yes
Lindero	6,000	Meadows	872	1,255,680			
Del Sol	5,000	Lang Ranch/Sunset #2	1,666	2,399,040			
		Oakbrook/Sunset #3	1,437	2,069,280			
		Sunset Hydro	39	56,160			
		Reduced Lang Ranch	220	316,800			
		Reduced Minnecota	24	34,560			
subtotal	*11,000*		*4,258*	*6,131,520*	11	7,260,000	Yes

Downstrean Reservoirs		Off-Peak Max Day Demand		
Name	Operational Storage (gal)	(gpm)	(gpd)	Remaining Storage (gal)
Kelley	520,000	151	81,540	
		373	201,420	
		524	*282,960*	237,040
Ventu Park	3,300,000	1,215	656,100	
		81	43,740	
		1,296	*699,840*	2,600,160
Pederson	2,670,000	2,833	1,529,820	
Rolling Oaks	310,000	110	59,400	
Tara	3,740,000	848	457,920	
Freeway	940,000	94	50,760	
La Granada	3,770,000	1,155	623,700	
	11,430,000	*5,040*	*2,721,600*	8,708,400
Wilder	910,000	644	347,760	
Grissom #1	200,000	157	84,780	
Grissom #2	200,000	47	25,380	
		16	8,640	
	1,310,000	*864*	*466,560*	843,440
Meadows	3,160,000	872	470,880	
Lang Ranch	4,640,000	1,666	899,640	
Oakbrook	2,130,000	1,437	775,980	
Sunset #3	710,000	39	21,060	
Sunset #2	960,000	220	118,800	
		24	12,960	
	11,600,000	*4,258*	*2,299,320*	9,300,680

[1] All turnouts are completely shut-off during peak CMWD hours, 5-10 AM and 6-10 PM.
Pump Station supply turnouts are also completely shut-off during peak energy hours, 1-5 PM.

Table VIII-3
CMWD Peaking Analysis Results - Alternative 2

Turnouts	Turnout Capacity (gpm)	Service Area Zones	Future Max Day Demand (gpm)	Future Max Day Demand (gpd)	Downstrean Reservoirs Name	Downstrean Reservoirs Operational Storage (gal)	Turnout Hours of Operation [1]	Constant Flowrate Required	Can Turnout(s) Supply Constant Flowrate?
Gravity Feed Turnouts									
West Kelley	2,000	Kelley	151	217,440	Kelley	520,000			
		Kelley Hydro	373	537,120					
			524	*754,560*			24	524	Yes
Ventu Park	2,000	Ventu	1,215	1,749,600	Ventu Park	3,300,000			
		Ventu Hydro	81	116,640					
			1,296	*1,866,240*			24	1,296	Yes
Hillcrest	2,500	Pederson/Willow	2,833	4,079,520	Pederson	2,670,000			
Gainsborough	2,500	Rolling Oaks	110	158,400	Rolling Oaks	310,000			
Las Flores	3,000	Tara	848	1,221,120	Tara	3,740,000			
Los Arboles	3,000	Northwood Booster	94	135,360	Freeway	940,000			
Encino Vista	2,500	Freeway/La Granada	1,155	1,663,200	La Granada	3,770,000			
subtotal	*13,500*		*5,040*	*7,257,600*		*11,430,000*	24	5,040	Yes
Pump Station Supply Turnouts									
Lone Oak	3,500	Wilder	644	927,360	Wilder	910,000			
		Grissom	157	226,080	Grissom #1	200,000			
		Grissom Hydro	47	67,680	Grissom #2	200,000			
		Reduced Sapra	16	23,040					
subtotal			*864*	*1,244,160*		*1,310,000*	20	1,037	Yes
Lindero	6,000	Meadows	872	1,255,680	Meadows	3,160,000			
Del Sol	5,000	Lang Ranch/Sunset #2	1,666	2,399,040	Lang Ranch	4,640,000			
		Oakbrook/Sunset #3	1,437	2,069,280	Oakbrook	2,130,000			
		Sunset Hydro	39	56,160	Sunset #3	710,000			
		Reduced Lang Ranch	220	316,800	Sunset #2	960,000			
		Reduced Minnecota	24	34,560					
subtotal	*11,000*		*4,258*	*6,131,520*		*11,600,000*	20	5,110	Yes

[1] All gravity feed turnouts are running all day long.
Pump Station supply turnouts are completely shut-off during peak energy hours, 1-5 PM.

IX - Pump Station Analysis

IX. PUMP STATION ANALYSIS

A. INTRODUCTION

In order to provide adequately pressurized water to the City's customers and to fill the reservoirs located at higher gradients than that of the CMWD system, pump stations are required.

This section will evaluate the following three items in regards to the existing pump stations and existing operations:

- Energy Usage
- Existing/Future Pumping Capacity
- Redundancy

B. ENERGY ANALYSIS

Pumping stations require energy to operate, and energy costs money. This analysis utilized the calibrated hydraulic model to determine if the City can utilize different rate structures in order to achieve a more energy-efficient operation at the pump station.

Southern California Edison (SCE) is the energy provider for the City. SCE has developed several rate schedules that apply charges based on varying energy demands and time of usage. Details of each rate schedule were obtained from SCE, last revised March 2002, and are described below. The City's energy billing data was used to analyze and evaluate pump schedule efficiency for each pump station. The hydraulic model evaluated the efficiencies of the pump stations at each rate schedule to find the most cost effective plan. The analysis process is as follows:

1. Input current rate schedules into the model and run the energy management tool under current operating schedules.
2. Compare the model output data to actual SCE bills.
3. Re-analyze the hydraulic model using different rate structures at each pump station.
4. Review SCE bills and SCADA data.
5. Make recommendations for pump station operating hours and rate structures.

1. Existing Rate Schedules

SCE offers a selection of rate schedules that are based on demand usage, peak pumping and connected load. Seven common rate schedules implemented by SCE that are pertinent to the City's operating system, effective March 2002, are listed below and were used in the pump station energy analysis.

- GS-1
- PA-1
- PA-2
- TOU-PA-A
- TOU-PA-B
- TOU-PA-SOP
- TOU-PA-SOP-1

GS-1 and PA-1 are flat-based rates that are based on the maximum daily demand. The remaining five rate schedules have a time related component and either a facilities related component or the amount of connected load. The time-of-use based rates have peaking times between 5-10 am and 6-10 pm. The current SCE rate schedule for the City's pump stations are listed in Table IX-1.

Table IX-1
Current Rate Structure

Pump Station	SCE Rate Structure
Erbes Road	TOU-PA-SOP-1
Kelley Road	GS-1
Lang Ranch	PA-1
Lone Oak	TOU-PA-SOP-1
Los Arboles	PA-1
Northwood Booster	GS-1
Pederson	TOU-PA-SOP-1
Rolling Oaks	PA-1
Sunset No. 1	TOU-PA-SOP-1
Sunset No. 2	TOU-PA-SOP-1
Sunset No. 3	GS-1
Ventu Park	PA-1
Wilder	TOU-PA-SOP-1
Willow Lane	TOU-PA-SOP-1

The existing rate schedules were analyzed using the calibrated hydraulic model. Results of the model were compared to actual energy billing data. Based on the results of the model, various rate schedules were analyzed at each pump station to determine the optimal schedule.

2. Rate Schedule Recommendations

Each rate schedule was applied to each pump station to determine if a different schedule would better match the pump station's typical usage. Based on the typical pump station operation, flow rate and hydraulic model results, the ideal rate schedule was determined. Most of the pump stations were found to be running on an efficient and cost effective rate schedule. Four pump stations are recommended to switch to a more cost effective rate plan that may better fit the pump station's usage profile. The recommended pump station rate schedules can be seen in Table IX-2.

Table IX-2
Recommended Rate Structure

Pump Station	Maximum Monthly Demand (kWh) [1]	Current Rate Structure	Recommended Rate Structure	Projected Monthly Cost Savings
Erbes Rd	284	TOU-PA-SOP-1	TOU-PA-SOP-1	-
Grissom	Not provided	PA-1	PA-1	-
Kelley	Not provided	GS-1	PA-1	$ 1,282
Lang Ranch 4A	112	PA-1	PA-1	-
Lone Oak	156	TOU-PA-SOP-1	TOU-PA-SOP-1	-
Los Arboles	85	PA-1	PA-1	-
Northwood Booster	8	GS-1	PA-1	$ 252
Pederson	122	TOU-PA-SOP-1	TOU-PA-SOP-1	-
Rolling Oaks	32	PA-1	PA-1	-
Sunset No. 1	216	TOU-PA-SOP-1	TOU-PA-SOP-1	-
Sunset No. 2	69	TOU-PA-SOP-1	TOU-PA-SOP-1	-
Sunset No. 3	10	GS-1	PA-1	$ 335
Ventu Park	16	PA-1	PA-1	-
Wilder	67	TOU-PA-SOP-1	TOU-A	$ 824
Willow Lane	84	TOU-PA-SOP-1	TOU-PA-SOP-1	-
			Total Projected Monthly Cost Savings:	**$ 2,693**

The recommended rate schedules are based on the existing operation of the system. When CMWD implements the new billing schedule, it is recommended that the City conduct a revised analysis based on the revised operation of their system.

[1] Per January 2003-December 2003 SCE electric bills

C. SCE HYDRAULIC TEST RESULTS

In 2004, SCE performed pump tests for each of the City's pump stations, documenting pump efficiencies, providing a Pumping Cost Analysis and recommendations for improving the pump efficiency. According to SCE, a pump is considered efficient if the overall efficiency is 70% or more. The results of the pump tests are summarized in Table IX-3. The annual cost savings, calculated by SCE, are based only on increasing efficiency with the current pump rate schedule. Increasing the efficiency will allow the pump to run for shorter periods of time and as a result less energy usage.

Table IX-3
SCE Hydraulic Pump Test Results

Pump Station Name	Pump #	Efficiency	Increased Efficiency to 70% Estimated Cost Savings
Erbes Road	1, 2, 4	<70%	$ 6,967
	3	OK	-
Grissom Hydro	1, 2	<70%	$ 678
Kelley Hydro	1, 2	OK	-
Lang Ranch	1, 2	OK	-
Lone Oak (Freeway)	2	OK	-
Lone Oak (Wilder)	1, 2, 3	OK	-
Los Arboles	1, 2	OK	-
Northwood Booster	1, 2	<70%	$ 1,485
Pederson	1, 2, 3	OK	-
Rolling Oaks	1, 2	OK	-
Sunset No. 1	1, 2, 3	OK	-
Sunset No. 2	1	OK	-
Sunset No. 3 Hydro	1, 2	OK	-
Ventu Park Hydro	1, 2, 3	OK	-
Wilder	1 2	OK	-
Willow Lane	1, 2, 3	OK	-
Estimated Total Annual Cost Savings			**$ 9,130**

D. EXISTING/FUTURE CAPACITY EVALUATION

The City has a total of fifteen existing pump stations. The pump stations were evaluated to determine if the existing capacity is adequate to pump existing and future demands. The criteria established for this analysis is that each pump station must meet the ultimate maximum day demand of the service area zones while the largest pump is out-of-service. The results of the analysis are shown on Table IX-4.

Table IX-4
Pump Station Capacity Evaluation

Billing Zone	Service Area Zone	Future Max Day Demand (GPM)	Pump Station Serving Zone	Total Pump Station Capacity (GPM)	Pump Criteria Capacity (GPM)[1]	Capacity Adequacy (Criteria Capacity > Demand)
NEWBURY PARK						
1	Kelley	148	*N/A*	-	-	N/A
1	Ventu	1,216	*N/A*	-	-	N/A
2	Kelley Hydro	368	Kelley Booster	1,350	650	OK
2	Ventu Hydro	85	Ventu Booster	1,000	450	OK
MAIN THOUSAND OAKS						
1	Pederson/Willow	2,837	*N/A*	-	-	N/A
2	Freeway/La Granada	1,153	Willow Lane Lone Oak	2,250 1,750	1,500 1,200	OK
2	Meadows	871	Erbes Rd	1,650	0	Deficient
2	Tara	848	Pederson	3,650	2,400	OK
2	Rolling Oaks	112	Rolling Oaks	400	200	OK
2	Lang/Sunset2 Reduced Minnecota	1,687	Erbes Rd Sunset No.1	3,750 3,500	1,250 2,100	OK
2	Wilder	646	Lone Oak	2,000	1,300	OK
3	Grissom Reduced Sapra	175	Wilder	800	400	OK
3	Northwood Booster	94	Northwood Booster	1,000	500	OK
3	Oakbrook/Sunset3 Reduced Lang Ranch	1,656	Los Arboles Lang Ranch Sunset No.2	1,200 1,400 900	600 700 450	OK
4	Grissom Hydro	49	Grissom Hydro	1,100	1,000	OK
4	Sunset Hydro	40	Sunset No. 3 Hydro	1,500	1,000	OK

[1] Pump Criteria Capacity is the total pump capacity with the largest pump out of service.

The Erbes Road Pump Station has one (1) pump dedicated to the Meadows Service Area Zone. The pump station capacity evaluation revealed that the Erbes Road Pump Station, with the largest pump out of service, does not have sufficient capacity to meet the existing and future maximum day demands of the Meadows Service Area Zone. The existing pump has adequate capacity to meet the existing and future maximum day demand of the zone, however if the pump is out-of-service, the Meadows Service Area Zone must rely on an interconnection with the Tara Service Area Zone for emergency supply.

Two new, small pump stations will be required in the future when the Upper Kelley Estates and the Skyline Area are developed. These pump stations will be required to meet the

demands of the service area and fill the proposed reservoirs that will serve the area. Based on the calculated maximum day demand, the pump stations shall be sized with one duty and one stand-by pump that can provide the ultimate maximum day demand. It is also recommended, since these are low demand areas, to provide a higher flow pump that can be used in an emergency situation. Preliminary calculations identify the pump capacities to be as follows:

Upper Kelley Estates Pump Station:	Duty and Stand-by Pumps = 25 gpm Emergency Pump = 200 gpm
Skyline Area Pump Station:	Duty and Stand-by Pumps = 55 gpm Emergency Pump = 200 gpm

It is recommended that a sub-area master plan be performed to evaluate the size of these facilities when more information is available.

E. PUMP STATION REDUNDANCY

As a part of this report, a pump station redundancy analysis was performed. The redundancy analysis consisted of evaluating the pump station supply to the various reservoirs and service areas. The results of the analysis indicate that the Wilder Service Area Zone and subsequent service area zones above Wilder have one supply point, the Lone Oak Pump Station. It is recommended that the City construct a second pump station to provide a redundant supply to the Wilder Service Area Zone and reservoir. The proposed pump station shall be located at the site of the La Granada Reservoir. The La Granada pump station will be sized with one duty and one stand-by pump with a minimum capacity to boost the ultimate demand of the Wilder zone (646 gpm).

In addition, it is recommended that a pump station be constructed to provide back-up supply to the Grissom and Reduced Sapra Service Area Zones. The proposed pump station, the Wilder No. 2 Pump Station, shall be located at the site of the proposed Wilder Reservoir No. 2. The pump station shall include one duty pump and one stand-by pump that each provides a minimum capacity equal to the ultimate maximum day demand of the Grissom and Reduced Sapra Service Area Zones (175 gpm).

F. CONCLUSIONS AND RECOMMENDATIONS

The pump station analysis resulted in the following conclusions:

- The SCE rate structures for the Kelley, Northwood, Sunset #3 and Wilder pump stations shall be changed for economic efficiency.
- The following pumps shall be refurbished or replaced to improve the efficiency above 70%: Erbes Road 1, 2 and 4; Grissom Hydro 1 and 2; Northwood 1 and 2.
- All the pumping stations have adequate capacity to meet the future build out maximum day demands of the City.
- The Erbes Road pump station has only one pump available to boost to the Meadows Service Area Zone, therefore the pump station does not have adequate back-up supply if that pump were to be taken out-of-service. Currently, manually opening an isolation valve that connects the Meadows and Tara zones provides back-up supply to the Meadows Service Area Zone. This allows the Meadows zone to be supplied by the Pederson pump station in the event of an emergency at the Erbes Road pump station. However, it is recommended that an additional pump be installed at the Erbes Road pump station to provide a back-up supply to the Meadows Service Area Zone. The Erbes Road pump station has one vacant pump can (pump no. 5), which can accommodate an additional vertical turbine pump. It is recommended to install an additional pump with 600 gpm capacity so as not to exceed the current capacity of the Lindero turnout. A preliminary design report should be conducted to determine exactly where the new pump should be installed and the piping required (possibly relocate pump No. 2 to pump can No. 5 and install new pump in pump can No. 2).
- Proposed pump stations will be required in the future to supply the Skyline and Upper Kelley Estates areas when they get developed. The developed areas will require the pump station capacities as shown below.

  Skyline: Pump 1 & 2 = 55 gpm
  Pump 3 = 200 gpm

  Upper Kelley: Pump 1 & 2 = 25 gpm
  Pump 3 = 200 gpm

- A pump station shall be constructed at the site of the La Granada Reservoir to provide a secondary source of supply to the Wilder Service Area Zone. The pump station shall consist of two pumps, each with a minimum capacity of 650 gpm.
- A pump station shall be constructed at the site of the proposed Wilder No. 2 reservoir to provide a secondary source of supply to the Grissom and Reduced Sapra Service Area Zones. The pump station shall consist of two pumps, each with a minimum capacity of 175 gpm.

The following projects are recommended as a result of this analysis:

- Upgrade Pumps at Erbes Road, Northwood and Grissom
- Construct the La Granada Pump Station
- Construct the Wilder No. 2 Pump Station
- Install additional 600 gpm pump at Erbes Road Pump Station to supply Meadows Service Area Zone

X - Pipeline Analysis

X. PIPELINE ANALYSIS

A. INTRODUCTION

The City maintains a distribution system that consists of approximately 225 miles of pipeline that vary in size and material. Pipelines are the "veins" of a distribution system. This section will discuss how the use of the GIS data and hydraulic model were utilized to evaluate the pipeline network within the City's distribution system.

When establishing a pipeline replacement program, the following criteria were evaluated:

- Pipeline Age
- Pipeline Size
- Pipeline Material
- Pipeline Velocity

There are several other factors that play an important role in establishing a pipeline replacement program, such as soil corrosivity and pipe break history, that were not available at the time of this study.

B. WATERLINE REPLACEMENT PROGRAM

The City is currently undertaking two replacement programs, the small diameter pipe replacement program and the polybutylene replacement program. A brief description of these programs are as follows:

1. Small Diameter Program

   The City has currently undertaken a program to upsize all 3-inch, 4-inch and 6-inch pipelines to a minimum of 8-inch diameter pipelines. In Section III.2.a of General Order 103, the Public Utilities Commission of California mandates that distribution system pipelines should not be less than 6-inches in diameter. GIS data indicated that the following lengths of small diameter piping still remain in the City's distribution system (as of January 2005).

   3-inch diameter = 50 linear feet
   4-inch diameter = 23,255 linear feet
   6-inch diameter = 367,167 linear feet (excluding all fire hydrant laterals)

2. Polybutylene Program

The City has identified the need to replace service laterals constructed of the material polybutylene. The material has a history of cracking and unreliability. The laterals constructed of this material are being replaced with 1-inch copper service laterals using a slip-lined type replacement method. The polybutylene pipeline replacement is reviewed every 6 months to identify the areas of highest priority. See Appendix B for the areas within the system where polybutylene piping still exists and is scheduled to be replaced.

C. DISTRIBUTION MAIN REPLACEMENT

The hydraulic model was analyzed to determine if any of the existing distribution and transmission pipelines appeared to be undersized. The model was evaluated by simulating a future peak hour demand condition and identifying pipelines with velocities in excess of 10 feet per second. The results of this analysis indicated that there are no pipelines in the system that exceed this criteria, therefore no pipelines were determined to be undersized.

The average age of the pipelines in the City system is 27 years old, with the oldest pipes around 52 years old. Most of the pipe is made of asbestos cement, PVC and steel. The City has expressed an interest in replacing all of the asbestos cement pipe with steel, ductile iron or PVC. The life expectancy of most pipe materials, although theoretically are infinite, are typically assumed to be between 80 and 100 years. Based on the relatively young age of pipelines in the City's system, a wide-scale pipeline replacement program will not be required to begin for another 30 years. For this analysis it is assumed that the minimum pipeline age required for replacement is 80 years old. Based on the date of installation, Figure X-1 depicts the year and length of pipeline that will need to be replaced. Table X-1 summarizes the total length and age of each pipe material in the City's system.

Figure X-1
80-Year Pipeline Life – Replacement Projection

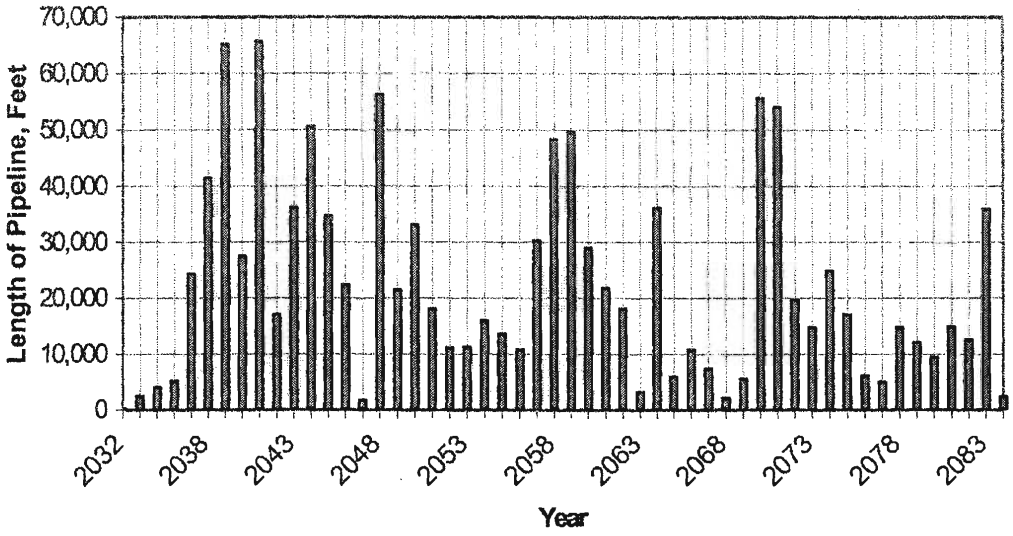


Table X-1
Existing Pipeline Lengths (in feet) by Age and Material

	Asbestos Cement	Brass	Cast Iron	Ductile Iron	Polyvinyl Chloride	Steel	Unknown	Length[1] (feet)	Length (miles)
10 Years	15,105	-	13	461	126,395	4,613	-	***146,587***	***27.8***
20 Years	65,149	-	-	256	120,589	26,418	-	***212,412***	***40.2***
30 Years	226,005	24	30		1,257	15,346	143	***242,807***	***46.0***
40 Years	234,255	-	-	95	2,806	23,521	-	***260,677***	***49.4***
50+ Years	287,227	-	-	-	439	284	560	***288,510***	***54.6***
Unknown	9725	-	-	-	1,879	457	13,537	***25,598***	***4.8***
Totals	837,466	24	43	812	253,366	70,639	14,241	**1,176,591**	**222.8**

The projection of 80-year old pipe shows a large amount to be replaced between the Year 2038 and 2046 and again from Year 2056 to 2060. It is recommended that the City evaluate a comprehensive pipeline replacement program in Year 2025 to streamline the amount of pipeline to be replaced.

[1] Lengths based on GIS calculated lengths.

D. LOOPING ANALYSIS

The looping analysis focused on areas within the system that were identified as having a high water age based on the water age analysis described in Section XIV and areas that are supplied through a single pipeline. The looping analysis examined those areas and explored the potential for looping the system in order to increase circulation, decrease water age and provide redundant and reliable supply sources. Criteria were established to determine the potential connection points for looping of the system. Those criteria are listed below.

- Looping should occur within the same service area zone.
- Looping should be located through existing roads and easements, if possible.
- Looping should avoid major road and freeway crossings.
- Looping should connect to areas of significantly lower water age.

Using the criteria listed above, several areas were identified as possible looping locations. Each of these locations was further evaluated to determine if they are satisfactory looping candidates based on the criteria above. The detailed evaluation identified the following four looping locations:

- Whitechapel Place to Eaglewood Avenue (Atlas Page S19) – The installation of approximately 850 linear feet of 8-inch water line connecting the existing pipelines in Whitechapel and Eaglewood would provide for additional circulation within the Oakbrook/Sunset #3 Service Area Zone and eliminate two dead end mains.
- Rimrock Road to Sundown Road (Atlas Pages I15 & J15) – The installation of approximately 1,500 linear feet of 6-inch water line connecting the existing pipelines in Rimrock Road and Sundown Road will provide for additional looping and significantly improve the reliability of the Rolling Oaks Service Area Zone.
- South Lynn Road and Helga Court (Atlas Page J8) – The installation of approximately 200 linear feet of 8-inch water line near South Lynn Road and Helga Court will improve the water quality and provide a more reliable distribution system in the Kelley Hydro Service Area Zone.
- Corte Cancion (Atlas Page U17) – The installation of approximately 25 linear feet of 6-inch water pipeline and an isolation valve will connect the Oakbrook/Sunset #3 Service Area Zone to the Lang Ranch/Sunset #2 Service Area Zone. This proposed tie-in will provide a back-up supply to the Oakbrook/Sunset #3 Service Area Zone customers located west of the 23 Freeway (which currently are supplied through one pipeline). It should be noted that this tie-in should normally be closed, however in an emergency the Oakbrook/Sunset #3 area can

supplied from the Lang Ranch/Sunset #2 HGL in order to keep water in the pipes (albeit at a lower pressure than normal).

At three of the areas identified in this analysis as looping candidates, property acquisition or easements will be required.

E. FUTURE PIPELINES

The future developments in the Upper Kelley Estates region and the Skyline Area will require extension of the distribution system. A preliminary pipeline layout for the two areas determined that the anticipated piping lengths required for the regions. Piping in the Upper Kelley Estates will be constructed in roads that currently do not exist. Piping in the Skyline Area will be required in Skyline Drive, Conejo Ridge Road, and Manzanita. The anticipated pipeline lengths and diameters are summarized in Table X-2. Exhibit X-1 and Exhibit X-2 shows the anticipated future pipe locations for the Skyline and Upper Kelley Estates areas.

Table X-2
Skyline Area and Upper Kelley Estates Pipeline Lengths

	Pipe Diameter		
	8-inch	**10-inch**	**12-inch**
Skyline Area	6,175 LF	4,175 LF	3,375 LF
Upper Kelley Estates	6,600 LF	0	0

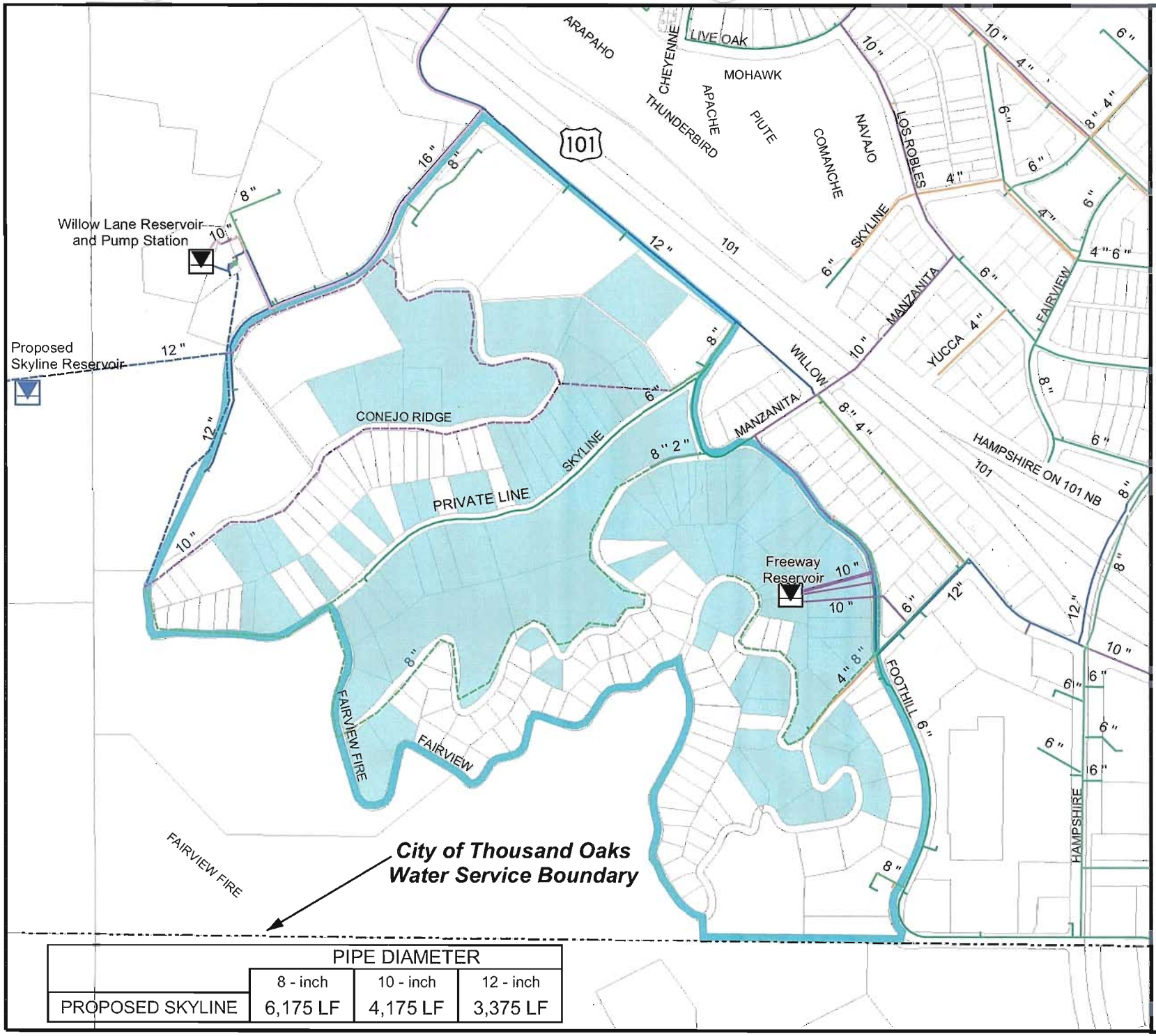
It is recommended that the pipeline layout, diameters and lengths be evaluated with a sub-area master plan when development plans have begun.

F. CONCLUSIONS AND RECOMMENDATIONS

The results of the pipeline analysis using the hydraulic model indicated that there are no pipelines that require upsizing or paralleling. The following conclusions and recommendations resulted from this analysis:

- The City shall continue the program to replace all 3-inch, 4-inch and 6-inch pipelines with a minimum of 8-inch pipeline.
- The City shall continue with the program to replace all polybutylene pipe with 1-inch copper service laterals using a slip-lined type replacement method.
- The City shall implement a flushing program to improve water circulation and water quality.

- Once planning begins for development of the Skyline Area and Upper Kelley Estates, it is recommended that the City administer a sub-area master plan of the areas to verify the size, location and length of he pipes.
- Pipeline looping is recommended at the following four locations:
  - Whitechapel Place to Eaglewood Avenue (Atlas Page S19)
  - Rimrock Road to Sundown Road (Atlas Pages I15 & J15)
  - South Lynn Road and Helga Court (Atlas Page J8)
  - Corte Cancion (Atlas Page U17)



	PIPE DIAMETER		
	8 - inch	10 - inch	12 - inch
PROPOSED SKYLINE	6,175 LF	4,175 LF	3,375 LF

CITY OF THOUSAND OAKS

SKYLINE AREA

*Proposed piping is only preliminary and will require a detailed analysis to be done in a Sub-Area Master Plan.

Water Service Boundary
Skyline Boundary
Parcels Requiring Water Service

Existing Pipes

2" 8"
3" 10"
4" 12"
5" 14"
6" 16"

Proposed Pipes

8"
10"
12"

Total Vacant Lots	98
Total Vacant Acreage	52.22

0 250 500

SCALE IN FEET

RBF GIS

EXHIBIT X-1

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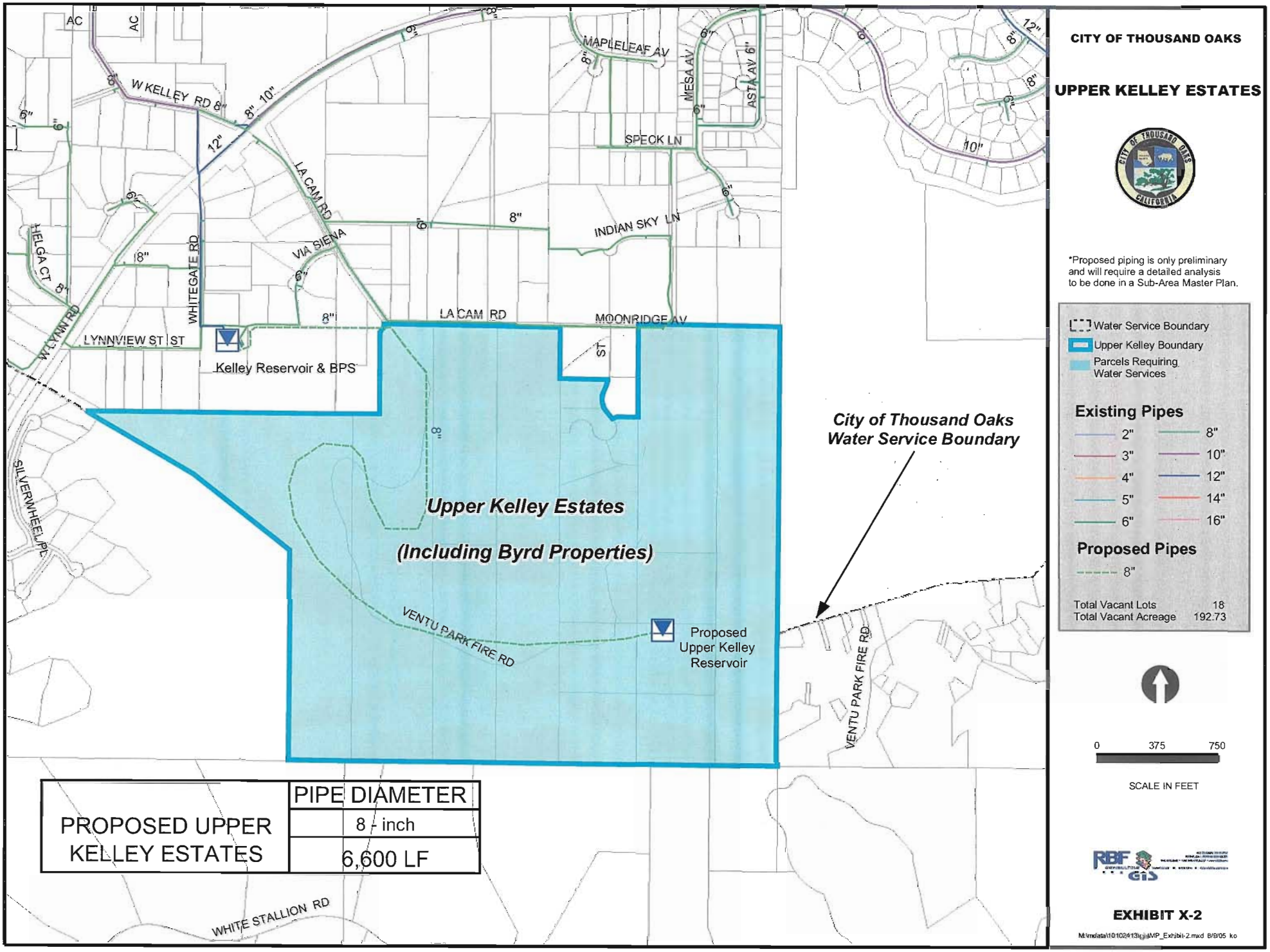
CITY OF THOUSAND OAKS
UPPER KELLEY ESTATES
*Proposed piping is only preliminary and will require a detailed analysis to be done in a Sub-Area Master Plan.
Water Service Boundary
Upper Kelley Boundary
Parcels Requiring Water Services
Existing Pipes
2"
3"
4"
5"
6"
8"
10"
12"
14"
16"
Proposed Pipes
8"
Total Vacant Lots 18
Total Vacant Acreage 192.73
0 375 750
SCALE IN FEET
EXHIBIT X-2
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City of Thousand Oaks Water Service Boundary
Upper Kelley Estates
(Including Byrd Properties)
Kelley Reservoir & BPS
Proposed Upper Kelley Reservoir
W KELLEY RD
LA CAM RD
MAPLELEAF AV
MESA AV
ASTA AV
SPECK LN
INDIAN SKY LN
VIA SIENA
MOONRIDGE AV
WHITEGATE RD
HELGA CT
W LYNN RD
LYNNVIEW ST
SILVERWHEEL PL
VENTU PARK FIRE RD
WHITE STALLION RD
PROPOSED UPPER KELLEY ESTATES
PIPE DIAMETER
8 - inch
6,600 LF

XI - Hydraulic Evaluation

XI. HYDRAULIC EVALUATION

A. INTRODUCTION

The model was used to evaluate minimum and maximum pressures experienced under varying demand and operational conditions. For areas of low pressure or high pressure indicated by the model, alternative solutions were evaluated. Possible solutions include adjusting service zone boundaries to improve system pressures and operational efficiencies. The adjustment of existing zone boundaries may require modifications to existing facilities or the installation of new facilities. The results of this analysis are discussed below.

B. EXISTING SYSTEM EVALUATION

1. Low Pressure Areas

Results of the hydraulic model confirmed an area of low pressure exists in the Meadows zone, shown on Exhibit XI-1. The model indicated several nodes in this area experience pressures below 45 psi under normal demand and operating conditions. Pressures in the area range between 30-45 psi based on a mid-tank water level hydraulic grade at Meadow's Reservoir of 1077 feet. In order to meet minimum pressure requirements in the area, a minimum HGL of 1107 feet is required. Therefore, to meet minimum requirements, the area should be supplied from a higher hydraulic gradient. Three alternatives were analyzed in the Technical Memorandum, Zone 2- Low Pressure Area Analysis, dated May 17, 2004. Refer to the memorandum for details of this analysis and the alternatives. The recommended project is described herein.

The recommended alternative, based on cost effectiveness and meeting the City's minimum water pressure requirement of 45 psi, is Alternative 3 of the Technical Memorandum. This alternative adjusts the service zone boundaries to include residents on Aspenpark Court, Rusticpark Court, Greenpark Court, Northpark Court and portions of Summerpark Court into the Reduced Lang/Sunset 2 Zone. This alternative would include installation of one pressure reducing valve assembly for primary supply, installation of three isolation valves to isolate the existing Meadows system, installation of an 8-inch pipeline to maintain looping, and the installation of a pressure reducing valve assembly for back-up supply. The pressure reducing valves should be set at approximately 60 psi and 70 psi, respectively, to achieve optimal pressures. Refer to Exhibit XI-2 to see the recommended alternative.

The model was used to verify minimum pressure requirements and fire flow requirements could be met based on the proposed improvements.

2. High Pressure Areas

The hydraulic model was used to evaluate if areas of high pressure exist within the distribution system. According to model output data, an area of high pressure, in excess of 145 psi, was identified in the Oakbrook/Sunset Zone. Pressures were shown to be in the 160-175 psi range. An evaluation into the City's customer logs confirmed that some complaints came from the area due to water pressure. Individual homeowner regulators have been installed at each service connection to regulate the high water pressure. The complaints of high water pressure brought to the City were often due to problems with homeowner regulators and household piping. There are no recommended operational improvements or facility improvements in this area.

3. Bypass Service

It has been identified that there is no backup service to the Reduced Sapra Zone. The Reduced Sapra Zone is supplied through one pressure-regulating valve connected to the Grissom Zone. If this valve were to fail or need to be taken out-of-service, the customers within the Reduced Sapra Zone would have their water service disrupted. The water pressure difference from the Grissom Zone to the Reduced Sapra Zone is approximately 63 psi. It is recommended to upgrade the Sapra Street pressure regulating station to include a new bypass line with a pressure-reducing valve for redundancy.

4. Redundancy and Reliability

A critical component of every water distribution system is that a reliable and redundant source of supply exists. The City's system was evaluated to determine if every customer had a reliable source of supply from a reservoir, and a secondary source of supply if there were to be a failure at the primary supply point. For this evaluation, a source of supply is considered to be a reservoir that can supply flow via gravity (through a pressure-reducing valve is considered adequate). Table XI-1 identifies the primary and secondary sources of supply to each service area zone.

Table XI-1
Redundant Supply Source

Billing Zone	Service Area Zone	Primary Supply	Secondary Supply	Redundancy?
NEWBURY PARK				
Zone 1	Kelley	Kelley Reservoir	Ventu Park Reservoir	Yes
Zone 1	Ventu Park	Ventu Park Reservoir	Ventu Park Reservoir	Yes [1]
MAIN THOUSAND OAKS				
Zone 1	Pederson/Willow Lane	Pederson Reservoir	Willow Lane Reservoir	Yes
Zone 2	Freeway/La Granada	La Granada Reservoir	Freeway Reservoir	Yes
Zone 2	Meadows	Meadows Reservoir	Tara Reservoir	Yes
Zone 2	Tara	Tara Reservoir	Meadows Reservoir	Yes
Zone 2	Rolling Oaks	Rolling Oaks Reservoir	None	No
Zone 2	Lang Ranch/ Sunset No.2	Lang Ranch Reservoir	Sunset No. 2 Reservoir	Yes
Zone 2	Wilder	Wilder Reservoir	None	No
Zone 3	Grissom No. 1/Grissom No.2	Grissom No. 1 Reservoir	Grissom No. 2 Reservoir	Yes
Zone 3	Oakbrook/Sunset No.3	Oakbrook Reservoir	Sunset No. 3 Reservoir	Yes

[1] Ventu Park Reservoir acts simultaneously as a primary and secondary supply source. The reservoir is a buried concrete reservoir consisting of two independent chambers. Each chamber has a unique inlet/outlet pipe, and thus acts as two separate reservoirs at the same site.

The Rolling Oaks Zone and the Wilder Zone currently do not have a redundant source of supply from a gravity source. The following projects are proposed to remedy the issue:

- The secondary supply source for the Rolling Oaks Zone is recommended from an emergency interconnection with the California American Water Company (Cal-Am) system, which serves the area directly west of the Rolling Oaks Service Area Zone. A proposed location for the interconnection is near the intersection of Rolling Oaks Drive and Rimrock Road. The HGL of the Los Robles service area is 1,120 feet, compared to the Rolling Oaks gradient of 1,096 feet. The available storage in the Los Robles service area is 0.63 MG. An agreement must be reached with the California American Water Company to provide emergency service to the City.

- The secondary supply source to the Wilder zone would be from the proposed Wilder No. 2 Reservoir, as discussed in Section VII.

C. FUTURE SERVICE AREA ZONES

The ultimate buildout of the City's water service area will require two new service area zones, one for the Upper Kelley Estates area and one for the Skyline area. The hydraulic gradient of the new zones will be based on the surface elevations within the zone and the elevation of the proposed reservoirs. Preliminary grades are discussed below.

- Upper Kelley – The proposed Upper Kelley Service Area Zone (Billing Zone 2) will most likely draw water from the Kelley Service Area Zone and boost to a new reservoir. The service zone will feed the immediate Kelley Estates and Byrd Properties. One new reservoir, at an HGL of approximately 1443 feet, and a new pump station will be required for this service area zone.
- Skyline – The proposed Skyline Service Area Zone (Billing Zone 2) will most likely draw water from the Pederson/Willow Service Area Zone and will feed the customers within the Skyline area. Water will get boosted from the Pederson/Willow hydraulic gradient to the proposed reservoir from a proposed pump station. One new reservoir and pump station will be required for this new service zone. The approximate HGL of the zone is 1248 feet.

D. CONCLUSIONS AND RECOMMENDATIONS

The results of the hydraulic evaluation resulted in the following conclusions and recommendations:

- Construct improvements to adjust the service area zone boundaries to improve water pressure to the customers on Aspenpark Court, Rusticpark Court, Greenpark Court, Northpark Court and portions of Summerpark Court. The required improvements are:
  - One pressure reducing valve assembly for primary supply
  - Three isolation valves to isolate the existing Meadows system
  - 8-inch pipeline to maintain looping
  - One pressure reducing valve assembly for back-up supply. The pressure reducing valves should be set at approximately 60 psi and 70 psi, respectively, to achieve optimal pressures.
- There are no areas of high pressure that require operational or facility improvements.
- Install a new bypass line with a pressure-reducing valve in the Sapra Street PRV Station for redundancy.

- Construct an emergency interconnection to the Cal-Am system to provide redundant water supply to Rolling Oaks Service Area Zone.
- When development dictates service to the Upper Kelley Estates and Skyline Area; the City shall evaluate the facilities required to create service zones, such as new reservoirs, pump stations, and pipelines, as detailed in Sec VII and IX.

CITY OF THOUSAND OAKS

EXISTING WATER PRESSURE MAP

EXHIBIT XI-1

PARKVIEW DR
AVENIDA DE LOS ARBOLES
NORTHPARK ST
HOLLOWPARK CT
FLINTRIDGE CT
COALFAX CT
SUMMERPARK CT
GREENPARK CT
RUSTICPARK CT
ASPENPARK CT
SCENICPARK ST
ERBES RD.
Detail A
ERBES ROAD PUMP STATION
Not to Scale

Legend

ZONE
- Meadows
- Lang/Sunset 2
- Out of Area

ZONE
- Meadows
- Lang/Sunset 2

Existing
- 0
- 30 - 34.9 PSI
- 35 - 44.9 PSI
- 45 - 55.9 PSI

200 100 0 200

SCALE IN FEET

RBF CONSULTING GIS PLANNING DESIGN CONSTRUCTION

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CITY OF THOUSAND OAKS

PRESSURE MAP AFTER ZONE RECONFIGURATION ALTERNATIVE 3

EXHIBIT XI-2

PROPOSED ZONE 2-8 INCH PVC CONNECTION

PROPOSED ISOLATION VALVES

PROPOSED PRV

DETAIL A

AVENIDA DE LOS ARBOLES

PARKVIEW DR

NORTHPARK ST

HOLLOWPARK CT

FLINTRIDGE CT

COALFAX CT

SCENICPARK ST

SUMMERPARK CT

GREENPARK CT

RUSTICPARK CT

ASPENPARK CT

ERBES RD.

ERBES ROAD PUMP STATION

Detail A

Not to Scale

Legend

ZONE

- Meadows
- Lang/Sunset 2
- Reduced Lang/Sunset 2
- Out of Area

ZONE

- New
- Meadows
- Lang/Sunset 2
- Reduced Lang/Sunset 2

ALT3

- 0
- 45 - 74.9 PSI

200 100 0 200

SCALE IN FEET

RBF CONSULTING GIS

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XII - Fire Flow Analysis

XII. FIRE FLOW ANALYSIS

A. INTRODUCTION

The City strives to provide a reliable source of good quality water to the customers and at an adequate service pressure. It is imperative that the City's system be able to meet fire flow requirements. This section will discuss the results of the analysis conducted to assess the system's capabilities to meet fire flow requirements.

B. EXISTING SYSTEM ANALYSIS

The analysis was performed using the calibrated hydraulic model. A maximum day demand scenario was used to evaluate the fire flow capabilities at each fire hydrant within the system. The model runs a system-wide fire flow scenario by placing a fire flow of 1,250 gpm at each hydrant individually. The 1,250 gpm flowrate was selected because a majority of the City is comprised of single-family residential land use. Pressure within the system must maintain a minimum level of 20 psi.

1. Newbury Park

The fire flow analysis in the Newbury Park area showed that a minimum fire flow of 1,250 gpm could be provided at each hydrant during the maximum day demand condition while maintaining a minimum system pressure of 20 psi.

2. Main Thousand Oaks

The fire flow analysis in the Main Thousand Oaks area indicated that several fire hydrants could not provide the required fire flow. Each of these hydrants were identified and evaluated in greater detail, taking into account the location of the hydrant, and was determined that many of the hydrants were capable of providing the minimum required fire flow at sufficient pressures. For example, the model indicated that many fire hydrants in the hydropneumatic zones could not meet minimum fire flow requirements, however those hydrants were deemed sufficient due to diesel powered stand-by pumps at each pump station which can provide the additional demand. Diesel stand-by pumps are not simulated in the model. Hydrants located adjacent to reservoirs can provide fire flow, however pressures are often below 20 psi due to inadequate hydraulic head. In addition, single fire hydrants which could not provide a sufficient fire flow were further evaluated with fire flow being provided from two hydrants within close proximity to each other and operating in combination. The hydrants originally identified as not being able to provide adequate fire flow was reduced to the following areas:

- The model indicated several hydrants in the Meadows zone had pressures below 20 psi in a fire flow condition. These hydrants are in the area that was identified as having low system pressures in Section XI.B.1. If the recommended solution identified in Section XI is implemented, the fire flow availability will improve to meet minimum requirements.

- One hydrant on the edge of the Freeway/La Granada Zone did not meet the fire flow requirement. The hydrant, ID I17-3, is located on South Skyline Drive, a steep street in a residential area on the southern edge of the water service boundary. The water is conveyed through a dead end 6-inch diameter pipeline that is approximately 1,700 feet long. With a pressure of 20 psi at the hydrant, the fire flow available is 350 gpm. The pipeline and hydrant are privately owned and serves one residence.

  By upsizing the existing pipeline on South Skyline Drive to 8-inches, the available fire flow at hydrant I17-3 will increase to 665 gpm. With a 12-inch diameter pipeline, the available flow is 1,225 gpm. Upsizing the pipeline to 12-inches will improve fire flow, however it will cause water quality problems. The location of the fire hydrant is shown on Exhibit XII-1. When the future Skyline area is constructed with new pipelines and hydrants it is anticipated that this area will be able to meet the required fire flow.

C. CONCLUSIONS AND RECOMMENDATIONS

The fire flow analysis conducted with the calibrated hydraulic model indicated that the City's distribution system is able to provide a minimum fire flow of 1,250 gpm at a minimum of 20 psi at almost all of the hydrants within the City. There were two areas where the 1,250 gpm fire flow requirement could not be met. The following conclusions and recommendations are made as a result of this analysis:

- Implement the alternative to alleviate the low-pressure area of the Meadows Zone, as described in Section XI.
- It is recommended that the City connect fire hydrant I17-3 into the Skyline area service zone when it gets constructed.

It should be noted that the model does not take into consideration if valves are unknowingly closed, or partially closed. It is recommended that the City utilize the hydraulic model to conduct individual fire flow simulations when new developments or redevelopments are proposed. Actual fire flow tests shall be conducted in the field to verify model results.

CITY OF THOUSAND OAKS
WATER MASTER PLAN

EXHIBIT XII-1 - LOW FIRE FLOW HYDRANT

XIII - Facility Assessment

XIII. FACILITY ASSESSMENT

A. INTRODUCTION

Each individual facility within the City's distribution system was assessed based upon site visits and review of record drawings. All facilities, including reservoirs, pump stations, pressure reducing stations, turnouts and wells were accounted for and assessed based on their existing physical condition, performance reliability and collection of data from City staff. Each of the facilities were assessed based on the following categories:

- SCADA/Telemetry
- Electrical
- Corrosion
- Structural
- Site Civil
- Hydraulics

The condition assessment consisted of a registered professional corrosion engineer, structural engineer, electrical engineer, and civil engineer visiting each facility to evaluate their respective components of each site. In addition, a qualified diver inspected each reservoir from the interior. The results of the site evaluations, record drawing evaluations and discussions with City staff resulted in recommendations for each site. The site assessments were summarized in tabular format for each facility and compiled in a database.

The results of the condition assessment and recommendations are included in a separate report, "Water Facilities Condition Assessment Report." Minor recommendations for maintenance of facilities are not included in the Capital Improvement Program but should be performed as a part of a routine maintenance program. A summary of the recommendations for each facility is included in the following pages of this section.

B. RESERVOIRS

Reservoirs were assessed based on the following criteria:

- External Site Inspection
- Piping and Valving Assessment
- Reservoir Mixing / Water Quality Assessment
- Dive Inspection

A team of engineers conducted all the assessments by visiting the reservoirs, evaluating record drawings, and having discussions with City Staff.

The external site inspection of steel tank reservoirs included an analysis of the structural condition, external coating and possible corrosion at the site. The internal inspection evaluated the cathodic protection systems, internal coatings, internal structural components and potential corrosion sites. Preliminary inspection does not always reveal a corrosion problem. For a full analysis of corrosion, a drained reservoir inspection is necessary where pitting and other corrosion problems may be revealed. The interior and exterior coatings of each steel reservoir were tested and found to contain lead, chromium and zinc. Since these metals are present, air testing will be required when recoating takes place and regulations must be adhered to for the proper disposal of the hazardous waste.

The City currently checks the cathodic protection systems at the reservoirs on an annual basis and it is recommended that this inspection continue to take place.

The City of Thousand Oaks also maintains three partially buried concrete reservoirs with hopper bottoms, the Meadows Reservoir, Pederson Reservoir, and Ventu Park Reservoir.

The Piping and Valving Assessment was conducted by an analysis and review of record drawings, photos, operation and maintenance information, and notes from site visits.

The Reservoir Mixing / Water Quality Assessment was made by conducting an analysis of inlet/outlet configuration and discussions with City staff as to which reservoirs currently experience low chlorine residual.

In addition, Perliter & Ingalsbe and Associates conducted a Preliminary Design Report for improvements to reservoirs and pump stations, dated January 2004. A detailed review and analysis of the report was conducted which led to an agreement with all of the listed recommendations noted at each facility.

Recommended action for each reservoir facility is listed below:

Freeway Reservoir

1. Exposed lead based paints need to mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Re-inspect interior by 2011.
3. Replace wooden enclosure with NEMA 3R enclosure.
4. Install additional manway per AWWA Standards for welded steel tanks to meet OSHA requirements.
5. Install chlorine analyzer.
6. Install tide-flex mixing system or a dedicated inlet pipe for improved water mixing.
7. Remove hood on inlet pipeline.
8. Larger cracks in ring footing should be sealed with epoxy adhesive injection to prevent corrosion in reinforcement.
9. Reservoir has been previously modified for seismic integrity in 1990. With seismic events happening post 1990 the reservoir should be investigated for updated site specific seismic information and current codes.
10. Tank is unanchored and may require anchorage for current seismic loads.
11. Reservoir roof may be susceptible to damage due to inadequate freeboard if water level is at maximum operating level and should be investigated.
12. As a minimum the tank should be evaluated to determine maximum operating level under current conditions.

Grissom No. 1 Reservoir

1. Exposed lead based paints need to mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Re-inspect interior by 2011.
3. See Grissom Pump Station recommendations for service panel information.
4. Replace transmitter enclosure.

5. Install flexible pipe connections instead of existing rigid pipe connections.
6. Larger cracks in ring footing should be sealed with epoxy injection to prevent corrosion in reinforcement
7. Investigate for seismic integrity for compliance with updated site-specific information and current codes.
8. Unless seismic analysis is undertaken, the tank should not be operated at the maximum level.

Grissom No. 2 Reservoir

1. Exposed lead based paints need to be mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Re-inspect interior by 2011.
3. See Grissom Pump Station recommendations for service panel information.
4. Replace transmitter enclosure.
5. Install additional manway per AWWA Standards for welded steel tanks to meet OSHA requirements.
6. Install an earthquake sensitive control system.
7. Remove hood on inlet pipeline to improve water mixing.
8. Investigate for seismic integrity for compliance with updated site-specific seismic information and current codes.
9. Roof may be susceptible to damage if waterload is at maximum operating level.
10. Unless seismic analysis is undertaken, the reservoir should be operated at a reduced water level.

Kelley Reservoir

1. Exterior does not need to be repainted at this time. Adhesion testing required to determine ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Evidence of active corrosion sites on the shell suggests that the cathodic protection system is not working properly.
3. See Kelley Pump Station recommendations for service panel information.
4. Re-pipe and locate combination air vacuum/air release valve above ground per California Department of Health Standards.
5. Remove hood on inlet pipeline to improve water mixing.

6. Reservoir had been previously modified for seismic stability in 1991. Reservoir should be investigated for current seismic information and codes
7. Roof may be susceptible to damage if water level is at maximum operating level.
8. Unless seismic analysis is undertaken, the reservoir should be operated at a reduced water level.

La Granada Reservoir

1. Adhesion testing required to determine ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Interior roof and shell need to be recoated. Recommend recoating floor at same time with an NSF approved epoxy coating.
3. All corrosion sites need to be repaired.
4. Install tide-flex mixing system.
5. Install chlorine analyzer with remote read capability.
6. Install an earthquake sensitive control system.
7. Remove hood on inlet pipeline to improve water mixing.
8. Investigate for seismic integrity for compliance with updated site-specific seismic information and current codes.
9. The reservoir should be operated at a reduced level if seismic analysis is not undertaken soon.

Lang Ranch Reservoir

1. Exposed lead based paints need to mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Re-coat interior with an NSF approved epoxy.
3. Install an earthquake sensitive control system.
4. Remove hood on inlet pipeline to improve water mixing.
5. Larger cracks in ring footing should be sealed with epoxy injection to prevent corrosion in reinforcement.
6. Investigate for seismic integrity for compliance with updated site-specific seismic information and current codes.

Meadows Reservoir

1. Remove all existing caulking sealants and dispose of as a hazardous waste.
2. Re-caulk all joints with an EPA/NSF approved material.

3. Repair corroding reinforcing steel.
4. Repair corroding overflow pipe and recoat.
5. Repair gaps and exposed steel of interior roof.
6. Verify SCE meter location.
7. Construct dedicated inlet pipeline with altitude valve. Convert existing inlet/outlet pipe to dedicated outlet pipe.
8. Reservoir should be evaluated immediately for the site specific seismic information and current codes.
9. The roof of the structure is above finish grade and may be susceptible to uplift.

Oakbrook Reservoir

1. Exposed lead based paints need to mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Gap between floor plate and ring wall footing needs to be re-grouted.
3. Use same key for all control panels.
4. Install an earthquake sensitive control system.
5. Remove hood on inlet pipeline.
6. Investigate possible corrosion in plate underneath the tank.
7. The condition of the floor plate should be examined and the loss of uniform bearing support under the tank should be investigated, and corrective measures should be taken immediately.
8. Check for seismic stability for compliance with updated site-specific seismic information and current codes.
9. Since the high water level is in the knuckle area, the tank may not have adequate freeboard and may be susceptible to roof damage. As such the tank should be operated at a reduced water level unless a seismic evaluation is undertaken.

Pederson Reservoir

1. Remove all existing caulking sealants and dispose of as a hazardous waste.
2. Re-caulk all joints with an EPA/NSF approved material.
3. Repair column caps and cracks in walls and floor.
4. Repair broken step.
5. See Pederson Pump Station recommendations.
6. Valve vault needs new flood alarm and sump pump.

7. The reservoir should be inspected from outside periodically to observe the general condition and observe the propagation of cracks.
8. A mid-rail with a toe plate should be added at the reservoir stair.
9. At the altitude vault a ladder-up device with fall protection system should be added for safe access inside the vault.
10. Reservoir should be evaluated immediately for site specific seismic information and current codes.
11. Periodic inspection of the tank.

Rolling Oaks Reservoir

1. Install chlorine analyzer with SCADA connection.
2. Install tide-flex mixing system.
3. Investigate for seismic integrity for compliance with updated site-specific seismic information and current codes.

Sunset No. 2 Reservoir

1. Exterior needs to be repainted. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Interior needs to be recoated with an NSF approved epoxy coating.
3. All corrosion pits need to be repaired.
4. Fix broken cathodic protection components as soon as possible.
5. See Sunset No. 2 Pump Station recommendations.
6. Replace level transmitter enclosure as part of pump station modifications.
7. Remove hood on inlet pipeline.
8. Reservoir has been previously modified for seismic integrity in 1990. Reservoir should be investigated for current seismic information and codes.
9. Reservoir roof may be susceptible to damage due to inadequate freeboard if water level is at maximum operating level.
10. Unless seismic analysis is undertaken, the reservoir should be operated at a reduced water level.

Sunset No. 3 Reservoir

1. Exposed lead based paints need to mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).

2. Re-inspect interior by 2011.
3. Repair cathodic protection system as soon as possible.
4. Re-pipe combination air vacuum/air release valve and put above ground.
5. See Sunset No. 3 Pump Station recommendations.
6. Remove hood on inlet pipeline.
7. Reservoir has been previously modified for seismic integrity in 1991. Reservoir should be investigated for current seismic information and codes.

Tara Reservoir

1. Exposed lead based paints need to be mitigated when tank modifications are planned. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
2. Recoat interior roof and top of course of shell.
3. Area of gap needs to be cleaned out and sealed to prevent moisture from entering.
4. Monitor dimension of gap in order to try and determine if ring wall is settling and why.
5. Install grating over overflow exterior pipe.
6. Add ladder extension for access.
7. Eliminate "P" trap on overflow interior pipe and connect internal coupler to cathodic protection system/repair.
8. Replace irrigation pump/motor controller enclosure.
9. Dresser couplings should be replaced with flexible couplings at pipe connection for seismic considerations.
10. Install an earthquake sensitive control system.
11. Floor plate should be investigated for possible corrosion immediately.
12. Areas between the top of ring footing and bottom of annular plate should be re-grouted for firm uniform bearing immediately.

Ventu Park Reservoir

1. Repair corroding reinforcing steel and replace ladder bolts.
2. Install dedicated inlet pipeline to each reservoir chamber with altitude valve.
3. Convert existing inlet/outlet pipe to be a dedicated outlet pipe.

Wilder Reservoir

1. Exterior floor flange needs to be exposed, cleaned and repainted, and left exposed and covered with gravel only.
2. Exterior needs to be repainted. Adhesion testing required determining ability to overcoat existing paint. Lead must be mitigated by removal or encapsulating (overcoating).
3. Interior needs to be recoated with an NSF approved epoxy coating.
4. All corrosion pits need to be repaired.
5. Patch cracked coating of exterior roof and monitor annually.
6. See Wilder Pump Station recommendations.
7. Install an earthquake sensitive control system.
8. Remove hood on inlet pipeline.
9. Heighten existing fence by 24" with outrigger.
10. Install interior perimeter intrusion detection system (dual technology system).
11. Install hardened enclosure equipped with intrusion alarm sensors around facility and exposed piping (roof hatches and high security door).
12. Install steel over the altitude valve vault with access port and intrusion alarm sensors.

Willow Lane Reservoir

1. Exposed lead based paints need to mitigated when tank modifications are planned. Due to condition of existing paints, overcoating is not an option. Lead must be mitigated by removal.
2. Completely remove both exterior paints and interior coatings, repair all corrosion damage and recoat all surfaces. This work should be done by 2007.
3. See Willow Lane Pump Station recommendations.
4. Perform periodic inspections to monitor cracks in footing.
5. Install additional manway per AWWA Standards for welded steel tanks.
6. Install an earthquake sensitive control system.
7. Inspect roof condition in detail and repair as required.
8. Investigate for seismic integrity for compliance with current seismic information and codes.

C. PUMP STATIONS

Pump stations were assessed based on the following criteria:

- External Site Inspection
- Piping and Valving Assessment

A team of engineers conducted the assessments by visiting the pump station sites, evaluating record drawings, and participating in discussions with City Staff.

Perliter & Ingalsbe and Associates conducted a Preliminary Design Report (PDR) for improvements to reservoirs and pump stations in January 2004. This report called for a total of nine pump stations to perform field investigations on and to develop improvement plans. The focus of the field investigations and improvements has been to upgrade the existing electrical and control equipment, and the pump station buildings. A detailed review and analysis of the report was conducted which led to an agreement with all of the listed recommendations noted at each facility.

Recommended action for each pump station facility is listed below.

Erbes Road Pump Station

1. Add labeling to easily identify P1-P4.
2. Masonry joint mortar should be replaced and added as needed.
3. The vertical gap at the building exterior should be grouted. However the joint should be observed periodically. The horizontal gap between the roof and the wall should also be grouted. Re-grouting should be done immediately.
4. Repair or replace CBs on starters to ensure they engage properly.

Grissom Hydropneumatic Pump Station

Replace motor control center and transfer switch inside a new electrical/control building.

Kelley Hydropneumatic Pump Station

1. Install a new MCC in building, add status/alarms for diesel pump, and modify hydropneumatic control system.
2. Construct a 14' x 10' masonry building to house the electrical equipment.
3. Stencil pump numbers on pump motors.
4. Cracks in concrete support slab should be sealed with epoxy injection.

Lang Ranch Pump Station

Replace corroding switchboard.

Lone Oak Pump Station

1. Replace the existing MCC, switchboard and control panel; modify control logic; and provide accurate "As-built" information.
2. Building improvements need to take place at the pump station site.
3. The structure should be inspected periodically to observe the cracks in masonry walls.
4. Reinforce door with reinforced high tensile steel door.
5. Harden facility roof.
6. Install interior perimeter intrusion detection system (dual technology system).

Los Arboles Pump Station

Floor cracks should be sealed.

Northwood Booster Pump Station

1. Replace the switchboard, MCC and control panel; modify hydropneumatic pump control logic; add diesel pump status/alarm for remote SCADA monitoring and provide as built documentation.
2. Building and roof improvements need to take place at the site.
3. Clean and paint entry handrail.

Pederson Pump Station

1. Replace the switchboard, MCC and control panel; modify control logic; and provide as built documentation.
2. Construct a new roof over the existing building for the pumps.
3. Periodic inspection to monitor minor cracks in walls.

Rolling Oaks Pump Station

Facility is in good condition with no actions recommended.

Sunset No. 1 Pump Station

Security lights come on during day. Move sensors.

Sunset No. 2 Pump Station

1. Replace the switchboard and MCC; and modify control logic.
2. Construct a 14' x 10' masonry building to house the electrical equipment.
3. Add emergency generator receptacle.

Sunset No. 3 Pump Station

1. Suggest adding SCADA control for pump sequencing.
2. Replace the MCC and switchboard; modify control logic; and add status/alarms of diesel pump for remote SCADA monitoring.
3. Construct a 14' x 10' masonry building to house the electrical equipment.

Ventu Park Hydropneumatic Pump Station

Cracks in floor slab should be sealed with epoxy injection.

Wilder Pump Station

1. Include improved access to generator receptacle as part of planned improvements.
2. Install a new electrical switchboard/MCC and control panel to replace the existing equipment.
3. Construct a masonry building to house the electrical equipment.
4. Pump cans corrosion and leakage should be addressed.
5. Cement coating with severe cracks should be repaired/replaced.
6. Install roof over switchboard and MCC for weather protection.
7. Facility should be periodically inspected.
8. Heighten existing fence by 24" with outrigger.
9. Install interior perimeter intrusion detection system (dual technology system).
10. Install hardened enclosure equipped with intrusion alarm sensors around facility and exposed piping (roof hatches and high security door).
11. Install steel over the altitude valve vault with access port and intrusion alarm sensors.

Willow Lane Pump Station

1. Replace the switchboard, MCC and control panel; modify control logic; and provide as built documentation.
2. Repair work should be performed on the roof.
3. Call SCE to have transformer replaced.
4. Periodic inspection.

D. TURNOUTS

Calleguas Municipal Water District (CMWD) Turnouts were assessed based on the following criteria:

- External Site Inspection
- Piping and Valving Assessment

A team of engineers conducted all the assessments by visiting the turnout sites, evaluating record drawings, and having discussions with City Staff.

The turnouts are housed in below grade vaults. All facilities were found to have no visible corrosion problems and to be in overall good condition. A common recommendation for each facility was to connect it to the City SCADA/telemetry in order that City staff does not have to manually read the meters. It is also recommended that the City coordinate with CMWD when upgrades are made so the electrical cabinet can accommodate City's SCADA system.

Through a review of record drawings, photos and site visits, the piping and valving configurations at each turnout were determined to be adequate.

Recommended action for each turnout facility is listed below.

Del Sol Turnout

1. Connect intrusion switch.
2. Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Encino Vista Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Gainsborough Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Hillcrest Drive Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Las Flores Turnout

1. Trim trees for access to control panel.
2. Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Lindero Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Lone Oak Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Los Arboles Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

Ventu Park Turnout

Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.

West Kelley Turnout

1. Make improvements to allow for totalized flow to be read remotely through City SCADA/telemetry, minimizing the need for staff to visit site and manually record data.
2. Masonry wall should be repaired as necessary and should be continued at the end.

E. PRESSURE REGULATING STATIONS

Pressure regulating stations were assessed based on an external site inspection, evaluation of record drawings, and through discussions with City Staff. The stations were evaluated from a hydraulic, corrosion, electrical, and structural standpoint.

The pressure reducing stations are in below grade vaults. Conditions of the valves and piping vary. Lang Ranch, Lynn Road, and Westlake Pressure Reducing Stations are all relatively new and have no visible corrosion problems. Fountain Crest, Minnecota Drive, and Sapra Street Pressure Regulating Stations are in poor condition with corrosion issues.

Recommended action for each pressure regulating station is listed below.

Fountain Crest Pressure Regulating Station

1. Clean and paint valves and piping.
2. Remove hose bib.
3. Pump out vault regularly.

Lang Ranch Pressure Regulating Station

Remove hose bib.

Lynn Road Pressure Regulating Station

1. Remove hose bib.
2. Check drain.

Minnecota Drive Pressure Regulating Station

Replace entire facility including new vault and lid; move facility from within sidewalk.

Sapra Street Pressure Regulating Station

Replace entire facility including new vault and lid. Move facility from the middle of the street to a location where access and maintenance will not be an issue.

Westlake Boulevard Pressure Regulating Station

Remove hose bib.

F. WELLS

The City of Thousand Oaks wells were assessed based on the following criteria:

- External Site Inspection
- Piping and Valving Assessment

A team of engineers conducted all the assessments by visiting the well sites, evaluating record drawings, and participating in discussions with City Staff.

The City owns four groundwater wells, two of which are currently inactive and two are active. The wells are primarily used for irrigation purposes.

Recommended action for each well is listed below.

Goebel Well

This well is currently inactive. It is recommended to properly abandon this well per criteria established in the California Well Standards and American Water Works Association Standards.

Hillcrest Drive Well

Facility is in good condition and no action is recommended for this site.

Library Well

This well is currently inactive. It is recommended to properly abandon this well per criteria established in the California Well Standards and American Water Works Association Standards.

Los Robles Golf Course Well

Facility is in good condition and no action is recommended for this site.

XIV - Water Quality Analysis

XIV. WATER QUALITY ANALYSIS

A. POTABLE WATER REGULATORY REVIEW

1. Introduction

The United States Environmental Protection Agency (EPA) is authorized by the Safe Drinking Water Act (SDWA) to set national health-based standards for drinking water and its sources. The SDWA was originally passed in Congress in 1974 and has since been amended twice, in 1986 and 1996. These national standards are set to protect against both naturally occurring and man-made contaminants that may be found in drinking water.

The SDWA applies to every public water system in the United States. Individual states may choose to accept the responsibility for oversight and enforcement of the national drinking water regulations. A state may also choose to enforce standards above and beyond those established by the EPA. The State of California Department of Health Services (DHS) has been granted responsibility by the EPA to enforce the standards set by the EPA. DHS' drinking water regulations are identified in Titles 17 and 22 of the California Code of Regulations.

The EPA has established the National Primary Drinking Water Regulations (NPDWRs) for contaminants occurring in drinking water. NPDWRs are established and enforced to protect the public from adverse health effects resulting from a drinking water contaminant. Included in these regulations are the drinking water standards which set either 1) treatment techniques to control a contaminant, or 2) the Maximum Contaminant Level (MCL) allowable for the contaminant in drinking water.

The City's water system is operating in compliance with the standards referenced above; however, there are several regulations that are currently under review by the EPA and DHS, which may be enforced at a later date.

2. Recent Changes/Future Regulations

Future drinking water regulations are of paramount importance to a water district. Changes in EPA and DHS regulations may require major changes in treatment and distribution operations. Below is a summary of recent regulatory modifications and future

water regulations under development by the EPA and DHS, as well as a discussion of possible impacts to the City's operations. Annual water quality reports for both the City and Calleguas Municipal Water District (CMWD) for 2003 were reviewed during this analysis.

- Arsenic Rule - The Safe Drinking Water Act requires EPA to revise the existing 50 parts per billion (ppb) standard for arsenic in drinking water. On January 22, 2001 EPA adopted a new standard, and public water systems must comply with the 10 ppb (0.01 mg/L) standard beginning January 23, 2006.

  Based upon the CMWD monitoring in 2003, arsenic is at non-detectable levels in the City's water supply, so the lower standard will not impact the City.

- Ground Water Rule - EPA established a rule in July 2003, which specifies the appropriate use of disinfection in ground water and addresses other components of ground water systems to assure public health protection. This rule does not apply to the City's system at this time, as the City does not utilize any groundwater supply for potable use.

- Lead and Copper - The Lead and Copper Rule was promulgated by the EPA in 1992, and subsequently updated on April 11, 2000. The rule streamlines monitoring requirements, and establishes a treatment technique that includes requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. These requirements are triggered by exceedences of lead and copper action levels measured in samples collected at service taps.

  The City's 2003 annual monitoring results for copper and lead were 0.241 mg/L and 3.4 ppb, respectively, for the 90th percentile results. These are well below the action levels of 1.3 mg/L for copper and 15 ppb for lead.

- Microbial and Disinfection Byproducts - A major challenge for water suppliers is how to balance the risks from microbial pathogens and disinfection byproducts. It is important to provide protection from these microbial pathogens while simultaneously ensuring decreasing health risks to the population from disinfection byproducts. The Safe Water Drinking Act requires EPA to develop rules to achieve these goals.

  EPA is proposing the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) to reduce disease incidence associated with Cryptosporidium and

other pathogenic microorganisms in drinking water. The LT2ESWTR will supplement existing regulations by targeting additional Cryptosporidium treatment requirements to higher risk systems. This proposed regulation also contains provisions to mitigate risks from uncovered finished water storage facilities and to ensure that systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. The LT2ESWTR will apply to all systems that use surface water or ground water under the direct influence of surface water. When this rule is promulgated, MWD and CMWD will have to ensure that treatment operations at the Jensen Filtration Plant and the Lake Bard Water Filtration Facility meet the treatment requirements. Additionally, CMWD and/or the City may be required to temporarily monitor for Cryptosporidium to be classified into a risk bin, which would determine if additional monitoring or treatment is required.

Concurrently with the LT2ESWTR, the EPA is developing the Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR), which focuses on public health protection by limiting exposure to DBPs, specifically total trihalomethanes (TTHM) and five haloacetic acids (HAA5), which can form in water as a by-product of disinfectants used to control microbial pathogens. Stage 1 of this rule, now in effect, established system-wide average Maximum Residual Disinfectant Level (MRDL) limits for disinfectant residuals and disinfectant by-product levels, including:

- Free chlorine or chloramines maximum residual of 4 mg/L
- Total Trihalomethane (TTHM) maximum level of 0.080 mg/L
- Haloacetic Acids (HAA5) maximum level of 0.060 mg/L
- Chlorite maximum level of 1.0 mg/L
- Bromate maximum level of 0.01 mg/L

Based on 2003 monitoring by the City, system-wide average levels are 2.4 mg/L for chloramines, 0.015 mg/L for HAA5, and 0.054 mg/L for TTHMs, all in compliance with the Stage 1 requirements.

The Stage 2 requirements will extend these system-wide MDRLs to apply to specific monitoring locations within the system. According to City's quarterly TTHM/HAA5 report to DHS for the 4th quarter 2003 through 3rd quarter 2004, the City is monitoring

at 4 individual locations within the distribution system. The locational monitoring results range from 0.043 mg/L to 0.063 mg/L for TTHMs and from 0.007 mg/L to 0.022 mg/L for HAA5. Based upon these results, it appears that the City will be in compliance with the proposed Stage 2 requirements. However, under the requirements of the Stage 2 rule, the City will be required to perform an evaluation of its system to determine necessary monitoring locations within its distribution system. This would identify areas at higher risk for high DBP levels, such as dead ends or areas with long residence time, and require monitoring at these locations to ensure compliance throughout the system.

- MTBE - EPA has placed MTBE on the drinking water Contaminant Candidate List (CCL) for further evaluation to determine whether or not regulation with a National Primary Drinking Water Regulation (NPDWR) is necessary. The CCL divided the contaminants among those which are priorities for additional research, those which need additional occurrence data, and those which are priorities for consideration for rulemaking. The Agency determined that MTBE needs more health effects research and occurrence data before a regulatory determination can be made. MTBE was non-detectable in all 2003 CMWD monitoring.

- Perchlorate – Perchlorate currently has an action level of 4 ppb, and both EPA and DHS are considering establishment of a primary maximum contaminant level for perchlorate in the future. Perchlorate was non-detectable in all 2003 CMWD monitoring.

- Chromium 6 - Chromium-6, a specific form of the chromium ion in water, is regulated under the 50 ppb maximum contaminant level (MCL) for total chromium. DHS will be adopting an MCL that is specific for chromium-6. Chromium 6 was non-detectable in all 2003 CMWD monitoring.

- Radionuclides - EPA has updated its standards for radionuclides in drinking water. EPA also has set a new standard for uranium, as required by the 1986 amendments to the Safe Drinking Water Act. The standards are: combined radium 226/228 (5 pCi/L); beta emitters (4 mrems); gross alpha standard (15 pCi/L); and uranium (30 µg/L). The 2003 monitoring results show that the City's water meets the updated standards.

- Radon - Radon is a naturally occurring radioactive gas that may cause cancer, and may be found in drinking water and indoor air. Some people who are exposed to

radon in drinking water may have increased risk of getting cancer over the course of their lifetime, especially lung cancer. Radon in soil under homes is the biggest source of radon in indoor air, and presents a greater risk of lung cancer than radon in drinking water. As required by the Safe Drinking Water Act, EPA has developed a proposed regulation to reduce radon in drinking water.

The proposed rule applies to all water systems that use groundwater or mixed ground and surface water. The proposed rule would not apply to systems that use solely surface water, such as the City's system. In addition, according to CMWD monitoring in 2003, no radon was detected in the City's water supply.

- Unregulated Contaminant Monitoring Rule - EPA published the Unregulated Contaminant Monitoring Rule September 17, 1999 and supplemented the rule on March 2, 2000 and January 11, 2001. EPA uses the data generated by the new UCMR to evaluate and prioritize contaminants on the Drinking Water Contaminant Candidate List, a list of contaminants EPA is considering for possible new drinking water standards. These data help to ensure that EPA has the high quality scientific data it needs to make decisions about future drinking water standards. Under this rule, CMWD and/or the City are required to monitor for various unregulated contaminants and report to the EPA.

- Sulfate Rule - Sulfate is a substance that occurs naturally in drinking water. Health concerns regarding sulfate in drinking water have been raised because of reports that diarrhea may be associated with the ingestion of water containing high levels of sulfate. Sulfate in drinking water currently has a secondary maximum contaminant level (SMCL) of 250 milligrams per liter (mg/L), based on aesthetic effects (i.e., taste and odor). The Safe Drinking Water Act (SDWA), as amended in 1996, directs the EPA and the Centers for Disease Control and Prevention (CDC) to jointly conduct a study to establish a reliable dose-response relationship for the adverse human health effects from exposure to sulfate in drinking water, including the health effects that may be experienced by sensitive subpopulations (infants and travelers). The study was completed in January 1999. Sulfate is currently being reviewed by EPA as a potential contaminant for regulation; however, no decision has been made on this rule as yet.

  Based upon 2003 monitoring data, the average sulfate level in the City's system is 48 mg/L, so it is unlikely that the City would be impacted by future sulfate regulations.

3. Summary

Based on the proposed future regulations developed under the EPA and DHS, the City's water source is within acceptable levels or non-detectable levels at CMWD monitoring sites. The City should continue monitoring for the aforementioned contaminants and for unregulated contaminants, in the event they are added to the contaminants list in future drinking water standards.

B. FLUSHING PROGRAM

Routine flushing of mains is recommended for removing impurities that may accumulate over time in the distribution system in order to improve and/or maintain water quality.

1. Design Considerations

For implementation of a successful flushing program, it is important that the required facilities are available at accessible location. When designing new facilities, the following recommendations should be taken into consideration in order for proper implementation into the flushing program:

- Location of blow-off valves at low points and dead ends in the system which can be determined using a hydraulic model
- Location of hydrants, blow-offs, and valves so that flushing will cause minimum inconvenience or disruption to customers
- Adequate velocities and pressures maintained throughout the system during flushing
- Fire-flows will not be impacted during flushing
- Means for disposing of flushed water

2. General System Operational Practices

The following is a list of general system operational practices that should be implemented by the City that will assist the City in implementing a successful flushing program.

- Routinely flush all dead-end mains and mains subject to sediment deposition. Keep a record of complaints to help locate mains that require flushing, but also conduct flushing in anticipation of complaints.
- Inspect and test all hydrants and valves in the system, normally once a year.
- Record the condition of mains, valves, and fittings removed from the system to identify causes of failure.

3. Routine Flushing Program

An efficient and effective flushing program for a distribution system requires considerable effort. Keep records of all complaints and plot them on a distribution map. When a complaint is received for a dead-end main, place the main on a routine flushing schedule, such as once a month. If, after a few months, the water clears in 6 seconds, then place the main on a semiannual flushing schedule, or continue to adjust as needed.

Flush often enough to anticipate complaints, but conserve water, energy, and manpower. During drought season, water conservation becomes very important and public awareness of water use is heightened. Be prepared to justify the flushing program to different agencies and the public.

The time of day to perform the flushing operation is another point to consider. Flushing at night has the advantage that water demands are lower, and residual pressures in the system will not be affected as much. Flushing may flood streets and sidewalks and the impact to residences and businesses will be reduced by flushing at night. Specific flushing operation procedures per AWWA can be found in *Maintaining Distribution-System Water Quality*, AWWA 1986.

4. Flushing Locations

The flushing analysis for the City of Thousand Oaks water system was performed using the hydraulic model. The basic parameters used in the hydraulic model are as stated below:

- Average Day Demand
- Extended Period Simulation of 30 days (720 hours)
- Tank Mixing Method of Completely Stirred Tank Reaction (CSTR)
- All Turnouts "Supply Source" with Water Age of Zero Days

The flushing analysis was performed using the water age function within H2O Map Water. This analysis tool allows an age to be assigned to the water within the distribution system. Water age is the time spent by a parcel of water within the distribution network. Water that enters the system from a supply source, in this instance a fixed grade reservoir representing the turnouts within the system, is assigned a water age of zero. The hydraulic model treats water age as follows; as the water enters the model from a supply source the age assigned is zero, as the parcel of water migrates throughout the distribution system the water ages at the same rate at which the model simulation time advances. Major factors that affect water age within the hydraulic model include the demand assigned to the nodes and the location of the supply source.

For this particular analysis, a thirty-day (720 hour) simulation was run in order to obtain a representative sample of water age in the system. At day 16 of the analysis, the water age within the system was examined. This day was selected based on a study performed by AWWA, "Effects of Water Age on Distribution System Water Quality." A water age of 16 days is typical for systems similar in size to the City of Thousand Oaks, and therefore pipes with a water age equal to or greater than 16 days are selected as candidates for a flushing program. If the water age is equal to or greater than the simulation day at any node, in this instance 16 days old, the pipes adjacent to that node are identified as areas that may be candidates for a flushing program. See Exhibits IX-1a through IX-1c for a schematic of the City of Thousand Oaks water system with these areas identified.

5. Recommendations

A flushing program is recommended to reduce the water age in the distribution system in the areas identified, and therefore, improve the water quality. The hydraulic model was used to estimate the water age and identify locations to flush the system. The flushing locations shown should be reviewed by City operators to verify accessibility for flushing of the mains. The City should also review customer complaints that relate to water quality (such as taste, odor, and turbidity) and add these areas to a routine flushing program. Following the above-recommended design, operations, and flushing program at the shown locations will improve water quality and will enable the City to take a proactive approach to a flushing program.

C. RESERVOIR MIXING EVALUATION

Mixing and aging are two related trends that affect the water quality of a reservoir. Water quality deterioration is often associated with the age of the water. Long residence times depress disinfectant residuals and can promote bacterial re-growth. As a result, minimizing detention time and avoiding parcels of water that remain in the storage facility for long periods of time should be objectives in the design and operation of storage facilities. Maximum allowable detention time should depend on the quality of the water, its reactivity, the type of disinfectant used, and the travel time before and after the water's entry into the storage facility.

Mixing also has a direct effect on water quality in a reservoir. Uneven mixing can result in zones of older water. Finished storage tanks normally rely on the inlet pipe to provide mixing, instead of some type of internal mixing component. When water flows through the inlet pipe and into the reservoir, a jet is formed. Size and configuration of the inlet, velocity of the flow, and reservoir volume all contribute to the mixing in the tank.[1] The reservoir mixing analysis consisted of:

- Evaluating piping arrangements at each reservoir
- Determine if water quality issues are present at existing reservoirs.
- Conducting a tank mixing time analysis

1. Evaluation Criteria

When evaluating the piping arrangements at each reservoir, items to consider are:

- Single inlet/outlet pipe
- Separate inlet/outlet pipes
- Location of the pipe penetration to reservoir
- Reservoir shape
- Do Baffles exist
- Valved mixing system
- Deflection Plates

[1] Grayman, W.M. et al, 2004. Mixing and Aging of Water. *Jour. AWWA*, 96:9.

Discussions with the City staff indicated that several reservoirs experience water quality issues. The reservoir's general mixing and water quality information are identified in Table XIV-1.

Table XIV-1
Reservoir- Mixing Evaluation Data

Reservoir Name	Inlet/Outlet Piping (Dual/Individual)	Mixer Type	Historic Water Quality Issues
Freeway Reservoir	10" Dual	None	- WQ issues for 20 years. - Water gets pumped from Willow Lane Res. or turnout - Old Water Age
Grissom No. 1&2 Reservoirs	8" Dual	None	None
Kelley Reservoir	12" Dual	None	None
La Granada Reservoir	14" Dual	None	- Water gets pumped from Willow Lane Res. or turnout; long residence time
Lang Ranch Reservoir	18" Dual	None	None
Meadows Reservoir	16" Dual	None	- City unsure of problem - Operate manually to circulate
Oakbrook Reservoir	14" Dual	None	None
Pederson Reservoir	18" Dual	None	None
Rolling Oaks Reservoir	10" Dual	None	- Few customers served off of tank. - Lower set points in winter (after fire season). - Problematic during winter when irrigation demands are low
Sunset No. 2 Reservoir	12" Dual	None	None
Sunset No. 3 Reservoir	10" Dual	None	None
Tara Reservoir	16" Dual	None	- Water gets pumped from Pederson Reservoir; long residence time
Ventu Park Reservoir	Two 16" Dual	None	- Manually open/close turnout in order to circulate water
Wilder Reservoir	16" Dual	None	None
Willow Lane Reservoir	16" Dual, 12" Outlet	None	None

Finished storage tanks are predominantly operated without any active mixing devices, such as turbines or impellers. Instead, they rely on the energy created by the inlet pipe to provide mixing for the reservoir. The inlet pipe should be configured to best allow a jet to form at the inlet, which acts as the mixing agent for the reservoir.

For tanks operating in the fill and draw mode, mixing occurs primarily during the fill cycle. As a result, if the tank is relatively well mixed at the end of the fill cycle, mixing problems

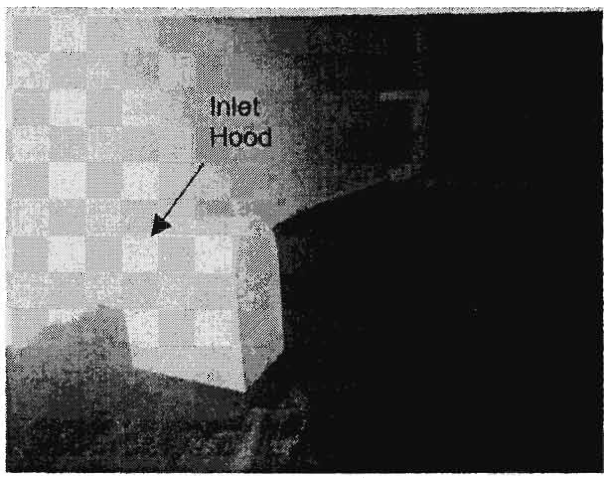
and water quality problems are unlikely. A formula was developed to determine if inlet pipe size is able to provide proper mixing in the reservoir[2]:

$$\Delta V/V > 9.03d/V^{1/3}$$

in which ΔV is the change in water volume during the fill period, V is the volume of water at the start of the fill period, and d is the inlet diameter. If the formula holds true for a certain reservoir, then the inlet pipe diameter is of adequate size to provide proper mixing in the reservoir.

All existing reservoirs have adequate sized inlet pipe diameters.

Several City of Thousand Oaks steel storage tanks have a hood configuration at the inlet to the reservoir. This configuration inhibits a jet from forming at the inlet, and therefore prevents proper mixing in the reservoir. An example of this is shown below at the inlet to Freeway Reservoir.



[2] Grayman, W.M. et al, 2004. Mixing and Aging of Water. *Jour. AWWA*, 96:9.

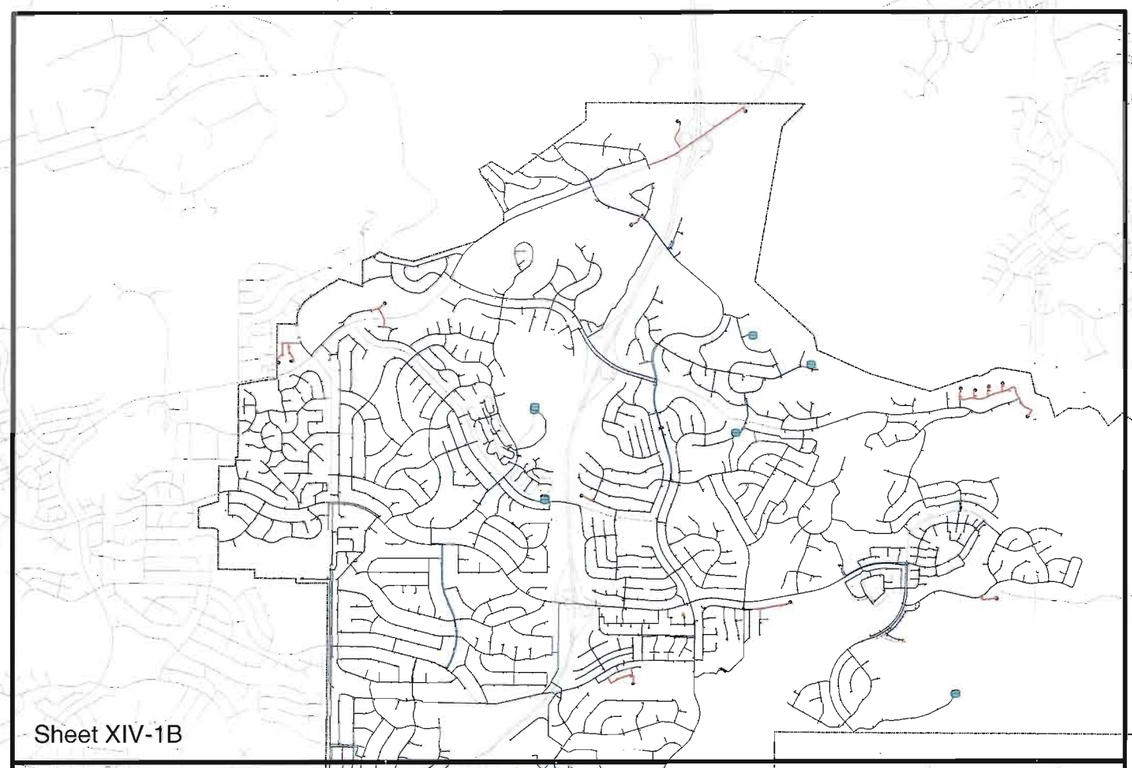
D. CONCLUSIONS AND RECOMMENDATIONS

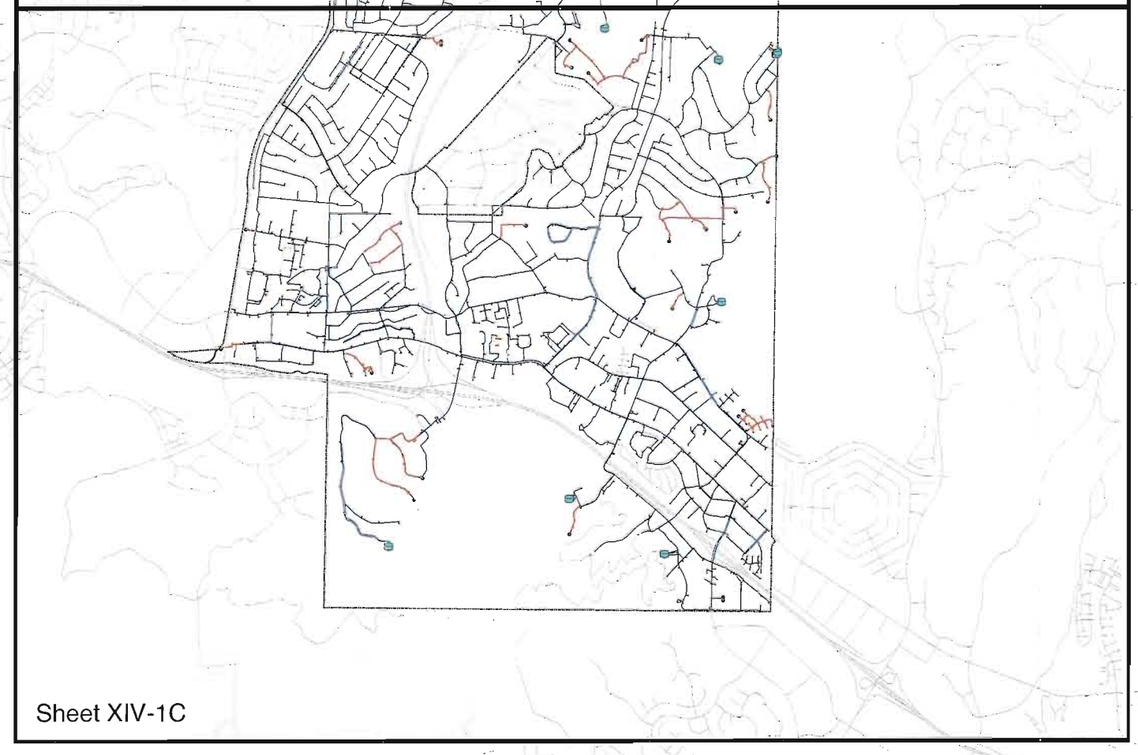
The following conclusions and recommendations resulted from the above evaluation:

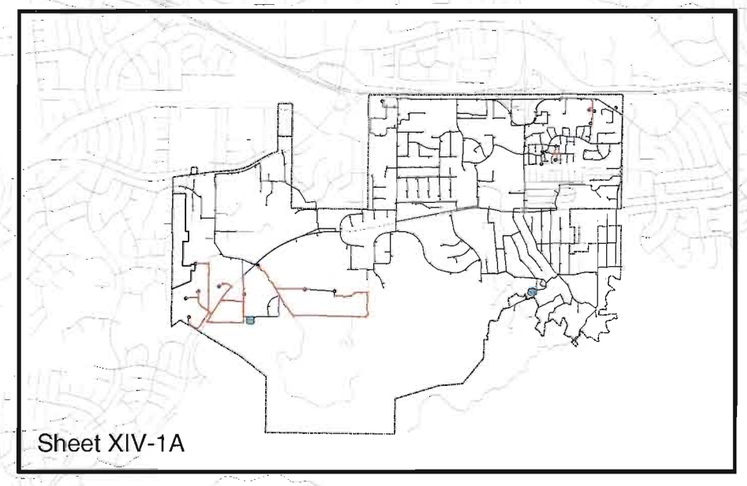
- Continue monitoring contaminants and unregulated contaminants on the top of the Drinking Water Contaminant Candidate List
- Implement Flushing Program at locations as shown on Exhibit IX-I
- Implement the following recommendations to improve water quality:
  1) Install a tide flex mixing system at the following:
     - Freeway Reservoir
     - La Granada Reservoir
     - Rolling Oaks Reservoir
  2) Install a chlorine analyzer connected to the City SCADA system at the following:
     - Freeway Reservoir
     - La Granada Reservoir
     - Rolling Oaks Reservoir
     - Tara Reservoir
     - Meadows Reservoir
     - Ventu Park
- At the Meadows Reservoir,
  1) Install dedicated inlet line with an altitude valve.
  2) Convert the existing inlet/outlet line to dedicated outlet and replace existing altitude valve with a check valve.
- At the Ventu Park Reservoir,
  1) Install a dedicated inlet line with an altitude valve to each reservoir chamber.
  2) Convert the existing inlet/outlet line to a dedicated outlet line by removing the existing altitude valve.
- Remove the hood at the inlet pipe at the following reservoirs
  - Freeway Reservoir
  - Grissom No. 2 Reservoir
  - Kelley Reservoir
  - La Granada Reservoir
  - Lang Ranch Reservoir
  - Oakbrook Reservoir
  - Sunset No. 3 Reservoir
  - Wilder Reservoir
  - Sunset No. 2 Reservoir

CITY OF THOUSAND OAKS

FLUSHING LOCATION OVERVIEW







Legend

- Flushing Location
- Reservoir
- Pipes Identified for Flushing

NOTE: Water service boundary defined by City of Thousand Oaks Water Atlas Maps.

3,500 1,750 0 3,500

SCALE IN FEET

RBF CONSULTING GIS

14725 ALTON PARKWAY
IRVINE, CALIFORNIA 92618-2027
949.472.3505 • FAX 949.472.8373 • www.RBF.com

PLANNING ■ DESIGN ■ CONSTRUCTION

EXHIBIT XIV-1

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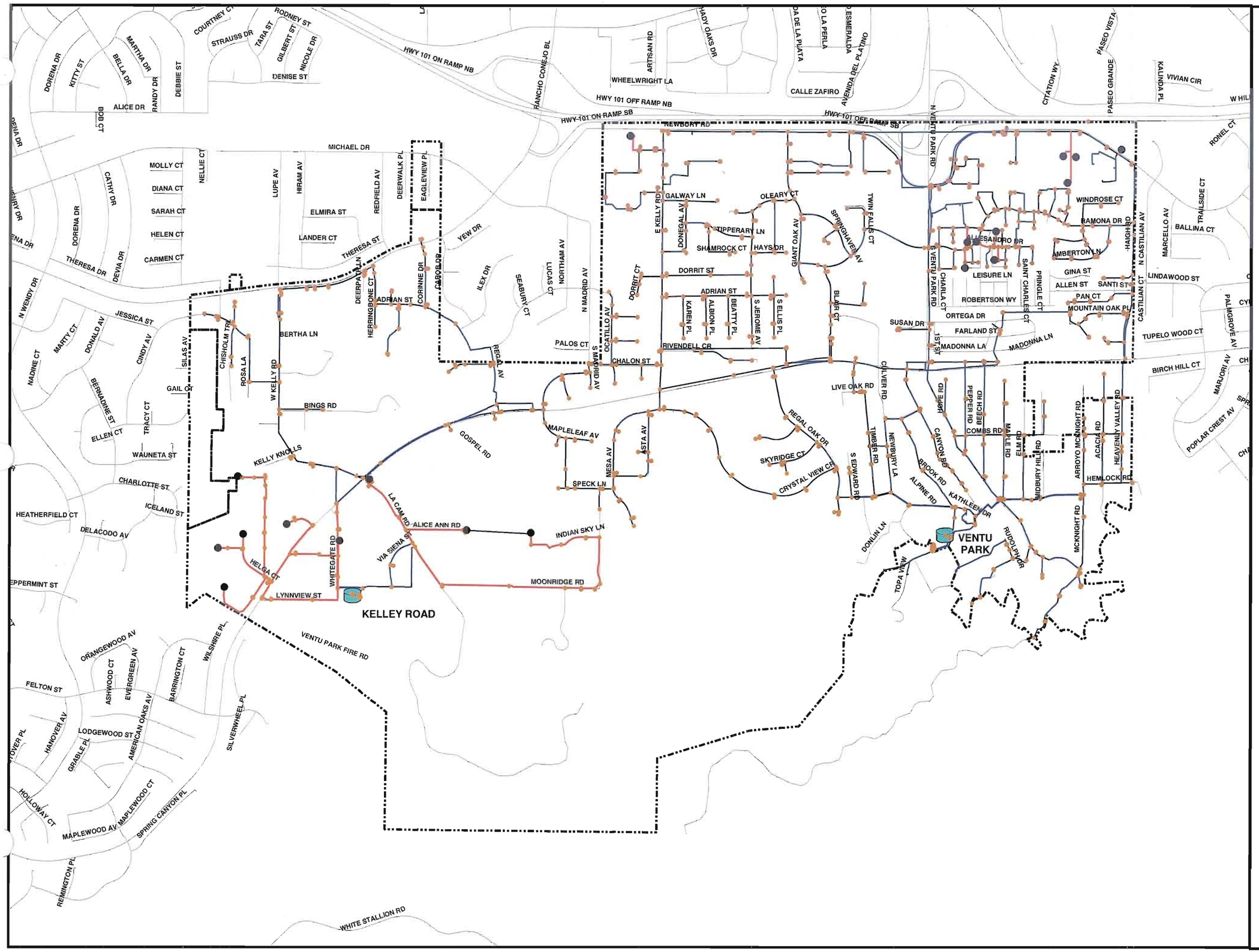
CITY OF THOUSAND OAKS

FLUSHING LOCATION OVERVIEW



Legend

- Flushing Location
- Reservoir
- Pipes Identified for Flushing

NOTE: Water service boundary defined by City of Thousand Oaks Water Atlas Maps.

1,000 500 0 1,000

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT XIV-1A

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CITY OF THOUSAND OAKS

FLUSHING LOCATION OVERVIEW

Sunset No.2

Sunset No.3

Tara

Lang Ranch

Pederson

Oakbrook

Legend

- Flushing Location
- Reservoir
- Pipes Identified for Flushing

NOTE: Water service boundary defined by City of Thousand Oaks Water Atlas Maps.

1,500 750 0 1,500

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT XIV-1B

M:\mdata\10102413\gis\MP_Flushing_XIV-1B.mxd 1/25/05 ko

CITY OF THOUSAND OAKS

FLUSHING LOCATION OVERVIEW

Legend

- Flushing Location
- Reservoir
- Pipes Identified for Flushing

NOTE: Water service boundary defined by City of Thousand Oaks Water Atlas Maps.

1,500 750 0 1,500

SCALE IN FEET

RBF CONSULTING GIS

EXHIBIT XIV-1C

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XV - Operational Evaluation

XV. OPERATIONAL EVALUATION

A. SCADA/TELEMETRY

A registered professional electrical engineer visited all the facilities within the City's distribution system to evaluate the facilities pertaining to the SCADA and Telemetry system. The assessment evaluated the following:

- Technical Support Requirements
- System Performance and reliability
- System Security
- System Use
- Data Reporting and Distribution
- Information use to support operation and maintenance decisions and optimization

The SCADA system assessment is described in the SCADA Master Plan Report, dated September 2004. The SCADA analysis determined the suitability of the system to meet the intended purpose and requirements of the present system configuration, to provide corrective recommendations where warranted and to meet future needs, and provide a vulnerability assessment to reduce the risk of tampering with the SCADA system. Refer to the SCADA Master Plan Report for the full analysis and recommendations to the City's system.

B. VULNERABILITY ASSESSMENT

Additional recommendations on the policies and procedures to further protect the City's policies and procedures are discussed in the Vulnerability Assessment (VA) Report. The VA Report details and recommends the following types of improvements to the City's system:

- Policies and Procedures (Good Business Practice)
- Consequence Mitigation Alternatives
- Contamination-Related Security Improvements

This report includes any site-specific physical improvements recommended as a result of the VA in Section VIII. The VA Report also includes general physical protection improvements recommended for all the facilities. These improvements are shown Table XV-1.

Table XV-1
Physical Protection Alternatives – General Improvements

General Physical Protection/ Security Improvements	Implementation Plan (Short, Intermediate, Long-term)
1) Examine and repair all existing fence lines	Short-term
2) Convert to combination locks for all facilities	Short-term
3) Increase warning signage on fence perimeters and heighten tone of language (i.e., change standard "No Trespassing" language to "This is a controlled facility – access strictly forbidden" or similar)	Short-term
4) Remove signs with facility names and capacities and replace with ID numbers	Short-term
5) Enclose/house all motor control center panels at all sites	Intermediate-term
6) Install motorized valves at outlet line at all reservoirs	Intermediate-term
7) Install steel plate from front of cathodic cabinet to tank wall at Facility A and similar measures at other similar sites as applicable to decrease ladder access	Intermediate-term

C. STAFFING CERTIFICATION

A Staffing Certification Report was prepared as a part of this project. The report, dated August 30, 2004, evaluated the City's current water distribution programs to ensure compliance with revised regulations on potable water treatment and distribution facilities. The report details certification requirements, a staffing summary and recommendations to ensure that the City's water distribution system meets or exceeds the California Department of Health Services (CDHS) staffing certifications. The report is included in Appendix C.

D. AUTOMATED METER READING (AMR)

The Automated Meter Reading (AMR) Project is currently in progress with the initial AMR Report completed. This project will determine which vendor the City can use in it's program and the cost and benefits to the City. The Automated Meter Reading (AMR) Report, dated March 2004, evaluates AMR vendors that may supply automated meter-reading equipment to

read the City's 16,124 water meters. The report summarizes the evaluation of the vendor demonstrations based on ratings from City reviewers and recommends the vendor Groeniger for the remaining portion of the AMR project. This evaluation does not take into account the City's previously started pilot program with one of the AMR vendors in 2003. The full report can be seen in Appendix D.

The AMR project will be carried out in the following four phases.

Phase I	Evaluate AMR Vendors
Phase II	Cost vs. Benefit Analysis
Phase III	Pilot Program
Phase IV	Implementation

Phase I has been completed but continuation of the AMR project will be suspended until a later date.

E. COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

The Computerized Maintenance Management System (CMMS) Implementation Plan has been completed as a part of this project. The report, dated September 21, 2004, presents implementation steps for the water distribution division and future phases of implementation for other Municipal Service Center (MSC) divisions. The software chosen which will be implemented is MRO Maximo. The plan details implementation tasks of Process Documentation and Design, Implementation, Training, and Integration of External Systems. The CMMS report can be seen in Appendix E.

F. EMERGENCY RESPONSE PLAN TRAINING

The City of Thousand Oaks submitted a Water Division Emergency Response Plan to the United States Environmental Protection Agency (USEPA), which was certified in June 2004. Training is an integral phase of the emergency planning process because it develops and sharpens the skills and readiness of a City's personnel. The USEPA cites lack of training to be a primary root of failure in emergency response plans and response guidelines. With proper training, the City's Water Division personnel can fully understand what is expected from them individually and as a team during an emergency. It is recommended that the City participate in a detailed emergency response plan training program.

XVI - Conclusions and Recommendations

XVI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

In general, the City's distribution system is in good physical condition. It provides reliable service at adequate operating pressures and is able to provide a minimum of a 1,250 gpm fire flow throughout the system. The system is adequately sized to accommodate the anticipated future demands. The City has adequate supply and storage throughout the distribution system to provide quality service to their existing and future customers. Many of the improvements noted are a result of improving efficiency and general system up-keep.

The analysis of the distribution system identified a few deficiencies and improvements that can be made to improve the system efficiency and optimization.

B. RECOMMENDATIONS

The following recommendations resulted from the system analysis:

Section III – (Design Criteria and Standards):

It is recommended that the criteria for calculating the required storage for a service area be modified to increase the regulatory storage from 80% of a maximum day demand to 100% of the maximum day demand for that specific service area. The criteria should be applied to all new reservoirs built within the City's distribution system.

It is recommended that the City adopt the design criteria and planning factors identified in this Section for all future water facility planning and design projects.

Section V – (Water Supply):

The following projects are recommended from this section:

- Properly abandon the Old Goebel and Library Wells per criteria established in the current versions of the California Well Standards and American Water Works Association standards. (CI-4558)

Section VII – (Reservoir Storage Analysis):

The following projects are recommended as a result of the analysis in this section:

- Construct a 1.0 MG Wilder No. 2 Reservoir to provide storage and redundancy to the Wilder service area zone. (CI-1167)

- Construct a 0.20 MG reservoir to meet fire flow requirements and future maximum day demands of the Upper Kelley Estates. (not a part of 5-year CIP)
- Construct a 0.25 MG reservoir to meet fire flow requirements and future maximum day demands of the Skyline Area. (not a part of 5-year CIP)

Section VIII – (Water Supply Analysis):

The following projects and/or operational changes are recommended as a result of this analysis in this section:

- Convert the Lynn Road emergency PRV to a regularly operating valve and adjust the pressure settings to allow filling of the Kelley reservoir. Shut-off the West Kelley turnout and operate in emergency conditions only. (operational change – not a CIP)
- Shut-off the Encino Vista turnout and maintain it for emergencies. (operational change- not a CIP)
- Adjust the operation of the Lindero, Lone Oak and Del Sol turnouts to minimize operation during the on-peak energy windows.
- Closely monitor the proposed Capacity Reservation Charges to be implemented by CMWD and adjust the operation of the supply system accordingly to reduce the peaking charges imposed by CMWD.

Section IX – (Pump Station Analysis):

The results of the pump station analysis resulted in the following conclusions and recommendations:

- The SCE rate structures for the Kelley, Northwood, Sunset #3 and Wilder pump stations shall be changed for economic efficiency. (operational change- not a CIP)
- The following pumps shall be evaluated to determine how to improve the overall efficiency to approximately 70%: Erbes Road 1, 2 and 4; Grissom Hydro 1 and 2; Northwood 1 and 2. (not a part of 5-year CIP)
- Proposed pump stations will be required in the future to supply the Skyline and Upper Kelley Estates areas when they get developed. The developed areas will require the pump station capacities as shown below. (not a part of 5-year CIP)

Skyline:	Pump 1 & 2 = 55 gpm	Upper Kelley:	Pump 1 & 2 = 25 gpm
	Pump 3 = 200 gpm		Pump 3 = 200 gpm

- Construct the La Granada pump station, consisting of two pumps, each with a minimum capacity of 650 gpm. (CI-8082)
- Construct the Wilder No. 2 pump station, consisting of two pumps, each with a minimum capacity of 175 gpm. (CI-1167)

- Install additional pump (600 gpm) at the Erbes Road pump station to supply the Meadows service area zone. (CI-4296)

Section X – (Pipeline Analysis):

The following conclusions and recommendations resulted from the analysis in this section:

- The City shall continue the program to replace all 3-inch, 4-inch and 6-inch pipelines with 8-inch pipeline. (MI-2009)
- The City shall continue with the program to replace all polybutylene pipe with 1-inch copper service laterals using a slip-lined type replacement method. (CI-1162)
- Pipeline looping is recommended at the following four locations: (CI-5041)
  - Whitechapel Place to Eaglewood Avenue (Atlas Page S19)
  - Rimrock Road to Sundown Road (Atlas Pages I15 & J15)
  - South Lynn Road and Helga Court (Atlas Page J8)
  - Corte Cancion (Atlas Page U17)

Section XI – (Hydraulic Evaluation):

The results of the service area zone evaluation resulted in the following conclusions and recommendations:

- Construct improvements to adjust the zone boundaries to improve water pressure to the customers on Aspenpark Court, Rusticpark Court, Greenpark Court, Northpark Court and portions of Summerpark Court (CI-4553). The required improvements are:
  - One pressure reducing valve assembly for primary supply
  - Three isolation valves to isolate the existing Meadows system
  - 8-inch pipeline to maintain looping
  - One pressure reducing valve assembly for back-up supply.
- Install a new bypass line with a pressure-reducing valve in the Sapra Street PRV Station for redundancy. (CI-4554)
- Construct an emergency interconnection to the Cal-Am system to provide redundant water supply to Rolling Oaks Service Area Zone. (not a part of 5-year CIP)

Section XII – (Fire Flow Analysis):

The following conclusions and recommendations are made as a result of the analysis in this section:

- Implement the alternative to alleviate the low-pressure area of the Meadows Zone, as described in Section XI. (CI-4553)
- It is recommended that the City connect fire hydrant I17-3 into the Skyline area service zone when it gets constructed.

Section XIII – (Facility Assessment):

Refer to the "Water Facilities Condition Assessment Report," under separate cover for a detailed description of the existing condition of each facility within the City's distribution system and the recommendations. Specific projects or programs that resulted from the facility condition assessment that are to be included in the CIP are as follows:

- Replace and relocate the Minnecota Drive PRV. (CI-4554)
- Reservoir Coating and Painting Program (MI-2010)
- Water System Repair and Replacement Program (MI-2011)
- Reservoir Tank Cleaning and Interior Inspection (MI-2501)
- Telemetry System Enhancement and Upgrades (MI-2505)

Section XIV – (Water Quality Analysis):

The following conclusions and recommendations resulted from the above evaluation:

- Continue monitoring contaminants and unregulated contaminants on the top of the Drinking Water Contaminant Candidate List.
- Implement Flushing Program at locations as shown on Exhibit IX-I. (CI-4266)
- Implement the following recommendations to improve water quality:
    1) Install a tide flex mixing system at the following (CI-4556):
        - Freeway Reservoir
        - La Granada Reservoir
        - Rolling Oaks Reservoir
    2) Install a chlorine analyzer connected to the City SCADA system at the following (CI-4290):
        - Freeway Reservoir
        - La Granada Reservoir
        - Rolling Oaks Reservoir
        - Tara Reservoir
        - Meadows Reservoir
        - Ventu Park
- At the Meadows Reservoir (CI-4556),
    1) Install dedicated inlet line with an altitude valve.
    2) Convert the existing inlet/outlet line to dedicated outlet and replace existing altitude valve with a check valve.
- At the Ventu Park Reservoir (CI-4556),
    1) Install a dedicated inlet line with an altitude valve to each reservoir chamber.

2) Convert the existing inlet/outlet line to a dedicated outlet line by removing the existing altitude valve.

- Remove the hood at the inlet pipe at the following reservoirs (CI-4556):
  - Freeway Reservoir
  - Grissom No. 2 Reservoir
  - Kelley Reservoir
  - La Granada Reservoir
  - Lang Ranch Reservoir
  - Oakbrook Reservoir
  - Sunset No. 3 Reservoir
  - Wilder Reservoir
  - Sunset No. 2 Reservoir

Section XV – (Operational Evaluation):

Refer to each respective report identified in this section for their respective recommendations.

Refer to the Capital Improvement Program for more description and implementation of the above-mentioned projects.

XVII - Capital Improvement Program

XVII. CAPITAL IMPROVEMENT PROGRAM

A. INTRODUCTION

This Section describes the projects that have been identified throughout the course of the water distribution system analysis and are recommended for inclusion in the City's capital improvement program (CIP). The recommended projects include the construction of new facilities to support anticipated development, the implementation of operations and maintenance programs, further studies and/or detailed evaluations. A write-up was prepared for each project or group of projects that includes the project identification number (CI/MI), project name, description, priority, estimated capital cost, and an exhibit/map of the recommended project.

B. PROJECT IDENTIFICATION

Each project was assigned an identification (CI/MI) number by the City. Projects that are located in undeveloped areas were not given an ID and not included in the 5-year CIP to identify that the funding for these projects will be through Special Facility Surcharge fees collected as the areas are being developed. Other projects not assigned a CI/MI number were also not included in 5-year CIP, but recommended for future funding consideration.

C. PRIORITY CRITERIA

Each project was assigned an implementation window based on its priority. The implementation window is the time span within project completion is recommended to occur. There are four implementation windows defined as follows:

- Immediate – projects to be implemented within 0-2 years
- Short Term – projects to be implemented within 2-5 years
- Medium Term – projects to be implemented within 5-10 years
- Long Term – projects forecasted to be implemented beyond 10 years

The project priority was established based on a combination of the following factors:

- Public health and safety
- System deficiency
- Facility condition

- Projected development (increased demands)
- Cost & available funding

Each recommended project was evaluated based on the above criteria and classified within one of the four implementation windows.

D. COST BASIS PARAMETERS

The estimates prepared herein are planning-level estimates. Detailed estimates should be prepared at the preliminary design level and final design level. All cost estimates have been prepared using present day U.S. dollars (January, 2005). A cost inflation rate of 4 percent is recommended to estimate the future cost of a project. Cost estimates for the capital improvement projects are based on the criteria shown in Table XVII-1.

A construction contingency of 20 percent was added to each capital improvement project to account for the unknown factors which accompany every project. An additional mark-up of 25 percent has been added to the cost estimates to cover engineering, administration and legal fees. Property acquisition and easement costs are not included in these estimates.

E. RECOMMENDED 5-YEAR CAPITAL IMPROVEMENT PROGRAM

The proposed improvements are based on system deficiencies and operational inefficiencies identified in the hydraulic analysis or identified by City staff. Each recommended project is described on one of the following pages. Each page describes one project and consists of the project ID, name, description, priority, cost and an exhibit or picture.

The recommended projects are prioritized in Table XVII-2 to develop the City's 5-year capital improvement program.

Table XVII-1
CIP Construction Cost Basis Parameters

Description	Unit Cost	
Pipeline Installation - Estimate of cost to construct a new pipeline in an existing City street at a standard depth of cover of 4-feet. Cost includes pipe material, fittings, appurtenances, excavation, backfill, compaction and re-paving. Costs do not include special circumstances such as deep construction, shoring, jack and boring, utility relocations, etc.		
6-inch	$70	/LF
8-inch	$80	/LF
10-inch	$90	/LF
12-inch	$100	/LF
16-inch	$140	/LF
20-inch	$180	/LF
24-inch	$220	/LF
Reservoirs		
Above-grade Concrete	$2.00	/GAL
Below-grade Concrete	$3.00	/GAL
Above-grade Steel	$1.00	/GAL
Exterior Re-coating	$50,000	/EA
Interior Re-coating	$50,000	/EA
Pump Stations		
Estimate includes the material and labor cost to install pumps, motors, valving, yard piping, back-up generator, minor earthwork, foundation, building, electrical, and telemetry. Costs do not include property acquisition, extensive earthwork, shoring and surge tanks.	$750,000	/EA
Pressure Reducing Stations		
Estimate includes the material and labor costs to construct a pressure reducing vault with one main line (8" or 10") and a bypass line (4"). Costs include the earthwork, a pre-cast vault, one hatch, site piping, site valving, electrical and telemetry. Costs do not include extensive traffic control, deep construction (beyond 8-feet) or property acquisition.	$150,000	/EA
Construction Contingencies	20%	
Engineering, Admin and Legal Fees	25%	

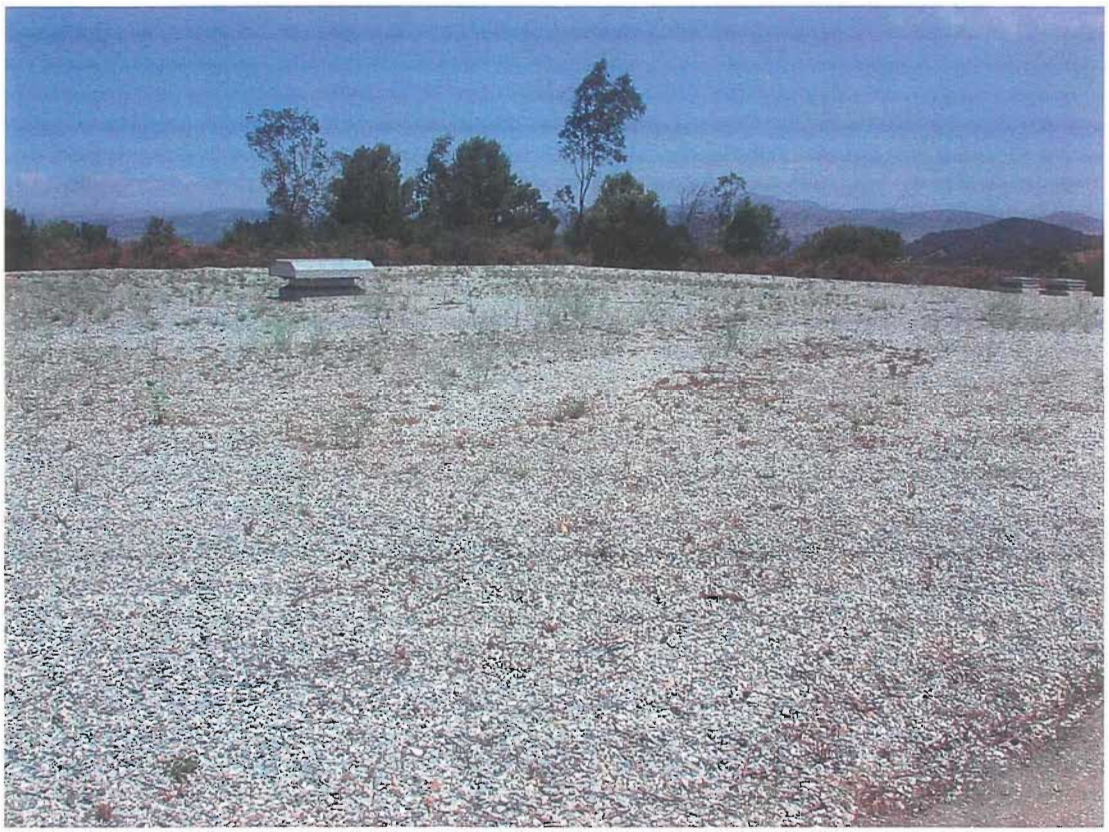
Table XVII-2
City of Thousand Oaks
5- Year Capital Improvement Program

Proj. No.	Project Title	Page	FY 2005/2006	FY 2006/2007	FY 2007/2008	FY 2008/2009	FY 2009/2010	Total
CI-1154	Fire Hydrant Upgrade Program - Various Locations	XVII-5		$25,000		$25,000		$50,000
CI-1157	Reservoir Site Development - Ventu Park	XVII-6	$30,000					$30,000
CI-1160	Reservoir Site Paving	XVII-7		$40,000		$40,000		$80,000
CI-1162	Water Service Line Upgrade - Polybutelene	XVII-8		$100,000		$100,000	$100,000	$300,000
CI-1164	Ventu Park Hydro Line Replacement	XVII-9	$60,000	$300,000				$360,000
CI-1165	Water Master Plan/Model/GIS Update	XVII-10	$30,000	$10,000	$10,000	$10,000	$10,000	$70,000
CI-1167	Construct Wilder Reservoir No. 2 (1.0 MG) & Pump Station No. 2	XVII-11		$450,000	$1,300,000			$1,750,000
CI-4028	Irving & Westgate - Small Water Lines	XVII-12	$550,000					$550,000
CI-4030	Pipe replacement program (8" and larger)	XVII-13		$300,000	$150,000	$150,000	$150,000	$750,000
CI-4266	Water System Valve Replacement	XVII-14			$60,000		$60,000	$120,000
CI-4267	Reservoir Security Enhancement	XVII-15	$100,000	$100,000				$200,000
CI-4290	Install Automated Chlorine Analyzers	XVII-16		$180,000	$450,000			$630,000
CI-4296	Water Master Plan and Facility Assessment Implementation	XVII-17	$200,000	$200,000				$400,000
CI-4304	Reservoir and Pump Station Improvements	XVII-18	$2,290,000	$600,000				$2,890,000
CI-4549	Reservoir Seismic Evaluation	XVII-19		$100,000	$400,000			$500,000
CI-4551	Automated Meter Reading Program (AMR)	XVII-20			$50,000	$200,000		$250,000
CI-4553	Improve Low Pressure Area of Meadows/Tara Zone	XVII-21	$400,000					$400,000
CI-4554	Replace and Relocate Sapra Street PRV w/ By-pass & Minnecota Drive PRV	XVII-22	$150,000	$150,000				$300,000
CI-4555	SCADA Master Plan Implementation	XVII-23		$200,000	$200,000			$400,000
CI-4556	Reservoir Mixing Improvements	XVII-24		$260,000	$150,000	$150,000	$150,000	$710,000
CI-4557	Cal-Am System Integration Implementation (estimate)	XVII-25	$150,000	$200,000				$350,000
CI-4558	Well Abandonment Program	XVII-26		$60,000				$60,000
CI-4571	Fire Hydrant/Water Meters	XVII-27	$65,000	$65,000	$65,000	$65,000	$65,000	$325,000
CI-5041	Pipeline Looping Program	XVII-28		$200,000	$200,000			$400,000
CI-5044	SCADA Improvements at CMWD Turnouts	XVII-29	$200,000	$200,000				$400,000
CI-5046	Hauser Circle to LD581 Water Line	XVII-30	$65,000					$65,000
CI-8082	Construct La Granada Pump Station	XVII-31		$300,000	$750,000			$1,050,000
MI-2009	Small Water Line Replacement Program - Citywide	XVII-32		$200,000		$200,000		$400,000
MI-2010	Reservoir Coating and Painting Program	XVII-33	$200,000		$100,000		$100,000	$400,000
MI-2011	Water System Repair and Replacement	XVII-34	$100,000	$100,000	$100,000	$100,000	$100,000	$500,000
MI-2501	Reservoir Tank Cleaning and Interior Inspection	XVII-35	$25,000	$25,000	$25,000	$25,000	$25,000	$125,000
MI-2503	Water Design and Construction Standards Update	XVII-36		$65,000				$65,000
MI-2504	CMMS Implementation/Pump Station	XVII-37	$450,000	$100,000				$550,000
MI-2505	Telemetry System Enhancement/Upgrade	XVII-38		$150,000		$30,000		$180,000
Project Totals			**$5,065,000**	**$4,680,000**	**$4,010,000**	**$1,095,000**	**$760,000**	**$15,610,000**

Project ID:	CI-1154
Project Name:	Fire Hydrant Upgrade Program - Various Locations
Description/Purpose:	Program to upgrade fire hydrants throughout the City to ensure properly function hydrants. It is recommended that the City maintain this program on a bi-annual basis.
Priority:	Bi-annual
Annual Cost:	$25,000 every other year

Exhibit: Typical fire hydrant assembly

Project ID:	CI-1157
Project Name:	Reservoir Site Development - Ventu Park
Description/Purpose:	Conduct site improvements at the Ventu Park Reservoir site.
Priority:	Immediate
Cost:	$30,000
Exhibit:	Ventu Park Reservoir site



Project ID:	CI-1160
Project Name:	Reservoir Site Paving
Description/Purpose:	This bi-annual program will rehabilitate, upgrade or repave one reservoir site every other year.
Priority:	Bi-annual
Annual Cost:	$40,000 every other year

Exhibit: Loose pavement at a reservoir site

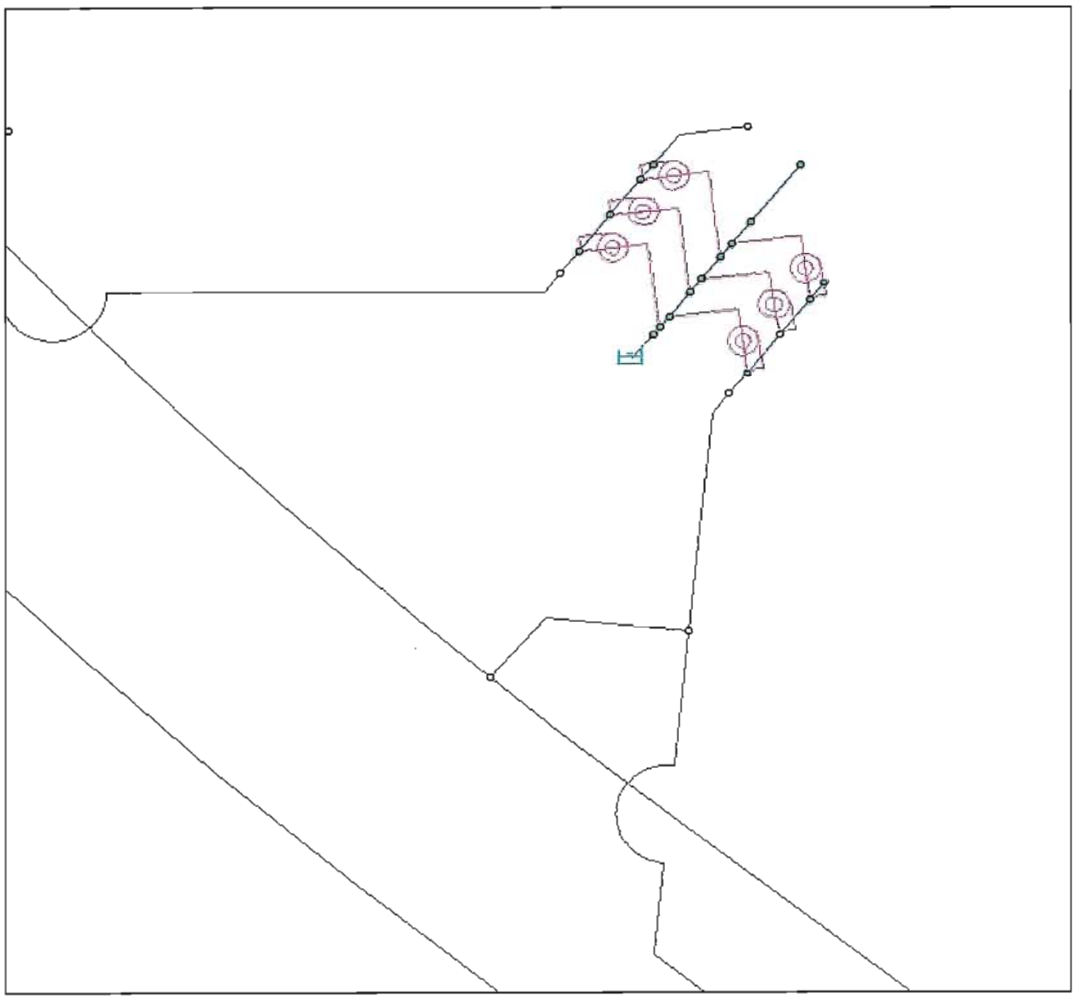
Project ID:	CI-1162
Project Name:	Water Service Line Upgrade - Polybutylene Laterals
Description/Purpose:	Replacing all of the polybutylene service laterals in the City with 1-inch copper services.
Priority:	Immediate
Total Cost:	$300,000

Exhibit: n/a

Project ID:	CI-1164
Project Name:	Ventu Park Hydro Line Replacement
Description/Purpose:	Replace a pipeline in the Ventu Park Hydro Zone.
Priority:	Short-term
Total Cost:	$360,000
Exhibit:	n/a

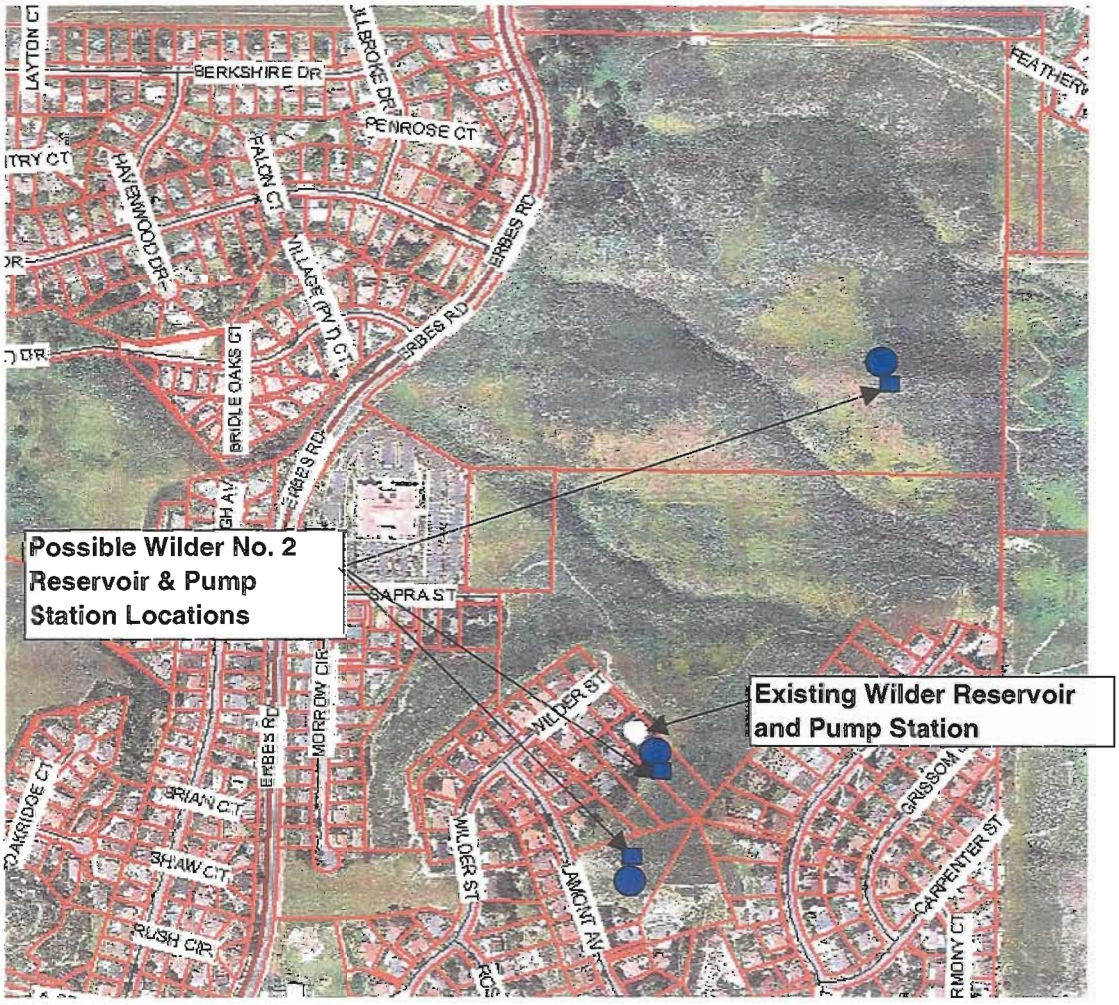
Project ID:	CI-1165
Project Name:	Water Master Plan/Model/GIS Update
Description/Purpose:	This project includes annual maintenance and upgrades to the to the hydraulic model and GIS, including license renewal fees.
Priority:	Annual
Annual Cost:	
Total Cost:	$70,000 (over the next 5 years)

EXHIBIT: H20MAP Hydraulic Model



Project ID:	CI-1167
Project Name:	Construct Wilder Reservoir No. 2 (1.0 MG) & Pump Station No. 2
Description/Purpose:	The Wilder Service Area Zone has a shortage of storage capacity and no existing secondary supply source for the Wilder Service Area Zone. This project recommends a new storage reservoir be constructed with a capacity of 1.0 MG. In addition, a new pump station is proposed to be constructed at the same site to provide back-up supply to the Grissom Zone. The pump station shall include one duty and one stand-by pump, each with a capacity of 175 gpm. Shown below are possible locations within the Wilder Service Area Zone with adequate elevations to construct the reservoir. The proposed Wilder No. 2 Pump Station should be located at the same site as Wilder No. 2 Reservoir.
Priority:	Short-term
Total Cost:	$1,750,000

EXHIBIT: Possible reservoir and pump station locations.



Project ID:	CI-4028
Project Name:	Irving and Westgate - Small Water Lines
Description/Purpose:	Replacing substandard lines
Priority:	Immediate
Cost:	$550,000
Exhibit:	n/a

Project ID:	CI-4030
Project Name:	Waterline Replacement Program
Description/Purpose:	A majority of the pipes within the City's distribution system are less than 50 years old. It is recommended that the City initiate a pipeline replacement program for all aging pipes in the system.
Priority:	Annual
Total Cost:	$750,000
Exhibit:	n/a

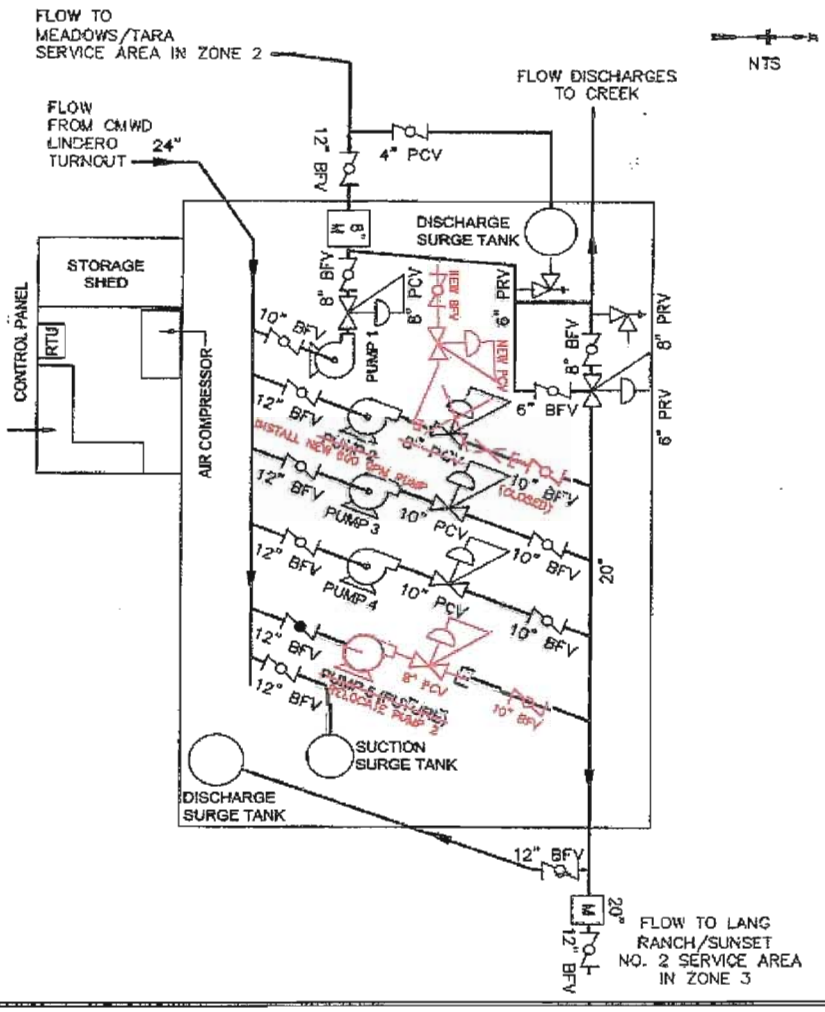
Project ID:	CI-4266
Project Name:	Water System Valve Replacement
Description/Purpose:	The valve replacement program shall replace all old and corroded valves in the City distribution system. This program also includes implementation of the pipeline flushing program.
Priority:	Bi-annual
Cost:	$60,000 every other year
Exhibit:	Exisitng butterfly valves in a PRV

Project ID:	CI-4267
Project Name:	Reservoir Security Enhancement
Description/Purpose:	To enhance the security at various reservoir sites.
Priority:	Immediate
Total cost:	$200,000
Exhibit:	N/a

Project ID:	CI-4290
Project Name:	Install Automated Chlorine Analyzers
Description/Purpose:	To monitor water quality at reservoirs with low chlorine residual, installation of automated chlorine analyzers is recommended at the following reservoirs: Freeway, La Granada, Meadows, Rolling Oaks, Ventu Park. This will enable the City to remotely monitor the chlorine residual in these tanks and take action accordingly.
Priority:	Short-term
Total cost:	$630,000
Exhibit:	N/a

Project ID:	CI-4296
Project Name:	Water Master Plan Implementation
Description/Purpose:	Implement miscellaneous projects related to system security/surveillance, emergency response, & other water projects citywide. One project identified to be included in this CIP is the installation of an additional pump at the Erbes Road Pump Station to provide back-up supply to the Meadows Service Area Zone. The pump shall have a design flow rate of 600 gpm so as not to exceed the capacity of the Lindero turnout. The new pump may be installed in the vacant pump can No. 5, or relocate the existing pump No. 2 to pump can No. 5 and install the new pump in pump can No. 2.
Priority:	Immediate
Total Cost:	$400,000

Exhibit: Erbes Road Pump Station Site Schematic with Proposed New Pump

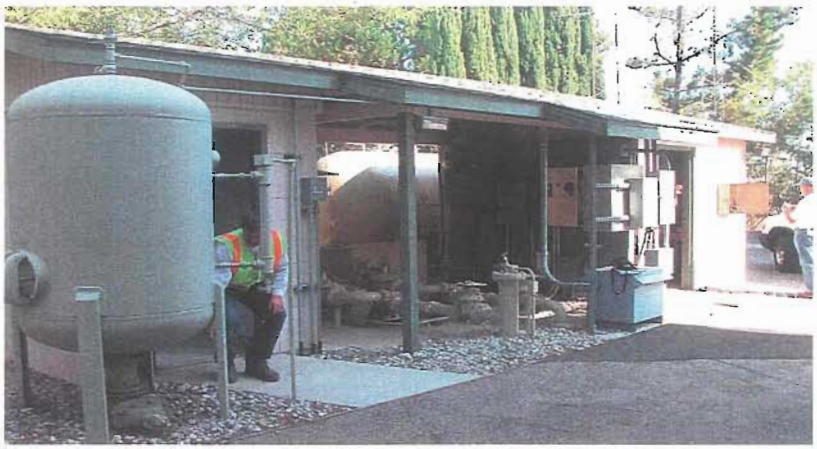


Project ID:	CI-4304
Project Name:	Reservoir and Pump Station Improvements
Description/Purpose:	Upgrade of electrical panel components at city's water pump stations. Enclosure structures at exposed pump station facilities, and provide seismic shut off valves at several reservoirs citywide.
Priority:	Short-term
Total Cost:	$2,890,000

EXHIBIT: Existing Building and electrical equipment at Grissom HPS

Grissom:
PS electrical upgrades.
PS construction of new building.

Install seismic control valve for reservoir.



Existing Site of Kelley HPS

Kelley:
PS electrical upgrades.
PS construction of new building.

Project ID:	CI-4304 (con't)
Project Name:	Reservoir and Pump Station Improvements

EXHIBIT:

Lone Oak:
PS replace existing electrical equipment.
PS upgrade existing building to accommodate new equipment.

Electrical Equipment to be replaced and existing building

Pederson:
PS electrical upgrades.
PS roof improvements.
Existing building has a damaged roof that was removed and never replaced.

Electrical equipment to be replaced and existing building

Sunset 2:
PS electrical upgrades.
PS construction of a new building.

Electrical equipment to be replaced and existing facility

Project ID:	CI-4304 (con't)
Project Name:	Reservoir and Pump Station Improvements

EXHIBIT:

Wilder:
PS electrical upgrades.
PS construction of a new building.

Install seismic control valve for reservoir.

Existing Wilder PS, with electrical equipment behind surge tanks.

Existing electrical equipment and roof

Willow Lane:
PS electrical upgrades.
PS building roof improvements.

Install seismic control valve for reservoir.

Existing facility and electrical equipment.

Sunset 3:
PS electrical upgrades.
PS construction of a new building.

Project ID:	CI-4304 (con't)
Project Name:	Reservoir and Pump Station Improvements
EXHIBIT:	Existing roof and electrical equipment

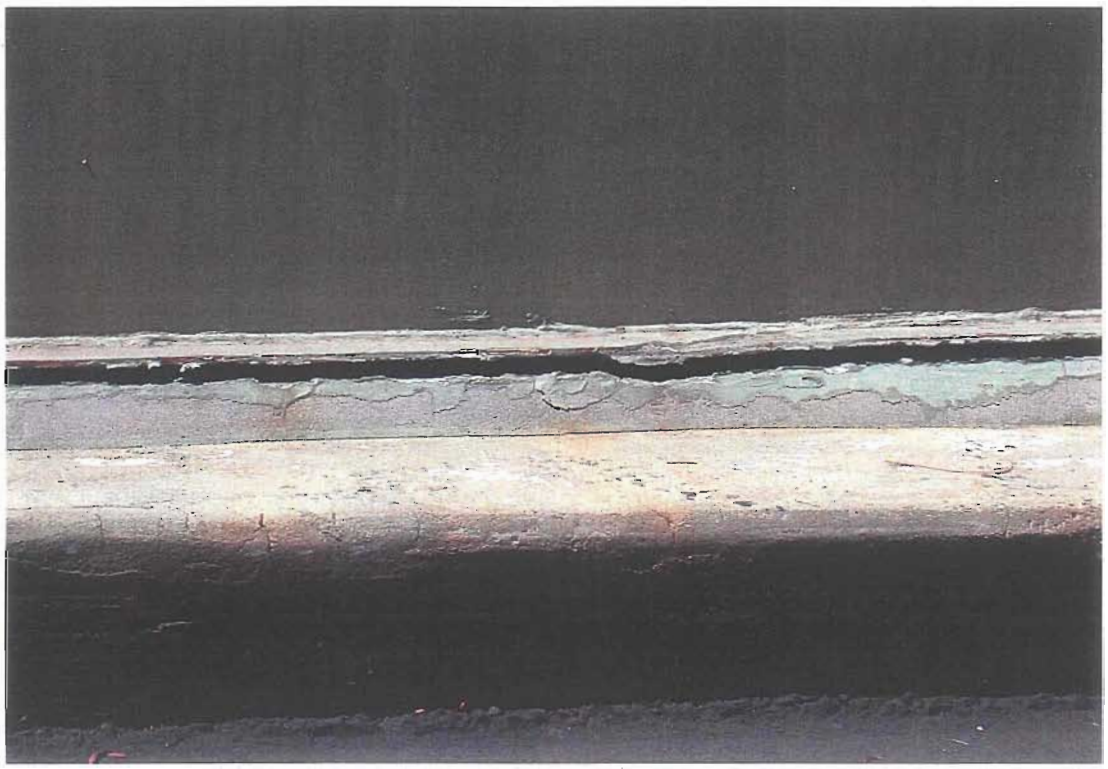
Northwood Booster:
PS electrical upgrades.
PS building roof improvements.

Existing inlet/outlet at Tara Reservoir

Reservoirs:
Installation of earthquake sensitive control system at Tara, La Granada, Oakbrook and Lang Ranch Reservoirs, which controls the operation of a facility during earthquake events.

Install flexible coupling at the inlet/outlet pipe of the Tara Reservoir.

Project ID:	CI-4549
Project Name:	Reservoir Seismic Evaluation
Description/Purpose:	The structural evaluation of the City reservoirs concluded that a detailed investigation for seismic integrity is needed at several reservoirs. The seismic investigation typically consists of a review of the design plans, specifications and shop drawings, a geotechnical investigation to determine potential seismic activity, a structural analysis, and a determination if retrofit is required. The structural evaluation determined that the following reservoirs require an immediate seismic evaluation: Meadows, Oakbrook, Pederson, Tara, and Ventu Park. The following reservoirs require a seismic evaluation in the next 2-5 years: Grissom No. 1, Grissom No. 2, Willow Lane, Freeway, La Granada, Lang Ranch, Kelley, Sunset No. 2, Sunset No. 3, and Wilder.
Priority:	Short-term
Cost/reservoir:	$500,000
Exhibit:	Footing of Tara Reservoir



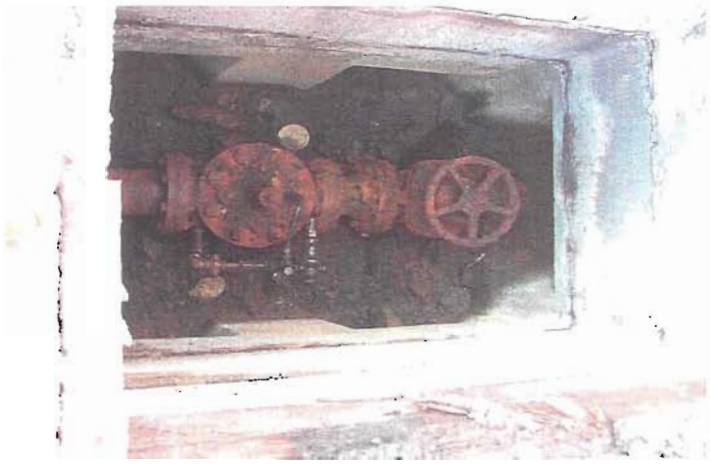
Project ID:	CI-4551
Project Name:	Automated Meter Reading Program (AMR)
Description/Purpose:	Phase 1 of the Automated Meter Reading (AMR) project is currently in progress with the initial AMR Report completed. This project consists of implementation of Phase II of the AMR program, which will determine which vendor the City can use in it's program and the cost and benefits to the City, and Phase III which is implementing pilot program.
Priority:	Medium-Term
Total Cost:	$250,000
Exhibit:	N/A

Project ID:	CI-4553
Project Name:	Improve Low Pressure Area of Meadows Zone
Description/Purpose:	Recommended action for the area include changing the service area zones of Aspenpark Court, Rusticpark Court, Greenpark Court, Northpark Court and include portions of Summerpark Court to improve pressure. This project requires the installation of one pressure reducing valve assembly for primary supply, installation of three isolation valves to isolate the existing Zone 2 system, installation of an 8-inch pipeline to maintain Zone 2 looping, and the installation of a pressure reducing valve assembly for back-up supply. The pressure reducing valves should be set at approximately 60 psi and 70 psi, respectively, to achieve optimal pressures.
Priority:	Immediate
Total Cost:	$400,000

EXHIBIT: Areas of low pressure in Meadows Zone

Project ID:	CI-4554
Project Name:	Replacement/Relocation of PRV at Sapra and Minnecota
Description/Purpose:	Sapra Street PRV is old and not serviceable. Replacement is needed. Under existing conditions, the reduced Sapra zone is only supplied through one PRV. If the PRV were to fail, the zone would have no water supply. Therefore, a bypass line is needed when the new PRV is installed. The Minnecota Drive PRV is in poor condition and the whole facility should be replaced and relocated outside of the sidewalk.
Priority:	Immediate
Total Cost:	$300,000

EXHIBIT: Sapra Street PRV (above) & Minnecota Drive PRV (below)



Project ID:	CI-4555
Project Name:	SCADA Master Plan Implementation
Description/Purpose:	The SCADA system assessment is described in the SCADA Master Plan Report, dated September 2004. The SCADA analysis determined the suitability of the system to meet the intended purpose and requirements of the present system configuration, to provide corrective recommendations where warranted and to meet future needs, and provide a vulnerability assessment to reduce the risk of tampering with the SCADA system.
Priority:	See Table
Total Cost:	$400,000

Exhibit: SCADA Master Plan Recommendation Summary Table

RECOMMENDATION DESCRIPTION	*PRIORITY*
Turnouts	
Trim trees at Las Flores Turnout	Maintenance
Connect panel intrusion switch at Del Sol turnout	Maintenance
Provide totalized flow monitoring through SCADA system at all turnouts. Study to establish the construction requirements and coordinate the interface with CMWD	Long term
Pump Stations	
Add operator interface panels at pump stations as pump stations are upgraded.	Long Term
Add power monitoring capability at pump stations.	Long Term
Reservoirs	
Add earthquake control valve remote capability	Short Term
Add chlorine analyzers and ability to monitor chlorine levels through the SCADA system	Intermediate term
Wells	
Add capability to monitor wells through the SCADA system	Long Term
Establish cost effective method of telemetry from City MSC to each well facility.	Short Term
Telemetry	
Provide direct communication between the reservoirs and pump stations.	Long Term
Establish cost effective method of telemetry between pump stations and reservoirs.	Short Term
Report Generation	
No recommendations	N/A
Display and Monitoring Capability	
Add digital photographs of each facility to the facility monitoring screen	Short Term
Add facility communication failure to display and generate an alarm condition at each facility	Short Term
Add low flow alarm condition to be generated when pumps are indicated to be running but expected flow is not achieved.	Short Term
Add overlay capability for trending displays of monitored parameters.	Short Term
Add pump station discharge pressure at each pump station to be monitored through the SCADA system	Intermediate term
Add security cameras and monitoring capability for selected facilities.	Intermediate term
Establish a system upgrade contract.	Short Term
Remote Access	
No Recommendations	N/A

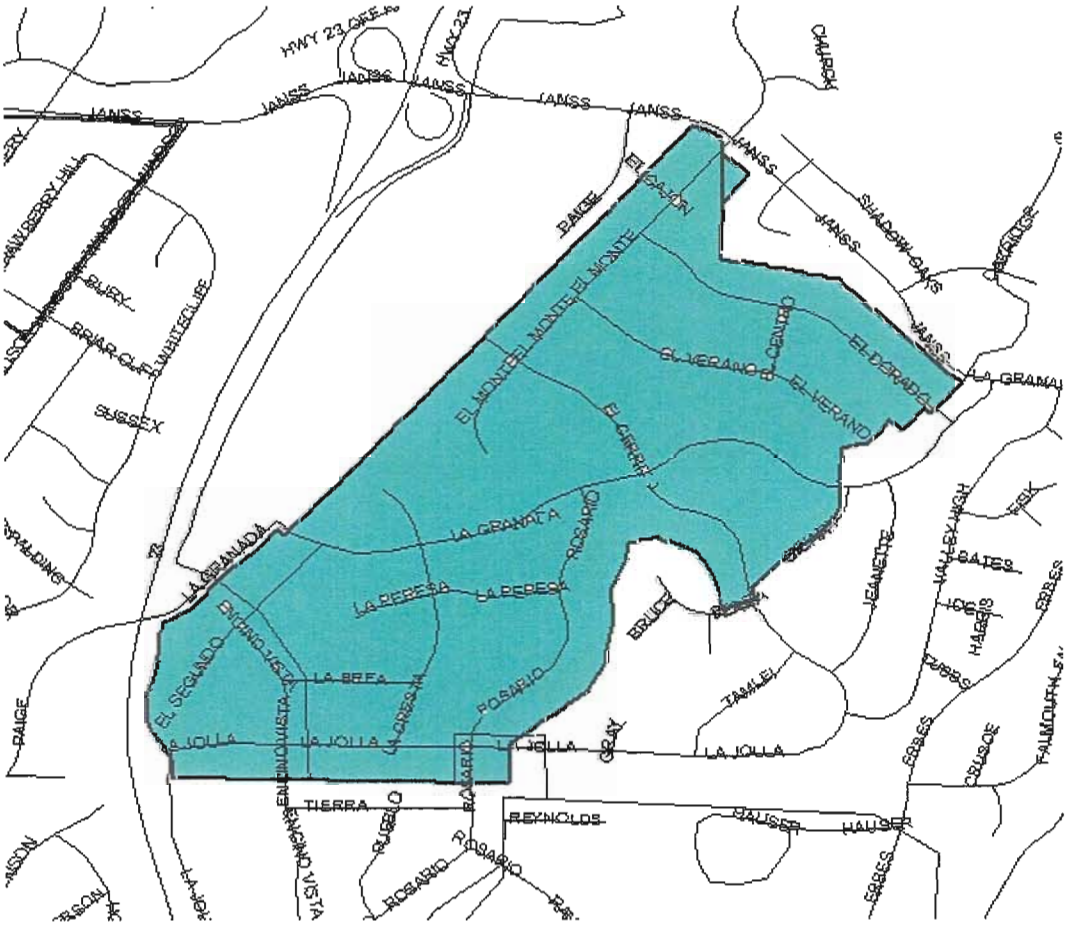
Project ID:	CI-4556
Project Name:	Reservoir Mixing Improvements
Description/Purpose:	To improve the circulation within reservoirs, the following improvements shall be made: The hood located on the inlet/outlet pipe should be removed at the following reservoirs: Freeway, Grissom No. 2, Kelley, La Granada, Lang Ranch, Oakbrook, Susnset No. 2, Sunset No. 3 and Wilder. To improve reservoir mixing, a Tide-Flex mixing system shall be installed inside each of the following reservoirs: Freeway and La Granada. A dedicated outlet pipe and a dedicated inlet pipe should be installed with an altitude valve for each chamber of Ventu Park Reservoir and for the Meadows Reservoir.
Priority:	Short-Term
Total Cost:	$710,000

Exhibit: Hood on inlet/outlet pipe on steel tank reservoir

Existing inlet/outlet pipe at Meadows Reservoir

Project ID:	CI-4557
Project Name:	Cal-Am System Integration Implementation
Description/Purpose:	In order to integrate the Conejo Oaks Service Area from California American Water Company into City's water distribution system, several improvements will be required. The extent of such improvements will be determined with the completion of the Cal-Am integration study. It is anticiapted that some pipeline looping, interconnections and pressure reducing facilities will be required to provide redundant supply to the area.
Priority:	Short-term (complete by Jan. 1, 2008)
Total Cost:	$350,000 (estimate)

Exhibit: Conejo Oaks Area, currently served by Cal-Am



Project ID:	CI-4558
Project Name:	Well Abandonment Program
Description/Purpose:	It is recommended to properly abandon the Goebel Well and the Thousand Oaks Library Well per criteria established in the California Well Standards and the American Water Works Association Standards.
Priority:	Immediate
Total Cost:	$60,000

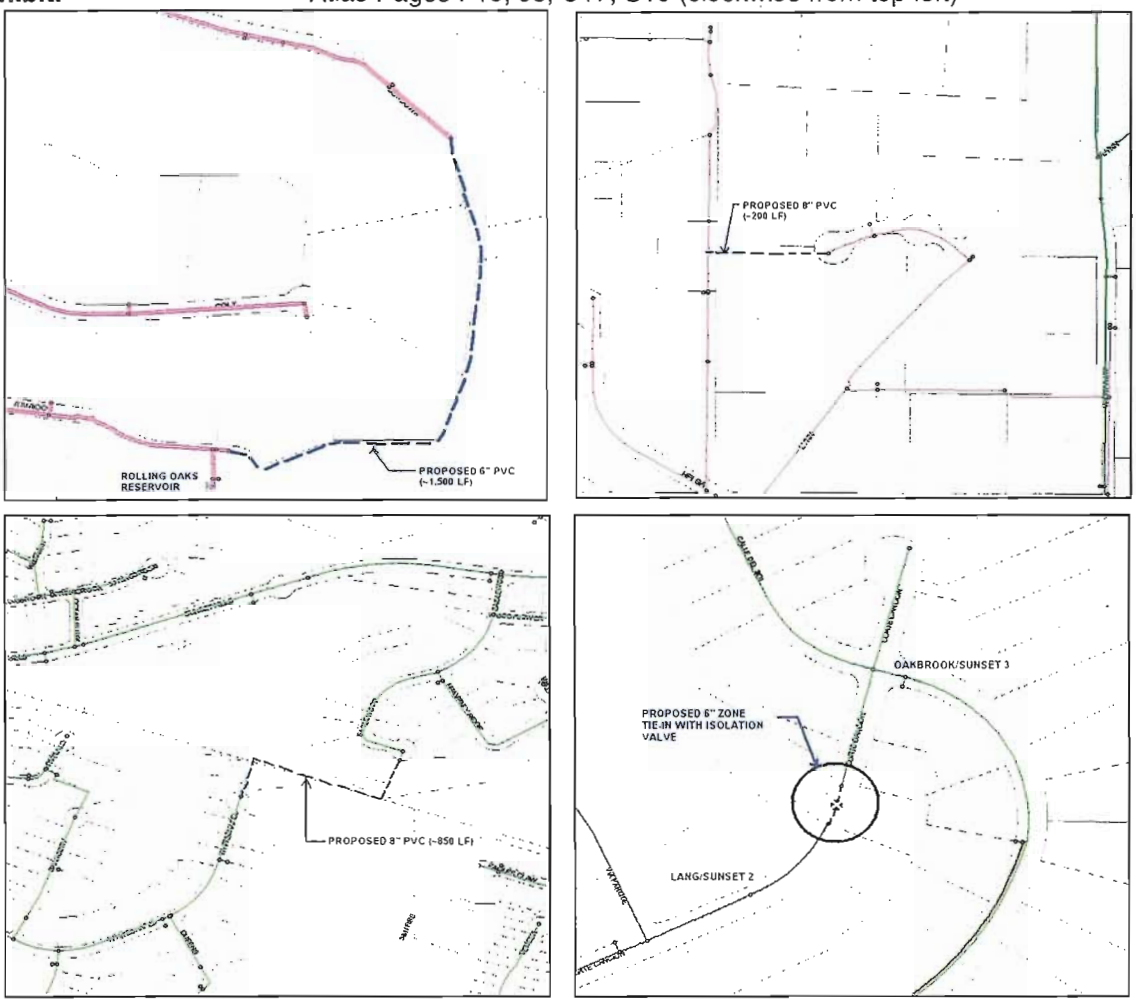
EXHIBIT: Goebel Well and Library Well

Project ID:	CI-4571
Project Name:	Fire Hydrant/Water Meters
Description/Purpose:	Install new standardized fire hydrants at locations which currently have dry-barrel or older fire hydrants.
Priority:	Annual
Annual Cost:	$65,000

Exhibit: Typical City fire hydrant assembly

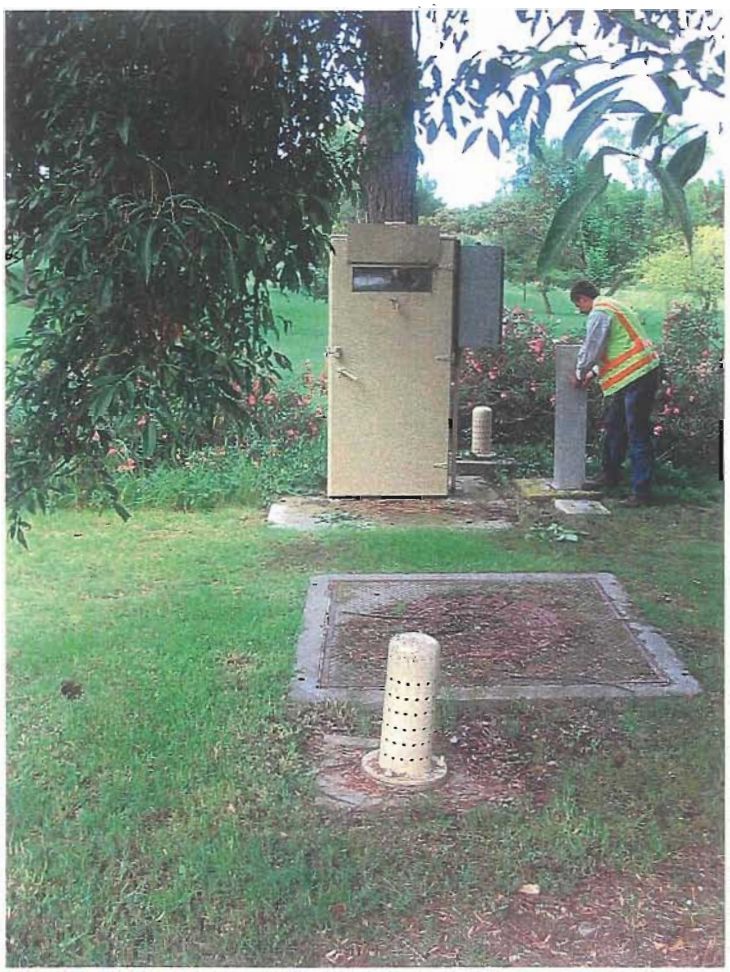
Project ID:	CI-5041
Project Name:	Pipeline Looping Program - Various Locations
Description/Purpose:	Four locations were identified to provide distribution system pipeline looping. It is recommended to install new piping at the size and location as shown in the exhibit below to improve system redundancy and reliability and improve water circulation and water quality. At three of these four locations, property acquisition and/or easement acquisition will be required.
Priority:	Immediate/Short-term
Total Cost	$400,000

Exhibit: Atlas Pages I-15, J8, U17, S19 (clockwise from top left)



Project ID:	CI-5044
Project Name:	SCADA Improvements at CMWD Turnouts
Description/Purpose:	It is recommended that the City integrate the SCADA system at all of their turnouts (10) with the CMWD SCADA system so flows can be read remotely. It is recommended that the City coordinate these improvements with planned improvements by CMWD.
Priority:	Immediate/Short-term
Total Cost	$400,000

Exhibit: Del Sol Turnout



Project ID:	CI-5046
Project Name:	Hauser Circle to LD584 Water Line
Description/Purpose:	Construct 8" water from Hauser Circle to Land Division-584 (LD584). This project requires the acquisition of an easement through the property at 1624 Hauser Circle and will also require a separate construction easement.
Priority:	Immediate
Cost:	$65,000
Exhibit:	Hydraulic Model screen shot of the existing piping in Hauser Circle

Project ID:	CI-8082
Project Name:	La Granada Pump Station
Description/Purpose:	This project would consist of installing a new booster pump station at the site of the La Granada Reservoir. The pump station shall provide supply to the Wilder service zone and Wilder Reservoirs. The project will provide a second supply source to the Wilder service zone. It will ease the demand on the Lone Oak Pump Station, therefore reducing the City's dependence on the Lone Oak turnout. It will allow the City more flexibility in utilizing the Zone 1 storage and gravity feed turnouts.
Priority:	Short-term (2005 - 2007)
Total Cost:	$1,050,000
Exhibit:	The pump station is proposed to be located at the site of the La Granada Reservoir

Project ID:	MI-2009
Project Name:	Small Water Line Replacement Program - Citywide
Description/Purpose:	This is a program to replace all 3-inch, 4-inch and 6-inch waterlines in the City with a minimum of 8-inch piping.
Priority:	Bi-annual
Total Cost:	$200,000

Exhibit: n/a

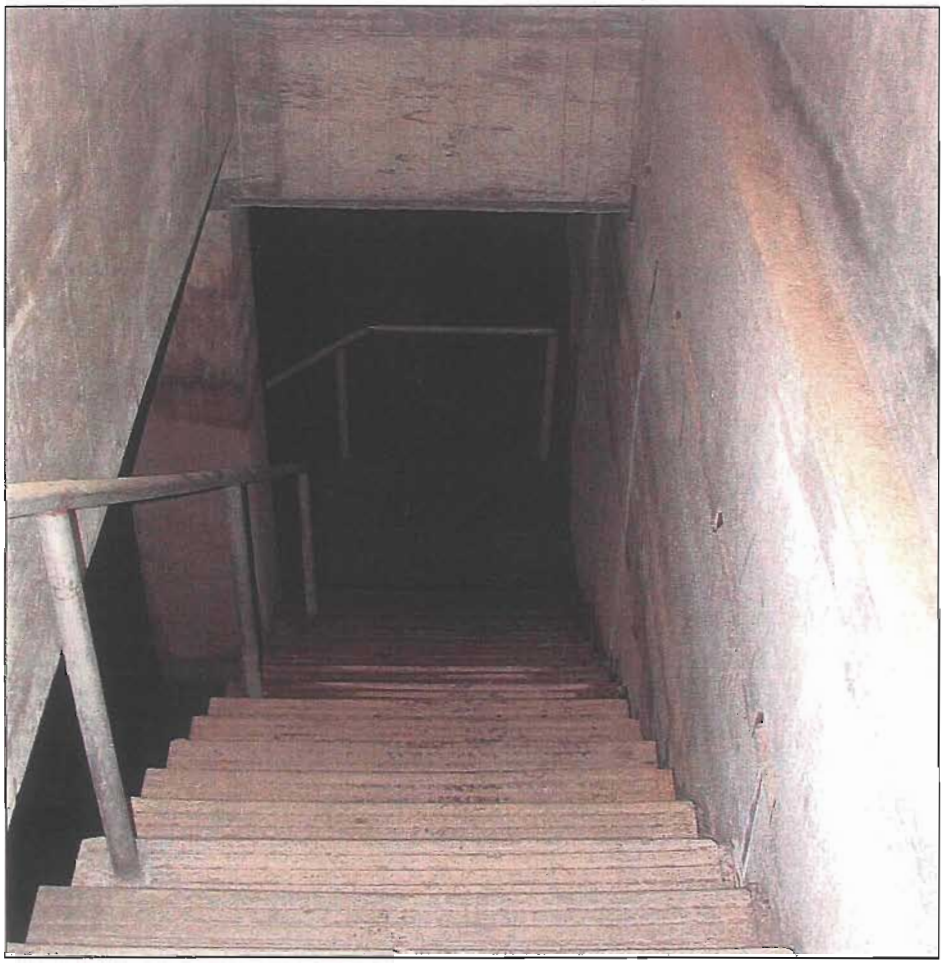
Project ID:	MI-2010
Project Name:	Reservoir Coating and Painting Program
Description/Purpose:	It is recommended that the City implement a program to re-coat and re-paint the interior and exterior of each of their steel reservoirs as required. Immediate attention is required to the Willow Lane Reservoir. It is recommended that the City re-coat and re-paint one steel reservoir within the distribution every other year.
Priority:	Immediate/Bi-annual
Total Cost:	$100,000

Exhibit: Willow Lane Reservoir external coating.

Project ID:	MI-2011
Project Name:	Water System Repair and Replacement
Description/Purpose:	An annual budget shall be established to cover the cost to repair and/or replace unforeseen problems within the water distribution system.
Priority:	Annual
Total Cost:	$100,000

Exhibit: n/a

Project ID:	MI-2501
Project Name:	Reservoir Tank Cleaning
Description/Purpose:	It is recommended the City implement an annual program to clean and inspect one reservoir per year. The tank cleaning schedule shall be coordinated with other reservoir improvements when possible.
Priority:	Annual
Total Cost:	$25,000
Exhibit:	View inside Pederson Reservoir



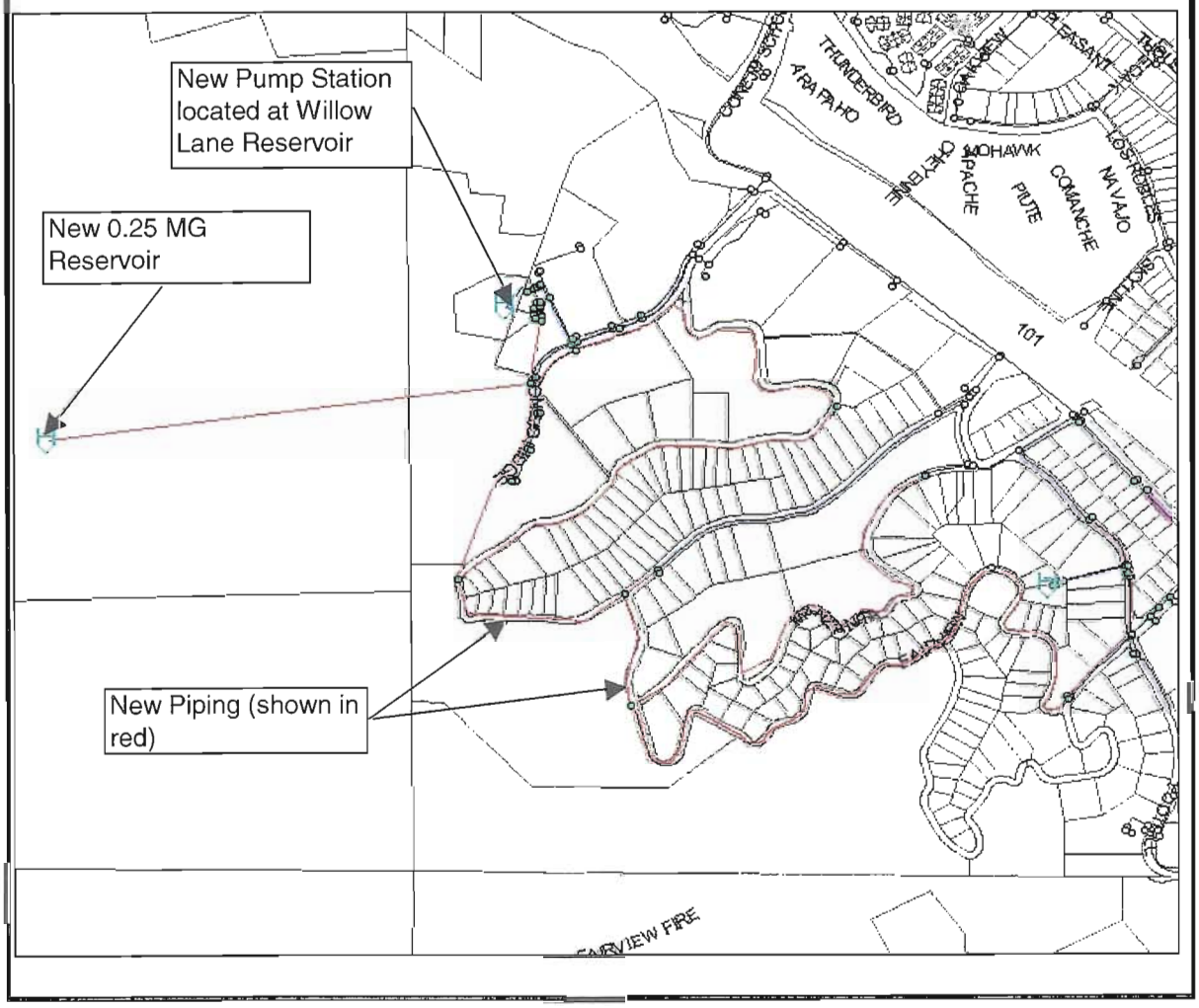
Project ID:	MI-2503
Project Name:	Water Design and Construction Standards Update
Description/Purpose:	The City shall update their design and construction standards.
Priority:	Short-term
Total Cost:	$65,000
Exhibit:	n/a

Project ID:	MI-2504
Project Name:	CMMS Implementation
Description/Purpose:	Provide computerized work order generation process and tracking system in conjunction with asset management capabilities.
Priority:	Immediate
Total Cost:	$550,000
EXHIBIT:	N/A

Project ID:	MI-2505
Project Name:	Telemetry System Enhancements/Upgrades
Description/Purpose:	A project to up-keep the telemetry system throughout the distribution system.
Priority:	Bi-annual
Total Cost:	$180,000
Exhibit:	n/a

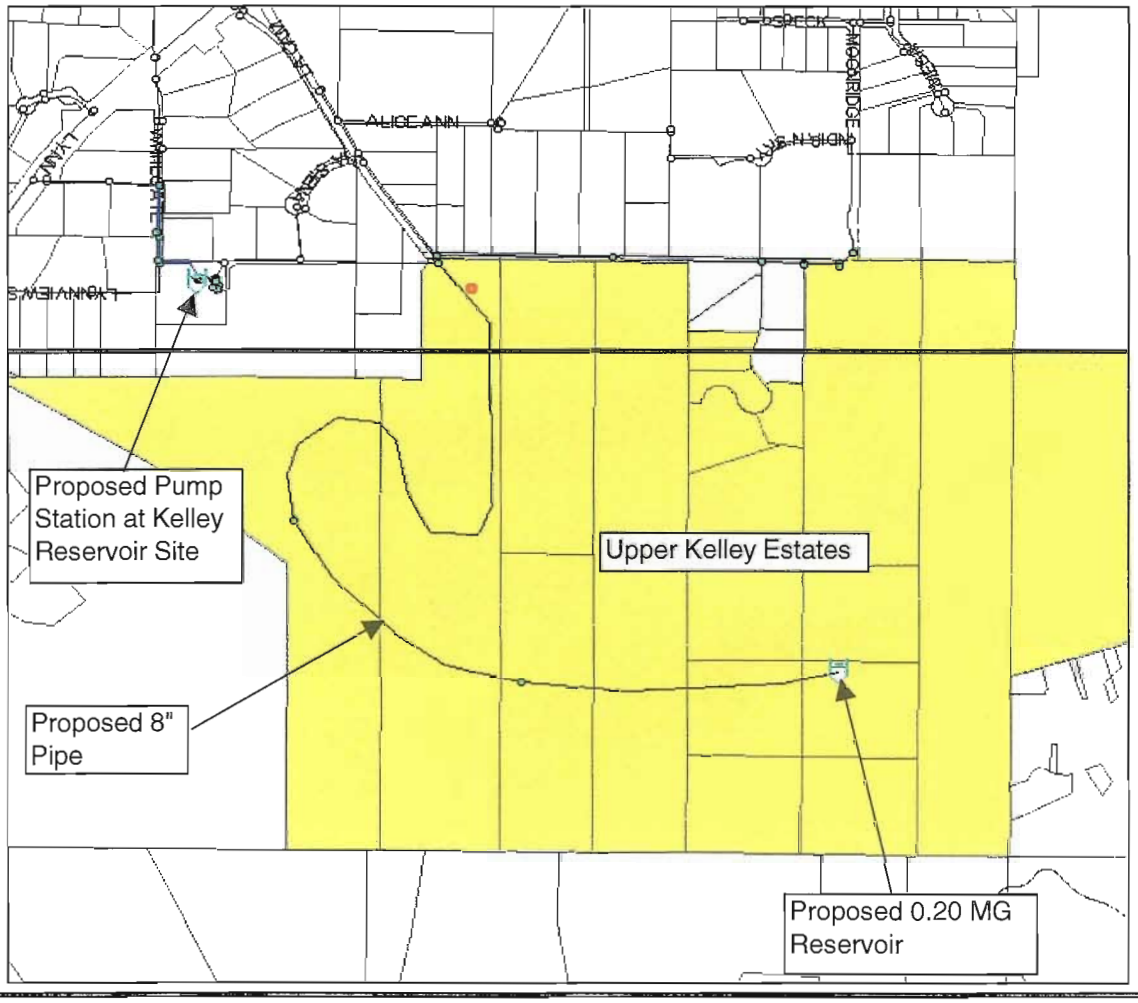
Project ID:	(not included in 5-year CIP)
Project Name:	Skyline Area Improvements
Description/Purpose:	As development occurs in the Skyline Area, a new service area zone will need to be created, including a new reservoir, a new pump station, and pertinent transmission and distribution piping to connect the facilities and serve the residents. The reservoir is proposed to be 0.25 MG, and located west of the site with a bottom elevation of 1225'. The pump station shall consist of two-55 gpm pumps, and one-200 gpm pump and is proposed to be located at the existing Willow Lane Reservoir site. Piping will include 8", 10", and 12" pipe located primarily in Skyline Drive, Conejo Ridge Road, and Manzanita.
Priority:	Long-term
Total Cost:	$3,150,000 (to be funded through development fees and special facility surcharges)

Exhibit: Skyline Area Improvements



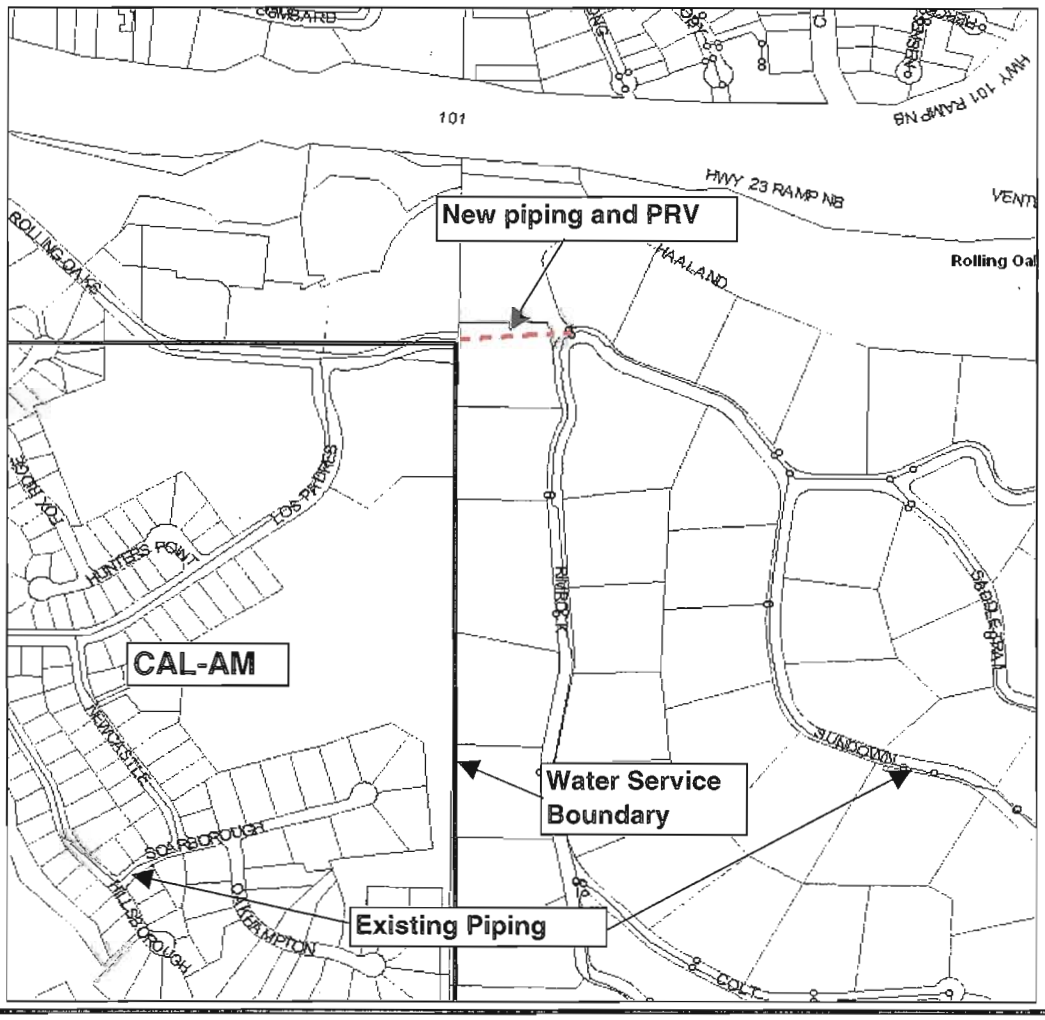
Project ID:	(not included in 5-year CIP)
Project Name:	Upper Kelley Estates Improvements
Description/Purpose:	The proposed Upper Kelley Estates will require a 0.20 MG reservoir, new pump station, and pertinent piping to connect the facilities and serve the residents. The reservoir will be 0.20 MG, and located at a peak at the southern end of the area, with an HGL of approximately 1,448 feet. The pump station will consist of two 25 gpm pumps, and one 200 gpm pump and located at the existing Kelley Reservoir site. Piping will be 8" pipe located in a road constructed for the development.
Priority:	Long-term
Total Cost:	$2,160,000 (to be funded through development fees and specialty facility surcharges)

EXHIBIT: Upper Kelley Estates Improvements



Project ID:	(Not included in 5-year CIP, recommended for future funding consideration)
Project Name:	Interconnection between Cal-Am and the Rolling Oaks service area
Description/Purpose:	The purpose of the interconnection is to provide a secondary water supply to the Rolling Oaks Service Area Zone. Cal-Am serves the area directly west of Rolling Oaks Zone, at a hydraulic grade of 1,120 feet. The hydraulic grade of Rolling Oaks Zone is 1087', so a pressure reducing valve will also be needed.
Priority:	Long-Term
Total Cost:	$140,000

Exhibit: Rolling Oaks Interconnection Improvements



RBF

APPENDIX A

APPENDIX A - SCE RATE SCHEDULE

SCE offers a selection of rate schedules that are based on demand usage, peak pumping and connected load. Below is a description of the seven most common rate schedules implemented by SCE that are pertinent to the City's operating system, effective March 2002.

GS-1: This is a general service rate structure, based on a flat-rate energy charge. This rate structure is applicable only to customers whose monthly maximum demand, in the opinion of SCE, is not expected to exceed 20 kW (27 hp) or has not exceeded 20 kW in any three months during the previous 12 months.

PA-1: This rate structure is a connected-load based structure. Charges are assessed based on the energy usage and size of the pumps (horsepower) at the respective pump station. The energy charge is a flat rate. This schedule is not applicable when, in the opinion of SCE, the customer's monthly maximum demand is expected to exceed 500 kW.

PA-2: This rate structure is based on a metered demand and the energy usage. The demand charge is comprised of two components, a facilities related component and a time related component. The facilities related component is based on the greater of the monthly maximum demand or 50% of the highest monthly maximum demand recorded during the previous eleven months. The time related component is based on the monthly maximum demand. The energy charge is based on a flat rate. This schedule is not applicable when, in the opinion of SCE, the customer's monthly maximum demand is expected to exceed 500 kW.

TOU-PA-A: This rate structure is a connected-load and time-of-use based structure. A service charge is determined based on the size (horsepower) of the connected pumps. An energy charge is applied based on the time of day the pumps operate. This schedule is not applicable when, in the opinion of SCE, the customer's monthly maximum demand is expected to exceed 500 kW.

TOU-PA-B: This rate structure is a metered demand and time-of-use based structure. The demand charge is comprised of two components, a facilities related component and a time related component. The facilities related component is based on the greater of the monthly maximum demand or 50% of the highest monthly maximum demand recorded during the previous eleven months. The time related component is based on the monthly maximum demand. An energy charge is applied based on the time of day the pumps operate. This schedule is not applicable

when, in the opinion of SCE, the customer's monthly maximum demand is expected to exceed 500 kW.

TOU-PA-SOP: This rate structure is based on a time-of-use based structure. The demand charge is comprised of two components, a facilities related component and a time related component. The facilities related component is based on the greater of the monthly maximum demand or 50% of the highest monthly maximum demand recorded during the previous eleven months. The time related component is based on the monthly maximum demand. An energy charge is applied based on the time of day the pumps operate. This rate utilizes a super-off-peak time period. This schedule is not applicable when, in the opinion of SCE, the customer's monthly maximum demand is expected to exceed 500 kW. This rate has two options for the summer season period.

TOU-PA-SOP-1: This rate structure is based on a time-of-use based structure. The demand charge is comprised of two components, a facilities related component and a time related component. The facilities related component is based on the greater of the monthly maximum demand or 50% of the highest monthly maximum demand recorded during the previous eleven months. The time related component is based on the monthly maximum demand. An energy charge is applied based on the time of day the pumps operate. This rate utilizes a super-off-peak time period and allows SCE to interrupt power if requested by SCE. This schedule is not applicable when, in the opinion of SCE, the customer's monthly maximum demand is expected to exceed 500 kW. In order to qualify for this rate, a minimum of 50 horsepower (hp) of the total connected load or 50 kW of maximum demand is required. This rate has two options for the summer season period.

Each of the above-mentioned rate structures also includes a basic customer charge, typically a daily or monthly charge. The charges will also vary based on the time of year, or season. Typically, the rates will decrease slightly during the winter season (first Sunday in October to the first Sunday in June). The summer and winter time periods are as follows:

Summer:	TOU-PA-A, TOU-PA-B	
	On-Peak:	Noon – 6 p.m. (weekdays except holidays)
	Mid-Peak:	8 a.m. – Noon, 6 p.m. – 11p.m. (weekdays except holidays)
	Off-Peak:	All other hours

TOU-PA-SOP, TOU-PA-SOP-I

On-Peak: 1 p.m. – 5 p.m. (weekdays except holidays)

Mid-Peak: 6 a.m. – 1 p.m., 5 p.m. – Midnight (weekdays)

6 a.m.- Midnight (weekends)

Super Off-Peak: Midnight – 6 a.m. (everyday)

Winter: TOU-PA-A, TOU-PA-B

On-Peak: None

Mid-Peak: 8 a.m. – 9 p.m. (weekdays except holidays)

Off-Peak: All other hours

TOU-PA-SOP, TOU-PA-SOP-I

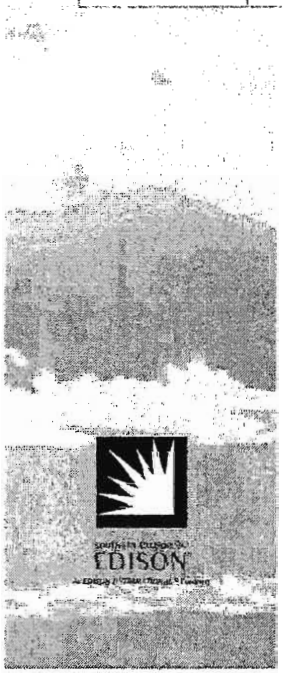
Mid-Peak: 6 a.m. - Midnight

Super Off-Peak: Midnight – 6 a.m.

AGRICULTURAL & PUMPING RATE SCHEDULES

Rate Schedule	Rate Structure	Customer Charge	Demand (kW) or Connected Load (Service) Charge	Energy Charge (per kWh)	Some Other Conditions/Charges
PA-1	• Flat rate energy charge • Service charge based on connected load	$17.65/ month	$2.05 per horsepower (hp) of connected load per month.	12.247¢	Service charge minimum based on 2 hp for single-phase service and 3 hp for three-phase service. Off-peak credit. Pay as you grow.
PA-2	• Two-tiered energy rate • Facilities- and Time-related demand charges • Seasonal demand charge structure	$30.35/ month	**Facilities-related demand charge***: $2.25 per monthly maximum kW, all year. **Time-related demand charge**: $7.40 per monthly maximum kW in the summer season, and $0.00 in winter.	9.124¢ for the first 300 kWh per kW of maximum demand for the billing period 10.056¢ for all additional kWh	Summer season is the first Sunday in June to the first Sunday in October; remaining months comprise the winter season. Optional Time-of-Use meter: $2.85 per month. Power factor adjustment charge. (See GS-2) Pay as you grow.
TOU-PA Option A	• Time-of-Use rate • Seasonal structure • Service charge based on connected load • Benefits customers who can use most of their electricity, or can shift load to, the off-peak time period	$42.80/ month	$2.40 per horsepower (hp) of connected load per month.	**Summer Season** 20.735¢/on-peak 11.896¢/mid-peak 6.704¢/off-peak **Winter Season** 13.516¢/mid-peak 6.704¢/off-peak	Summer season runs the first Sunday in June to the first Sunday in October; remaining months comprise the winter season. (See Time-of-Use charts for more information.) Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)

* Each month, this charge is applied to the higher of the current month's maximum demand (kW) or 50% of the highest demand recorded in the previous 11 months. In cases where little or no energy usage is recorded for extended periods of time, SCE has the option of applying this charge to 50% of the customer's connected load.



Eligibility for all Agricultural and Pumping schedules requires that 70% or more of the customer's electrical usage is for general agricultural purposes or for general water or sewerage pumping. When SCE initially determines the customer's monthly maximum demands will exceed 500 kilowatts (kW) or when 500 kW is exceeded in any three months during the preceding 12 months the customer is ineligible for Agricultural and Pumping rate schedules and will be transferred to Schedule TOU-8. The exceptions to this are large water agencies and agricultural water pumping accounts where at least 70% of their pumping is for agricultural purposes. These accounts must take service on an Agricultural and Pumping rate schedule.

Rate Schedule	Rate Structure	Customer Charge	Demand (kW) or Connected Load (Service) Charge	Energy Charge (per kWh)	Some Other Conditions/Charges
TOU-PA Option B	• Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure • Benefits customers who can use most of their electricity, or can shift load to, the off-peak time period	$42.80/ month	**Facilities-related demand charge*:** $2.85 per monthly maximum kW, all year. **Time-related demand charge:** $9.00 per maximum on-peak kW in the summer season; $0.00 in all other time periods.	**Summer Season** 17.408¢/on-peak 9.756¢/mid-peak 6.452¢/off-peak **Winter Season** 11.003¢/mid-peak 6.452¢/off-peak	Summer season runs the first Sunday in June to the first Sunday in October; remaining months comprise the winter season. (See Time-of-Use charts for more information.) Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)
TOU-PA-3	• Time-of-Use rate • Offers a choice of 3-hour summer weekday on-peak options: 1 to 4 pm; and 2 to 5 pm • Facilities- and Time-related demand charges • Benefits customers who can use most of their electricity, or can shift load to, the off-peak time period	$42.80/ month	**Facilities-related demand charge*:** $2.85 per monthly maximum kW, all year. **Time-related demand charge:** $9.00 per maximum on-peak kW in the summer season; $0.00 in all other time periods.	**Summer Season** 19.581¢/on-peak 11.155¢/mid-peak 6.129¢/off-peak **Winter Season** 12.645¢/mid-peak 6.129¢/off-peak	Summer season runs the first Sunday in June to the first Sunday in October; remaining months comprise the winter season. (See Time-of-Use charts for more information.) Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)
TOU-PA-4	• Time-of-Use rate • Offers a choice of 4-hour summer weekday on-peak options: noon to 4 pm; 1 to 5 pm; and 2 to 6 pm • Facilities- and Time-related demand charges • Seasonal structure • Benefits customers who can use most of their electricity, or can shift load to, the off-peak time period	$42.80/ month	**Facilities-related demand charge*:** $2.85 per monthly maximum kW, all year. **Time-related demand charge:** $9.00 per maximum on-peak kW in the summer season; $0.00 in all other time periods.	**Summer Season** 19.369¢/on-peak 11.018¢/mid-peak 6.073¢/off-peak **Winter Season** 12.484¢/mid-peak 6.073¢/off-peak	Summer season runs the first Sunday in June to the first Sunday in October; remaining months comprise the winter season. (See Time-of-Use charts for more information.) Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)
TOU-PA-5	• Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure • Benefits customers who can use most of their electricity, or can shift load to, the off-peak time period	$40.70/ month	**Facilities-related demand charge*:** $2.85 per monthly maximum kW, all year. **Time-related demand charge:** $9.00 per maximum on-peak kW in the summer season only; $0.00 in all other time periods for both summer and winter seasons.	**Summer Season** 13.545¢/on-peak 7.542¢/mid-peak 6.683¢/off-peak **Winter Season** 8.422¢/mid-peak 7.320¢/off-peak	**A minimum charge** of $25.55/kW for facilities-related demand in the summer and $11.05/kW in the winter applies. A minimum of 35 horsepower (hp) of total connected load, or 35 kW of maximum demand, required for eligibility. Summer season runs the first Sunday in June to the first Sunday in October; remaining months comprise the winter season. (See Time-of-Use charts for more information.) Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)

* Each month, this charge is applied to the higher of the current month's maximum demand (kW) or 50% of the highest demand recorded in the previous 11 months. In cases where little or no energy usage is recorded for extended periods of time, SCE has the option of applying this charge to 50% of the customer's connected load.

Rate Schedule	Rate Structure	Customer Charge	Demand (kW) or Connected Load (Service) Charge	Energy Charge (per kWh)	Some Other Conditions/Charges
TOU-PA-6	• For customers considering natural gas (rate A) or diesel fuel (rate B) as an alternate energy source to serve the water pumping load • Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure	**Rate A** $29.70/ month **Rate B** $31.40/ month	**Facilities-related demand charge***: $2.15 per monthly maximum kW, all year. **Time-related demand charge**: $6.45 per maximum on-peak kW in the summer season; $0.00 in all other time periods. **Facilities-related demand charge***: $1.90 per monthly maximum kW, all year. **Time-related demand charge**: $6.85 per maximum on-peak kW in the summer season; $0.00 in all other time periods.	**Rate A** **Summer Season** 15.740¢/on-peak 8.680¢/mid-peak 7.645¢/off-peak **Winter Season** 9.741¢/mid-peak 8.413¢/off-peak **Rate B** **Summer Season** 16.965¢/on-peak 9.466¢/mid-peak 8.296¢/off-peak **Winter Season** 10.664¢/mid-peak 9.163¢/off-peak	**Eligibility requires:** • 75 horsepower (hp) or more of connected water pumping load • Account has an annual load factor in excess of 9.1 percent in any continuous 12-month period during the previous 24 months; • The account's water pumping load is currently served by SCE; • The account is exempt from air quality permitting requirements; and • The customer's account was active on the utility's system as of June 5, 1994. Seasons are the same as TOU-PA-5. Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)
TOU-PA-7 (For accounts with less than 75 horsepower)	• For customers considering natural gas (Rate A) or diesel fuel (Rate B) as an alternate energy source to serve their water pumping load • Separate rates for accounts with less than 75 horsepower (hp) and for accounts with more than 75 hp (see TOU-PA-7 on the next page) • Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure	**Rate A, less than 75 hp** $29.30/ month **Rate B, less than 75 hp** $31.90/ month	**Facilities-related demand charge*, Rate A, less than 75 hp:** $2.05 per monthly maximum kW, all year **Time-related Demand Charge: Rate A, less than 75 hp:** $6.45 per maximum on-peak kW in the summer season; $0.00 in all other time periods **Facilities-related demand charge*, Rate B, less than 75 hp:** $2.25 per monthly maximum kW, all year **Time-related Demand Charge, Rate B, less than 75 hp:** $7.05 per maximum on-peak kW in the summer season; $0.00 in all other time periods	**Rate A, less than 75 hp** **Summer Season** 14.117¢/on-peak 7.636¢/mid-peak 6.778¢/off-peak **Winter Season** 8.515¢/mid-peak 7.415¢/off-peak **Rate B, less than 75 hp** **Summer Season** 14.798¢/on-peak 8.074¢/mid-peak 7.142¢/off-peak **Winter Season** 9.029¢/mid-peak 7.833¢/off-peak	**Eligibility requires:** • At least 50 horsepower (hp) or more of connected water pumping load • Account has an annual load factor of 9.1% in any continuous 12-month period during the previous 24 months • The account's water pumping load is currently served by SCE • The account is exempt from air quality permitting requirements • The customer's account was active on the utility's system as of June 5, 1994. If not, the customer must demonstrate that the account will have an annual load factor of 9.1% or greater and meet all the above applicability criteria Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)

* Each month, this charge is applied to the higher of the current month's maximum demand (kW) or 50% of the highest demand recorded in the previous 11 months. In cases where little or no energy usage is recorded for extended periods of time, SCE has the option of applying this charge to 50% of the customer's connected load.

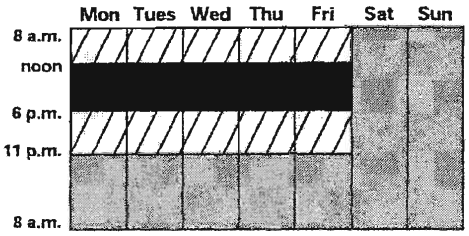
Rate Schedule	Rate Structure	Customer Charge	Demand (kW) or Connected Load (Service) Charge	Energy Charge (per kWh)	Some Other Conditions/Charges
TOU-PA-7 (For accounts with greater than 75 horsepower)	• For customers considering natural gas (Rate A) or diesel fuel (Rate B) as an alternate energy source to serve their water pumping load • Separate rates for accounts with less than 75 horsepower (hp) and for accounts with more than 75 hp (see below) • Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure	**Rate A, greater than 75 hp** $25.25/ month **Rate B, greater than 75 hp** $27.60/ month	**Facilities-related demand charge*, Rate A, greater than 75 hp:** $1.75 per monthly maximum kW, all year **Time-related Demand Charge, Rate A, greater than 75 hp:** $5.60 per maximum on-peak kW in the summer season; $0.00 in all other time periods **Facilities-related demand charge*, Rate B, greater than 75 hp:** $1.95 per monthly maximum kW, all year **Time-related Demand Charge, Rate B, greater than 75 hp:** $6.10 per maximum on-peak kW in the summer season; $0.00 in all other time periods	**Rate A, greater than 75 hp** **Summer Season** 13.716¢/on-peak 7.379¢/mid-peak 6.564¢/off-peak **Winter Season** 8.213¢/mid-peak 7.168¢/off-peak **Rate B, greater than 75 hp** **Summer Season** 14.403¢/on-peak 7.820¢/mid-peak 6.931¢/off-peak **Winter Season** 8.731¢/mid-peak 7.590¢/off-peak	**Eligibility requires:** • At least 50 horsepower (hp) or more of connected water pumping load • Account has an annual load factor of 9.1% in any continuous 12-month period during the previous 24 months • The account's water pumping load is currently served by SCE • The account is exempt from air quality permitting requirements • The customer's account was active on the utility's system as of June 5, 1994. If not, the customer must demonstrate that the account will have an annual load factor of 9.1% or greater and meet all the above applicability criteria Power factor adjustment charge. (See GS-2) Voltage discount. (See GS-2)
TOU-PA-SOP	• Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure • Benefits customers who can shift load to the super-off-peak time period	$42.80/ month	**Facilities-related demand charge*:** $2.85 per monthly maximum kW, all year. **Time-related demand charge:** $44.35 per maximum on-peak kW in the summer season; $0.00 in all other time periods.	**Summer Season** 14.669¢/on-peak 7.417¢/off-peak 5.074¢/super-off-peak **Winter Season** 7.881¢/off-peak 5.074¢/super-off-peak	Two summer season options: Option 1- Summer season runs the first Sunday in July to the first Sunday in October. Option 2- Summer season runs the first Sunday in June to the first Sunday in September. Remaining months comprise the winter season. (See Time-of-Use charts for more information.) Load Controller available.
TOU-PA-SOP-I	• Time-of-Use rate • Facilities- and Time-related demand charges • Seasonal structure • Benefits customers who can shift load to the super-off-peak time period • Provides a discount on energy and time-related demand charges for energy and demand above the Firm Service Level in exchange for interrupting power when requested by SCE to do so • Service provided concurrently under Schedule TOU-8 • Offered on a contract basis	$42.80/ month	**Facilities-related demand charge*:** $2.85 per monthly maximum kW, all year. **Time-related demand charge:** $36.45 per maximum on-peak kW in the summer season; $0.00 in all other time periods.	**Summer Season** 14.404¢/on-peak 7.265¢/off-peak 4.996¢/super-off-peak **Winter Season** 7.714¢/off-peak 4.996¢/super-off-peak	Same seasons as TOU-PA-SOP. A minimum of 50 horsepower (hp) of total connected load or 50 kW of maximum demand required for eligibility. Load Controller available.

* Each month, this charge is applied to the higher of the current month's maximum demand (kW) or 50% of the highest demand recorded in the previous 11 months. In cases where little or no energy usage is recorded for extended periods of time, SCE has the option of applying this charge to 50% of the customer's connected load.

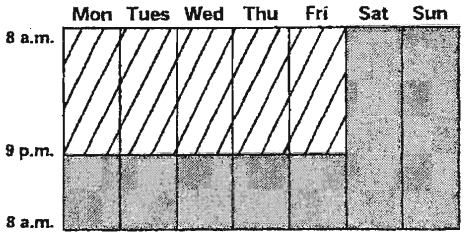
Rate Schedule	Rate Structure	Customer Charge	Demand (kW) or Connected Load (Service) Charge	Energy Charge (per kWh)	Some Other Conditions/Charges
AP-I Option	• Interruptible option applicable to all agricultural/ pumping schedules except TOU-PA-SOP and PA-1 accounts receiving the off-peak credit available in those schedules • Provides a discount on energy and time-related demand charges for energy and demand above the Firm Service Level in exchange for interrupting power when requested by SCE to do so • Service provided concurrently under Schedule TOU-8	Not Applicable.	Not Applicable.	Provides a .827¢/kWh credit for all kWh each month.	A minimum of 50 horsepower (hp) of total connected load or 50 kW of maximum demand required for eligibility. **Load Controller available.** Offered on a contract basis.

AGRICULTURAL & PUMPING TIME-OF-USE TIME PERIODS

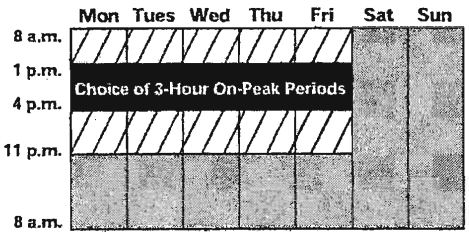
TOU-PA, TOU-PA-5, TOU-PA-6, TOU-PA-7 Summer
First Sunday in June to the first Sunday in October



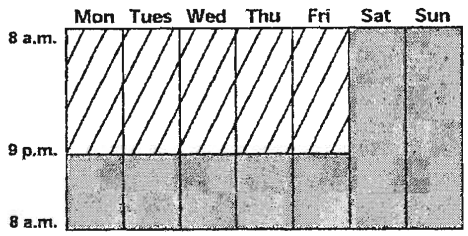
TOU-PA, TOU-PA-5, TOU-PA-6, TOU-PA-7 Winter
First Sunday in October to the first Sunday in June



TOU-PA-3 Summer
First Sunday in June to the first Sunday in October

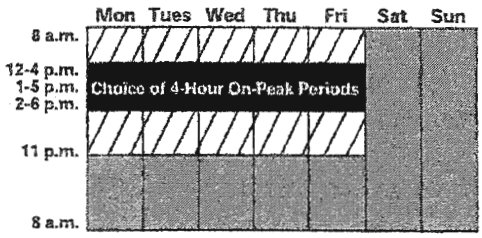


TOU-PA-3 Winter
First Sunday in October to the first Sunday in June



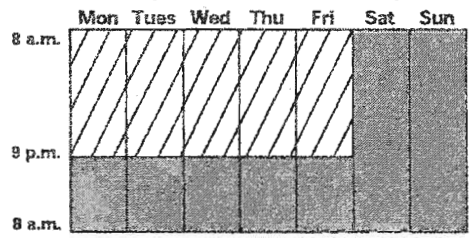
TOU-PA-4 Summer

First Sunday in June to the first Sunday in October



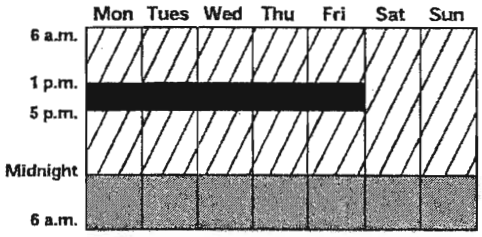
TOU-PA-4 Winter

First Sunday in October to the first Sunday in June



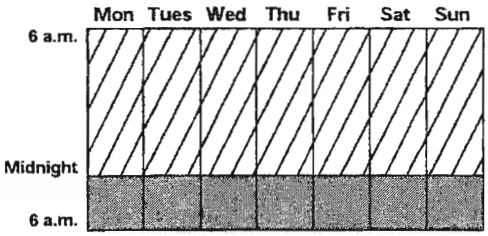
TOU-PA-SOP and TOU-PA-SOP-I Summer

First Sunday in July to the first Sunday in October (Option 1) or
First Sunday in June to the first Sunday in September (Option 2)



TOU-PA-SOP and TOU-PA-SOP-I Winter

First Sunday in October to the first Sunday in July (Option 1) or
First Sunday in September to the first Sunday in June (Option 2)



This fact sheet is meant as an aid to understanding SCE's pricing schedules. It does not replace the tariffs. Please refer to the individual rate schedule of interest for a complete listing of terms and conditions of service, which can be viewed or printed via the Internet at **www.sce.com** *(Regulatory Info Center).*

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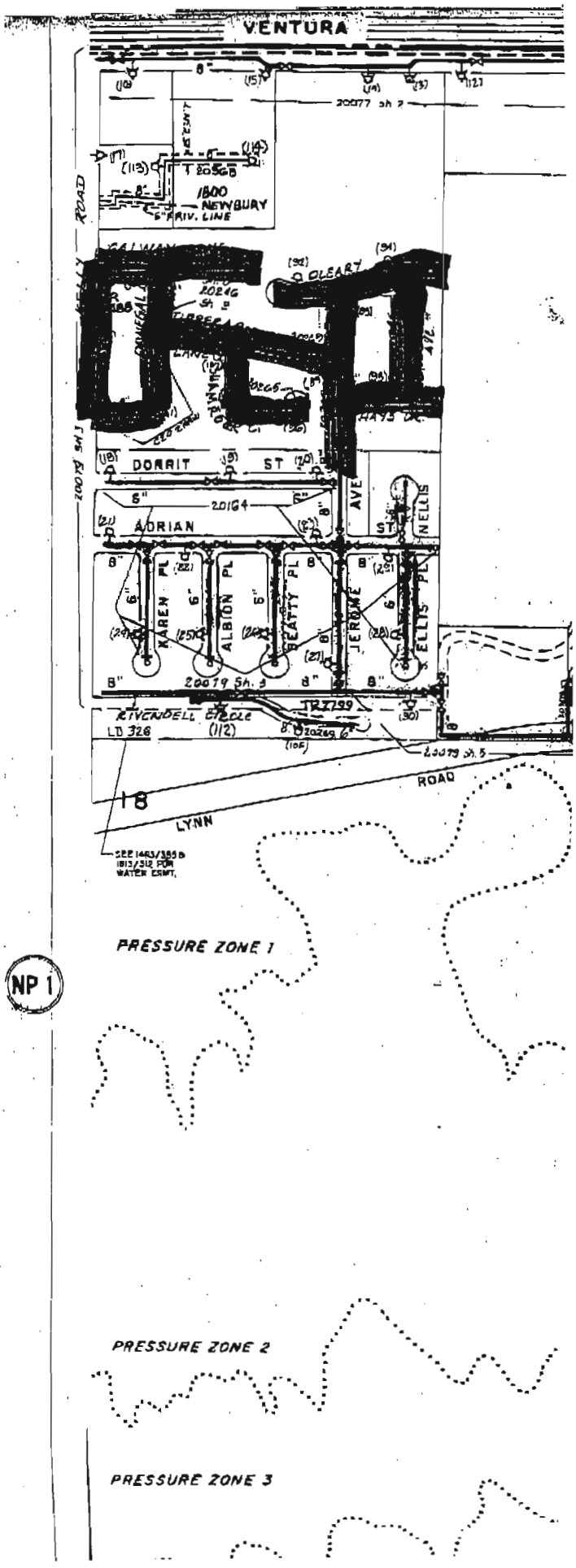
APPENDIX B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ADRIAN
AVE
ST
NELLIS
KAREN PL
ALBION PL
BEATTY PL
JEROME
ELLIS PL
RIVENDELL CIRCLE
LD 326
LYNN ROAD
18
PRESSURE ZONE 1
NP 1
PRESSURE ZONE 2
PRESSURE ZONE 3

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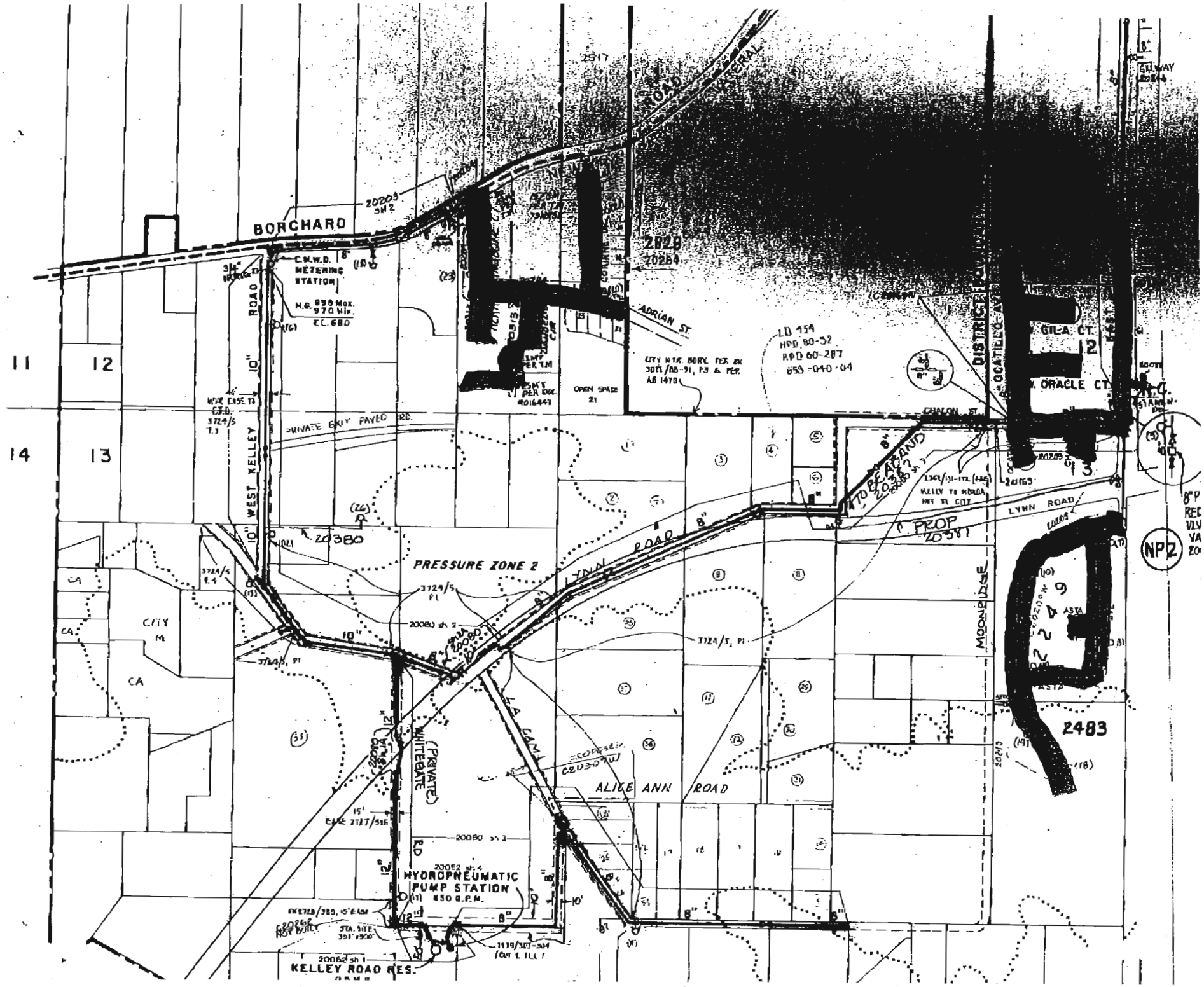
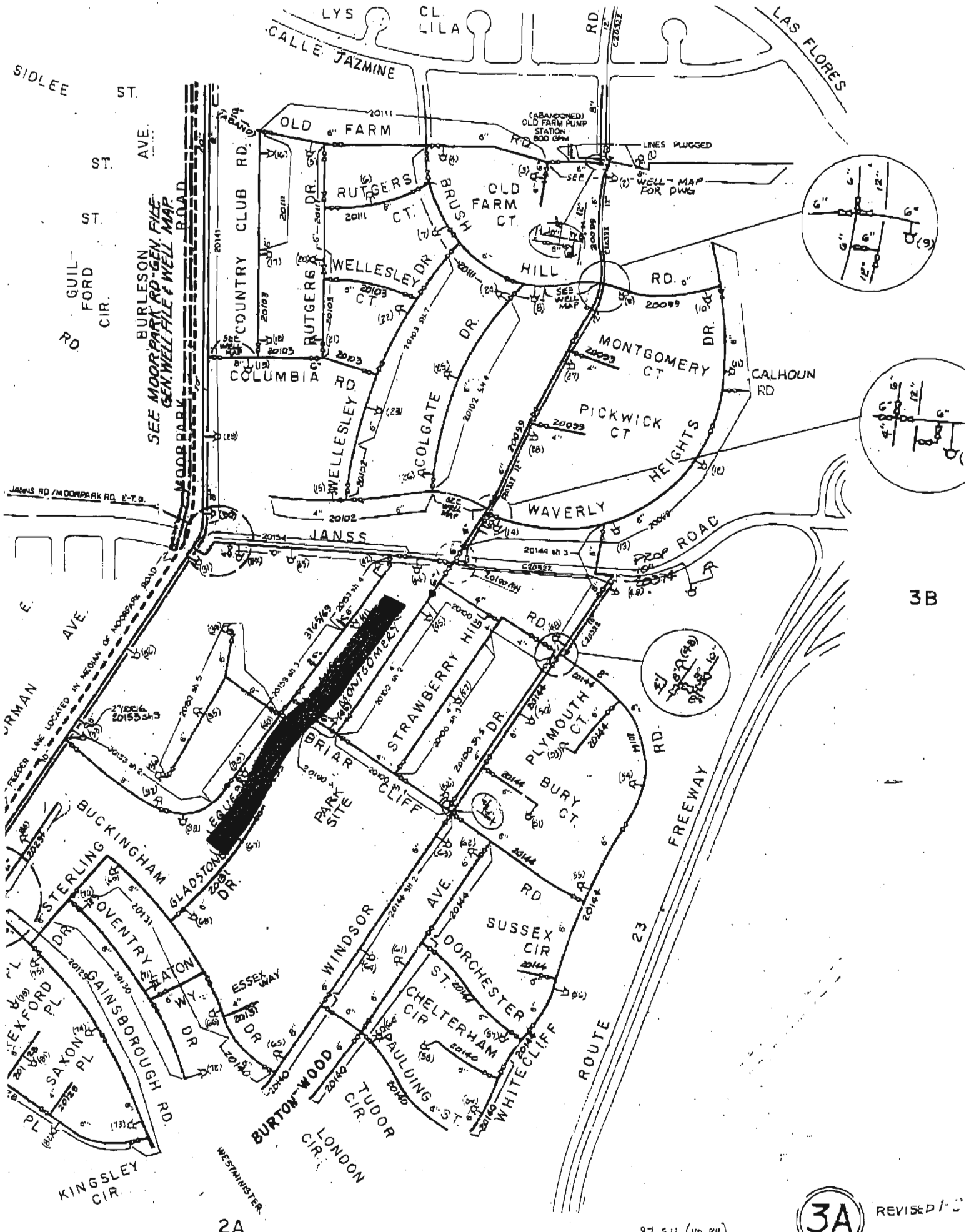
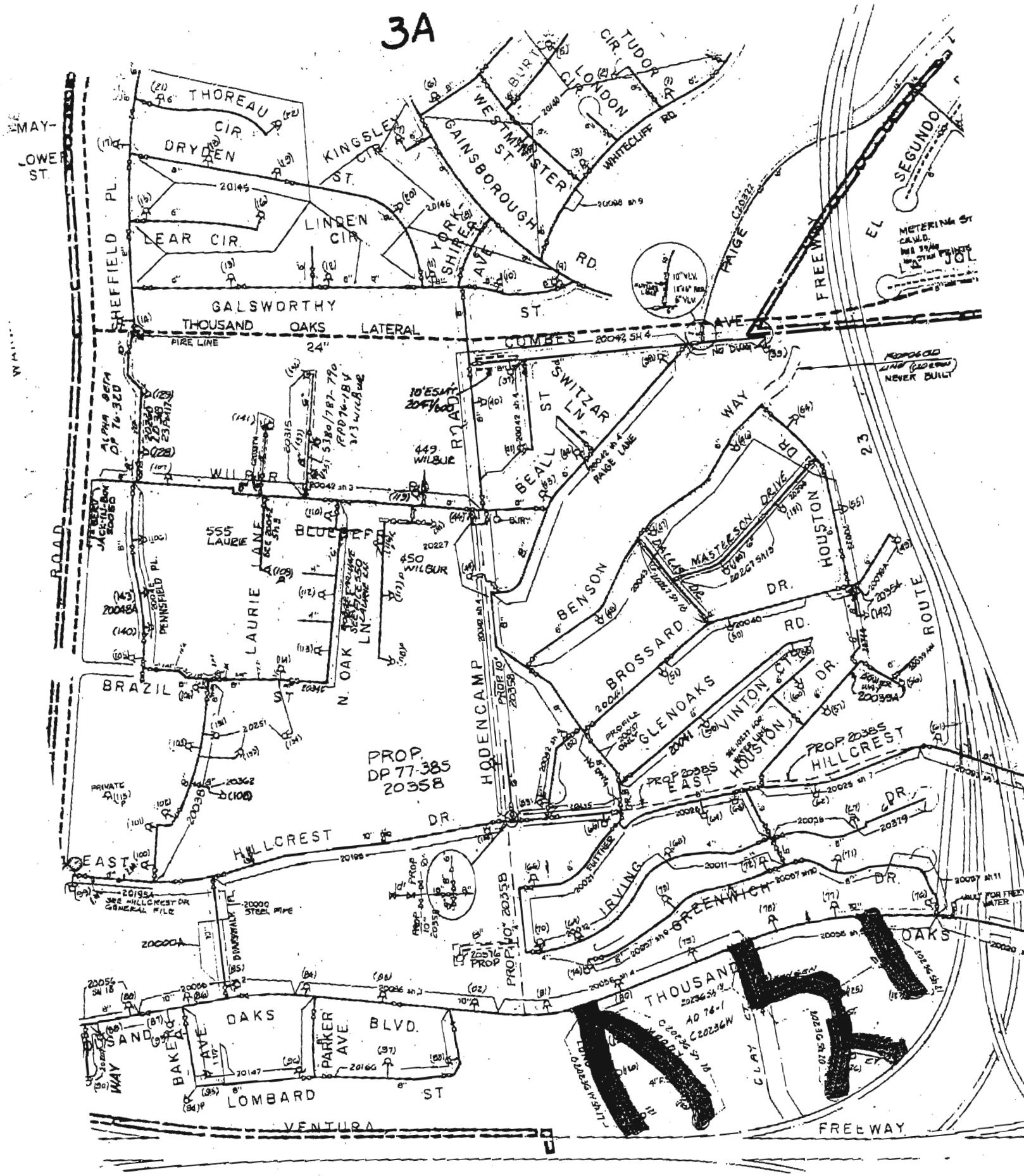
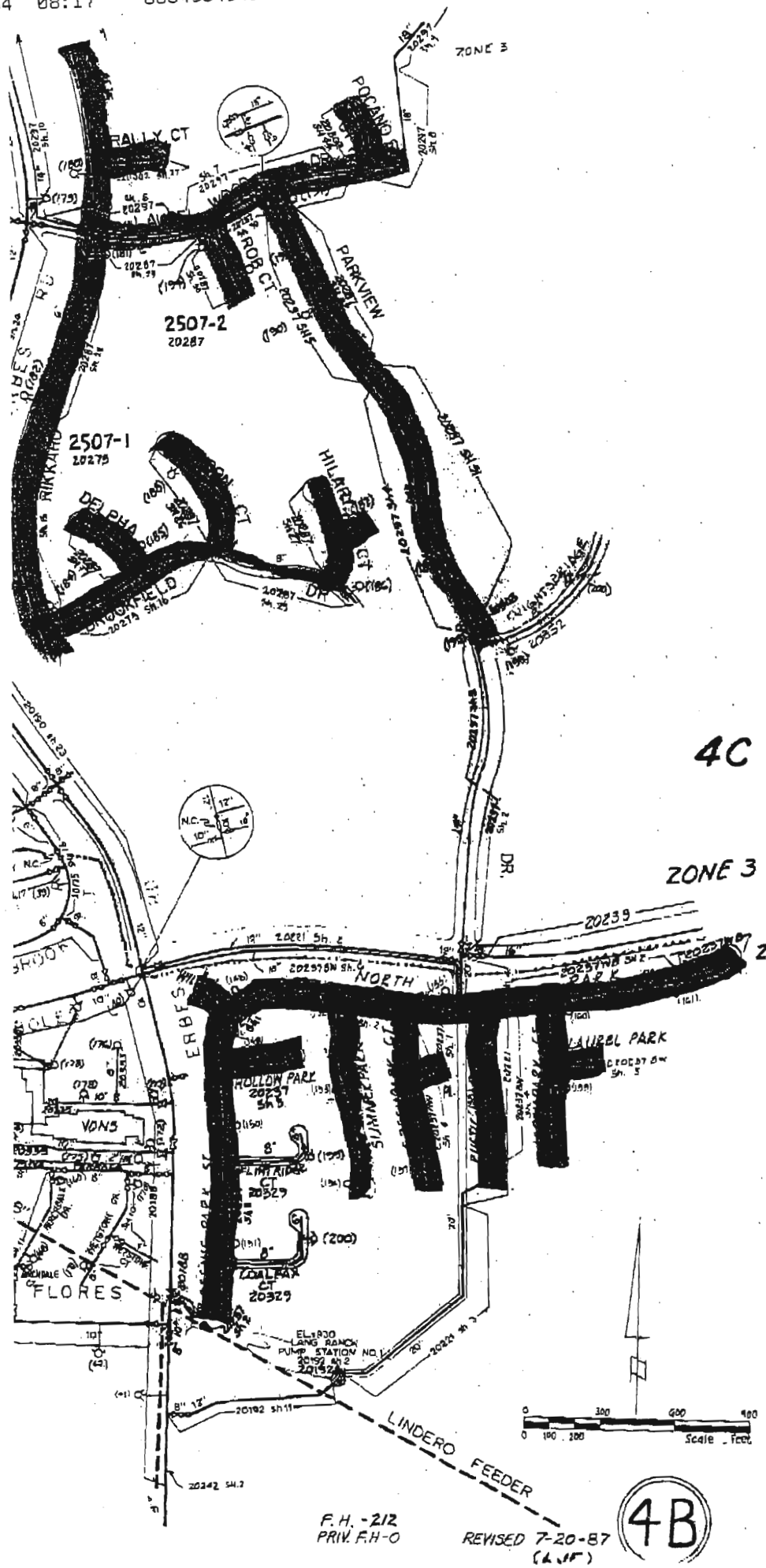



LYS CL.
LILA
CALLE JAZMINE
LAS FLORES
SIDLEE ST.
ST.
ST.
GUIL-FORD CIR.
RD
BURLESON AVE.
SEE MOORPARK RD-GEN. FILE GEN. WELL FILE & WELL MAP
MOORPARK ROAD
COUNTRY CLUB RD.
OLD FARM RD.
(ABANDONED) OLD FARM PUMP STATION 800 GPM
LINES PLUGGED
SEE WELL MAP FOR DWG
RUTGERS CT.
BRUSH HILL RD.
OLD FARM CT.
WELLESLEY DR.
WELLESLEY CT.
RUTGERS DR.
COLUMBIA RD.
COLGATE DR.
MONTGOMERY CT.
CALHOUN RD
PICKWICK CT
HEIGHTS DR.
WAVERLY
JANSS
JANSS RD/MOORPARK RD. E-T.D.
PROP ROAD
MONTGOMERY
STRAWBERRY HILL RD.
PLYMOUTH CT.
BURY CT.
BRIAR CLIFF
PARK SITE
BUCKINGHAM
GLADSTONE DR.
STERLING
COVENTRY
EATON WY.
GAINSBOROUGH RD.
SAXON PL
KINGSLEY CIR.
ESSEX WAY
WINDSOR AVE.
SUSSEX CIR
DORCHESTER ST.
CHELTERHAM CIR
PAULDING ST.
WHITECLIFF
TUDOR CIR.
LONDON CIR.
BURTON WOOD
WESTMINISTER
ROUTE 23 FREEWAY
3B
2A
3A
REVISED 1-2
87 F.H. (NO PK.)

3A



THOREAU CIR.
DRYDEN ST.
KINGSLEY CIR.
WESTMINSTER ST.
GAINSBOROUGH RD.
LONDON CIR.
TUDOR CIR.
WHITECLIFF RD.
LEAR CIR.
LINDEN CIR.
YORKSHIRE AVE.
SHEFFIELD PL.
GALSWORTHY ST.
THOUSAND OAKS LATERAL
FIRE LINE
24"
COMBES AVE.
PAIGE
FREEWAY
EL SEGUNDO
METERING ST.
NO DUMP
SWITZAR LN.
BEALL ST.
PAIGE LANE
WILBUR
449 WILBUR
555 LAURIE
LAURIE LANE
BLUEBERRY
450 WILBUR
N. OAK LN.
PENINSFIELD PL.
BRAZIL ST.
HODENCAMP
BENSON
MASTERSON DRIVE
HOUSTON DR.
BROSSARD DR.
GLENOAKS RD.
VINTON CT.
HOUSTON DR.
ROUTE 23
PROP. DP 77-385 20358
PROP. 20385
HILLCREST DR.
EAST HILLCREST DR.
IRVING
GREENWICH DR.
OAKS
THOUSAND OAKS BLVD.
BAKER AVE.
PARKER AVE.
LOMBARD ST.
VENTURA FREEWAY
CLAY CT.
ROAD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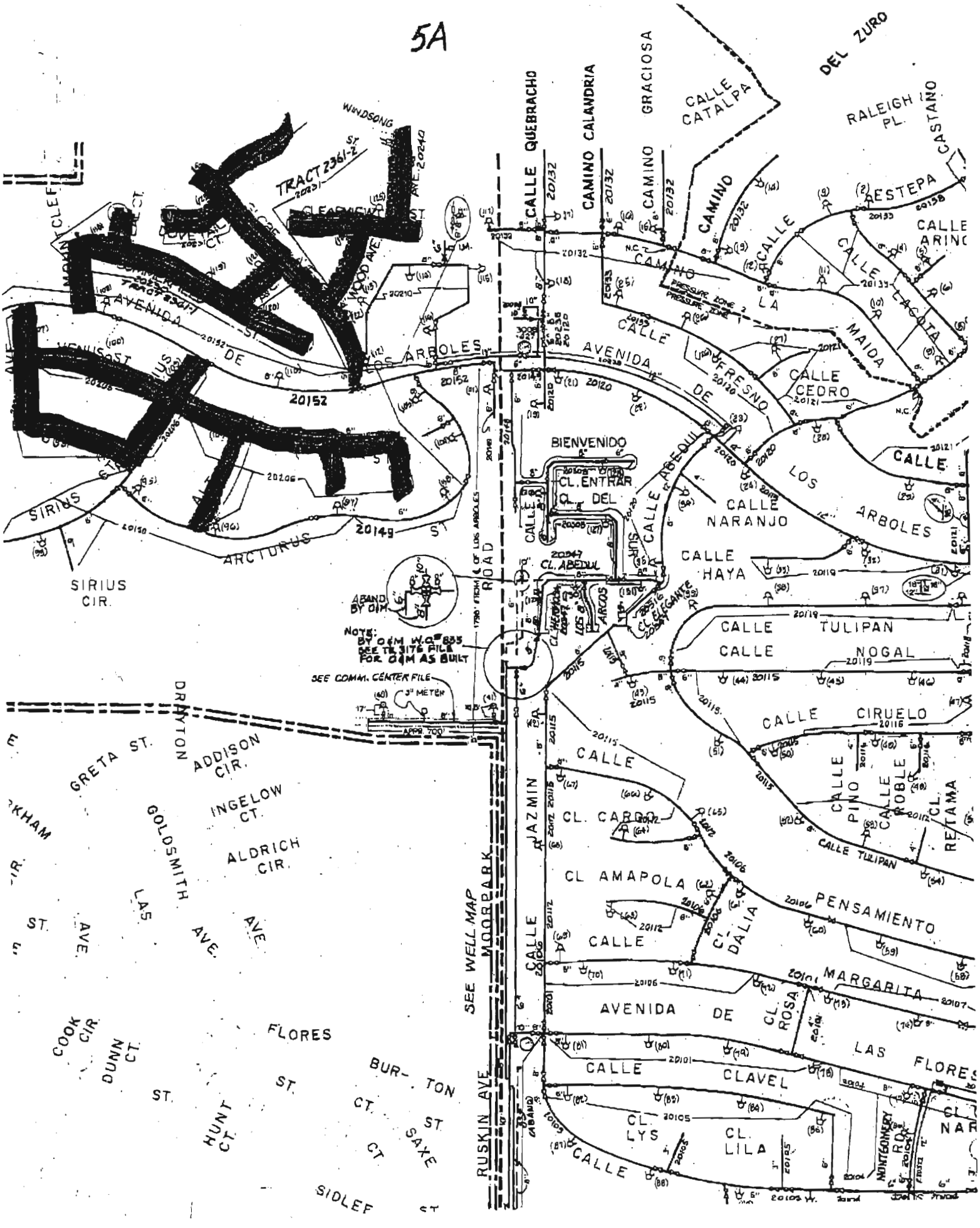
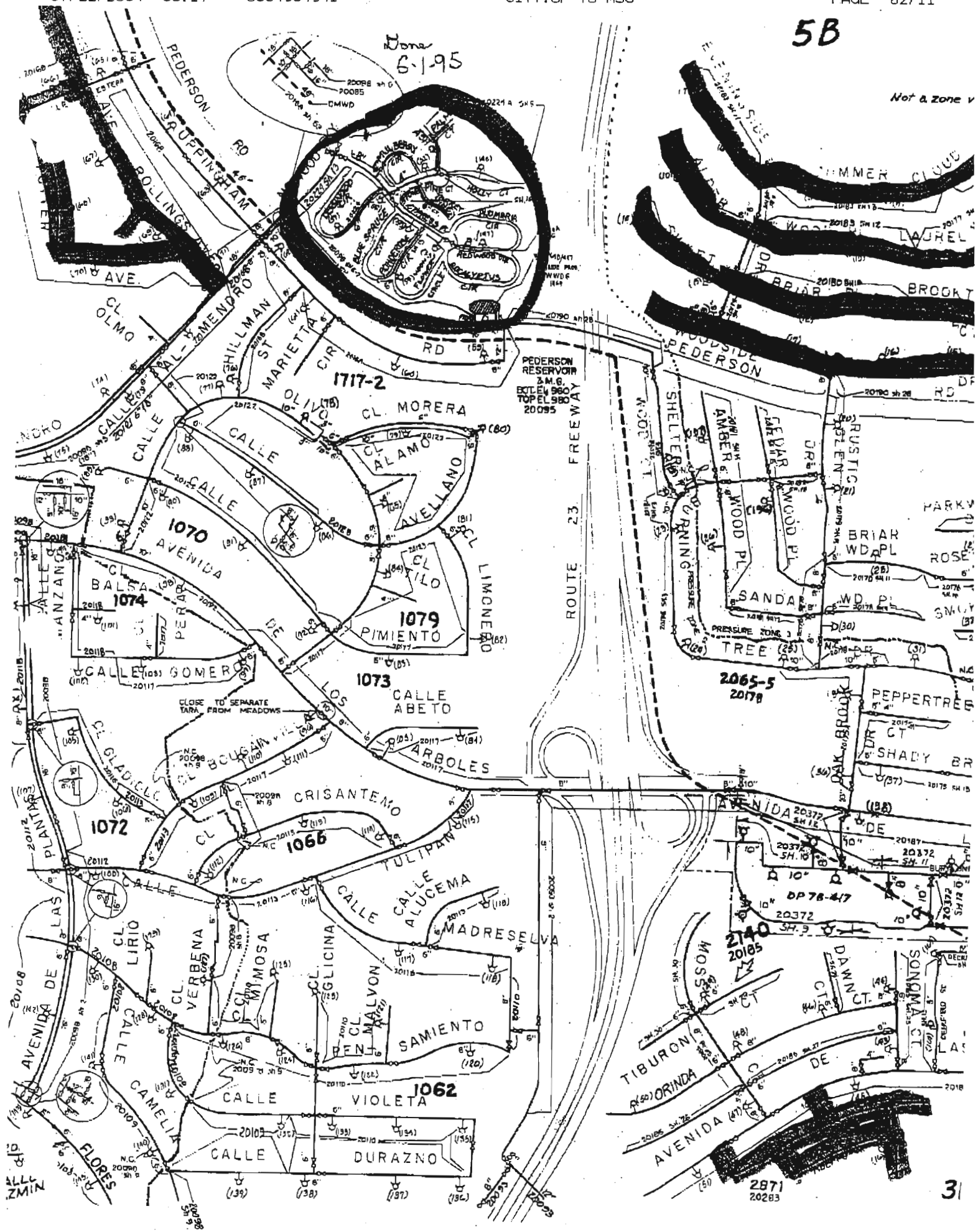
RALLY CT
POCANO
ROB CT
PARKVIEW
2507-2
20287
2507-1
20275
RIKKARD
DELPHA
HILARDA
CT
DR
4C
ZONE 3
ZONE 2
20239
NORTH
PARK
LAUREL PARK
HOLLOW PARK
20237
VONS
FLORES
COALFAX
CT
20329
EL.1930
LANG RANCH
PUMP STATION NO.1
20192
LINDERO FEEDER
Scale - Feet
F.H. -212
PRIV. F.H-0
REVISED 7-20-87
4B

5A



DEL ZURO
CALLE CATALPA
RALEIGH PL.
CASTAÑO
CALLE QUEBRACHO
CAMINO CALANDRIA
CAMINO GRACIOSA
CAMINO
CALLE ESTEPA
CALLE ARINO
CALLE LA MAIDA
CALLE LACOTA
CALLE FRESNO
CALLE CEDRO
CALLE LOS ARBOLES
CALLE NARANJO
CALLE HAYA
CALLE TULIPAN
CALLE NOGAL
CALLE CIRUELO
CALLE PINO
CALLE ROBLE
CL. RETAMA
CALLE TULIPAN
CALLE JAZMIN
CL. CARDO
CL AMAPOLA
CL. DALIA
PENSAMIENTO
CALLE MARGARITA
AVENIDA DE LAS FLORES
CL. ROSA
CALLE CLAVEL
CL. LYS
CL. LILA
CALLE
MONTGOMERY RD.
CL. NAR
RUSKIN AVE
MOORPARK ROAD
SEE WELL MAP
BIENVENIDO
CL. ENTRAR
CL. DEL
CL. ABEDUL
CL. ELEGANTE
CL. HERMOSA
LOS ARCOS
CALLE ABEDUL
SUR
AVENIDA DE LOS ARBOLES
WINDSONG ST.
TRACT 2361-2
CLEARVIEW ST.
DOVETAIL CT.
WOOD AVE.
AVENIDA DE LOS ARBOLES
VENUS ST.
SIRIUS
ARCTURUS ST
SIRIUS CIR.
ABAND BY O&M
NOTE: BY O&M W.O. 835 SEE TR 3176 FILE FOR O&M AS BUILT
SEE COMM. CENTER FILE
3" METER
APPR. 700'
DRAYTON
GRETA ST.
ADDISON CIR.
INGELOW CT.
GOLDSMITH
ALDRICH CIR.
LAS AVE.
AVE.
COOK CIR.
DUNN CT.
FLORES
BURTON ST.
HUNT CT.
SAXE CT.
SIDLEE ST.


5B
Zone 6-1-95
Not a zone v
PEDERSON RD
SAUPPINGHAM
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CL. MORERA
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CL. ALAMO
AVELLANO
1070
AVENIDA
CL. BALSA
1074
CL. PERA
CL. TILO
1079
PIMIENTO
CL. LIMONERO
CALLE GOMERO
1073
CALLE ABETO
CLOSE TO SEPARATE TARA FROM MEADOWS
LOS ARBOLES
CL. GLADIOLO
CL. BOUGAINVILLE
CRISANTEMO
1072
1066
TULIPAN
CALLE ALUCEMA
MADRESELVA
CL. LIRIO
CL. VERBENA
CL. MIMOSA
CL. GLICINA
CL. MALVON
PENSAMIENTO
1062
CALLE VIOLETA
CALLE DURAZNO
CALLE CAMELIA
AVENIDA DE LAS PLANTAS
FLORES
ROUTE 23 FREEWAY
WOODSIDE
PEDERSON
SHELTER
AMBER
CEDAR
WOOD PL
RUSTIC
BRIAR WD PL
SANDAL WD PL
TREE
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20178
PEPPERTREE
SHADY
AVENIDA DE
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SONOMA CT.
TIBURON
ORINDA
AVENIDA DE
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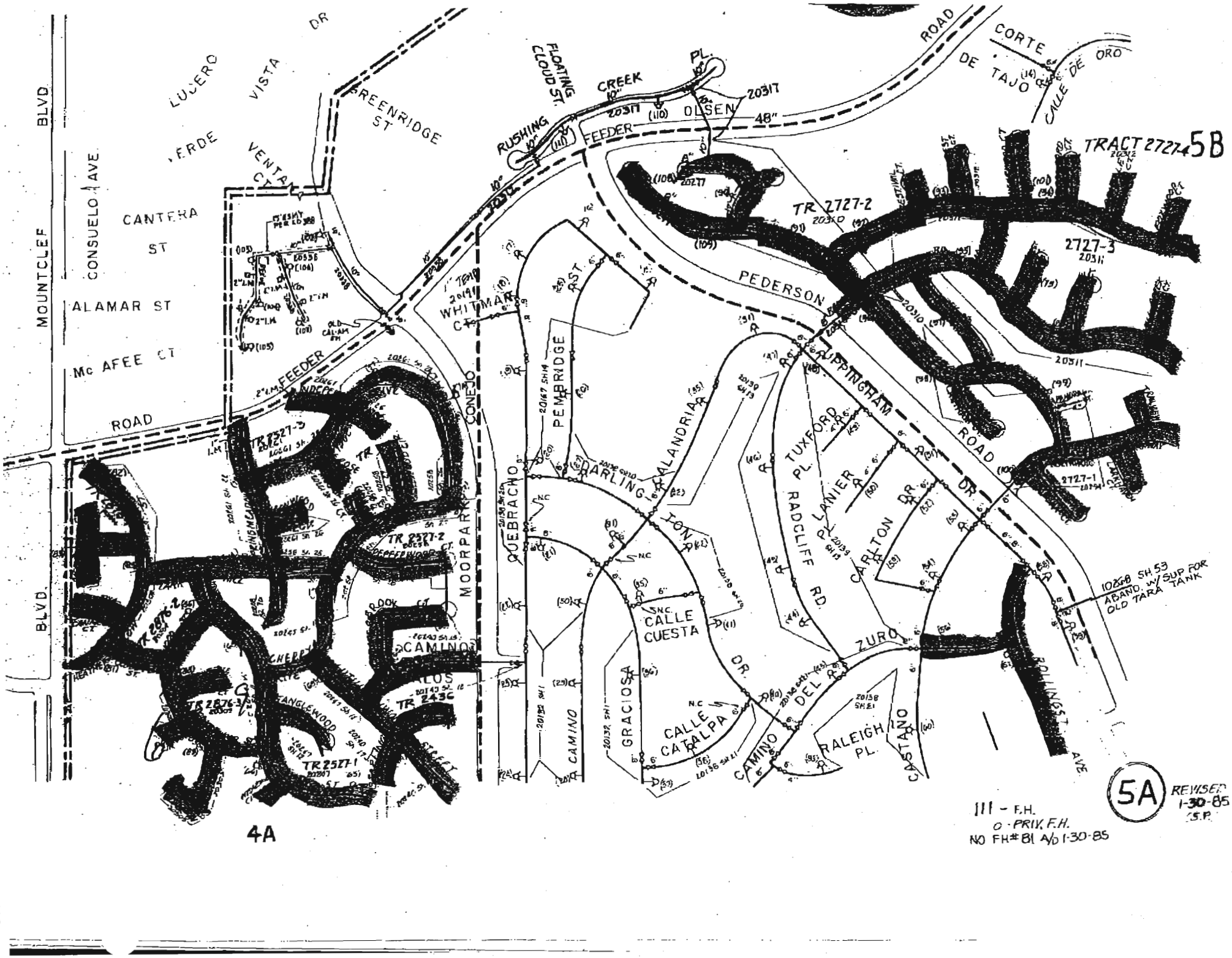

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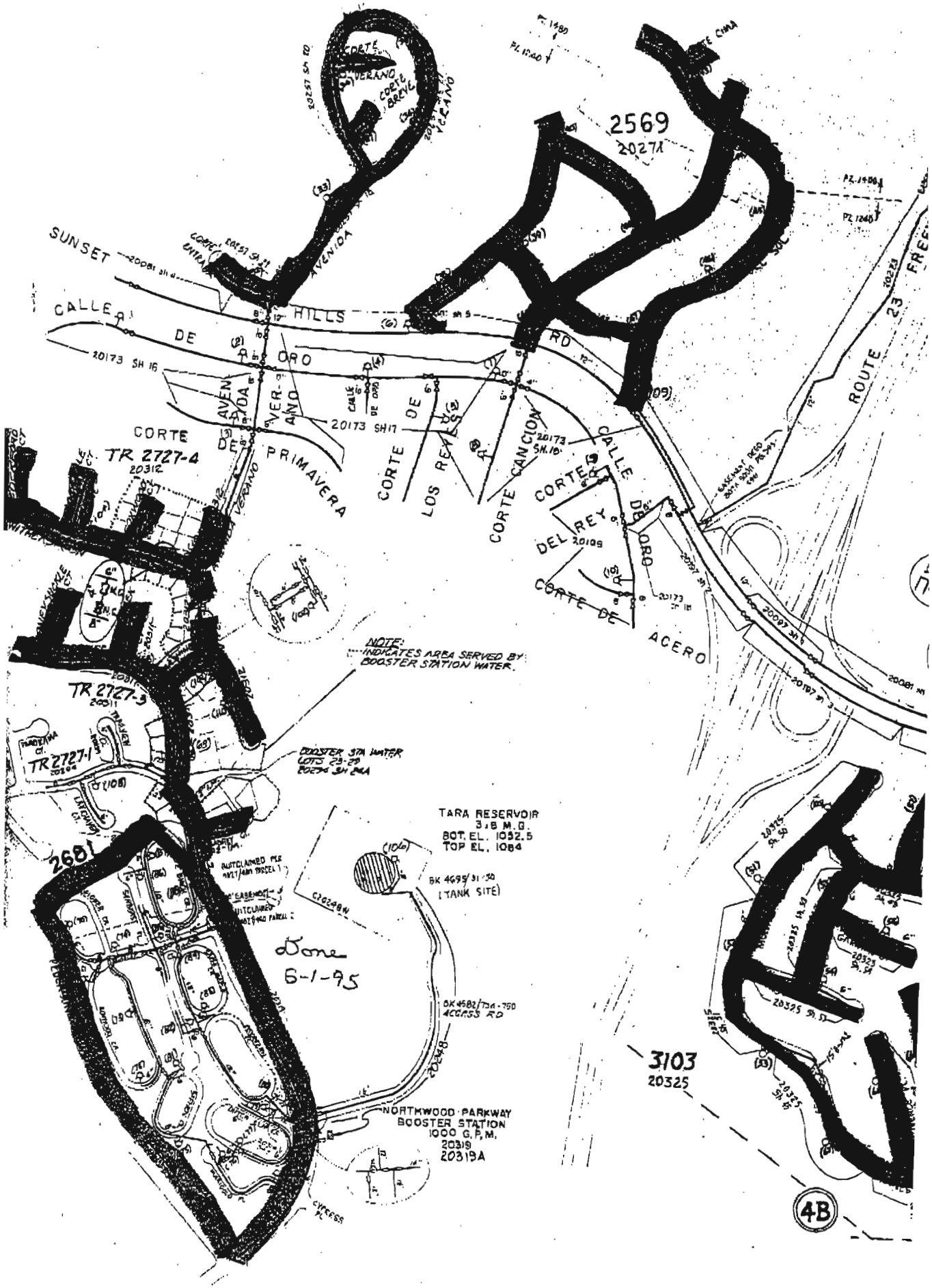
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CORTE CANCION
20173 SH.18
CORTE DEL REY
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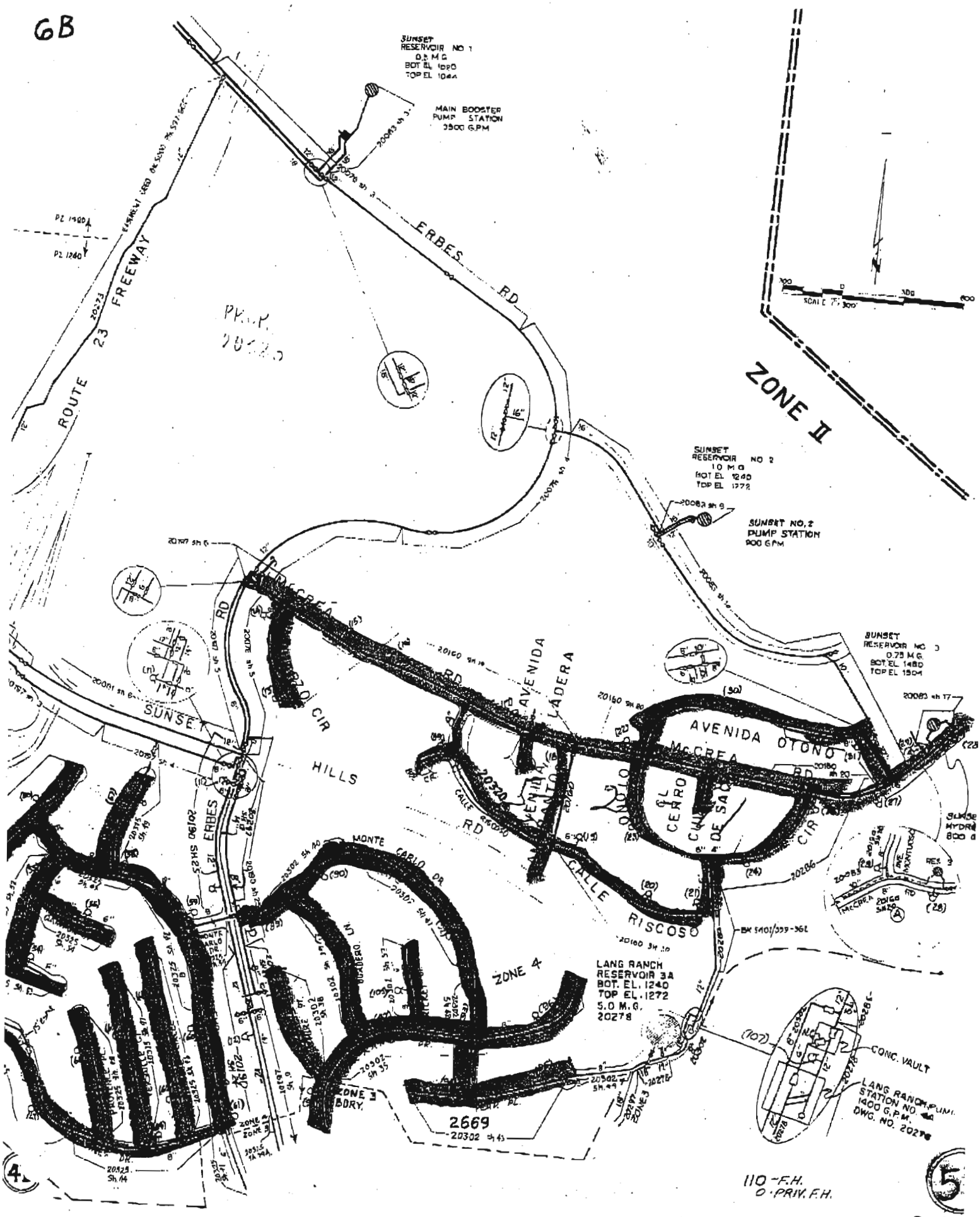
CORTE DE ACERO
ROUTE 23
TR 2727-4
20312
TR 2727-3
20311
TR 2727-1
20304
NOTE:
INDICATES AREA SERVED BY BOOSTER STATION WATER.
BOOSTER STA WATER LOTS 23-29
TARA RESERVOIR
3.8 M.G.
BOT. EL. 1052.5
TOP EL. 1084
BK 4695/31-30
(TANK SITE)
2681
Done
6-1-95
BK 4582/734-750
ACCESS RD
NORTHWOOD PARKWAY
BOOSTER STATION
1000 G.P.M.
20319
20319A
3103
20325
4B


6B
SUNSET RESERVOIR NO 1
MAIN BOOSTER PUMP STATION 3500 G.P.M
ERBES RD
ROUTE 23 FREEWAY
ZONE II
SUNSET RESERVOIR NO 2
SUNSET NO. 2 PUMP STATION 900 GPM
SUNSET RESERVOIR NO 3
AVENIDA OTONO
McCREA RD
SUNSET
HILLS
CIR
CALLE RISCOSO
MONTE CARLO DR
ZONE 4
LANG RANCH RESERVOIR 3A
BOT. EL. 1240
TOP EL. 1272
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REVISED

RBF

APPENDIX C

CITY OF THOUSAND OAKS MASTER PLAN AND GIS PROJECT

Staffing Certification Report

August 31, 2004

Background

The City of Thousand Oaks Public Works Department (TOPWD) distributes up to 9 million gallons of potable water each day to more than 16,300 residences and businesses. The mission of the TOPWD is to provide high quality water in accordance with EPA and California Department of Health Services (CDHS) regulatory requirements.

The regulations for potable water treatment and distribution facilities were revised about 5-years ago. One of the significant revisions transferred the regulatory authority from the California-Nevada Section of the American Water Works Association (CNAWWA) to the CDHS. Based upon these regulatory revisions and the mission of the TOPWD, the Water Division of the TOPWD decided to evaluate the TOPWD water distribution programs to ensure compliance with these regulations.

The City of Thousand Oaks determined that the evaluation should be performed by an independent source with extensive knowledge of drinking water regulations and the Thousand Oaks water distribution system. The City selected RBF Consulting (RBF) to prepare a Water Master Plan and develop the first phase of GIS mapping for the water distribution system. As part of this project RBF will review the CDHS regulations, assess the TOPWD level of current water certifications and provide suggestions to ensure that the TOPWD meets and exceeds these regulatory requirements.

Regulatory Classification

The CDHS is the regulatory authority to ensure that Safe Drinking Water Act (SDWA) requirements are maintained by public water treatment and distribution systems. The grade and number of certifications required by a public water treatment and distribution systems is dependent on the key criteria and the population served by the respective system. New codes and regulations for the CDHS related to drinking water became effective in April and June 2004, respectively. The code requires that public water systems employ certified persons with minimum classifications to supervise and operate water treatment plants and distribution systems. The grade of certification requirements for water treatment plant operators is dependent upon the size, character of the water being treated, type and degree of treatment, complexity of operation and other related conditions affecting the operation of the treatment plant. The grade of certification for water treatment plant operators range from T1 to T5 (lowest to highest certification). Similarly, the grade of certification requirements for water distribution system operators is dependent upon the size of the distribution system, sizes and quantities of storage tanks, the number of pressure zones and the size of pump stations. The grade of

certification for water distribution system operators range from D1 to D5 (lowest to highest certification).

Since the TOPWD does not own or operate any water treatment plants and purchases all potable water from the Callegus Municipal Water District (CMWD), the TOPWD is not classified with any T (treatment) level requirement. The total population of the City of Thousand Oaks is approximately 123,000 persons. The TOPWD provides water service to a population of approximately 49,000 of these residents. Due to franchise agreements with other water retailers, other customers in the City of Thousand Oaks are supplied potable water from other water distribution systems including TOPWD, California American Water Company, California Water Service Company, Academy Mutual Water Company and Camrosa Water District. The TOPWD water service population is within the CDHS water distribution system population range of 10,001 and 50,000. Based solely upon the population served, the TOPWD is a class D3 water distribution system. However, there are other criteria that affect the CDHS classification of a water distribution system.

The CDHS water distribution system classification is established by the methodology required by California Safe Drinking Water Act article 64413.3. The CDHS point values for the TOPWD water distribution system are shown in the table below.

Point Values		
Criteria	Quantity/Value	Points
Pressure Zones	18	6
Disinfectant(s)	0	0
Largest Pump	150 hp	6
Reservoirs	16	6
Uncovered Reservoirs	0	0
Non-potable Service	Yes	6
Total		24

Since the total point value for the TOPWD water distribution system exceeds 20, the water distribution system classification (based on population) is upgraded by one level from D3 [64413.3 (a)] to D4 [64413.3 (b)]. The local CDHS representative confirmed that the TOPWD is a class D4 water distribution system. The primary variable that could result in an upgrade in the classification of the TOPWD water distribution system would be an increase in population served to exceed 50,001. Since the City of Thousand Oaks is essentially built out in the TOPWD water service area, we do not currently anticipate the TOPWD water distribution system classification to upgrade from D4 to D5.

Certification Requirements

The CDHS regulations have several certification categories, but this report focuses on the water certification requirements that apply to the TOPWD. The initial transfer of regulatory authority from AWWA to CDHS included provisions for water distribution operators with AWWA certifications to obtain "interim distribution certificates" from the CDHS (63810). The interim certifications were valid for three years (expired January 01, 2007) and are only renewable one time. During this interval, any water system operator (treatment and distribution) having an interim classification should take the applicable certification examination and obtain required Continuing Education (CE) contact hours

prior to the January 01, 2007 deadline when all interim water operator certifications are invalid.

The CDHS regulation (64413.7) requires the chief and shift operators for the class D4 water distribution system to have minimum certifications of D4 and D3 respectively. All other staff assisting the chief or shift operator should have appropriate certifications for the level of decision making responsibility that the staff is authorized to perform [63370 (b)-(d)]. However, anyone "filling in" for either the chief operator or the shift operator, must hold a distribution system certification no more than one grade lower than the distribution system operated (63770-A).

Each certification level obtained by an individual must be renewed (including filing the application and renewal fees) within a year, but no later than 120 days (4 months), prior to the expiration date. If the expiration date is after December 31, 2003 then additional CE contact hours are required as shown in the table below. These CE contact hours must be completed 4 months prior to the expiration date of the certification to avoid any late fees.

Renewal Requirements		
Grade	Triennial Renewal Fee	Contact Hours
D1	$70	12
D2	$80	16
D3	$120	24
D4	$140	36
D5	$140	36

CE contact hours must meet the following criteria: 50-minutes of specialized training, class, presentation, course, or seminar consisting of subject matter specific to water distribution. CE contact hours may also be obtained through college courses related to the water industry. CE contact hours must be completed since the previous renewal or issuance of the initial certification [63840 (c)]. The CDHS regulations limit the number of CE contact hours to no more than 25-percent of the total CE contact hours required for the respective certification. The CDHS recently modified the operator certification regulations for the renewal of interim distribution certificates (July 20, 2003). The modification will allow operators with the interim distribution certification an additional year to meet the CE requirement (certificates will be revoked on January 02, 2005 if the CE contact hours are not completed and applicable renewal fees are paid). On January 02, 2007 all interim certificates that are not renewed will be revoked.

In order obtain the CCS certification, an individual must first be a current holder of the CNAWWA Backflow Prevention Assembly Tester certificate and secondly the CCS shall have completed either a 40-hour course of instruction on the theory of laws and regulations including techniques for administering a cross-connection control program or two years experience in making cross-connection surveys of water systems and program administration. The cross-connection classes and examination are offered in Sacramento twice a year with an initial and renewal fee of $65 (initial fee is $85 for non AWWA members). The supplemental CE contact hours are consistent with the renewal requirements for the CDHS distribution certificates as shown in the table above. The CCS is not required to be a certified treatment or distribution system operator. However

if the CCS is not certified for the D4 level required for the TOPWD, then the CCS must be accompanied by the TOPWD chief or shift operator who has the appropriate level of certification. In July 2003, draft legislation was proposed to modify the current cross-connection control program regulations. The primary modification will shift the program from **Title 17 Group 4-Drinking Water Supplies** to **Title 22 Chapter 3-Water Recycling Criteria** and **Chapter 19-Backflow Prevention and Cross Connection Control**. In addition, Section 64764 of the proposed legislation allows for CCS certified persons or organizations to perform testing required by the cross-connection control program.

The TOPWD chief and shift operators must have D4 and D3 certifications, respectively there must be at least one other operator having a minimum D3 certification to "fill in" for the chief or shift operators during vacation or sick leave. In addition, the TOPWD must have at least one CCS on staff or under contract. All other employees that work in the water department should have a minimum D1 certification.

Staffing Summary

The City of Thousand Oaks is classified as a D4 distribution system by the CDHS. The TOPWD Utilities Maintenance Supervisor job title is the equivalent to the CDHS term for chief operator and the TOPWD Water System Operator job title is equivalent to the CDHS term for shift operator. The TOPWD meets the CDHS requirements as the Utilities Maintenance Supervisor has a CDHS Grade D4 water distribution certification and the Water System Operator has a CDHS Grade D3 water distribution certification. The TOPWD has revised a series of Job Descriptions (see Appendix A) that lists the minimum certifications, training and other special requirements for the respective job. The water department classifications and minimum CDHS certifications are as follows:

- Utilities Maintenance Worker I - Grade D1 Water Distribution
- Utilities Maintenance Worker II - Grade D2 Water Distribution
- Utilities Maintenance Crew Leader - Grade D3 Water Distribution
- Water System Operator - Grade D3 Water Distribution
- Utilities Maintenance Supervisor - Grade D4 Water Distribution

Currently the water division of the TOPWD employs individuals at varying levels of CDHS water distribution certification as listed in the following table.

City of Thousand Oaks
Water Distribution Operator Classification Staffing

Grade	Staff Name	Division	Certification Renewal	Certification Expiration
D1				
Interim				
D2	Gary Frost	Water	04/01/06	08/01/06
	Bret Sherman	Water	02/01/07	06/01/07
	Steve Steiert	Water	02/01/07	06/01/07
	Mike Noblitt	Wst Wtr	01/01/06	05/01/06
	Susan Underwood	Wst Wtr		
	Bob Wilson	Wst Wtr	04/01/06	08/01/06
	Mel Henson	Pub Wrk	12/01/05	04/01/06
Interim				
D3	Ed Dusablon[1]	Water	12/01/05	04/01/06
	Joe Garcia	Water	12/01/05	04/01/06
	Chuck Heiman	Water	01/01/06	05/01/06
	Noe Magana	Wst Wtr		
	Enrique Magdaleno	Water	09/01/05	01/01/06
	John Smallis	Water	02/01/06	06/01/06
Interim	Bob Funfar	Water		01/01/07
	Rick Bratcher	Water		01/01/07
D4	Ken Witt	Water	02/01/06	05/01/06
Interim	Ed Dusablon[1]	Water		01/01/07
D5				
Interim				

Note:
1. Ed Dusablon has two certifications

In accordance with regulatory requirements, the Utilities Maintenance Supervisor (chief operator) is responsible to assign staff with appropriate levels of CDHS certification to perform required tasks for the operation and maintenance of the TOPWD water distribution system.

The City of Thousand Oaks contracts (Title 17: Article 7584) with the Ventura County Environmental Health Division (VCEHD) to administer the backflow and cross-connection program for the potable water system. The comprehensive backflow and cross-connection program includes the potable service, fire service and irrigation water systems. Upon the request of the TOPWD, the VCEHD also reviews water service connections for new developments to determine if a backflow prevention device is required. The contract to administer the cross-connection program is automatically renewed each year and includes provisions for either party to terminate the contract with adequate notice. The cost for this contract is based on an hourly rate of $80 per hour and currently averages approximately $15,000 per year.

Mr. Orville Kirk of the VCEHD oversees the TOPWD program for the City of Thousand Oaks. The comprehensive TOPWD program includes 1,039 devices including the potable water service (approximately 840 devices), fire service (approximately 10

devices) and irrigation system (approximately 150 devices) within the TOPWD service area. The VCEHD maintains inspection and testing records for these devices and provides updates to the TOPWD. In addition, VCEHD prepares the CDHS annual report for the comprehensive TOWPD system.

The potable water service in the TOPWD service area consists of approximately 840 customers. The potable water service customers are responsible to have the backflow device for the service tested annually and have the appropriate reports submitted to VCEHD. The VCEHD maintains and updates the database of backflow test reports. In the event that a potable water customer fails to submit the required test reports, the VCEDH mails the delinquent customer a notice that reminds the customer to complete the required testing and reporting. If the customer does not respond to the first delinquent notice then a second notice is mailed by the VCEHD to the delinquent customer. If the delinquent customer fails to comply with the second notice, then the VCEHD contacts the TOPWD for further action.

The fire service system consists of approximately 10 devices that are directly administered by the VCEHD. The TOPWD and VCEHD maintain database files to track testing of the fire service devices. The VCEHD notifies the TOPWD when the fire service devices should be tested. The VCEDH mails notices to the designated customers with information on the test requirements. The customers are responsible to have the required tests performed and must file necessary reports with VCEDH. The TOPWD and VCEHD compile the necessary report documentation for the CDHS annual report.

The landscape department of TOPWD is responsible for the inspection and testing of approximately 150 backflow prevention devices in the TOPWD irrigation system. The landscape department has two employees that are certified as Cross-Connection Specialists (CCS) in accordance with the CDHS requirements. The VCEHD notifies the TOPWD when the irrigation devices should be tested. The CCS certified staff from the TOPWD landscape department performs the required tests and reports on the designated irrigation devices. The reports from the CCS certified staff are submitted to the VCEHD to document compliance. The TOPWD and VCEHD compile the necessary report documentation for the CDHS annual report.

The contractual arrangement between the TOPWD and the VCEHD for the administration of the comprehensive total of 1,039 devices in the TOPWD backflow and cross connection program meets the CDHS requirements for the TOPWD's D4 distribution system classification.

Certification Summary

The City of Thousand Oaks currently has sufficient distribution system staffing and certifications to meet the CDHS requirements for the City's D4 water distribution system classification. However, the persons with interim D3 and D4 certification status should be preparing for the appropriate examination and actively pursuing the CE contact hour requirements to obtain the required grade certification or to obtain a higher certification before the termination of the interim certificate on January 01, 2007.

The City of Thousand Oaks currently has sufficient CCS staff for the cross-connection control program in accordance with the CDHS requirements for the TOPWD water distribution system.

Recommendations

The TOPWD has several key personnel with more than 20-years of public service and staff with interim water distribution operator certifications. In order to ensure that the TOPWD water distribution system meets or exceeds the CDHS staffing certifications the following recommendations are provided for consideration:

- Ensure that the interim classification water operators take the applicable examination and obtain CE contact hours required to attain the full certification level BEFORE the January 01, 2007 deadline.
- Ensure there is at least one other employee with a current Grade D4 certification besides the Utilities Maintenance Supervisor.
- Develop a transition matrix for promotions, retirements and related staffing changes.
- Revise all staff job descriptions to require a minimum D1 water certification

Further, it is recommended that the City consider providing cost effective assistance to TOPWD staff to maintain the CDHS water distribution system certifications. The assistance to obtain the required training and CE contact hours could include:

- in-house classes and programs,
- outside programs, seminars and classes

The current requirements for the CE contact hours should be monitored regularly through the CDHS. In addition, the TOPWD should evaluate promotion alternatives and incentives for staff.

Currently all of the backflow prevention devices in the landscape systems are tested in a very short time interval. The inspection and testing of more than 1,000 irrigation system backflow prevention (includes approximately 150 devices within the TOPWD service area) devices in the City of Thousand Oaks creates a significant burden on the CCS staff. The TOPWD should evaluate outsourcing the testing of these backflow prevention devices.

Developing new promotion and incentive programs could also serve to improve employee pride and morale. The improved morale and enthusiasm of TOPWD staff responding to customer complaints and emergencies would be evident to the customers. The enhancements to employee programs would improve customer relations and simultaneously enhance the mission of the TOPWD to provide high quality water in accordance with EPA and CDHS regulatory requirements.

RBF

APPENDIX D

Thousand Oaks
AMR Report

Prepared by:
Michael Moore, PE

JN 10-102413

March 4, 2004

RBF
CONSULTING

Introduction

The City of Thousand Oaks has contracted RBF Consulting to perform an evaluation of automated meter reading (AMR) vendors that may supply equipment to read the City's water meters. The evaluation included demonstrations by AMR vendors and a summary report with a recommended vendor. The City will then negotiate a pilot program for the selected vendor and evaluate the cost vs. benefit for an AMR system in the City. The AMR project is separated into the following phases:

Phase I	Evaluate AMR Vendors
Phase II	Cost vs. Benefit Analysis
Phase III	Pilot Program
Phase IV	Implementation

This report concludes the evaluation portion (Phase I) of the project. The report includes a summary of the City's water meter reading function and a summary of the vendor evaluation performed in January 2004. The City has previously started a pilot program with one of the AMR vendors in 2003. The program was not initiated at the time of this report, and the existing pilot program was not taken into account for this evaluation.

Background

The City's Water Division provides domestic service to 16,124 customers in the City of Thousand Oaks. Water is supplied through the City owned water distribution system to residential, commercial, industrial and irrigation customers. Potable water is served to domestic water customers and raw water is served to some irrigation customers. Customers pay for their water usage based on the quantity of water delivered through their water service. Each water service is metered and bills are sent to customers every two months. The City maintains 16,124 meters.

The City's water Division measures the amount of water produced versus the amount of water sold to customers. The difference between the two factors is the amount of water loss. Many factors in the distribution system may account for water loss, including inaccurate water meters. As water meters age, their mechanical parts wear down and they become less accurate. The American Water Works Association Standard C700 requires new water meters to meet a strict standard, including accuracy. Generally a new water meter is about 99% accurate. Older water meters may read 70% accuracy. The City maintains their meters by replacing them every 10 years. The City's annual water loss rate is about 3.5% of their total water production. The City has standardized their small meters (less then 2-inch) for the past several years. Over 95% of the water meters in service are manufactured by Badger Meter Company.

Each water meter records the amount of water used by each customer. Water Division staff read each meter every two months and enter the readings in a handheld computer. The computer downloads the meter reads at the end of the day and exports them into the City's HTE enterprise system. HTE calculates the quantity of water usage and prepares a water bill for each customer. Three water meters are used by the City to read, maintain and replace water meters.

System Requirements

AMR has been used by many water agencies over the past fifteen years. The City has been evaluating AMR for the past several years. A workshop was held with the Water Division staff to determine the requirements for an AMR system and some of the expected benefits.

Meter Reading Need	Benefit
Reduce the labor required to read meters	Labor can be used for meter replacement and servicing so water loss rate is reduced
The City may want to utilize their existing meters. AMR shall be compatible with the City's existing meters.	AMR will be flexible to provide for the existing meters or new meters, depending on Phase II of the project.
AMR shall be compatible with HTE	Allow data to be transferred into billing system without major re-programming cost.
Must be able to read all the City's meters	Reduces the number of missed reads and re-reads.

AMR Technology

Based on the criteria identified during the workshop, RBF evaluated the various AMR technologies for water systems. Three types of technology are presently being used for AMR in the United States. Fixed data collection, mobile data collection and handheld data collection are all used for AMR. Each system offers unique benefits that were compared to the requirements determined during the workshop.

All AMR systems consist of the same three parts; encoder, transmitter and the receiver. The transmitter is more commonly called a meter interface unit (MIU) by most vendors.

Encoder	Converts the volume of water through the meter to an electronic signal. Encoder may be integrated with the meter or include an external optical attachment that reads the motion of the meter sweep needle.
Transmitter/MIU	Converts the signal from the encoder to a measurement and is transmitted through either radio or telephone. Is programmed to read the meter in preset or user-defined intervals. Stores water usage until transmission to receiver. Includes a battery for data storage and transmission. If radio, includes antennae
Receiver	Includes a computer and antennae (if radio) to receive signal from transmitter. The signal is converted to volume of water used through software and stored in a database. The receiver may be a desktop PC for fixed network system, laptop PC for mobile system or a handheld computer for a handheld system.

Listed below is a description of the three types of AMR technology evaluated.

Fixed Data Collection	Utilizes either telephone of fixed radio network to communicate with a central receiver. Transmitters may be relayed several times daily to the central computer, depending on topography and obstructions.
Mobile Data Collection	Requires a van or mobile unit with a computer to collect meter reads as the unit drives by each meter. Transmitters and encoders are placed on the meters for reads to be digitally relayed to mobile unit.
Handheld Data Collection	Requires an individual to "touch" each meter box to collect the reads. Encoders are attached to the meter to give a digital meter reading.

The mobile data collection system was selected to best meet the needs expressed by the City of Thousand Oaks. The mobile system allows a significant reduction in labor for collecting readings. Currently an individual must walk across and access each meter for a reading. With the mobile system in place, they would only be required to drive a vehicle past each house, or down each street. Fixed and handheld data collection systems were less desirable for topography and minimal reduction of labor. Fixed data collection relies heavily on purchasing or leasing locations for the fixed radio stations and having the range of the transmitters to be unobstructed. Topography is the largest contributor to obstructions within the available range of each fixed radio station. The handheld data collection requires an individual to walk to and access each meter and make contact to obtain a reading. The reduction in labor from a manual reading is the time to read the digits off the manual read vs. touching the meter sensor and is very minor. The mobile data collection system will provide the City with a more efficient system and greatly reduce the labor of the individual collecting the readings.

Vendor Selection

RBF researched and identified vendors of AMR technology that provide products or services in California. Most vendors do not manufacture, install and service the three components of an AMR. Some vendors manufacture the encoder, MIU or receiver only. Vendors that only provided part of the AMR system typically team with other vendors for implementation. RBF identified the following AMR teams:

Table 1

	Team 1		Team 2		Team 3		Team 4	Team 5
Integrator	Groeniger		Orcom					
Radio Vendor	Datamatic	Itron	Ramar (Logicon)	Itron	Orion	Itron	Invensys (Sensus)	Neptune (Schlumberger)
Meter Vendor					Badger		Invensys	Neptune

The table above lists three types of vendors: integrator, radio and meter. Each team is comprised of at least 2 types of vendors. The integrator is a company that utilizes the technology developed by the radio vendors to sell the product. They coordinate with these radio vendors for projects or clients that purchase small quantities (magnitude of ~50,000+ units) of their products. Radio vendors sell and distribute the radio transmitters used for automated reading of many utilities, including water. Meter vendors are companies that sell the actual water meter but have a division to accommodate the specific needs of automated meter reading. These vendors typically accommodate the meter company they represent, but may also adapt for use with other meter brands.

A request for qualifications (RFQ) was sent to each AMR vendor. RBF reviewed their products and services with the City. Four vendor teams were invited to perform demonstrations. Demonstrations were performed by each of the vendors on January 28, 2004.

The vendor teams selected for the demonstrations were:

- Groeniger
- Neptune
- Northrup Grumman
- Badger

Listed below is a summary of the unique features of each product and services of the four vendor teams:

Groeniger

Groeniger & Co. is a waterworks product distributor with 14 branches (closest is Santa Paula). They supply many different water products including Datamatic AMR products. Groeniger integrates and services the Datamatic system with their customers. Datamatic has been manufacturing AMR products for 25 years. Their newest product is the Firefly MIU and Roadrunner Mobile AMR Receiver. The Datamatic MIU is unique in that it can

receive from any type of meter. It can also provide flow profiling. Any wired interface can be directly connected to the MIU. Meters without encoded registers can be read with an optical sensor. Although the optical sensor is not the preferred method of AMR, it does provide an alternative for the meter registers the City does not want to replace.

The products come with a 10 year prorated warranty after the first 5 years. The MIU includes a battery indicator that is transmitted with the reads. The MIU antennae can be underneath the lid or above the lid. There is currently no link to GIS. Support and training will be from Northern California. The system has been interfaced with several HTE Enterprise clients.

Neptune

Neptune is a meter manufacturer that has been implementing AMR for 15 years. Their products include the R900 MIU and EZDrivePLUS Mobile Data Collector. Neptune's presentation recommended the replacement of all the meters with the Neptune meters at the time of implementation. Much of the presentation was on the benefits of their lead-free turbine meters (not a part of this evaluation). The MIU has a high power output that will extend the radio signal for better coverage. One MIU can transmit reads from 2 meters. The antenna is recommended for external meter box installation. The battery life is estimated to last 17 years. The system is not presently compatible with GIS. Technical support and training is provided from their headquarters in Alabama.

Northrup Grumman

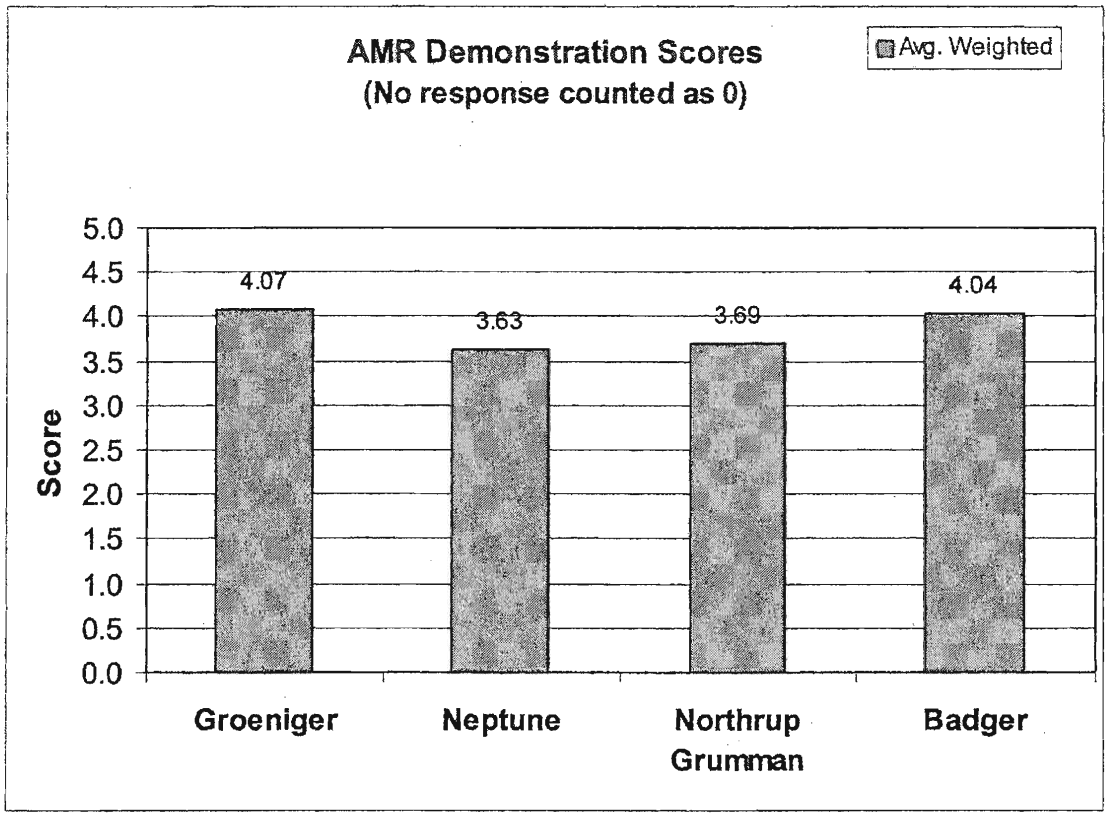
The Commercial Information Services Division of Northrup Grumman has acquired AMR products and services from Logicon. The AMR system includes two products; one is the Ramar MIU and the second is the Net Radio MIU. The Net Radio MIU has many more features and is more powerful then the other vendor's MIU's, however there is little past performance to evaluate and the cost is much higher. Therefore, this evaluation is based on the Ramar system. The Ramar MIU will work with any encoded meter register output. One MIU is provided for meters with discrete outputs and another MIU for absolute outputs. The estimated battery life is 10-15 years. The warranty is 10 years prorated after the first 5 years which is 100% replacement. The MIU has a 100mW output, which is the highest of the MIU's. The MIU has no external antenna. Any laptop can be used with the mobile data collection system. Sales, support and service is provided from their San Diego office.

Badger

Badger provides a turnkey AMR system with their own Orion system. The RTR or ADE encoder can be provided with new meters or retrofitted to the City's existing meters. The RTR is a pulse register and the ADE is an absolute register. Three types of MIU's are provided; integral, pit or remote. The pit installation is the most likely type of installation for the City. The pit installation allows the antenna to be installed inside or outside the meter box. The battery life is estimated at 13 years. The MIU includes a 7-year 100% warranty. The exact MIU output is not specified, but estimated to be around 100mW. The Orion system presently only connects to Badger meters, however they plan to be adapted to Sensus, Neptune and Ampco meters. The system does interface with the HTE Enterprise system. Support and training will be from their Milwaukee office. The mobile receiver system is based on a Panasonic Toughbook.

Each vendor provided a list of references. The references included local utilities that have used contracted installers. Other references have included HTE installations. The selection panel rated each vendor based on a weighted system. Chart 1 is a summary of the ratings from the City reviewers.

Chart 1



Recommendation

The ratings provided a close ranking of Groeniger and Badger for the best overall system based on the City's criteria. After discussing the ratings with the panel, the City favored the Groeniger system because of their flexibility with various meters. RBF has reviewed some of the references for Groeniger and have received positive feedback. The cost of the Groeniger system is comparable with the other AMR systems. Based on the positive scores and input after the demonstrations, Groeniger is the recommended AMR system to proceed with Phase II of the City's AMR program.

RBF

APPENDIX E

City of Thousand Oaks
CMMS Implementation Plan
September 21, 2004

Introduction

The City of Thousand Oaks (City) has selected MRO as its preferred software vendor for a Computerized Maintenance Management System (CMMS). This document outlines a plan for MRO Maximo to be implemented at the City's operations and maintenance divisions located at the Municipal Service Center (MSC). Due to the availability of complete and accurate asset data for the water distribution system, the first group recommended for implementation of the MRO Maximo is the water distribution division. Subsequent phases would include implementation of one MSC division at a time until all maintenance groups have been completely converted to the MRO Maximo CMMS.

The following tasks discuss the recommended implementation steps for the water distribution division and the responsibilities of Red Oak Consulting (Red Oak) during the implementation. Future phases of implementation for other MSC divisions are also presented in general form and are expected to be modified and detailed further based on the experience of the water division. An estimated budget is attached with a breakdown by implementation tasks.

Implementation Modules

The CMMS implementation is proposed to include the configuration of Maximo functional modules that will be used in by each maintenance division. These modules include:

- **Work Orders** will include all functionality to request, issue, manage and close work orders for daily maintenance activities. The separate modules that will be configured as part of this functionality include: work order tracking, quick reporting, labor reporting, work requests, and assignment manager. Work order screens will be customized to meet the needs of the MSC's for efficient work management. The initial phase of implementation for the water division will not include any integration with the City's HTE human resources or financial systems.
- **Preventive Maintenance** will include all functionality to create, schedule and update preventive maintenance work orders. Preventive maintenance screens will be customized to support the City's needs and processes. Template preventive maintenance schedules will be scheduled based on existing PMs that are conducted by the water division.
- **Equipment** is the basic Maximo module used to maintain asset information, equipment locations, failure codes, and condition monitoring activities. This module will be configured with the asset information that was collected as part of the Water System Master Plan. Failure codes and condition monitoring activities will be configured using available information provided by the water division.
- **Inventory** tracks materials used in maintenance activities. This module will be used solely to maintain the inventory necessary for work order management within Maximo and will not replace the current inventory management functionality of the City's HTE system. The Inventory module will be populated with the basic materials information from HTE that is required for work order tracking.
- **Resources** is used to track internal and external resources used to perform maintenance work. The resources module will be populated with the information determined to be needed for tracking of maintenance work completed. This may include companies, tools, service contracts, labor, crafts, and labor groups.

- **Plans** contains the standard templates of tasks, labor, material, tools, and safety information required to complete a maintenance activity. This module will be configured with template plans that can be used in the scheduling of preventive maintenance or other activities. Example plans include job plans, routes, safety plans, and lock-out/tag-out procedures.
- **Reports** will be made available in standard and customized formats. Key performance indicators will be configured in order to provide information for management decisions to improve maintenance efficiency and effectiveness.
- **GIS** will include the integration of the City's current GIS data with the CMMS through the ActiveG software. Existing GIS data will be referenced by ActiveG and the interface will be integrated with Maximo.
- **Mobile devices** will include the purchase and configuration of handheld PDAs with Maximo's Mobile Work Manager to allow access to work orders, job plans, capture time, parts used, and failure codes in the field.

Implementation Tasks

The MRO Maximo implementation for the water distribution division will occur in a series of tasks that ensure the successful delivery of a maintenance and work management platform to improve the overall efficiency and effectiveness of the MSC water division. An outline of the major implementation tasks is as follows:

- Establish implementation team, roles, and responsibilities
- Identify users and licensing requirements
- Identify seed data and data mapping
- Hardware and related software procurement
- Business process definition
- Design customizations
- Define data mapping and migration plan
- Install hardware and software
- Configure screens, database, and reports
- Load and verify data
- Test system
- Train users

Establish Implementation Team

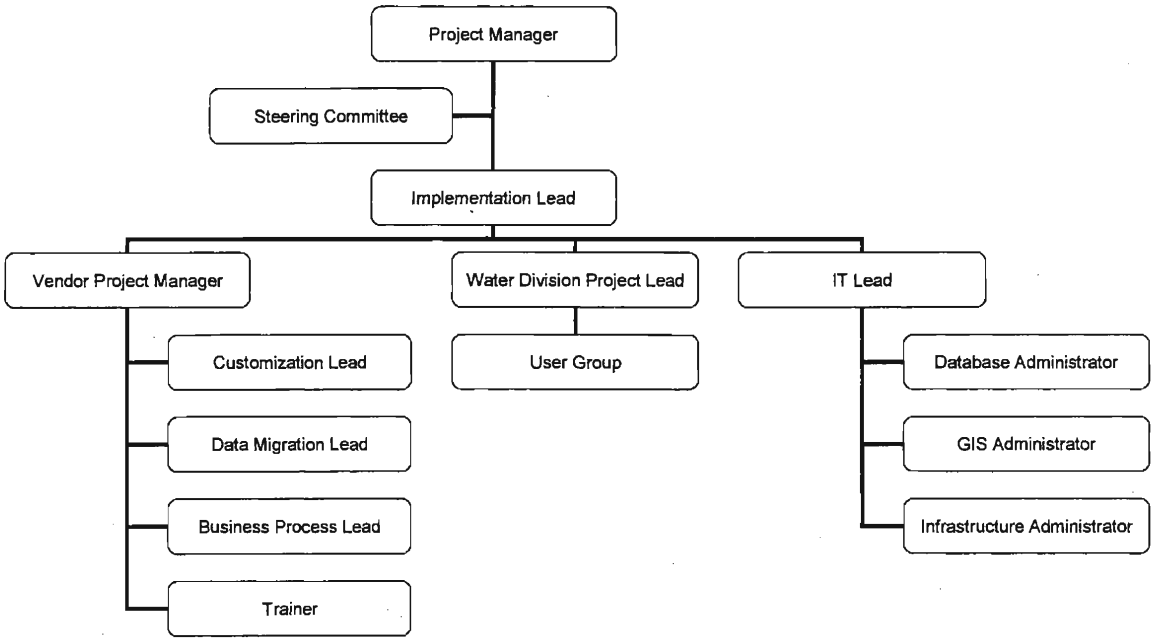
The implementation project responsibilities will be defined at a high level by the project organization chart. The project team will likely require the following membership:

- Project Manager: The person ultimately responsible for the success of the project. This will be the current project manager from the City.
- Steering Committee: A group of individuals who can be relied upon by the project manager to provide guidance throughout the project as well as deliverable review. Its membership will be comprised of the heads of divisions involved in the project.
- Implementation Lead: The person responsible for coordinating day-to-day activities of the implementation, providing technical review of plans and deliverables, and assuring that

budgets, schedules and milestones are achieved. This will be the current project manager from Red Oak.

- Vendor Project Manager: The vendor's point-of-contact and person responsible for business process documentation, CMMS customization, data migration/integration, testing and training.
- Water Division Project Lead: The person from the water division that serves as the project champion within that division. This person will be responsible for distributing project communication within the water division, scheduling interviews with water division staff, and organizing test groups.
- IT Lead: The person from the City's IT group that serves as the point-of-contact and coordinator of IT activities. This person will be responsible for assuring availability of hardware, connectivity in the networking environment, access to external systems (GIS, financial, etc.) and availability of database administrators.

An example organization chart, for discussion purposes, is provided below:



User Identification

Prior to hardware and software procurement, the City should finalize the estimated number of concurrent or named user licenses that will be required for the water division. The users should be grouped according to their classification by MRO: Primary User, Secondary User, and Casual User.

- Primary User: A registered user with access to all MAXIMO 5 licensed applications and licensed asset classes. A Primary User can create, view and edit all records (depending on City specified privileges) in all MAXIMO 5 applications, with full access to all MAXIMO reporting capabilities.
- Secondary User: An infrequent registered user where MAXIMO is not primary to the user's job function. Access to MAXIMO may be direct through the MAXIMO applications and/or database or supported indirectly through other licensed applications, portals, or mobile devices not supported by MRO Software.

- Casual User: Access only to the Work Requests application – can enter new work requests and view limited information for existing requests. Red Oak does not anticipate that the City will have Casual Users unless, at some time in the future, it wishes to allow residents to request work orders directly through a public website.

A preliminary estimate of users that was provided by the City and has been used for budget estimation is ten (10).

Seed Data Identification

Maximo will be populated with seed data from various sources. The seed data may be comprised of asset information, inventory information, historical work order information, failure/problem codes, preventative maintenance plans, safety plans, financial data, and staff information. Sources of this data may include:

- the current Water Master Plan project condition assessment and data collection effort,
- HTE financials/HR/inventory/landmaster,
- other AS400 applications,
- GIS, and
- paper documentation.

The City, with the aid of Red Oak, will determine the required amount of seed data to implement Maximo for the water distribution division successfully. The data will be roughly documented and characterized by its:

- location,
- accessibility,
- format,
- quality, and
- storage requirements

Hardware and Related Software Procurement

The required hardware for Maximo will need to purchased and configured at the MSC prior to system implementation. Red Oak estimates that two environments will be required:

1. Development/Testing
2. Production

Within each environment it is estimated one server can be used to host the application, web, and database software. An estimate of the hardware costs for the two (2) servers has been provided in the budget estimate. A basic recommendation on server specifications provided by MRO, is as follows:

- >1.5 GHz processing power
- 512 MB RAM
- > 20 GB hard drive space
- Backup facilities
- 100+ Mbps network connectivity

Mobile devices used for field data entry of work orders have also been included in the cost estimate. These devices will be a standard PDA configuration using HP/Compaq IPAQ's or Dell Axim with sufficient memory and processing power.

The estimated software licensing required to implement the complete MRO Maximo 5.x, ActiveG GIS Integration, and Maximo Mobile Suite for the water distribution division includes the following:

- 10 MRO Maximo 5.x Primary User Licenses: $3,050/user
- 4 MRO Maximo Mobile Work Manager Licenses: $1,250/user
- 1 activeG GIS Integration Gateway: $20,000
- 10 activeG Named User Licenses: $700/user

In addition, licenses for Windows 2000/2003 Server and Microsoft SQL Server 2000 will also be required on each server. The cost estimate includes approximate software licensing costs for both development and production environments.

Business Process Definition

The implementation team will require a detailed description of the internal maintenance workflows and business processes to be documented prior to customizing the CMMS software. Red Oak recommends that additional effort be expended to refine the future "to-be" workflow in coordination with MRO, so that special consideration can be given to how the software will be customized to work with the City's desired work order process.

The workflow for work orders should consider details such as emergency situations that expedite approval of work orders, situations where a work order requires re-work, and recurring work orders that might be classified as preventative maintenance activities. Red Oak recommends that workflow documentation be of reasonable detail without expending excessive effort. Technology cost studies have repeatedly shown that upfront documentation and needs analyses reduce costly rework during implementation phases.

Design Customizations

The customization of the Maximo user interface will be based on business process documentation developed during the business process definition task. Before effort is expended in actual customization, the design will be documented and approved by the City. The customizations will consist of the following five areas:

- User Interface: The user interface will be designed to adhere to the business processes utilized by the City. This includes defining the information to be displayed, the workflow in which the user engages, and the look and feel of the interface.
- Security: The security of the system will be defined to allow for multiple user roles. Roles will likely include: work order entry, work order review and approval, work order viewing and updating, administration, and viewing of metrics.
- Hierarchy: The asset hierarchy and network will be defined to adhere to the City's understanding of their own system to allow for more efficient access of data.
- Change Control: The detailed process by which users have access to update, add, and maintain data in the production environment will be defined and documented.
- Reports: Reports, as viewed by everyday users and management, will be defined to assure that accurate and meaningful information is presented.

Data Mapping and Migration Planning

This task will focus on detailing information about the seed data and mapping the seed data to the production environment. Documentation will be developed to describe how data will be migrated from its current format into a format usable by Maximo. The documentation will also include descriptions of any transformations or quality assurance checks that will be performed in the transfer.

Hardware/Software Install

Hardware dedicated to running the Maximo environments (development/testing and production) will be installed, configured and placed into operation. The base operating system will be installed and network connectivity to the CMMS client locations will then be verified.

Required software (Maximo application, web servers, application servers and database servers, monitoring/diagnostic software, backup software, etc.) will then be installed and tested. These environments will serve as the day-to-day development, testing and production platforms.

Configure Interface, Database, and Reports

Configuration of the application interface, the database(s) and reports will take place after all preceding tasks are complete. This task will likely prove to be a significant portion of the implementation as it encompasses the detailed configuration of the end-user application. The interface and database will need to modified and built-out to accommodate the specific workflows and data needs as determined in the seed data identification and customization design tasks. Any additional default reports that are required will also be developed under this task.

Load and Verify Data

Seed data that was previously identified will be extracted from its current location, transformed into a format usable by Maximo, and loaded into the new databases. Information not currently residing in electronic format, but still required for a successful implementation, will need to be hand entered or scanned into an electronic format that can be transferred into the database. In some cases, the electronic data will require cleanup and scrubbing prior to being loaded. Once data is in the new database, it will be verified for accuracy and completeness.

System Testing

Before release to all enterprise users, Maximo will be tested thoroughly using scripted scenarios to insure that it meets City requirements. The first round of testing will be performed by the customization team and Red Oak. A second round of testing will be performed by members of the project team including the project manager, an IT representative and the water division project manager. After the application is approved by the implementation team, it will be released for general use by water division staff, or a subset of water division staff. This round of testing is expected to provide the most thorough testing of the application and provide the most feedback about changes. After testing by the water division, the CMMS will be ready for production release to the assigned City users.

User Training

Training will occur in stages, with users trained on both the technical use of the software and its use on-the-job as integral to daily staff routines. Training will be customized for specific groups, including: administrators, management, maintenance staff, and administrative staff. Additional training will be provided to the City's system administrators for ongoing maintenance of the application.

Future Division Implementations

After demonstration of a successful CMMS implementation for the water distribution division, it is recommended that the City proceed with implementation for each additional division of the MSC. The future implementations will generally follow the program outlined above. Each successive phase will benefit from the initial water distribution division implementation and will be shorter in length and at reduced cost.

The City has determined that the following divisions will utilize MRO Maximo as their CMMS:

- Water Distribution

- Wastewater Collection
- Stormwater Collection
- Administration
- Landscaping
- Streets
- Fleet

It is recommended that the next division for implementation following water distribution should be wastewater collection. The wastewater collection division has the next best available asset inventory data and has already been using an existing CMMS for work order tracking.

Water Distribution Implementation Cost Estimate

A rough cost estimate was developed to assist with annual budget preparation at the City. The cost estimate is provided below and represents what Red Oak expects the implementation cost to be for the Water Distribution division. Please note that this is an estimate and detailed implementation can only be further quantified after the Process Documentation and Design tasks.

	Professional Services				
Task	**Consultant**	**Vendor**	**Software**	**Hardware**	**Task Totals**
Process Documentation And Design	$90,000	$80,000			**$170,000**
Implementation	$75,000	$135,000	$67,000	$15,000	**$292,000**
Training	$10,000	$15,000			**$25,000**
Cost Totals	**$175,000**	**$230,000**	**$67,000**	**$15,000**	**$487,000**

The task groups above are comprised of individual tasks as follows.

Process Documentation and Design

- Establish implementation team, roles, and responsibilities
- Identify users and licensing requirements
- Identify seed data and data mapping
- Identify hardware and related software licensing
- Business process definition
- Design customizations
- Define data mapping and migration plan

Implementation

- Install hardware and software
- Configure screens, database, and reports
- Load and verify data
- Test system

Training

- Training

Annual vendor support costs are expected to be approximately $12,000 to $15,000 per year. Future division implementations will benefit greatly from the experience and initial configuration

knowledge gained from the water distribution division implementation. Therefore, future implementation costs will be drastically reduced.

Integration of External Systems

The integration of external systems, such as HTE, will be considered after the successful base implementation of Maximo at the water distribution division. This phase of the overall CMMS implementation may occur in parallel with the implementation at other divisions. The integration of HTE and other external systems will likely involve significant effort from the implementation team, including staff from the City's finance and IT divisions. Ultimately, this integration will likely save the City a significant amount of daily effort by streamlining and automating time-consuming maintenance activities.

The integration points listed below will serve as a draft list to enhance the efficiency and usability of the CMMS system. Integration may be developed for different update frequencies: one-time transfers, regularly scheduled batch transfers, or real-time integration. The goal is to identify integration points that could add value to the overall system in a completed state.

Maximo – HTE Integration

1. **Import HTE HR/Labor Records into Maximo** – The purpose is to import employee, contractors, and trades information from the HTE Human Resources module into Maximo to create labor records with associated labor rate details for use in work order assignments. Recommended frequency: daily or weekly
2. **Import HTE GL Chart of Accounts into Maximo** – The purpose is to import the General Ledger (GL) chart of accounts and account component information from HTE Financials module into Maximo to allow cost accounting of work orders by appropriate account numbers. Frequency: daily
3. **Import HTE Customer Records into Maximo** – The purpose is to import a list of customer records from the HTE Billing/Customer Service module into Maximo to allow work order and maintenance history to be associated with individual customers. This may involve additional integration with the GIS and Land Master applications. Frequency: daily or real-time on customer record create/update
4. **Import HTE Service Requests/Work Orders into Maximo** – The purpose is to import service and work requests created in HTE into Maximo to allow seamless creation of actionable work orders. Frequency: real-time on service request creation
5. **Export Maximo Work Order Status Information to HTE** – The purpose is to export work order status information to HTE service requests as they are updated, modified, or closed in Maximo. Frequency: hourly or real-time on work order status update
6. **Export Maximo Journal Entries to HTE** – The purpose is to export summary level work order cost information to HTE financials for asset management and cost accounting purposes. Frequency: daily
7. **Import HTE Meter Codes into Maximo** – The purpose is to import meter codes that will be used to generate and track meter maintenance and repair needs on Maximo. Frequency: daily
8. **Export Maximo Meter Work Orders to HTE**– The purpose is to export work completed and associated costs to HTE Billing module for maintenance work orders on meters or other assets that require customer billing. Frequency: hourly or daily
9. **Import HTE Inventory to Maximo** – The purpose is to publish inventory items, balances, and costs from HTE to Maximo for use in work order assignment. Frequency: daily for items; real-time for balances and costs

10. **Export Maximo Material Reservations and Issues to HTE –** The purpose is to source material and inventory requirements assigned to work orders in Maximo against HTE inventory system. Frequency: real-time on material assignment
11. **Export Maximo Purchase Requisitions (PR) to HTE –** The purpose is to generate manual purchase requisitions on Maximo that are sent to HTE Inventory/Accounts Payable module for fulfillment. Frequency: hourly or real-time
12. **Import HTE PR/PO Status Information into Maximo –** The purpose is to import status update information from HTE Accounts Payable module into Maximo to update manual PRs created on Maximo. Frequency: hourly or real-time

Maximo – SCADA Integration

13. **Import SCADA Motor Runtimes into Maximo** – The purpose is to import motor runtimes from the SCADA system into Maximo to automatically generate preventative maintenance work orders. Frequency: daily or weekly

Maximo – Fuel System Integration

14. **Import Fuel Tracking into Maximo** – The purpose is to send to Maximo the information required to generate a preventive maintenance work order based on miles or hours of run-time. Also to create a mechanism to post journal entries to HTE to charge fuel usage back to the appropriate department. Frequency: weekly for fuel usage; monthly for balance reconciliation