



North and South AFC Water Master Plan

Prepared for:

WESTERN MUNICIPAL WATER DISTRICT
14205 Meridian Parkway.
Riverside, CA 92518
(951) 571-7100

Prepared by:

ALBERT A. WEBB ASSOCIATES
3788 MCCRAY STREET
RIVERSIDE, CA 92506
(951) 686-1070

JUNE 2014

TABLE OF CONTENTS

SECTION 1 - EXECUTIVE SUMMARY	1-1
SECTION 2 - SCOPE OF WORK	2-1
SECTION 3 - STUDY AREA	3-1
SECTION 4 - PRESSURE ZONES	4-1
SECTION 5 - EDU DEFINITION AND UNIT WATER DEMAND	5-1
SECTION 6 - PROJECTED ULTIMATE WATER DEMAND	6-1
SECTION 7 - WATER SUPPLY	7-1
SECTION 8 - PIPELINE REQUIREMENTS FOR ULTIMATE SYSTEM	8-1
SECTION 9 - STORAGE REQUIREMENTS FOR THE ULTIMATE SYSTEM	9-1
SECTION 10 - PUMPING REQUIREMENTS FOR THE ULTIMATE SYSTEM	10-1
SECTION 11 - CONSTRUCTION AND PROJECT COST ESTIMATES	11-1
APPENDIX I – MILLS GRAVITY LINE	AI-1

TABLE OF CONTENTS

LIST OF TABLES

Table 1	Projected Land Use and Water Demand by Pressure Zone-North AFC
Table 2	Projected Land Use and Water Demand by Pressure Zone-South AFC
Table 3	Existing Storage Facilities-North AFC
Table 4	Existing Storage Facilities-South AFC
Table 5	Maximum Fire Flows and Duration used by Pressure Zone- North AFC
Table 6	Maximum Fire Flows and Duration used by Pressure Zone- South AFC
Table 7	Ultimate Storage Requirements by Pressure Zone- North AFC
Table 8	Ultimate Storage Requirements by Pressure Zone- South AFC
Table 9	Existing Pumping Facilities-North AFC
Table 10	Existing Pumping Facilities-South AFC
Table 11	Ultimate Pumping Requirements-North AFC
Table 12	Ultimate Pumping Requirements-South AFC
Table 13	Construction and Project Cost for Proposed 1515 Pressure Zone Facilities
Table 14	Construction and Project Cost for Proposed 1650 Pressure Zone Facilities
Table 15	Construction and Project Cost for Proposed 1837 Pressure Zone Facilities
Table 16	Construction and Project Cost for Proposed 1900 Pressure Zone Facilities
Table 17	Total Project Cost by Pressure Zone-North AFC
Table 18	Total Project Cost by Category-North AFC
Table 19	Construction and Project Cost for Proposed 1783 Pressure Zone Facilities
Table 20	Construction and Project Cost for Proposed 2116 Pressure Zone Facilities
Table 21	Construction and Project Cost for Proposed 2320 Pressure Zone Facilities
Table 22	Construction and Project Cost for Proposed 2450 Pressure Zone Facilities
Table 23	Construction and Project Cost for Project Cost for Regional Facilities- South AFC
Table 24	Total Project Cost by Pressure Zone-South AFC
Table 25	Total Project Costs-South AFC

TABLE OF CONTENTS

LIST OF FIGURES

Figure 1 _____ North Added Facilities Area-Study Area Boundary

Figure 2 _____ South Added Facilities Area-Study Area Boundary

Figure 3 _____ North Added Facilities Area-Pressure Zone Boundaries

Figure 4 _____ South Added Facilities Area-Pressure Zone Boundaries

Figure 5 _____ North Added Facilities Area-Existing & Proposed Water System

Figure 6 _____ South Added Facilities Area-Existing & Proposed Water System

LIST OF APPENDICES

Appendix I – Mills Gravity Line

SECTION 1 - EXECUTIVE SUMMARY

ULTIMATE DEMAND

Ultimate water demand for the North Added Facilities Charge (North AFC) area based on existing General Plan land use is estimated at 29,769 af-ft/yr for 37,160 EDU's. The total remaining EDU's are estimated to be 19,487.

Ultimate water demand for the South Added Facilities Charge (South AFC) area based on existing General Plan land use is estimated at 7,548 ac-ft/yr for 5,675 EDU's. The total remaining EDU's are estimated to be 3,886.

Note that the District has additional retail water demand for other areas outside of the North and South AFC area, such as Murrieta Division, Lake Hills and MARB, which are not included in the above water demand total.

PROJECT COST

The total project cost of the ultimate facilities improvements for the North Added Facilities Charge (North AFC) area is estimated at \$64,740,000 excluding applicable charges for water supply.

The total project cost of the area ultimate facilities improvements for the South Added Facilities Charge (South AFC) is estimated at \$42,290,000 excluding applicable charges for water supply.

SECTION 2 - SCOPE OF WORK

The objective of this report is to update the February 2004 and October 2008 draft North Added Facilities Area Master Plan and South Added Facilities Area Master Plan incorporating any updates to land use, water supply and unit water demand within the study boundaries. Data developed in the updated plans was used to develop project costs for needed improvements for the ultimate water supply and distribution system and determine development fees needed to fund construction of the water supply, transmission and storage facilities outlined in this report.

- Develop a data base of land use and water demand for each parcel within the study area.
- Confirm the definitions of an EDU to be used within the study area.
- Determine unit water demand for each individual EDU type.
- Update the pressure zone boundaries based on current District Operations and available elevation data for undeveloped properties
- Determine for each pressure zone the following:
 - Ultimate Water Demand
 - Pumping Requirements
 - Storage Requirements
 - Transmission Pipeline Requirements
 - Water Supply
- Evaluate emergency / redundant facilities and pressure zone interconnections.
- Prepare Cost Estimates for facilities proposed.
- Identify near term improvements required by existing or proposed development.
- Calculate proposed master plan fees required to fund proposed ultimate facilities.

SECTION 3 - STUDY AREA

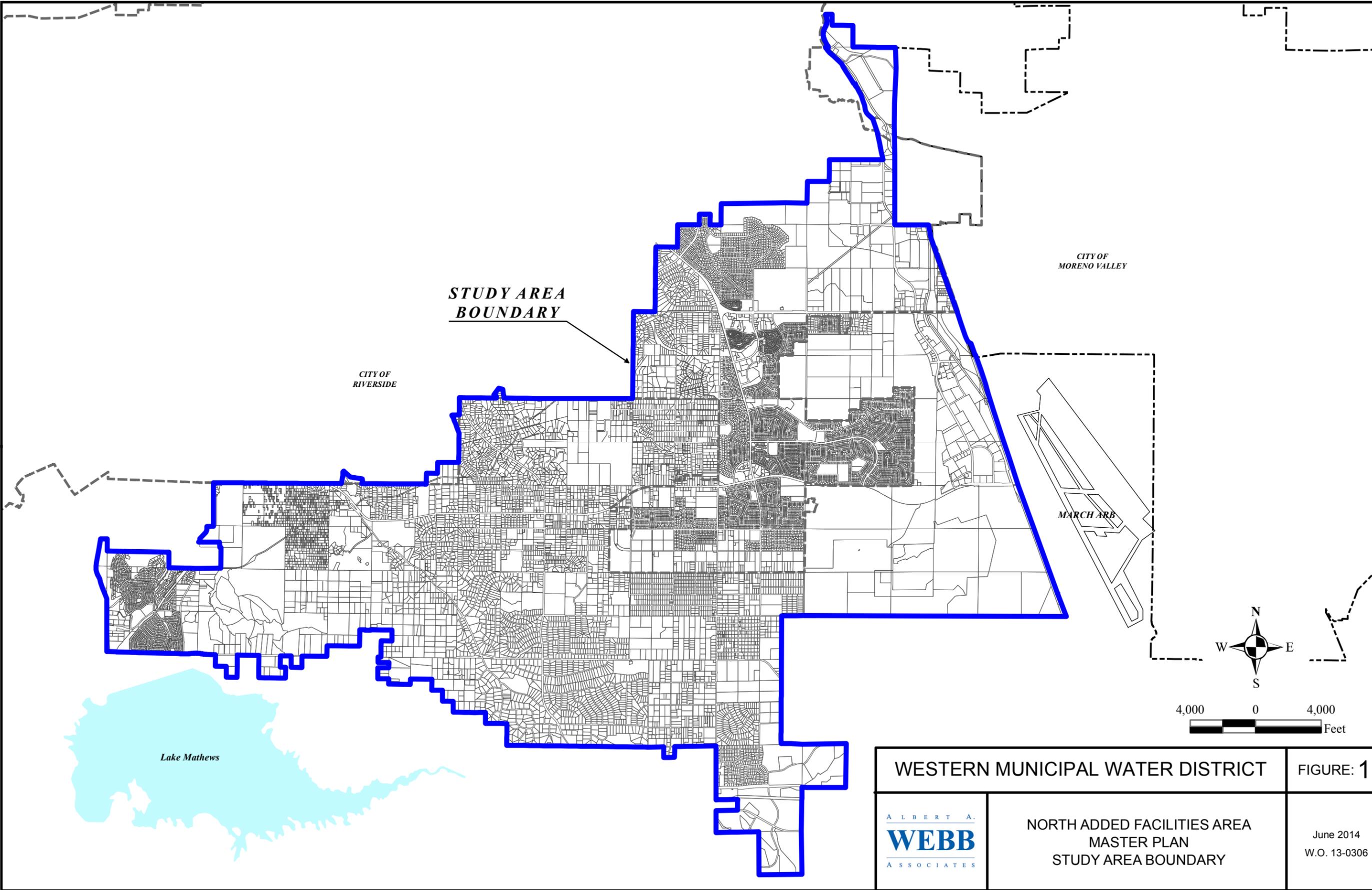
The study area for the North Added Facilities Area is given in **Figure 1**. The study area includes portion of the City of Riverside and unincorporated portions of the County of Riverside. Water demand wheeled through the study area for March Air Reserve Base (MARB), March Joint Powers Authority (MJPA), Box Springs Mutual Water Company (BSMWC), Lake Hills and EMWD has been included. Data was obtained from various planning documents for these adjoining areas.

The study area for the South AFC Area is given in **Figure 2**. The study area includes unincorporated portions of the County of Riverside incorporating Western's former Improvement Districts 2, 4 and U-3. Based on the current water supply plan, no water demand for neighboring agencies or improvement areas is anticipated to be supplied using facilities within the study area. Therefore, all facilities have been sized to meet the demands of the study area only.

Data was obtained from various planning documents for these areas. These source materials are identified as follows:

The source materials identified in said study are as follows:

- County of Riverside's GIS Database for Landuse within the study area
- City of Riverside's GIS Database for Landuse within the study area
- General Plan of the March Joint Powers Authority
- Specific Plan No. 326, Victoria Grove East
- Specific Plan No. 224, Three Sisters
- Specific Plan No. 229, HB Ranches, Boulder Springs
- Specific Plan No. 299, Alta Cresta Ranch
- Specific Plan No. 250, Gateway Center
- Lake Mathews Area Plan
- Specific Plan No. 308, Gavilan Hills Golf Course
- Specific Plan No. 198, Belle Meadows
- Specific Plan No. 130, El Nido



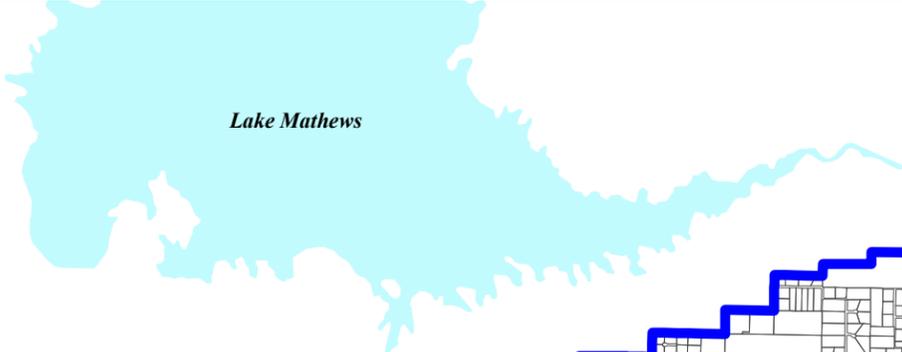
WESTERN MUNICIPAL WATER DISTRICT

FIGURE: 1

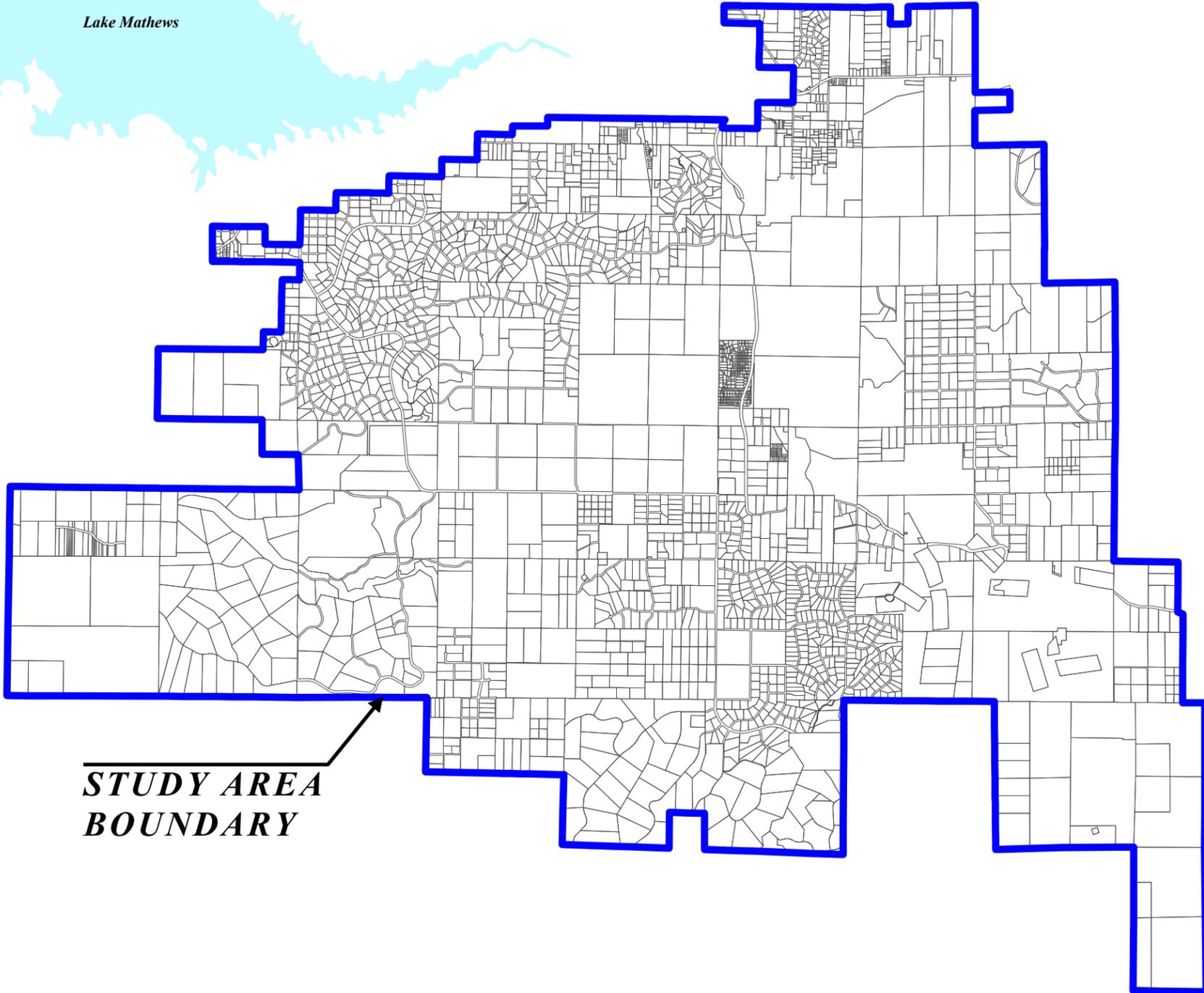


NORTH ADDED FACILITIES AREA
MASTER PLAN
STUDY AREA BOUNDARY

June 2014
W.O. 13-0306



Lake Mathews



**STUDY AREA
BOUNDARY**



WESTERN MUNICIPAL WATER DISTRICT

FIGURE: 2



SOUTH ADDED FACILITIES AREA
MASTER PLAN
STUDY AREA BOUNDARY

June 2014
W.O. 13-0306

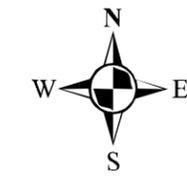
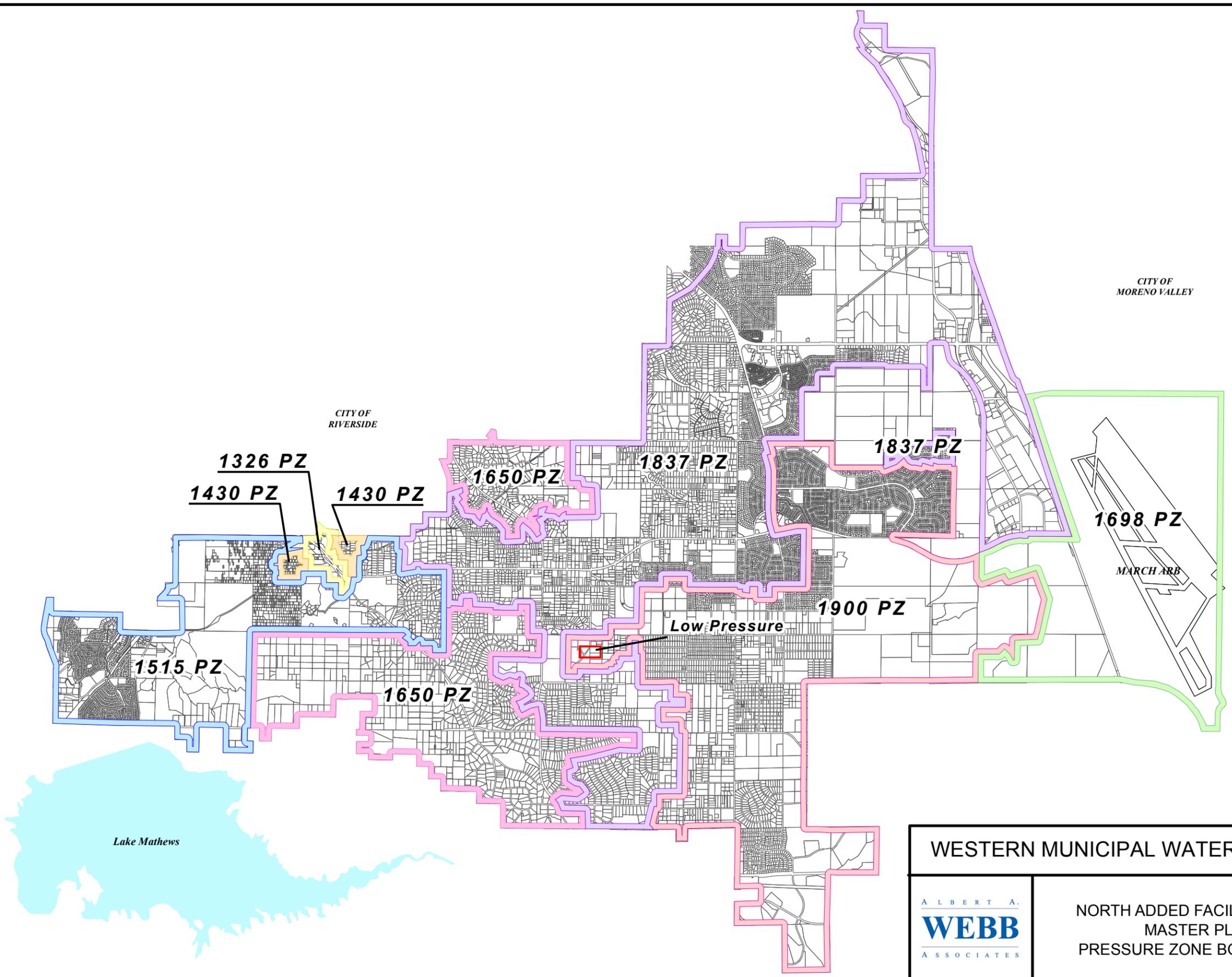
SECTION 4 - PRESSURE ZONES

The boundaries of each pressure zone have been based on pressure zone maps provided by the District. Some changes to these boundaries are proposed to provide a minimum static pressure of approximately 43 psi (100') and a maximum static pressure of approximately 130 psi (300'). In addition, other operational considerations were used to adjust the pressure zone boundaries outside of the above criteria. The boundaries are shown in **Figure 3** for the North AFC area and **Figure 4** for the South AFC area. Minor changes to the boundaries due to development may be allowable based on operational considerations at the time of development.

With the acquisition of the March Air Reserve Base (MARB) water distribution system by the District, an additional pressure zone has been added to the District's distribution system. The 1698' pressure zone serves East March (east of I-215 freeway) and some limited services west of the I-215 Freeway including the Riverside National Cemetery and Western Water Recycling Facility. While a majority of this new service area and pressure zone is not currently within the North AFC area, water supply for the MARB wheeled through the North AFC area has been accounted for as part of this study.

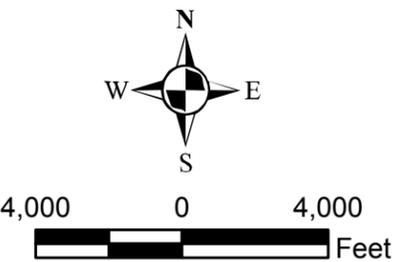
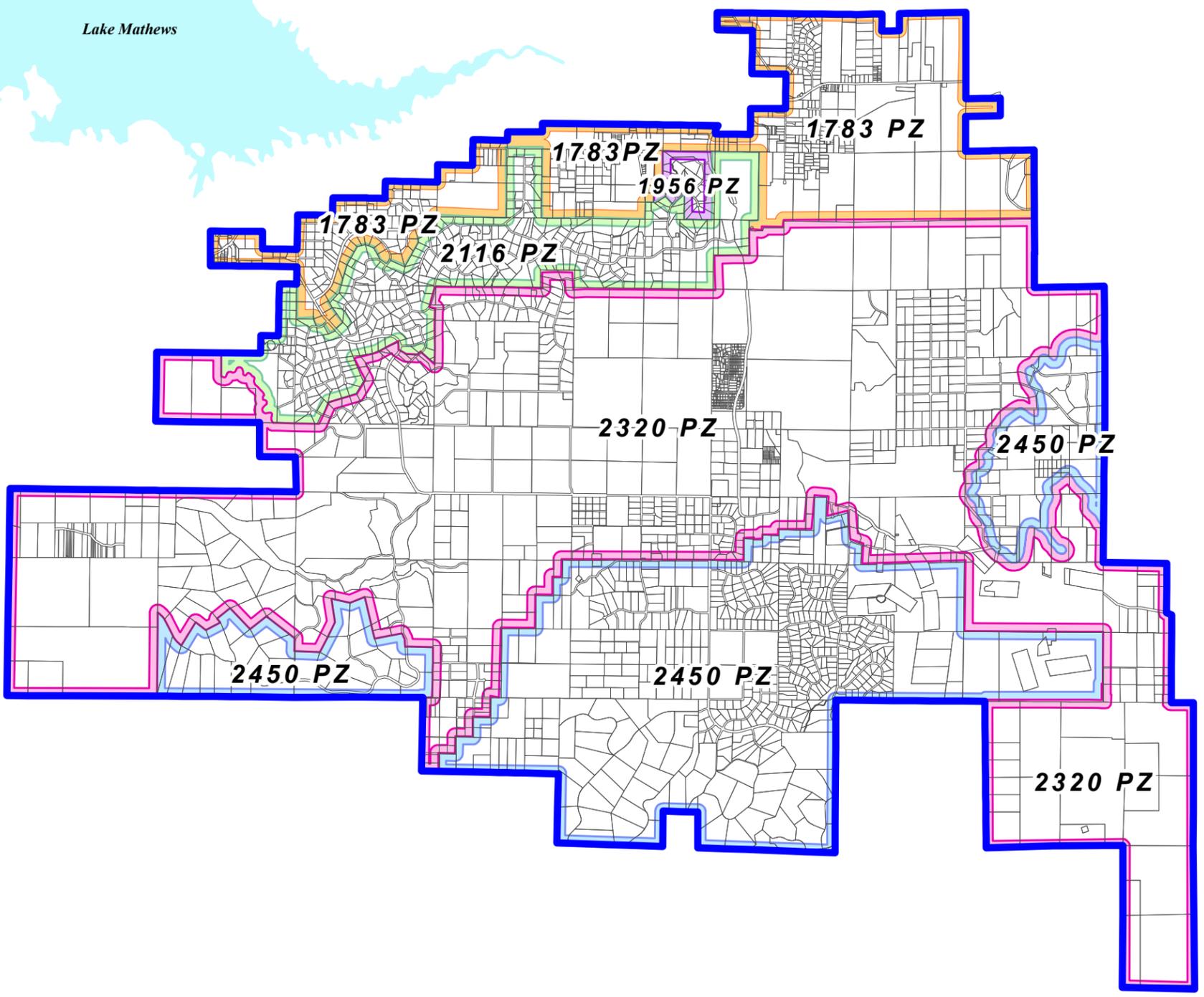
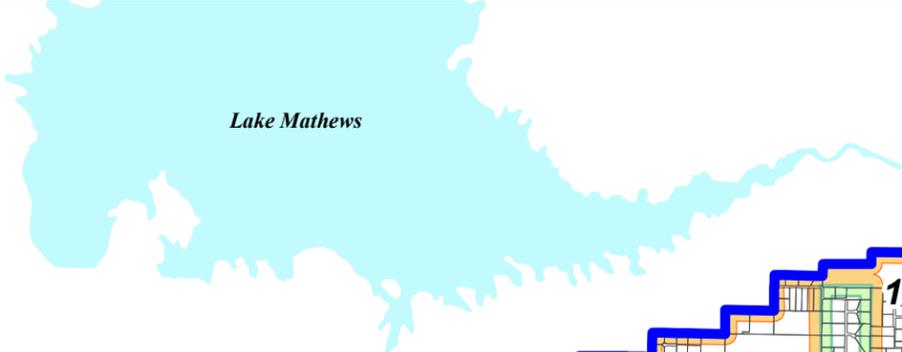
Some small areas of the 1900' pressure zone in Section 36 of Township 3 South, Range 5 West have high elevations (above 1760' msl) that may require a local constant pressure pumping system to provide adequate pressure at the service locations. These low pressure areas are identified on Figure 3. The southwestern portions of the 2450' pressure zone in Sections 32, 33 and 34 of Township 4 South, Range 5 West and Section 3 of Township 5 South, Range 5 West have higher elevations and steep topography that may require a local constant pressure pumping system to provide adequate pressure at future service locations. These local pumping facilities are not considered master plan facilities and are not included in the cost estimates.

The isolated portion of the 2450' pressure zone in Sections 29 of Township 4 South, Range 5 West may be temporarily served by a hydro-pneumatic pump station funded by developer until the master planned pipeline can be extended to this area.



WESTERN MUNICIPAL WATER DISTRICT		FIGURE: 3
	NORTH ADDED FACILITIES AREA MASTER PLAN PRESSURE ZONE BOUNDARIES	
	June 2014 W.O. 13-0306	

G:\2013\13-0306\GIS\AFC_PZs_north_17x11.mxd



WESTERN MUNICIPAL WATER DISTRICT		FIGURE: 4
ALBERT A. WEBB ASSOCIATES	SOUTH ADDED FACILITIES AREA MASTER PLAN PRESSURE ZONE BOUNDARIES	June 2014 W.O. 13-0306

G:\2013\13-0306\GIS\AFC_PZs_south_17x11.mxd

SECTION 5 - EDU DEFINITION AND UNIT WATER DEMAND

The Equivalent Dwelling Unit (EDU) for the North Added Facilities Area is defined as a 7,000 sq-ft residential lot similar to much of the existing residential development in the Orangecrest area. The unit water demand is 0.80 ac-ft/yr/EDU. This unit water demand was determined using the average water demand of over 1,800 active water services within Sections 21 and 22 of Township 3 South, Range 4 West for the water year 2000. Based on this demand, the District provides a ¾-inch meter for each EDU for the North AFC area.

The Equivalent Dwelling Unit (EDU) for the South AFC Area is defined as one estate sized residential lot. An estate sized lot is defined as a residential lot with an area of one half acre or more. Most of the South Added Facilities Area is planned for a rural residential setting with estate sized one half acre lots or larger. This is comparable to the existing residential development in the 2450' pressure zone. The unit annual water demand used in this report is 1.33 ac-ft/yr/EDU. Unit annual water demand was determined from the average annual water demand of over 400 active water services on estate sized lots within ID4 area for the water year 2000. Based on this demand, the District provides a 1-inch meter for each EDU for the South AFC area.

SECTION 6 - PROJECTED ULTIMATE WATER DEMAND

Land use acreages were determined using the applicable county or city planning documents or from data bases provided by the County of Riverside and the City of Riverside. The projected number of EDU's was calculated for each pressure zone. Commercial water demand is estimated at 2000 gpd/acre. Demand within the existing higher density mobile home park was determined to be 0.34 ac-ft/yr/lot using year 2000 actual data.

Table 1 contains a summary of projected land use, annual, maximum day, and peak hour water demands for each pressure zone within the North AFC area.

**Table 1
Western Municipal Water District
North AFC
Projected Land Use and Water Demand by Pressure Zone**

Pressure Zone	Total Acreage	EDU's	Annual Demand (ac-ft/yr)	Maximum Day Demand (cfs)⁽¹⁾	Peak Hour Demand (cfs)⁽²⁾
1325'	124	83	66	0.3	0.4
1420'	109	54	43	0.2	0.2
1515'	3,070	4,765	3,812	14.4	21.6
1650'	3,894	2,108	1,687	6.4	9.6
1837'	9,770	18,948	15,159	57.3	86.0
1900'	5,586	11,202	8,962	33.9	50.8
TOTALS	22,553	37,160	29,729	112.5	168.6

⁽¹⁾ Calculation Method for Maximum Day

- a. Maximum Month is 15% of annual demand
- b. Maximum Day is 150% of average day of Maximum Month

⁽²⁾ Peak Hour is 150% of Maximum Day

Table 2 contains a summary of projected land use, annual, maximum day, and peak hour water demands for each pressure zone within the South AFC area.

Table 2
Western Municipal Water District
South AFC
Projected Land Use and Water Demand by Pressure Zone
Existing General Plan Land Use

Pressure Zone	Total Acreage	EDU's	Annual Demand (ac-ft/yr)	Maximum Day Demand (cfs)⁽¹⁾	Peak Hour Demand (cfs)⁽²⁾
1783'	2,656	1,822	2,423	9.2	13.7
2116' ⁽³⁾	1,648	592	788	3.0	4.5
2320'	11,336	2,472	3,288	12.4	18.6
2450'	3,983	789	1,049	4.0	6.0
TOTALS	19,624	5,675	7,548	28.6	42.8

⁽¹⁾ Calculation Method for Maximum Day

- a. Maximum Month is 15% of annual demand
- b. Maximum Day is 150% of average day of Maximum Month

⁽²⁾ Peak Hour is 150% of Maximum Day

⁽³⁾ 1959 pressure zone is a PRV Zone served entirely from the 2116 pressure zone. All demand for the 1959 pressure zone has been included in the 2116 pressure zone.

SECTION 7 - WATER SUPPLY

Water supply is assumed to come entirely from MWD's Mills Treatment Plant. Water is either pumped into the 1837' pressure zone by the District's Holcomb Pump Station or gravity fed into the Mills Gravity Line (MGL) for distribution. From the 1837' pressure zone, water is pumped to the 1900' pressure zone by the Bergamont Pump Station and PRV stations serve water to adjoining 1650' and 1515' pressure zones. From the MGL, water is pumped into the 1650' pressure zone at Mockingbird Pump Station or delivered directly to the La Sierra Tank via a PRV station for service to the west end of the 1515' zone and Lake Hills.

When available, the District can purchase water from the City of Riverside at the Mockingbird Pump Station of the Whitegates interconnection. Quantities from the City have been limited in the past based on available groundwater supply, the capacity of the City's distribution system and water quality considerations. The District and the City have executed agreements to wheel water through the City's system to the above mentioned connection points.

An additional 10 cfs can be supplied to the 1698' pressure zone by Eastern Municipal Water District (EMWD). This water is also treated at MWD's Mills Treatment Plant and pumped through EMWD's distribution system to various connections for the 1698' pressure zone. This water supply was acquired by the District when the MARB water system was transferred to the District in September 2002. The District is considering a supply agreement with EMWD for the MARB water system that would transfer ownership of this 10 cfs capacity to EMWD in trade for additional capacity in other EMWD to supply the MARB water system. Future development within the MARB water system would pay its fair share for these additional facilities. These facilities are beyond the scope of this report and analyzed in other reports.

A 5.0 cfs water supply connection to EMWD from the 1900' pressure zone is located near the intersection of Barton Street and Nandina Avenue. A 28.6 cfs water supply connection to the District's South AFC Area from the 1650' pressure zone has been planned at the District's Operations Center. Ultimate facilities have been sized for these additional water supplies to be wheeled through the North AFC transmission and distribution system.

For the South AFC Area, the higher pressure zones are dependent upon lower pressure zones for water supply. Water is pumped by the Intake Pump Station from the terminus of the Mockingbird Pipeline (MBP) and the North AFC Area's 1650' pressure zone, across Metropolitan Water District's (MWD) Colorado River Aqueduct (CRA) channel to the Hillside Tank in the 1783' pressure zone. Water is further pumped from the 1783' pressure zone to either the 2116' pressure zone or 2320' pressure zone and from the 2320' pressure zone to the 2450' pressure zone. All facilities have been sized based on ultimate demand.

Additional connections to the South AFC Area that bypass the MGL, MBP and Intake pump station for emergency backup have been planned. A small existing PRV station on Wyler Road can supply up to 800 gpm in emergency situations from the 1837' pressure zone to the 1783' pressure zone. Additional facility improvements to transfer additional water to the 1783' pressure zone from the existing 1837' pressure zone and the near-term expansion of the 1900' pressure zone have been sized to accommodate average day demand for the entire South AFC Area. The required pipelines and PRV facility improvements are included in the 1783' zone facilities and associated cost estimates.

SECTION 8 - PIPELINE REQUIREMENTS FOR ULTIMATE SYSTEM

The design criteria used to size the transmission pipeline network is consistent with criteria used in previous Master Plans as well as the District's current design criteria contained in the District's "Developer Handbook and Standard Drawings" manual. The transmission network will serve as the backbone of the water distribution system with additional pipelines constructed to provide service to individual parcels or tracts. The following is a summary of the design criteria used:

- Maximum velocity of 6ft/sec in transmission pipelines under replenishment conditions.
- Maximum friction loss of 3.5ft/1000 ft of transmission line under replenishment conditions.
- Maximum velocity of 7.5 ft/sec in any water pipelines during peak hour or maximum day demand plus emergency fireflow conditions.
- Transmission pipelines shall be no smaller than 12-in diameter.

As part of the Master Plan, a computer model was developed to simulate the existing and ultimate waster system. The computer model used is H2ONET® Version 3.1 developed by MW Soft, Inc. Conditions analyzed include the current conditions, ultimate system at peak hour, ultimate system at maximum day demand plus fireflow and ultimate system at replenishment conditions.

The proposed transmission pipelines for the North AFC Area's ultimate system are shown in **Figure 5**. The proposed system requires approximately 22.1 miles of new pipeline which is broken down as follows:

- 1515' Pressure Zone – 27,720 lf of 12-in to 30-in diameter pipeline
- 1650' Pressure Zone – 20,000 lf of 24-in to 36-in diameter pipeline
- 1837' Pressure Zone – 39,750 lf of 24-in to 36-in diameter pipeline
- 1900' Pressure Zone – 29,000 lf of 12-in to 18-in diameter pipeline

The proposed transmission pipelines for the South AFC Area's ultimate system are shown in **Figure 6**. The proposed system requires approximately 17.9 miles of new pipeline broken down as follows:

1783' Pressure Zone – 40,000 lf of 12-in to 33-in diameter pipeline

2116' Pressure Zone – 4,750 lf of 12-in diameter pipeline

2320' Pressure Zone – 32,250 lf of 12-in diameter pipeline

2450' Pressure Zone – 17,550 lf of 12-in diameter pipeline

Within the Sycamore Canyon Business Park, the pipelines have been sized to provide a minimum level of service of maximum day demand plus 5,000 gpm fire flow. Based on previous payments and credits between the City of Riverside and the District, any future pipelines must be sized to provide 5,000 gpm fire flow, are to be funded by future development and are not included in the master plan cost estimates. All connection fees in this area have been paid so no North AFC fees are to be collected for future meters.

The Meridian March Business Center is not within the District's North Added Facilities Charge Area. The District has a separate Development Agreement for a portion of this project to fund its fair share of the required improvements.

Modeling results indicate that several system improvements are warranted beyond the sizing of the transmission pipelines. These improvements can be summarized as follows:

- The western sections of both the 1783' and 2116' pressure zones should be connected to higher zones with PRV's to improve reliability. These facilities are included in the master plan.
- Existing 8-in pipeline in Gavilan Road serving the mobile home park should be reinforced by an alternate looped supply to improve reliability under ultimate demand conditions. The pipeline extensions to the east along Idaleona and Santa Rosa Mine Road should be looped together. This looping is considered a local improvement and has not been included in the master plan.
- When tanks are constructed at multiple sites within a single zone, altitude valves and additional SCADA interface controls with pump stations are required to prevent tank overflow and system over pressurization. This will be the case for the 1783', 2116' and 2320' pressure zones.

- Some areas of the 1900' and 2450' pressure zone must be served by local constant pressure pumping systems because of higher elevations and steep terrain. Constant pumping systems have not been included as master planned facilities because they are considered local improvements funded directly by the developer and/or land owner.
- A 33-in diameter transmission pipeline from Intake Pump Station is required for the ultimate system. The proposed alignment shown in Figure 6 avoids crossing the open channel of the CRA and sensitive habitat within the Lake Mathews Reserve. A more direct route may be selected for the final alignment of the pipeline, if a cost effective channel crossing and appropriate environmental mitigation can be identified during the planning and final design phases of this project.

STORAGE REQUIREMENTS

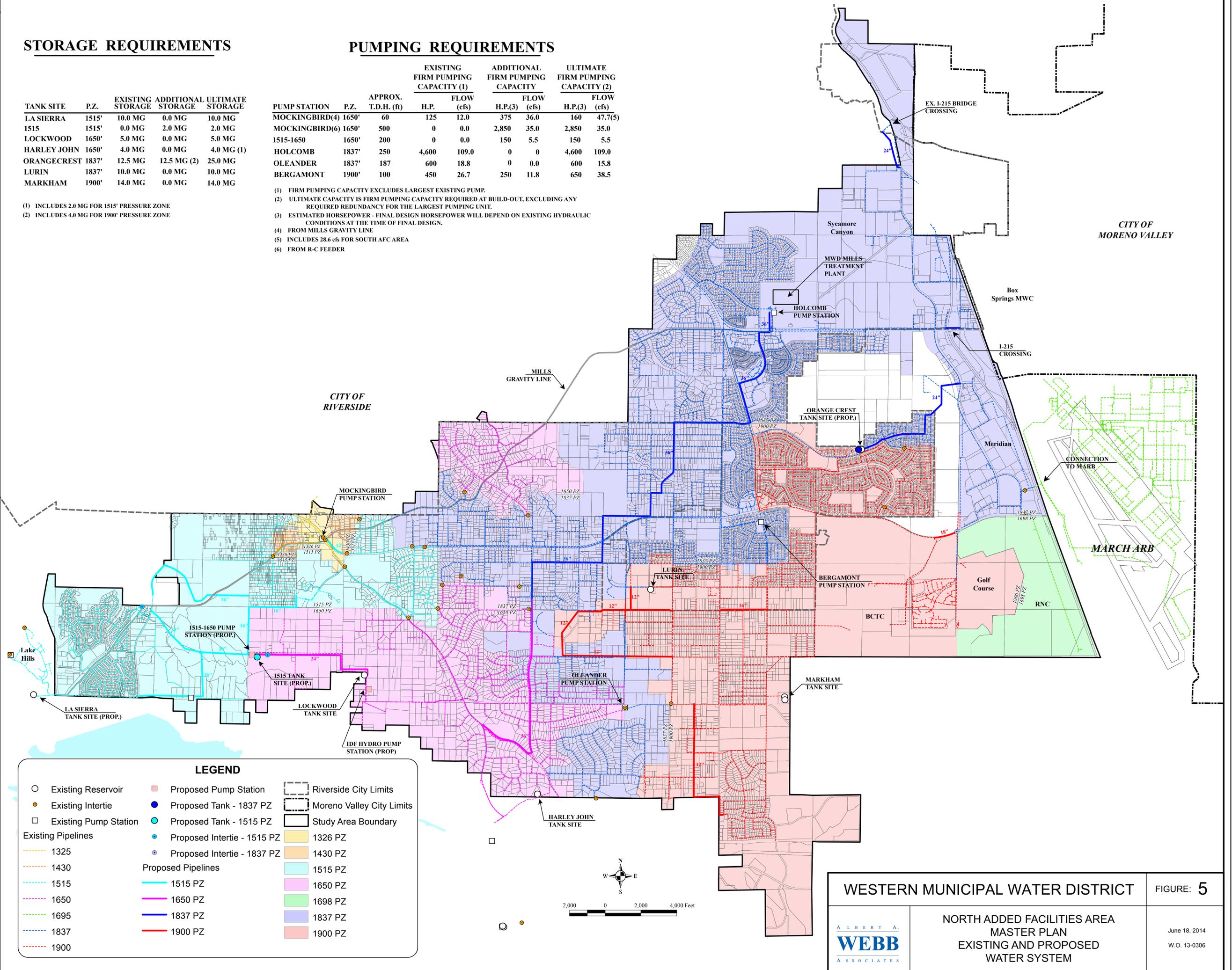
TANK SITE	P.Z.	EXISTING STORAGE	ADDITIONAL STORAGE	ULTIMATE STORAGE
LA SIERRA	1515'	10.0 MG	0.0 MG	10.0 MG
1515	1515'	0.0 MG	2.0 MG	2.0 MG
LOCKWOOD	1650'	5.0 MG	0.0 MG	5.0 MG
HARLEY JOHN	1650'	4.0 MG	0.0 MG	4.0 MG (1)
ORANGECREST	1837'	12.5 MG	12.5 MG (2)	25.0 MG
LURIN	1837'	10.0 MG	0.0 MG	10.0 MG
MARKHAM	1900'	14.0 MG	0.0 MG	14.0 MG

- (1) INCLUDES 2.0 MG FOR 1515' PRESSURE ZONE
 (2) INCLUDES 4.0 MG FOR 1900' PRESSURE ZONE

PUMPING REQUIREMENTS

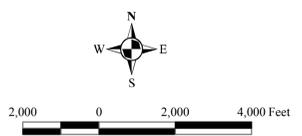
PUMP STATION	P.Z.	APPROX. T.D.H. (ft)	EXISTING FIRM PUMPING CAPACITY (1)		ADDITIONAL FIRM PUMPING CAPACITY		ULTIMATE FIRM PUMPING CAPACITY (2)	
			H.P.	FLOW (cfs)	H.P.(3)	FLOW (cfs)	H.P.(3)	FLOW (cfs)
MOCKINGBIRD(4)	1650'	60	125	12.0	375	36.0	160	47.7(5)
MOCKINGBIRD(6)	1650'	500	0	0.0	2,850	35.0	2,850	35.0
1515-1650	1650'	200	0	0.0	150	5.5	150	5.5
HOLCOMB	1837'	250	4,600	109.0	0	0	4,600	109.0
OLEANDER	1837'	187	600	18.8	0	0.0	600	15.8
BERGAMONT	1900'	100	450	26.7	250	11.8	650	38.5

- (1) FIRM PUMPING CAPACITY EXCLUDES LARGEST EXISTING PUMP.
 (2) ULTIMATE CAPACITY IS FIRM PUMPING CAPACITY REQUIRED AT BUILD-OUT, EXCLUDING ANY REQUIRED REDUNDANCY FOR THE LARGEST PUMPING UNIT.
 (3) ESTIMATED HORSEPOWER - FINAL DESIGN HORSEPOWER WILL DEPEND ON EXISTING HYDRAULIC CONDITIONS AT THE TIME OF FINAL DESIGN.
 (4) FROM MILLS GRAVITY LINE
 (5) INCLUDES 28.6 cfs FOR SOUTH AFC AREA
 (6) FROM R-C FEEDER



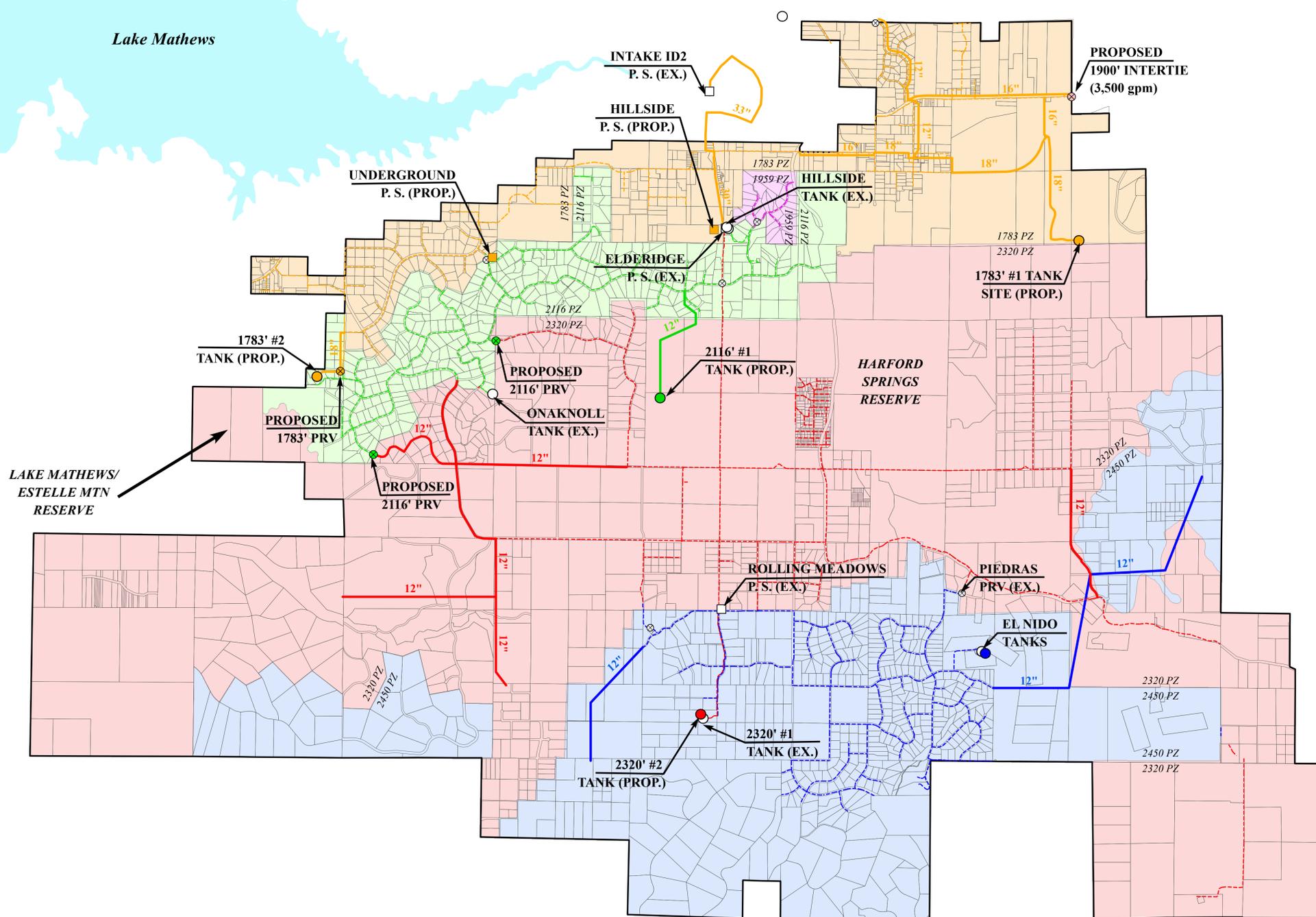
LEGEND

- | | | |
|---------------------------|-------------------------------|-----------------------------|
| ○ Existing Reservoir | ■ Proposed Pump Station | ▭ Riverside City Limits |
| ● Existing Intertie | ● Proposed Tank - 1837 PZ | ▭ Moreno Valley City Limits |
| □ Existing Pump Station | ● Proposed Tank - 1515 PZ | ▭ Study Area Boundary |
| Existing Pipelines | | |
| — 1325 | ● Proposed Intertie - 1515 PZ | ■ 1326 PZ |
| — 1430 | ● Proposed Intertie - 1837 PZ | ■ 1430 PZ |
| — 1515 | ■ Proposed Pipelines | ■ 1515 PZ |
| — 1650 | — 1515 PZ | ■ 1650 PZ |
| — 1695 | — 1650 PZ | ■ 1698 PZ |
| — 1837 | — 1837 PZ | ■ 1837 PZ |
| — 1900 | — 1900 PZ | ■ 1900 PZ |



WESTERN MUNICIPAL WATER DISTRICT		FIGURE: 5
		June 18, 2014
NORTH ADDED FACILITIES AREA MASTER PLAN EXISTING AND PROPOSED WATER SYSTEM		W.O. 13-0306

G:\2013\13-0306\GIS\AFC_WMP_north_Jan2014.mxd; Map revised June 18, 2014.



LEGEND

- Proposed Pump Station
- Proposed Intertie/PRV
- 1783 PZ
- 1900 PZ
- 2116 PZ
- Proposed Tanks
- 1783 PZ
- 2116 PZ
- 2320 PZ
- 2450 PZ
- Existing Tanks
- Existing Intertie/PRV
- Existing Pump Station
- Existing Pipelines
- 1783
- 1959
- 2116
- 2320
- 2450
- Proposed Lines
- 1783 PZ
- 2116 PZ
- 2320 PZ
- 2450 PZ
- 1783 PZ
- 1959 PZ
- 2116 PZ
- 2320 PZ
- 2450 PZ
- Study Area Boundary

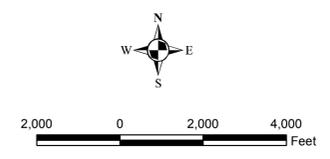
STORAGE REQUIREMENTS

TANK SITE	P.Z.	EXISTING STORAGE	ADDITIONAL STORAGE	ULTIMATE STORAGE
HILLSIDE (DOM)	1783'	1.0 MG	0.0 MG	1.0 MG
1783' #1	1783'	0.0 MG	2.8 MG	2.8 MG
1783' #2	1783'	0.0 MG	1.0 MG	1.0 MG
ONAKNOLL	2116'	0.5 MG	0.0 MG	0.5 MG
2116' #1	2116'	0.0 MG	1.1 MG	1.1 MG
2320' #1	2320'	2.7 MG	2.7 MG	5.4 MG
EL NIDO	2450'	1.3 MG	0.8 MG	2.1 MG

PUMPING REQUIREMENTS

PUMP STATION(3)	P.Z.	APPROX. T.D.H.(ft)	EXISTING FIRM PUMPING CAPACITY (1)		ADDITIONAL FIRM PUMPING CAPACITY		ULTIMATE FIRM PUMPING CAPACITY (2)	
			H.P.	FLOW (cfs)	H.P.(4)	FLOW (cfs)	H.P.(4)	FLOW (cfs)
INTAKE ID 2	1783'	220	425	14.3	600	18.4	1025	32.7
ELDERIDGE	2116'	350	60	1.0	75	1.1	135	2.1
UNDERGROUND(5)	2116'	350	-	-	40	0.5	40	0.5
HILLSIDE (DOM)	2320'	550	400	4.1	950	13.5	1350	17.6
ROLLING MEADOWS	2450'	180	60	2.7	50	1.3	100	4.0

- (1) FIRM PUMPING CAPACITY EXCLUDES LARGEST EXISTING PUMP.
- (2) ULTIMATE CAPACITY IS FIRM PUMPING CAPACITY REQUIRED AT BUILD-OUT, EXCLUDING ANY REQUIRED REDUNDANCY FOR THE LARGEST PUMPING UNIT
- (3) 28.6 cfs IS SUPPLIED FROM MOCKINGBIRD PUMP STATION (NORTH AFC)
- (4) ESTIMATED HORSEPOWER - FINAL DESIGN HORSEPOWER WILL DEPEND ON EXISTING HYDRAULIC CONDITIONS AT THE TIME OF FINAL DESIGN
- (5) EXISTING UNDERGROUND PUMP STATION IS BEYOND ITS USEFUL LIFE AND CURRENTLY OUT-OF-SERVICE.



WESTERN MUNICIPAL WATER DISTRICT		FIGURE: 6
		June 18, 2014 W.O. 13-0306
SOUTH ADDED FACILITIES AREA MASTER PLAN EXISTING AND PROPOSED WATER SYSTEM		

G:\2013\13-0306\GIS\AFC_WMP_south_Jan2014.mxd

SECTION 9 - STORAGE REQUIREMENTS FOR THE ULTIMATE SYSTEM

EXISTING STORAGE

The North AFC area has 55.2 MG storage within existing active facilities as shown in **Table 3**.

**Table 3
Western Municipal Water District
North AFC
Existing Storage Facilities**

Reservoir	Pressure Zone	Existing Storage (MG)	HWL	LWL
La Sierra	1515'	10.0	1515'	1468'
Lockwood	1650'	5.0	1650'	1619'
Harley John	1650'	4.0	1660'	1629'
Orangecrest	1837'	12.5	1844'	1797'
New Lurin	1837'	10.0	1837'	1798'
Markham	1900'	13.7	1900'	1861'

The South AFC area has 3.8 MG storage within existing facilities as shown in **Table 4**.

**Table 4
Western Municipal Water District
South AFC
Existing Storage Facilities**

Reservoir	Pressure Zone	Existing Storage (MG)	HWL	LWL
Hillside #1	1783'	0.5	1783'	1756'
Hillside #2	1783'	0.5	1783'	1756'
Oaknoll/Capello	2116'	0.5	2116'	2085'
Hidden Valley	2320'	2.7	2320'	2281'
El Nido	2450'	1.3	2450'	2419'

The District also owns the 1.5 MG Lake Hills Tank and the 1.3 MG Old Lake Tank providing storage for the Lake Hills area which is outside of the North AFC study area and therefore not listed above.

STORAGE DESIGN CRITERIA

The proposed storage facilities are required to meet the peak hour demand, maximum day demand, fire flow and other emergency conditions and are equivalent to 75% of maximum day demand plus worst case fireflow storage requirements. The following criteria were used to determine storage volume:

Equalizing Storage

Pumping facilities have been sized to meet maximum day demand flows. Any peak demands (ie peak hour) greater than maximum day must be supplied from storage. Equalizing storage provides the storage to meet these short term peak demands. Twenty-five percent (25%) of the estimated maximum day demand is used as the criteria needed to meet the daily demand fluctuations within each pressure zone.

Fire Flow Storage

Fire flow requirements for each pressure zone must be met through storage and have been estimated based on the fire flow criteria given in Table 2.

Emergency Storage

Emergency storage capacity would be needed to sustain the water needs during periods of total or partial shutdown of the water supply facilities. One-half (50%) of the estimated maximum day demand is used to calculate emergency storage by pressure zone.

Fireflows and durations used in the analysis are given in **Table 5** for the North AFC area and **Table 6** for the South AFC area. In each case, highest requirement was used for each pressure zone.

Table 5
Western Municipal Water District
North AFC
Maximum Fire Flows and Duration used by Pressure Zone

Pressure Zone	Fire Flow (gpm)	Duration (hour)	Total Storage Volume (gallons)
1325'	Included in 1515' Zone		
1420'	Included in 1515' Zone		
1515'	2,500	2	300,000
1650'	2,000	2	240,000
1837'	5,000	4	1,200,000
1900'	5,000	4	1,200,000

Table 6
Western Municipal Water District
South AFC
Maximum Fire Flows and Duration used by Pressure Zone

Pressure Zone	Fire Flow (gpm)	Duration (hour)	Total Storage Volume (gallons)
1783'	2,500	2	300,000
2116'	1,000	2	120,000
2320'	2,500	2	300,000
2450'	1,000	2	120,000

ULTIMATE STORAGE REQUIREMENTS:

The projected ultimate storage requirements for each pressure zone were calculated to meet peak hour, fire flow, and emergency conditions per the listed criteria. No storage was included to wheel water through a pressure zone to a higher pressure zone except where noted. These ultimate requirements were then compared to existing storage capacity to determine additional storage required to meet ultimate demands. **Table 7** and **Table 8** give the existing and required storage by zone for the North AFC and South AFC areas, respectively.

Table 7
Western Municipal Water District
North AFC
Ultimate Storage Requirements by Pressure Zone

Pressure Zone	Existing Storage (MG)	Additional Storage (MG)	Ultimate Storage (MG)
1515'	10.0	2.0	12.0
1650'	9.0	0.0	9.0
1837' ⁽¹⁾	22.5	12.5	35.0
1900'	13.7	0.0	13.7
Totals	55.2	14.5	69.7

⁽¹⁾ Includes 4.0 MG of required storage capacity required for the 1900 pressure zone.

Table 8
Western Municipal Water District
South AFC
Ultimate Storage Requirements by Pressure Zone

Pressure Zone	Existing Storage (MG)	Additional Storage (MG)	Ultimate Storage (MG)
1783'	1.0	3.8	4.8
2116'	0.5	1.1	1.6
2320'	2.7	2.7	5.4
2450'	1.3	0.8	2.1
Totals	5.5	8.4	13.9

1325' and 1420' Pressure Zones

No Storage will be constructed within these pressure zones. In both cases, water is supplied through pressure reducing valves (PRV's) from a higher pressure zone. Approximately 100,000 gallons for 1326' pressure zone and 450,000 gallons for the 1430' pressure zone of additional storage will be contained in the 1515' and 1650' pressure zones.

1515' Pressure Zone

Currently within the 1515' pressure zone, the 10 MG La Sierra Tank is the only storage. As part of the ultimate Mills Gravity Line system, approximately 2.0 MG of this storage has been allocated as a regulating reservoir to future water deliveries to both the District's retail district

and wholesale customers. The eastern portion of the 1515' pressure zone is currently isolated from the La Sierra Tank and is supplied through PRV's from the 1650' and 1837' pressure zones. Approximately 2.0 MG of additional storage has been located in the 1650' pressure to supply the PRV portion of the 1515' pressure zone. The ultimate distribution system will interconnect the entire 1515' pressure zone. The additional 2.0 MG of storage is planned near the center of the 1515' pressure zone as a regulating reservoir for the proposed 22 cfs connection to the Mills Gravity Line, 1515-1650 pump station and for service to the eastern portions of the 1515' pressure zone.

1650' Pressure Zone

Currently, the 1650' pressure zone has a storage capacity of 9.0 MG, which is located at Lockwood (5MG) and Harley John (4MG) sites. The ultimate storage capacity for the 1650' pressure zone is 9.0 MG. This 9.0 MG includes 2.0 MG required by the 1325', 1430' and currently isolated eastern 1515' pressure zones. No additional storage is currently planned. The existing Roosevelt Tank site has available space for an additional 5.0MG tank which could be used for either a future potable or non-potable regulating reservoir. No costs for a future Roosevelt Tank have been included at this time.

1698' Pressure Zone

The current system has no appreciable active storage. The Van Buren Tank on the west side of the I-215 freeway and the ground level and elevated tanks on Meyer are currently out of service due to the poor condition of the facilities and are planned to be demolished. The existing system is supplied through the 1837' pressure zone by a new PRV station on Opportunity Way. Additional connections to EMWD are located at West Gate, East Gate and Philips. These existing connections are all intended for emergency connections for either low pressure or fire flow conditions. Additional storage for equalizing, emergency, or fire flow will be funded by any future development and are subject of the MARB Water Master Plan report dated June 2014. Any proposed facilities or the associated costs for the 1698' pressure zone have not been included in this report.

1837' Pressure Zone

The ultimate storage capacity for the 1837' pressure zone is 35.0 MG. This 35.0 MG includes 31.0 MG required by the 1837' pressure zone plus 4.0 MG additional storage capacity for the 1900' pressure zone. Currently, the 1837' pressure zone has a storage capacity of 22.5 MG, which is located at both the Lurin Tank site (10 MG) and the Orangecrest Tank site (12.5 MG). The Lurin tank site is at ultimate storage capacity. The Orangecrest tank site is expected to have 25 MG ultimate storage capacity. The existing site can accommodate a future 12.5 MG tank. The existing high water level of the Lurin site is 1837' while the Orangecrest site is 1844'. Altitude valves and adequate transmission pipelines are essential to take full advantage of all the storage available at both sites while balancing water quality and water age.

1900' Pressure Zone

The ultimate storage requirement for the 1900' pressure zone is 17.7 MG. The current Markham Site has one 7.0 MG reservoir and one 6.7 MG reservoir for an ultimate total reservoir capacity of 13.7MG. Other potential 1900' sites have been not identified. Absent a future 1900' storage site, additional storage in the 1837' pressure zone is required with the pumping system transferring water from the 1837' to the 1900' pressure zone without interruption. Therefore, the remaining 4.0 MG storage required for the 1900' has been planned within the 1837' pressure zone, increasing the ultimate storage capacity in the 1837' pressure zone from 31.0 MG to 35.0 MG. The Bergamont Booster Station will have approximately fifty percent (50%) of its ultimate capacity driven by natural gas engine units to transfer water from the 1837' storage to the 1900' pressure zone. The natural gas units will enable the 1900' pressure zone to be fed during electric shutdowns, minimizing the potential for water outages.

1783' Pressure Zone

Currently, two 0.5 MG tanks are located side by side at the Hillside site. The far west end of the 1783' pressure zone is connected to the reservoir by a single transmission pipeline. It is recommended that 1.0 MG of storage be located on that west end of the 1783' pressure zone. A fourth 2.2 MG reservoir should be located in the eastern end of the zone to accommodate future higher density development and provide storage and the hydraulic grade for future emergency water supplies.

2116' Pressure Zone

The existing storage facilities (0.5MG) within the 2116' pressure zone represent approximately 31% of the ultimate storage requirements. An additional 1.1 MG reservoir is needed at the eastern end of the pressure zone. Several potential tank sites were identified in a November 1994 study titled, *Improvement District 2 Evaluation of Alternative 2116 Pressure Zone Tank Sites*. Option 1 has been used in the hydraulic modeling and facility cost estimates. The existing Onaknoll or Capella Tank is beyond its useful life and will be replaced. An additional PRV station on Via Barranca is being constructed to provide back-up storage from the 2320' pressure zone.

2320' Pressure Zone

The Hidden Valley Tank 1 is now operational within the 2320' pressure zone given the District extra storage capacity in this zone. The Jim Jack Tank has been taken out of service and may be replaced if ultimate storage conditions warrant. One additional tank is planned at Hidden Valley for a total of 5.4 MG of storage capacity at that site.

2450' Pressure Zone

The existing El Nido Tank is 1.3 MG. A second tank at the site (0.33 MG) has been converted to non-potable service. The existing site can accommodate another 0.8 MG tank to meet ultimate capacity.

SECTION 10 - PUMPING REQUIREMENTS FOR THE ULTIMATE SYSTEM

The existing pumping facilities are given in **Table 9** for the North AFC area and **Table 10** for the South AFC area. These facilities include all available pumps. For any potable water pumping system, firm pumping capacity is determined by assuming that the largest available pump is out of service. Both actual and firm pumping capacities are given for each pump station.

Table 9
Western Municipal Water District
North AFC
Existing Pumping Facilities

Site	Pump	Pump Capacity, (gpm)	Pump HP	Station Total Capacity, gpm	Station Firm Capacity, gpm ⁽¹⁾
Holcomb	G1	5,600	525	56,000	50,400
	E2	5,600	500		
	G3	5,600	525		
	E4	5,600	500		
	G5	5,600	525		
	E6	5,600	500		
	G7	5,600	525		
	E8	5,600	500		
	G9	5,600	525		
	E10	5,600	500		
Bergamont	E1	1,400	75	18,900	12,000
	E2	3,700	150		
	E3	Future			
	G4	6,900	265		
	G5	6,900	265		
Oleander	E1	2,300	200	9,656	9,656 ⁽²⁾
	E2	2,300	200		
	E3	2,300	200		
	E4	2,356	200		
Mockingbird					
From MGL ⁽³⁾	E1	3,688	25	10,800	5,400
From MGL ⁽³⁾	E2	2,199	15		
From City	E3	1,800	300		
From City	E4	1,800	300		
From City	E5	1,200	200		
From MGL	E6	5,400	125		
From MGL	E7	5,400	125		
From MGL	E8	Future			
From MGL	E9	Future			
From MGL	E10	Future			

⁽¹⁾Firm Pumping Capacity is defined as Total Station Pumping Capacity less largest pump capacity

⁽²⁾No reduction is required because Oleander Station is an entirely redundant station.

⁽³⁾Pump can only be used when HGL of MGL is high, therefore not included in ultimate pumping capacity in Section 10.

Table 10
Western Municipal Water District
South AFC
Existing Pumping Facilities

Site	Pump	Pump Capacity (gpm)	Pump HP	Station Total Capacity, gpm	Station Firm Capacity, gpm ⁽¹⁾
Intake	E1	1,600	75	9,600	6,400
	E2	1,600	150		
	E3	3,200	350		
	E4	3,200	200		
Elderidge	E1	465	60	930	465
	E2	465	75		
	E3	Future			
Hillside	E4	1,500	300	3,350	1,300
	E5	900	200		
	E6	950	200		
Underground	E1 ⁽²⁾	190	20	380	190
	E2 ⁽²⁾	190	20		
Rolling Meadows	E1	600	30	1765	1165
	E2	565	30		
	E3	600	40		

⁽¹⁾ Firm Pumping Capacity is defined as Total Station Pumping Capacity less the capacity of the largest pump

⁽²⁾ Underground Pump Station is currently out of service.

Pumping Station Description

Holcomb

The existing facility has ten pumping units, five of which are powered by 525 hp gas engines and five powered by 500 hp electric motors (four fixed speed and one VFD). The station is built out to its ultimate design. Reinforcement of the existing suction header with an additional connection from MWD to the western end of suction header has been constructed to provide adequate Net Positive Suction Pressure to the ultimate pumping units.

Bergamont

The existing facility has four existing pumping units, two driven by electric motors and two driven by natural gas engines. There is space in the existing facility for one additional electric pump. The combination of natural gas and electric driven pumps is designed for maximum flexibility vs. energy price fluctuations and electrical power outages because some of the ultimate 1900 pressure zone storage required is contained within the 1837' pressure zone.

Mockingbird

The existing facility has seven pumping units. Two pumps, (E1 and E2), lift water from the Mills Gravity Line (MGL) into the 1650' pressure zone when the MGL is at a high HGL. Three pumps, (E3, E4 and E5) pump available water from the City of Riverside Connection to the 1650' pressure zone. Two pumps (E6 and E7) lift water from MGL into the 1650' pressure zone when the MGL is at a low HGL. There is space for these additional pumps. Other facilities located at this station include metering facilities, a chloramination station for the City of Riverside and a PRV station supplying water to the 1515' pressure zone from the discharge side of the pump station. A pump station to convey water from the future Riverside-Corona Feeder to the 1650' pressure zone is proposed nearby the Mockingbird Pump Station with a planned capacity of 35 cfs which is included in the master plan. The exact location and capacity are yet to be finalized.

Oleander

The existing facility has four pumping units, available to pump water from the 1650' pressure zone the 1837' pressure zone when excess water is available from the City of Riverside or when additional water is conveyed to the 1650' pressure zone from the Mills Gravity Line.

Intake

The existing facility has four pumping units all powered by electric motors. The existing site has space to accommodate future expansion to the ultimate facility. Water is pumped from the terminus of the Mockingbird Pipeline at the hydraulic grade provided by the 1650' pressure zone. Essentially, all water supplied to the South area must pass through this pump station.

Hillside and Elderidge Pump Stations

Both pump stations are located on the Hillside Tank site. The existing Hillside facility has three pumping units all driven by electric motors designed to pump from the 1783' pressure zone to the 2320' pressure zone. The existing Elderidge facility has two electrically driven pumping units that deliver water to the 2116' pressure zone with space to accommodate a third pumping unit. An irrigation system pump station (Hillside-Irrigation) is also located at the same site.

Underground Pump Station

The existing facility has two pumping units designed as a temporary supply to pump from the 1783' pressure zone to the 2116' pressure zone on the western portion of the system. The pumps are no longer in service. Reactivation for the ultimate condition will require the station to be relocated out of the street right-of-way and above grade to a secure location.

Rolling Meadows Pump Station

The existing facility has three pumping units driven by electric motors with a total capacity of 1765 gpm, and a firm pumping capacity of 1165 gpm. The Steele Valley Pump Station for the irrigation system is also located at the same site.

Ultimate Pumping Requirement

Pumping requirements for the proposed ultimate system have been calculated based on maximum day demand. It is assumed that all water must be supplied from MWD's Mills Filtration Plant located on Alessandro Blvd. Pumping requirements include demands to be wheeled through a particular pressure zone to a higher pressure zone and other potable water connections. In addition, pumping capacity has been included for future alternative water supplies from the Riverside-Corona Feeder of 35 cfs at a HGL of 1150' and from the City of Riverside of between 10 and 30 cfs at a HGL of 1200'. Pumping capacities at the Oleander Pump Station and the future 1515'-1650' pump station are planned for redundant pumping facilities only, providing added flexibility and redundancy to the system for emergency situations. Ultimate pumping capacity was compared to existing pumping capacity to determine additional pumping capacity required. **Table 11** gives the required pumping capacity for the ultimate North AFC area system and **Table 12** for the ultimate South AFC area system. Final pump station horsepower and total discharge head will be determined during final design of each pump station.

Table 11
Western Municipal Water District
North AFC
Ultimate Pumping Requirements

Pump Station	Pressure Zone	Existing Firm Pumping Capacity (cfs)	Additional Pumping Capacity (cfs)	Ultimate Pumping Capacity (cfs)
1515-1650	1650'	0.0	5.5	5.5
Mockingbird (from Mills)	1650'	12.0	23.0	35.0
Mockingbird (from R-C Feeder)	1650'	0.0	35.0	35.0
Holcomb	1837'	109.0	0.0	109.0
Bergamont	1900'	26.7	11.1	37.8
Oleander ⁽¹⁾	1837'	18.8	0.0	18.8
Totals		166.5	74.6	241.1

⁽¹⁾Firm Pumping Capacity reduced for Oleander based on hydraulics of station when operating multiple pumps.

Table 12
Western Municipal Water District
South AFC
Ultimate Pumping Requirements

Pump Station	Pressure Zone	Existing Firm Pumping Capacity (cfs)	Additional Pumping Capacity (cfs)	Ultimate Required Pumping Capacity (cfs)
Intake	1783'	14.3	14.3	28.6
Elderidge	2116'	1.0	1.1	2.1
Underground	2116'	0.0	0.4	0.4
Hillside	2320'	4.1	12.3	16.4
Rolling Meadows	2450'	2.7	1.3	4.0
Totals		22.1	29.4	51.4

Expansion of Holcomb Pump Station

The existing Holcomb Pump Station has been expanded to the ultimate build-out of the pump station. Based on estimated ultimate demand for the current land use estimates, additional pumping capacity is available if needed.

Expansion of Bergamont Pump Station

The existing Bergamont Pump Station is designed for one additional pump with an electric motor to expand to ultimate build-out of the pump station. It is anticipated that this pump will increase the pump station capacity by approximately 5,000 gpm depending on the hydraulics and capacity determined during final design.

Expansion of the Oleander Pump Station

The limiting factor for additional pumping capacity at the Oleander Pump Station is the diameter of the pipelines on the suction size of the station. The existing 22-in diameter pipeline is limited to approximately 7,100 gpm maximum flow at 6.0 fps maximum. Since the Oleander Pump Station is itself a redundant facility, no additional internal pump station redundancy is planned.

Expansion of the Mockingbird Pump Station

Ultimate expansion of the Mockingbird Pump Station will include supplies from the Mills Gravity Line, City of Riverside and the future Riverside-Corona Feeder. Other regional facilities benefiting the wholesale district may also be located at or near this facility to provide further

interconnection capability during times of limited supply. The entire 28.6 cfs supply for the South AFC area must be pumped from the Mills Gravity Line into the 1650' pressure zone at this station. Costs for this additional pumping capacity have been included in the South AFC Master Plan. Three pump cans are available for future pumps.

Expansion of the Hillside Pump Station

Space constraints may impact the ultimate facility layout because the Hillside Domestic, Hillside Irrigation and Elderidge Pump stations along with the Hillside tanks are all located at the same facility. The overall ultimate facility layout must be considered prior to any expansion at this site. No contingency for additional land acquisition has been included in the cost estimates.

Underground Pump Station

As stated previously, the Underground Pump Station is currently out-of-service. This station is required for ultimate pumping requirement. Costs to relocate this pump station outside of the Right-of-Way and above grade have been included in the cost estimates. The District has purchased a small parcel for this pump station.

Rolling Meadows Pump Station

Ultimate Pumping Capacity at the Rolling Meadows Pump Station is 4.0 cfs or 1,800 gpm. With required redundancies, four 600-gpm pumping units have been planned. Future expansion plans will add one additional 600-gpm pumping unit in the E4 position. Space is available to add an additional pump can to the existing pump station suction and discharge headers.

Redundant 2320 Pump Station

The existing South AFC above the 1783' pressure zone is dependent on one system of pump stations and transmission pipelines with essentially no system redundancy. Pumping capacity for the proposed redundant 2320' Pump Station has been sized at 8 cfs for average day demand within the 2320' and 2450' pressure zones, providing added flexibility and redundancy to the system in emergency situations. The proposed pump station could be located near the proposed 1783' Tank #1 with an 18-in transmission line connecting to the existing pipeline in Idaleona Road near Juniper Road. Costs for this pump station and any suction or discharge transmission pipelines have not been included in the cost estimates.

SECTION 11 - CONSTRUCTION AND PROJECT COST ESTIMATES

Cost estimates have been developed for the facilities proposed to serve each pressure zone at ultimate development. The cost estimates are based on unit costs for water pipelines (\$/lf) and lump sum estimates for pump stations, reservoirs and PRV stations. For the North AFC Area, cost estimates for individual pressure zones are presented in **Table 13** through **Table 16**. A summary of the total construction and project cost for each pressure zone is shown in **Table 17** and for each category is shown in **Table 18**. For the South AFC Area, cost estimates for individual pressure zones are presented in **Table 19** through **Table 23**. A summary of the total construction and project cost for each pressure zone is shown in **Table 24** and for each category is shown in **Table 25**.

The construction and project cost shown were obtained from manufacturers, construction firms and recorded data from result bid results for similar water facilities. The estimated project costs shown on Tables 13 through 25 are based on the January, 2014 ENR-Los Angeles Construction Cost Index of 10,736.18. Estimated project costs include construction cost and project overhead. Project overhead is estimated at 40% of construction costs and is broken down as follows:

- (1) Contingencies - 10% of construction cost.
- (2) Technical Services – 15% of construction cost which includes preparation of a non-controversial environmental assessment, processing of necessary approvals and permits, engineering survey and photogrammetry, design and specifications.
- (3) Field Engineering – 10% of construction costs which includes contract administration, coordination with other agencies, administration of geotechnical and other necessary outside services, construction surveying, construction inspection and preparation of as-built drawings.
- (4) District Contract Administration – 5% of construction cost.
- (5) Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition and right of way agent costs are not included.

Costs for proposed facilities within the Sycamore Canyon Business Park and Meridian (March) Business Center not specifically shown on Figure 5 that directly serve the high fireflow demand (5,000 gpm) are not included as part of the required master planned facilities and associated cost estimates.

Table 13
Western Municipal Water District
Construction and Project Cost for
Proposed 1515 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
30-inch Dia. Water Line	6,500	L.F.	\$263	\$1,711,385
18-inch Dia. Water Line	5,320	L.F.	\$169	\$898,681
16-inch Dia. Water Line	6,000	L.F.	\$151	\$908,700
16-inch Dia. Water Line	7,900	L.F.	\$151	\$1,196,455
12-inch Dia. Water Line	2,000	L.F.	\$122	\$244,650
Pavement Repair	5,450	L.F.	\$35	\$190,478
2.0 MG Welded Steel Tank, Including foundation (1515)	1	EA.	\$1,432,950	\$1,432,950
PRV Station, 22 cfs connection from the Mills Gravity Line	1	EA.	\$221,350	\$221,350
PRV Station, 1515' to 1650'	1	EA.	\$104,850	<u>\$104,850</u>
Construction Cost				\$6,909,499
Project overhead (40% of construction cost) ⁽¹⁾				<u>\$2,763,799</u>
Total Project Cost				\$9,673,298

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 14
Western Municipal Water District
Construction and Project Cost for
Proposed 1650 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
24-inch Dia. Water Line	8,000	L.F.	\$217	\$1,733,520
36-inch Dia. Water Line	12,000	L.F.	\$313	\$3,756,000
Pavement Repair	12,000	L.F.	\$35	\$419,400
Pumping facility for 1515-1650 @ 5.5 cfs	1	EA.	\$3,495,000	\$3,495,000
Pumping facility at Mockingbird @ 9.8 cfs from MGL ⁽²⁾	1	EA.	\$553,375 ⁽¹⁾	\$553,375
Pumping facility at Mockingbird @ 35 cfs (R-C Feeder)	1	EA.	\$5,126,000	\$5,126,000
PRV Station 1837 to 1650 ⁽³⁾	1	EA.	\$192,225	\$192,225
IDF Hydro Pumping Facility	1	EA.	\$512,600	<u>\$350,000</u>
Construction Cost				\$15,625,520
Project overhead (40% of construction cost) ⁽⁴⁾				<u>\$6,250,208</u>
Total Project Cost				\$21,875,728

⁽¹⁾ \$1,900,000 cost split: 25% to North AFC, 75% to South AFC

⁽²⁾ Total Ultimate capacity 48 cfs; 12 cfs existing, 9.8 cfs for North, and 33 cfs for South.

⁽³⁾ PRV Station constructed as part of Oleander Pump Station (1837 Pressure Zone).

⁽⁴⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 15
Western Municipal Water District
Construction and Project Cost for
Proposed 1837 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
24-inch Dia. Water Line	8,000	L.F.	\$217	\$1,733,520
24-inch Dia. Water Line	2,250	L.F.	\$217	\$487,553
36-inch Dia. Water Line	29,500	L.F.	\$313	\$9,233,500
Pavement Repair	34,000	L.F.	\$35	\$1,188,300
215 Freeway Crossing	1	EA.	\$699,000	\$699,000
12.5 MG Welded Steel Tank, Including foundation (Orangecrest)	1	EA.	\$5,250,000	\$5,250,000
Construction Cost				\$18,591,873
Project overhead (40% of construction cost) ⁽¹⁾				\$7,436,749
Total Project Cost ⁽²⁾⁽³⁾				\$26,028,622

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

⁽²⁾ Quantities and costs for Pipelines within the Sycamore Canyon Business Park are not included.

⁽³⁾ Facilities and costs to provide service to March Business Center are not included.

Table 16
Western Municipal Water District
Construction and Project Cost for
Proposed 1900 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
18-inch Dia. Water Line	1,300	L.F.	\$169	\$219,700
16-inch Dia. Water Line	2,700	L.F.	\$151	\$408,915
12-inch Dia. Water Line	16,950	L.F.	\$122	\$2,073,409
12-inch Dia. Water Line	5,300	L.F.	\$122	\$648,323
12-inch Dia. Water Line	2,750	L.F.	\$122	\$336,394
Pavement Repair	27,700	L.F.	\$35	\$968,115
 PRV Station 1900 to 1837	 1	 EA.	 \$192,225	 \$192,225
 Pumping facility for Bergamont @ 11.8 cfs	 1	 EA.	 \$267,950	 \$267,950
 Construction Cost				 \$5,115,030
Project overhead (40% of construction cost) ⁽¹⁾				 \$2,046,012
 Total Project Cost ⁽²⁾				 \$7,161,042

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

⁽²⁾ Facilities and costs to provide service to March Business Center are not included.

Table 17

**Western Municipal Water District
Total Project Cost by Pressure Zone
North Added Facilities Area**

DESCRIPTION	PROJECT COST
1515' Pressure Zone	\$9,673,298
1650' Pressure Zone	\$21,875,728
1837' Pressure Zone	\$26,028,622
1900' Pressure Zone	\$7,161,042
Total Project Cost ⁽¹⁾	\$64,738,689
Total Project Cost	\$64,740,000

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 18

**Total Project Cost by Category
North Added Facilities Area**

	CONST. COST
Pipelines	
1515' Pressure Zone	\$5,150,349
1650' Pressure Zone	\$5,908,920
1837' Pressure Zone	\$13,341,873
1900' Pressure Zone	\$4,654,855
Construction Cost	\$29,055,996
Project overhead (40% of construction cost)	\$11,622,398
Project cost	\$40,678,394
Storage	
1515' Pressure Zone	\$1,432,950
1650' Pressure Zone	\$0
1837' Pressure Zone	\$5,250,000
1900' Pressure Zone	\$0
Construction Cost	\$6,682,950
Project overhead (40% of construction cost)	\$2,673,180
Project cost	\$9,356,130
Pumping & PRV Facilities	
1515' Pressure Zone	\$326,200
1650' Pressure Zone	\$9,716,600
1837' Pressure Zone	\$0
1900' Pressure Zone	\$460,175
Construction Cost	\$10,502,975
Project overhead (40% of construction cost) ⁽¹⁾	\$4,201,190
Project cost	\$14,704,165
Total Project Costs of Proposed Facilities	\$64,738,689
Total Project Costs including adjustments	\$64,738,689
Total Project Cost	\$64,740,000

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10.736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 19
Western Municipal Water District
Construction and Project Cost for
Proposed 1783 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
33-inch Dia. Water Line	8,400	L.F.	\$289	\$2,426,928
30-inch Dia. Water Line	2,500	L.F.	\$263	\$658,225
18-inch Dia. Water Line	13,250	L.F.	\$169	\$2,238,256
16-inch Dia. Water Line	10,000	L.F.	\$151	\$1,514,500
12-inch Dia. Water Line	5,900	L.F.	\$122	\$721,718
Pavement Repair	16,300	L.F.	\$35	\$569,685
2.2 MG Welded Steel Tank Including foundation (1783 #1)	1	EA.	\$1,512,170	\$1,512,170
1.0 MG Welded Steel Tank Including foundation (1783 #2)	1	EA.	\$955,300	\$955,300
Pumping facility for 18.4 cfs (Intake ID 2)	1	EA.	\$1,980,500	\$1,980,500
Tank Site Acquisition	6	Acre	\$50,000	\$300,000
PRV Stations	2	EA.	\$104,850	\$209,700
Construction Cost				\$13,086,982
Project overhead (40% of construction cost) ⁽¹⁾				\$5,234,793
Total Project Cost				\$18,321,774

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 20
Western Municipal Water District
Construction and Project Cost for
Proposed 2116 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
12-inch Dia. Water Line	4,750	L.F.	\$122	\$581,044
0.9 MG Welded Steel Tank	1	EA.	\$873,750	\$873,750
Pumping Capacity for 1.1 cfs (Elderidge)	1	EA.	\$139,800	\$139,800
Tank Site Acquisition	3	Acrc	\$50,000	\$150,000
PRV Station	2	EA.	\$104,850	\$209,700
Pumping facility for 0.4 cfs (Underground)	1	EA.	\$920,350	<u>\$920,350</u>
Construction Cost				\$2,874,644
Project overhead (40% of construction cost) ⁽¹⁾				<u>\$1,149,858</u>
Total Project Cost				\$4,024,501

No significant pavement repair is anticipated.

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 21
Western Municipal Water District
Construction and Project Cost for
Proposed 2320 Pressure Zone Facilities

DESCRIPTION	QUANTITY		UNIT	UNIT COST	CONSTRUCTION COST
12-inch Dia. Water Line	32,250	L.F.		\$122	\$3,944,981
Pavement Repair	6,650	L.F.		\$35	\$232,418
2.7 MG Welded Steel	1	EA.		\$1,698,570	\$1,698,570
Pumping Facility for 19.3 cfs (Hillside)	1	EA.		\$3,611,500	\$3,611,500
Construction Cost					\$9,487,469
Project overhead (40% of construction cost) ⁽¹⁾					\$3,794,988
Total Project Cost					\$13,282,456

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 22
Western Municipal Water District
Construction and Project Cost for
Proposed 2450 Pressure Zone Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
12-inch Dia. Water Line	17,550	L.F.	\$122	\$2,146,804
0.8 MG Welded Steel	1	EA.	\$815,500	\$815,500
Rolling Meadows Pump Station 1 pump, (600 gpm with unit piping)	1	EA.	\$133,975	<u>\$133,975</u>
Construction Cost				\$3,096,279
Project overhead (40% of construction cost) ⁽¹⁾				<u>\$1,238,512</u>
Total Project Cost				\$4,334,790

No significant pavement repair is anticipated.

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 23
Western Municipal Water District
Construction and Project Cost for
Regional Facilities

DESCRIPTION	QUANTITY	UNIT	UNIT COST	CONSTRUCTION COST
Pumping facility at Mockingbird @ 33 cfs from MGL ⁽²⁾	1	EA.	\$1,660,125 ⁽¹⁾	\$1,660,125
Construction Cost				\$1,660,125
Project overhead (40% of construction cost) ⁽³⁾				\$664,050
Total Project Cost				\$2,324,175

⁽¹⁾ \$2,213,500; 25% to North, and 75% to South.

⁽²⁾ Total Ultimate capacity 48 cfs; 12 cfs existing, 9.8 cfs for North, and 33 cfs for South.

⁽³⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 24

**Western Municipal Water District
Total Project Cost by Pressure Zone
South Added Facilities Area**

DESCRIPTION	PROJECT COST
1783 Pressure Zone	\$18,321,774
2116 Pressure Zone	\$4,024,501
2320 Pressure Zone	\$13,282,456
2450 Pressure Zone	\$4,334,790
Regional Facilities	<u>\$2,324,175</u>
Total Project Cost ⁽¹⁾	\$42,287,697
Total Project Cost	\$42,290,000

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

Table 25
TOTAL PROJECT COSTS
SOUTH ADDED FACILITIES AREA

Pipelines	COST
1783' Pressure Zone	\$8,129,312
2116' Pressure Zone	\$581,044
2320' Pressure Zone	\$4,177,399
2450' Pressure Zone	\$2,146,804
<hr/>	
Construction Cost	\$15,034,558
Project overhead (40% of construction cost)	\$6,013,823
Project cost	<u>\$21,048,381</u>
Storage	COST
<hr/>	
1783' Pressure Zone	\$2,767,470
2116' Pressure Zone	\$1,023,750
2320' Pressure Zone	\$1,698,570
2450' Pressure Zone	\$815,500
<hr/>	
Construction Cost	\$6,305,290
Project overhead (40% of construction cost)	\$2,522,116
Project cost	<u>\$8,827,406</u>
Pumping / PRV Facilities	COST
<hr/>	
1783' Pressure Zone	\$2,190,200
2116' Pressure Zone	\$1,269,850
2320' Pressure Zone	\$3,611,500
2450' Pressure Zone	\$133,975
Regional Facilities	\$1,660,125
<hr/>	
Construction Cost	\$8,865,650
Project overhead (40% of construction cost)	\$3,546,260
Project cost	<u>\$12,411,910</u>
Total Project Cost ⁽¹⁾	\$42,287,697
Total Project Cost	\$42,290,000

⁽¹⁾ Project Cost is 1.4 times construction cost. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and nominal environmental documentation. Costs are based on ENR Construction Cost Index Los Angeles, January 2014 (ENR = 10,736.18). Escalation, financing, interest during construction, legal, EIR/EIS, land acquisition, except where explicitly noted and R-O-W agent costs are not included.

APPENDIX I – MILLS GRAVITY LINE

The Mills Gravity Line (MGL) is a regional pipeline owned by the District providing wholesale water from MWD's Mills Water Treatment Plant to various retail agencies. Various agencies have purchased or lease capacity rights in the MGL. The original cost basis for one cfs purchased capacity right is \$581,000 indexed to ENR CCI LA at 5770.12 (May 1989). Based on the current index of 10,736.18 (January 2014), the current cost basis for one cfs purchased capacity right is \$1,081,000.

In January 2008, Kennedy/Jenks Consultants prepared a Preliminary Design Report for Parallel Mills Gravity Pipeline for the purposes of identifying alternative parallel pipeline alignments to provide additional capacity paralleling MGL's Reach A. A comparable Project Cost Estimate was prepared for the existing MGL using similar cost assumptions in the above referenced report. The conceptual alignment for this parallel pipeline has been included in Figure 5 and is shown as a 36-in diameter pipeline originating at the Holcomb Pump Station and continuing southwest terminating at the Mockingbird Canyon Pipeline near the District's Operations Center. The proposed pipeline crosses both the 1837' and 1650' pressure zones. Construction and Project Costs for this pipeline have been included in the cost estimates for each zone within Section 11.