

# Meadowbrook Water System Intertie Feasibility Study

Prepared for  
Merced Subbasin Coordinating Committee

April 2021

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## Background and Purpose of Study

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- Project funded by State under 2017 Proposition 1, Sustainable Groundwater Planning Grant Program, on behalf of the GSAs. Administered by Merced Irrigation District for the GSA.
- Purpose of the grant is to provide funding to assist the GSAs in financing and planning and/or selecting project activities that will improve sustainable groundwater management.
- Project is to evaluate the needs and feasibility of connecting the Meadowbrook water system to either the Atwater or Merced city water system

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## Public Participation

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- Draft study presented at virtual workshops on October 19 and 21, 2020. Meeting materials made available in English, Spanish, and Hmong at [mercedsgma.org](http://mercedsgma.org).
- 30-day public review period followed the October workshops.
- Comments made at workshops and during review period were considered and/or incorporated into the document.
- Comments and questions were primarily related to funding for construction and timing of future construction. Recommendations of the study were not questioned.

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# Meadowbrook Water System

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Owner: California American Water Company since 2017

Geographic Area: 3.5 square miles in Merced County

Customers: 5,640 population  
1,670 metered service connections including  
57 commercial connections

	Well 4	Well 5	Well 6	Total
Active Permitted Groundwater Wells:	1,800 gpm	630 gpm	1,160 gpm	3,590 gpm

Storage: No significant storage in the water system

Emergency Backup Power: Ability to connect mobile generators at wells now.  
Well 4 will be equipped with permanent generator.

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# Meadowbrook Water System

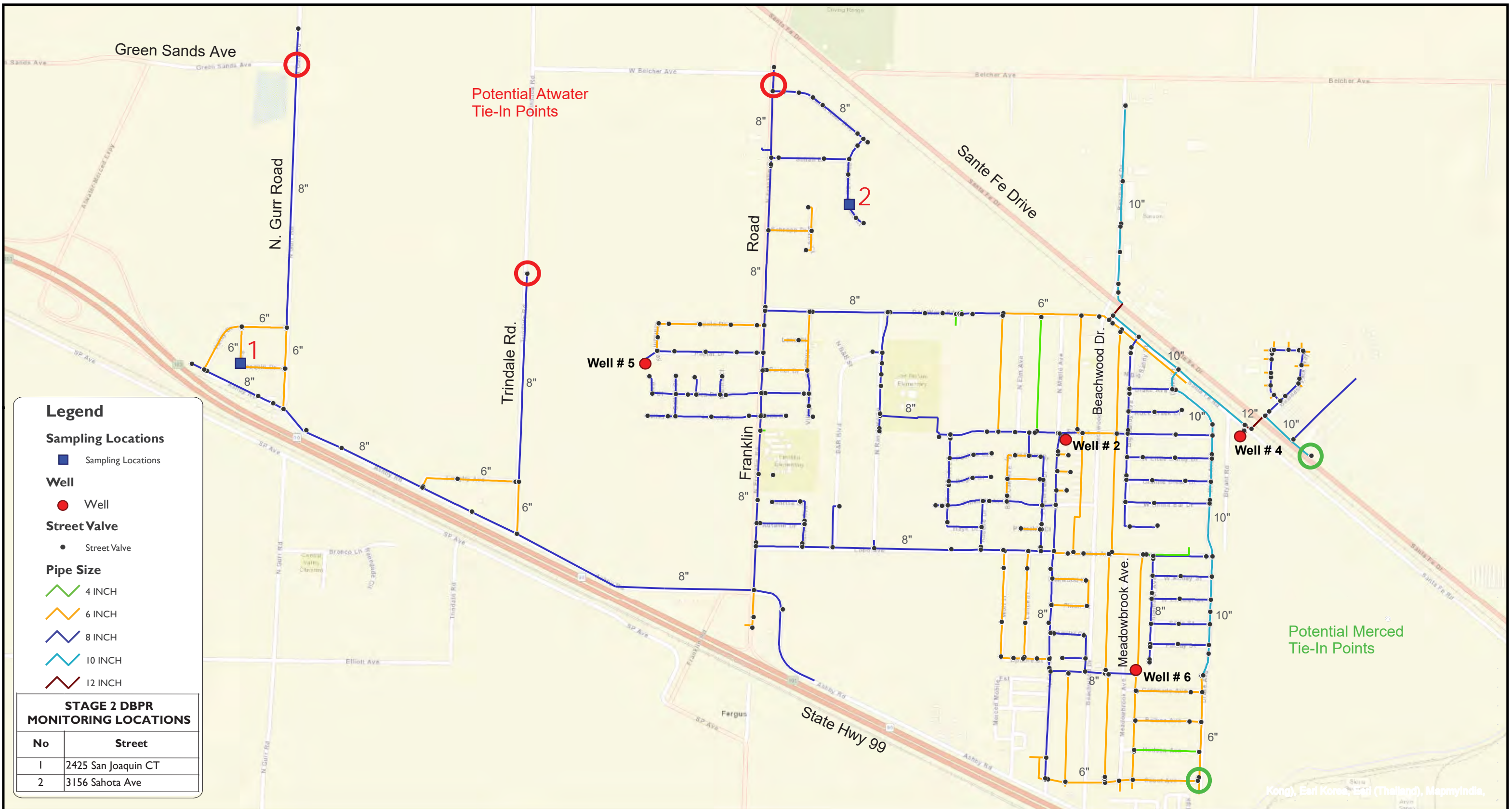
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Operating Pressures: 40 to 60 psi

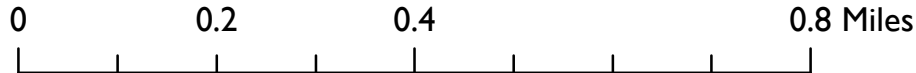
Chlorination: All wells are equipped with chlorination.

System Demands:

Year	Yearly Total (MG)	ADD in Max Month (gpm)	MDD (gpm)	MDD (gallons)	PHD (gpm)
2018	317.266	871	1,305	1,881,000	1,958



# MEADOWBROOK DISTRIBUTION SYSTEM



**POTENTIAL CONNECTION POINTS**

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# Evaluation of Meadowbrook System

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## California Water Works Standards Compliance Criteria

- Public water system's source shall have the capacity to meet the system's maximum day demand.
- According to the State DDW and AWWA, a water systems should be able to meet maximum day demand or peak hour demand with the largest well out of service.
- For systems with 1,000 service connections, the system shall be able to meet 4 hours of peak hour demand using source capacity, storage capacity, and/or emergency connections.

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## Evaluation of Meadowbrook System

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- Meadowbrook's total source capacity is 3,590 gpm and 1,790 gpm with the largest well (Well 4) out of service. In addition, a reliable water system should have sufficient water supply capacity to meet peak demand as well as water requirements during emergencies such as fires, power outages, and natural or manmade disasters. Typical evaluation criteria for the water systems include the following:
  - The well supply must be adequate to meet maximum day demand with the largest well out of service.



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## Evaluation of Meadowbrook System

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- If storage is not adequate to provide total emergency, fire, and operational storage combined, the well supply must be available to meet the differences.
- If adequate gravity-supplied storage or storage equipped with booster pumps with auxiliary power is not available to meet maximum day demand when there is a power outage, supply wells required to meet the difference must be equipped with auxiliary power.
- If supply from storage in conjunction with wells is not available to meet peak hour demand, the deficit in water supply must be met from the well supply.

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## Evaluation of Meadowbrook System

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- Storage and/or well supply must be adequate to supply fire flows during maximum day demand.
- If supply storage in conjunction with wells is not available to meet PDD during a power outage, the deficit in water supply must be met from wells equipped with auxiliary power. Should this occur, loss of power alone would reduce the peak hour demand due to closure of businesses, schools, etc. Therefore, meeting peak hour demand solely with wells equipped with auxiliary power is not considered necessary.

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## Evaluation of Meadowbrook System

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- It is recommended that this small water system strive to have a sufficient capacity to meet maximum day demand concurrent with one fire flow demand. This water demand should be met with the largest well out of service to achieve reliable firm capacity. Typically, a fire flow of 1,500 gpm would be required for nonsprinklered residential, commercial, and small businesses in this small water system. These criteria were used for evaluation of the Meadowbrook water system and determination of the advantages to providing an intertie to an adjacent water system as shown in the following table.

# Evaluation of Meadowbrook System

## Criteria for Meadowbrook Water System Evaluation

Criteria	Meadowbrook System Flow Rate (gpm)	Comments
Average day demand in maximum month	871	--
Maximum day demand	1,305	--
Peak hour demand	1,958	--
Fire flow demand	1,500	--
Maximum day demand plus 1,500-gpm fire flow	2,805	--
Total well supply capacity	3,590 available	Meets all required demands
Total well supply capacity with largest well offline	1,790 available	168 gpm short of meeting peak hour demand 1,015 gpm short of meeting maximum day demand plus fire flow

# Evaluation of Meadowbrook System

Criteria	Meadowbrook System Flow Rate (gpm)	Comments
Storage capacity	0 available	No storage available
Power loss, well supply with auxiliary power	1,800 available <sup>1</sup>	158-gpm capacity short of meeting peak hour demand 1,005 gpm short of meeting maximum day demand plus fire flow
Emergency supply required to meet ADD in maximum month with all wells off during a disaster scenario	871 required 0 available	871 gpm short

<sup>1</sup> Assuming Well 4 is equipped with permanent generator, rented generator may supply additional water from Wells 5 and 6 (1,790 gpm).

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## Evaluation of Meadowbrook System

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- Based on this evaluation for the relatively critical conditions shown above, the water system could benefit by having an additional 1,000-gpm supply such as from an intertie to a nearby water system. If an additional 25 percent is added to this shortage to allow for possible growth (250 gpm), a total of at least 1,250 gpm is estimated as an intertie capacity that would benefit the Meadowbrook system.

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## Benefits and Purpose of Intertie

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- **Emergency Supply:** In the case of a disaster (earthquake, fire, terrorist action) that disables all wells, an intertie of 1,250 gpm would satisfy average daily demands for a maximum month for life safety uses.
- **Peak Day/Hour Supply:** An intertie would provide the shortage of approximately 170 gpm during peak hour demands plus some capacity for growth.

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## Benefits and Purpose of Intertie

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- **System Redundancy:** An intertie to an entirely separate larger water system with excess capacity is advantageous for a small water system with only three wells that could be vulnerable to mechanical or structural failures.
- **Fire Flow:** An intertie of 1,250 gpm plus existing Wells 5 and 6 (total 3,040 gpm) will provide fire flow capacity of 1,500 gpm during maximum day demands (total 3,805 gpm) with the largest well out of service.



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## Benefits and Purpose of Intertie

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- **Supply Future Connections:** An intertie of 1,250 gpm would provide an additional 250 gpm for growth and would accommodate approximately 200 additional service connections at 1.17 gpm each during peak hour conditions.
- **Pressure Increase:** An intertie connection of 1,250 gpm would maintain system pressures to customers during critical maximum day demands with a 1,500-gpm fire flow with the largest well out of service. A minimum of 20 psi is required by fire codes.

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## Benefits and Purpose of Intertie

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- **Water Quality:** Should one or more of the three existing wells be impacted by a groundwater contaminant (nitrates, TCP, PCE, DBCP, arsenic, etc.) requiring it to be shut down for an extended period and/or treated, an intertie that can be readily opened would be important.

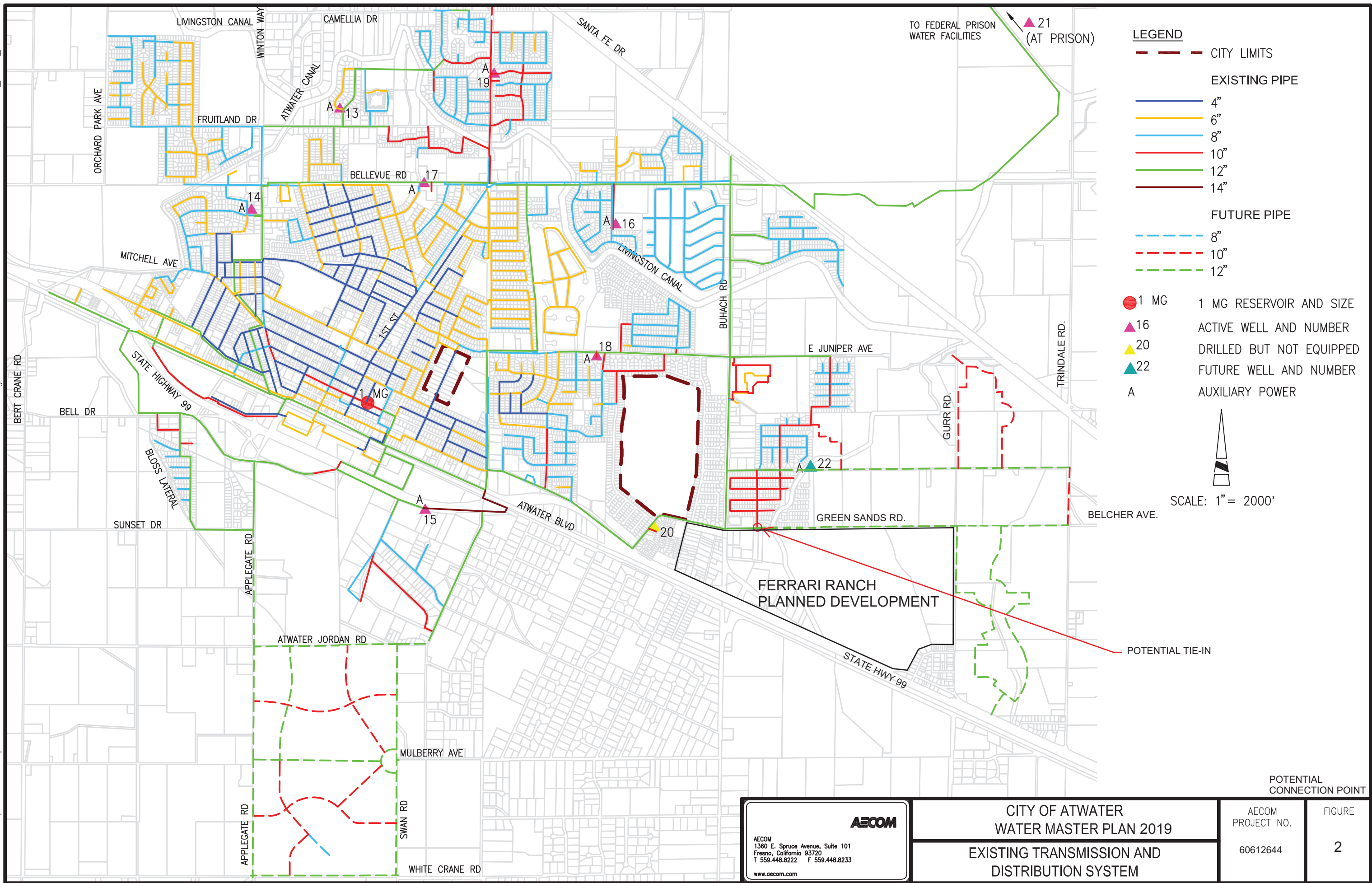
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# City of Atwater Water System

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- Active wells: 8
- Service connections: Approximately 5,460
- Storage available: 1.5 MG for Atwater
- Source Capacity: 15,500 gpm
- Emergency Generators: 7 wells

DWG: \\Fresno\Fresno\Projects\ATWATER\_CITY\60313352\_2016\_MPs\900-CAD-GIS\910-CAD\20-SHEETS\FIG4-2.dwg  
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 USER: deandab



**LEGEND**

- CITY LIMITS
- EXISTING PIPE**
- 4"
- 6"
- 8"
- 10"
- 12"
- 14"
- FUTURE PIPE**
- 8"
- 10"
- 12"
- 1 MG 1 MG RESERVOIR AND SIZE
- ▲ 16 ACTIVE WELL AND NUMBER
- ▲ 20 DRILLED BUT NOT EQUIPPED
- ▲ 22 FUTURE WELL AND NUMBER
- A AUXILIARY POWER

SCALE: 1" = 2000'

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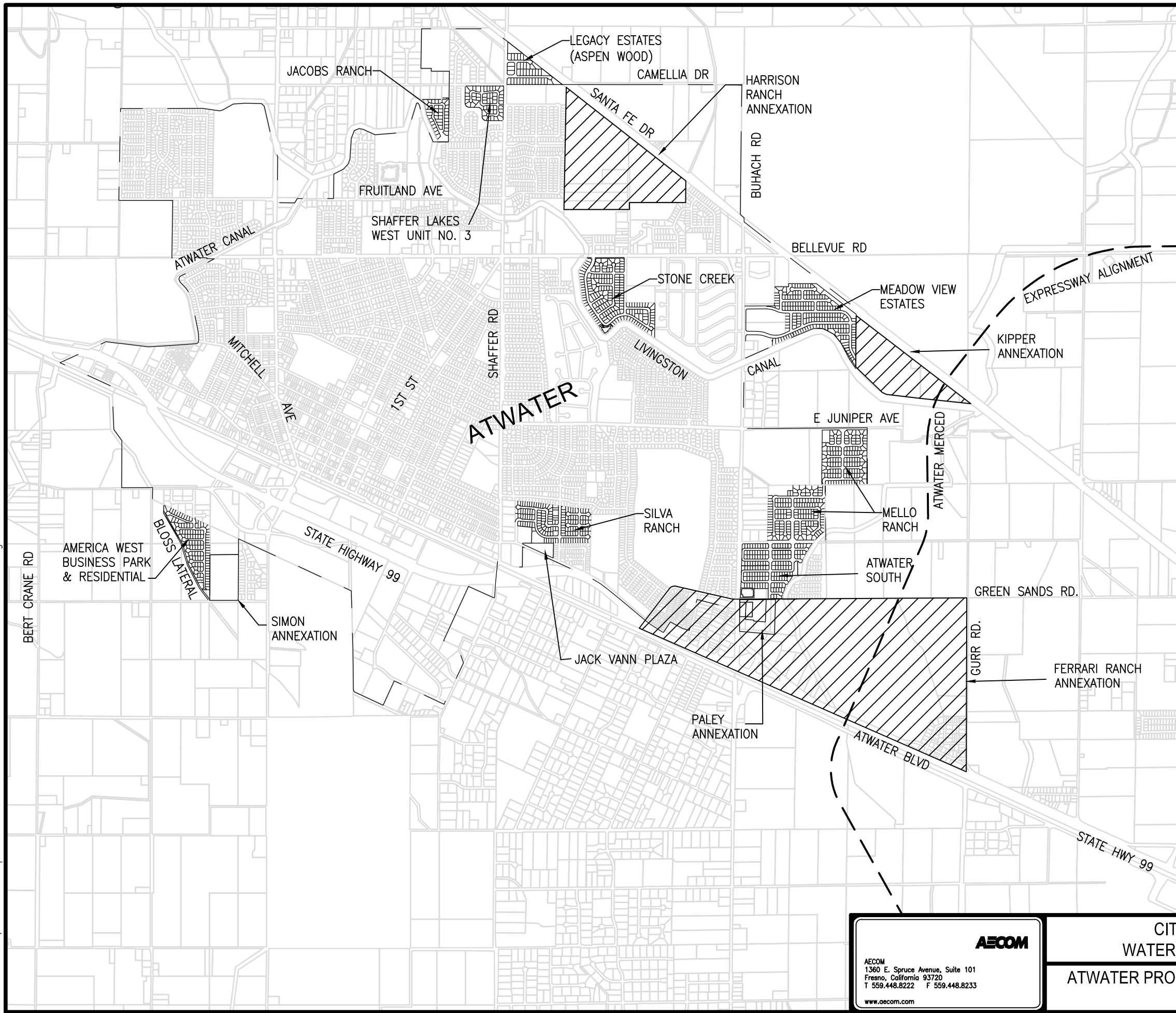
**CITY OF ATWATER  
 WATER MASTER PLAN 2019**

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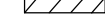
**EXISTING TRANSMISSION AND  
 DISTRIBUTION SYSTEM**

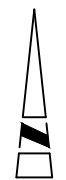
POTENTIAL CONNECTION POINT	FIGURE
AECOM PROJECT NO. 60612644	2

DWG: K:\Projects\Merced Irrigation District\60612644\_Meadowbrook Interlie Study\900\_CAD\_GIS\910\_CAD\02-Sheets\City of Atwater Water MP.dwg  
 DATE: Mar 09, 2020 4:45pm  
 USER: Phillip.Boren  
 XREFS: c-base G--BD11x17h AECOM--logoFR IMAGES: SD-10.tif



### LEGEND

-  EXSITING OR FUTURE DEVELOPMENT LOT LAYOUT
-  NEW DEVELOPMENT LOT LAYOUT
-  PROPOSED ATWATER - MERCED EXPRESSWAY
-  PENDING AND RECENT ANNEXATION



SCALE: 1" = 2000'

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CITY OF ATWATER  
 WATER MASTER PLAN 2019

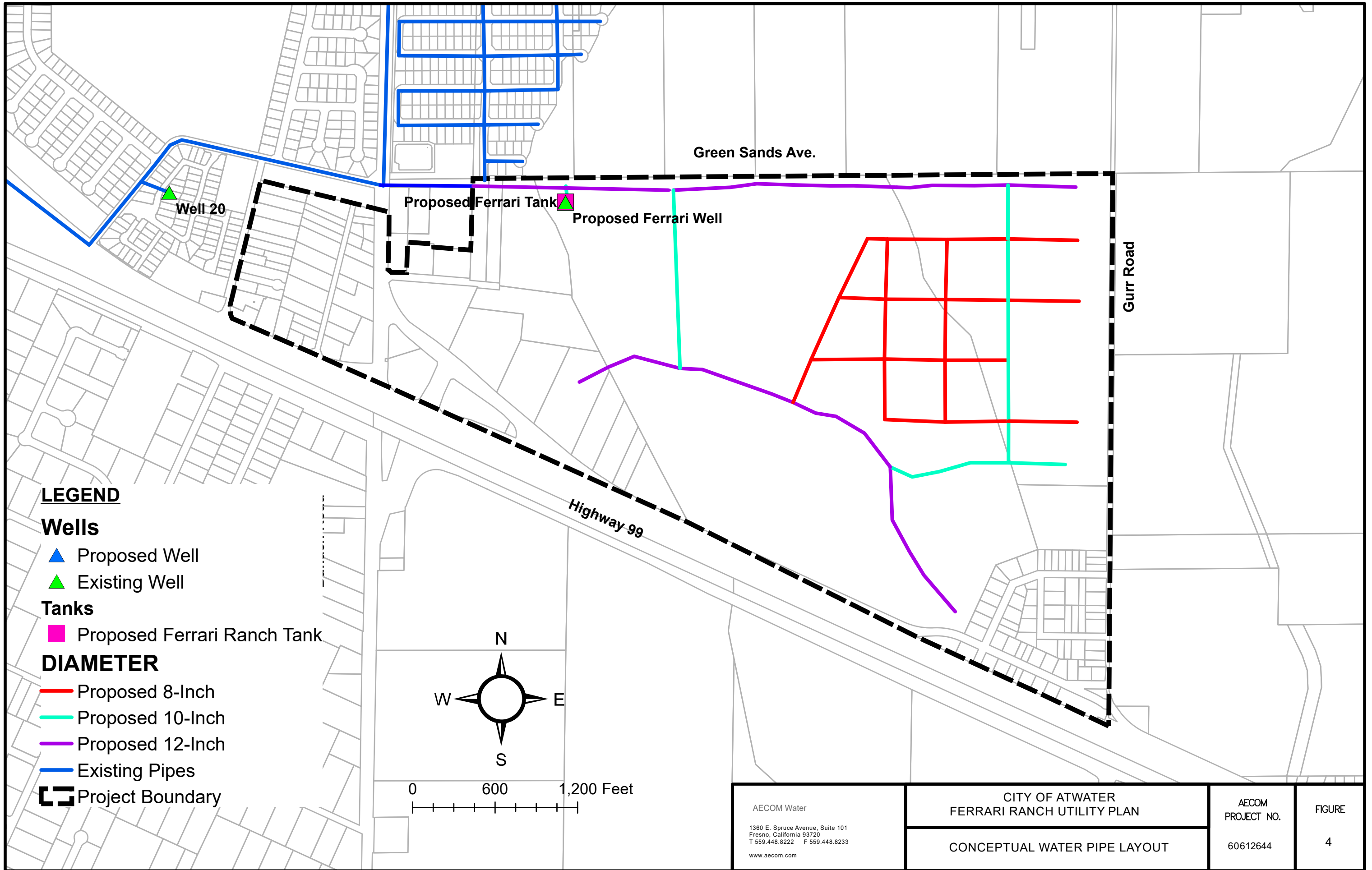
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ATWATER PROPOSED DEVELOPMENTS AS  
 OF 2018

AECOM  
 PROJECT NO.  
 60612644

FIGURE  
 3

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**LEGEND**

**Wells**

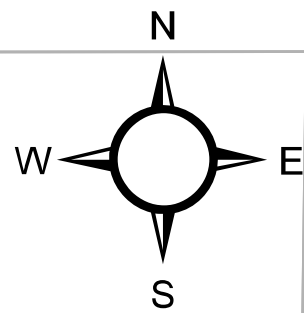
- ▲ Proposed Well
- ▲ Existing Well

**Tanks**

- Proposed Ferrari Ranch Tank

**DIAMETER**

- Proposed 8-Inch
- Proposed 10-Inch
- Proposed 12-Inch
- Existing Pipes
- Project Boundary



0 600 1,200 Feet

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CITY OF ATWATER  
 FERRARI RANCH UTILITY PLAN

CONCEPTUAL WATER PIPE LAYOUT

AECOM  
 PROJECT NO.  
 60612644

FIGURE  
 4

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## Storage Evaluation per Atwater Master Plan

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- Based on evaluation criteria and as shown in Table 7 of the report, Atwater is approximately 2.2 MG short of recommended operational/fire/emergency storage with largest well out of service.
- However, there is an additional Well 21, 0.5-MG storage, and a booster station at the federal prison that could be used to supply Atwater in an emergency.

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# Well Supply Evaluation per Atwater Master Plan

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- Peak hour demand: 17,570 gpm
- Firm well capacity with largest well offline<sup>1</sup>: 11,300 gpm
- Supply from storage<sup>2</sup>: 3,000 gpm
- Deficit supply capacity<sup>3</sup>: (3,270 gpm)

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<sup>1</sup> Well supply does not include Well 21 and Well 17 (largest active well).

<sup>2</sup> Includes 1-MG elevated tank supplying 2,500 gpm plus one of the two 0.5-MG reservoirs at prison supplying 500 gpm. Assumes one 0.5-MG MG reservoir would be dedicated to the federal prison.

<sup>3</sup> Deficit can be met using Well 20 (2,000 gpm) once equipped or using water from federal prison system (1,270 gpm).



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# Well Supply Evaluation per Atwater Master Plan

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- Evaluation of supply needed to satisfy maximum day demand without largest well during power outage.

## Supply Requirements for Current (2018) Demand (Maximum Day Without Largest Well) During Power Outage (gpm)

City's Existing Maximum Day Demand	10,910
Approximate Available Well Supply (10,100 gpm) <sup>1</sup>	10,100
Approximate Available Storage Supply <sup>2</sup>	3,000
<b>City's Excess Supply Capacity</b>	<b>2,190</b>

<sup>1</sup> Well supply does not include the supply from Well 21 and the largest well (Well 17) and the wells without auxiliary generators (Well 13).

<sup>2</sup> Includes 1-MG elevated tank plus one of the two 0.5-MG reservoirs at the prison. Assumes one 0.5-MG reservoir would be dedicated to the federal prison.

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# Well Supply Evaluation per Atwater Master Plan

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- Evaluation of supply needed to meet maximum day demand plus 3,000-gpm fire flow shows adequacy
  - Maximum day plus fire flow = 13,910 gpm
  - Firm supply 11,300 gpm + 3,000 gpm storage = 14,300 gpm
  
- Based on the above evaluation, Atwater would have excess supply capacity of approximately 2,190 during maximum day demand with largest well off.

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# City of Atwater Water System

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Figure 5 shows two options, with **Option A-1** being preferred.

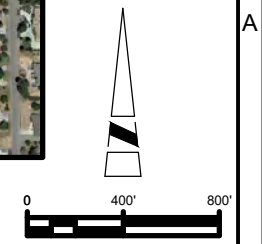
**Supply Requirements for Current (2018) Demand  
(Maximum Day Without Largest Well) During Power Outage (gpm)**

Option	Pipe Length		Pressure Loss for 1,250 gpm (psi)	Pipe Sizes at Connection (diameter)
	12-Inch Pipe (ft)	10-Inch Pipe (ft)		
A-1	4,300	4,010	16	8-inch
A-2	4,300	5,113	17	8-inch



**PROPOSED WATER MAIN LENGTHS**

OPTION	DISTANCE (FT.)
A-1	8310.0
A-2	9413.0



REV	DATE	DESCRIPTION	APPR

<b>VERIFY SCALES</b> BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	DESIGNED BY	PROJECT ENGINEER
	DRAWN BY	REG NUMBER      EXP DATE
	CHECKED BY	PROJECT NUMBER      60612644
	DATE	CADD STANDARDS      AECOM

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MEADOWBROOK
<b>ATWATER/MEADOWBROOK POTENTIAL CONNECTION POINTS</b>
FIG. 5

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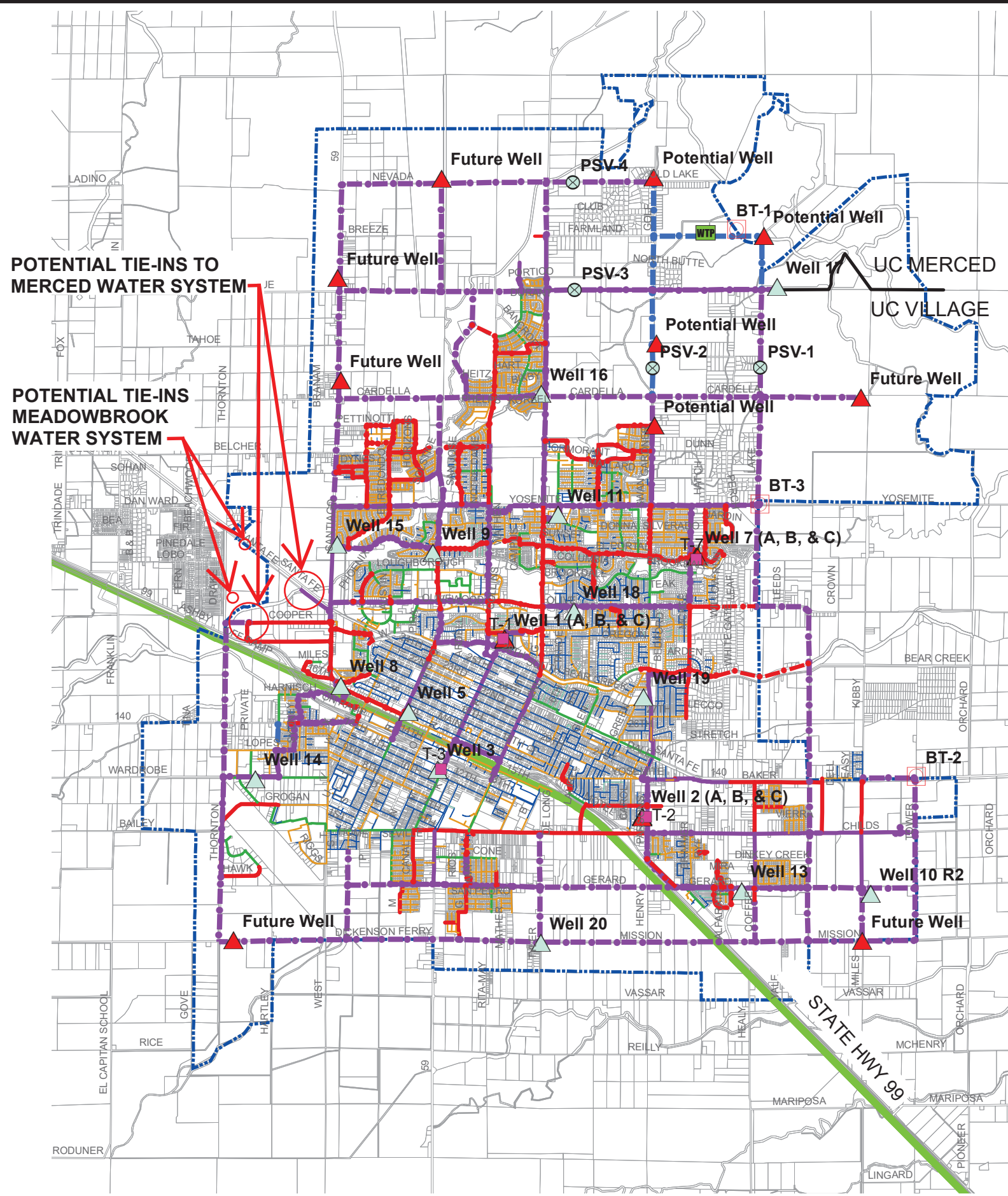
# City of Merced Water System

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- Active wells: 20
- Service connections: 21,523
- Storage available: 1MG
- Source capacity: 54,400 gpm<sup>1</sup>
- Emergency backup generators: All wells

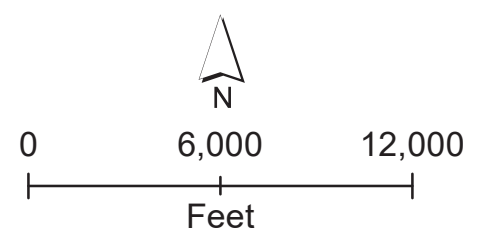
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<sup>1</sup> 59,400 gpm once two more wells are completed.



**LEGEND**

- Existing Tank
- ▲ Existing Wells
- ▲ Future Wells
- 2030 Booster Pump
- ⊗ 2030 Pressure Sustaining Valve
- WTP Water Treatment Plant
- Existing Pipelines**
- 4 in.
- 6 in.
- 8 in.
- 10 in.
- 12 in.
- 16 in.
- 18 in.
- 2030 Pipelines**
- - - 12 in.
- - - 16 in.
- - - 18 in.
- 12
- 16
- Future High Speed Rail Alignment
- Merced Vision 2030 Boundary



AECOM Water 1360 E. Spruce Avenue, Suite 101 Fresno, California 93720 T 559.448.8222 F 559.448.8233 www.aecom.com	CITY OF MERCED WATER MASTER PLAN 2015		AECOM PROJECT NO. 60612644	FIGURE 6
	RECOMMENDED WATER SYSTEM IMPROVEMENTS			

# City of Merced Water System

## Existing City of Merced Water Supply and Pumping Capacity

Well No.	Existing Pumping Capacity, gpm	Existing Maximum Day Demand Plus Fire Flow, gpm <sup>1</sup>	Existing Peak Hour Demand, gpm
1A	2,200		
1C	2,200		
2A	2,200		
2B	2,200		
2C	2,500		
3C	3,000		
5B	3,000		
7C	2,800		
8	2,000		
9	1,800		
10R2	3,000		
11	3,000		
13	3,000		
14	4,000		

# City of Merced Water System

Well No.	Existing Pumping Capacity, gpm	Existing Maximum Day Demand Plus Fire Flow, gpm <sup>1</sup>	Existing Peak Hour Demand, gpm
15	3,500		
16	3,500		
17	2,500		
18	3,000		
19	2,500		
20 (under const.)	(2,500)		
21	2,500		
22 (under const.)	(2,500)		
<b>Total Capacity</b>	<b>54,400<sup>3</sup></b>		
<b>Total Firm Capacity<sup>2</sup></b>	<b>50,400</b>	<b>34,508</b>	<b>44,960</b>

<sup>1</sup> Based on a maximum day demand of 30,508 gpm and a fire flow of 4,000 gpm in 2012.

<sup>2</sup> Defined as the total capacity of the individual wells with the largest well pump out of service. For this case Well 14 is the largest well and so was not considered in calculating firm pumping capacity.

<sup>3</sup> 59,400-gpm total capacity when construction is completed.



# Storage Evaluation per Merced Master Plan

## Comparison of Existing Available and Required Storage Capacity for Merced

Available Storage Capacity, MG	Required Storage Capacity, MG				Excess Capacity <sup>3</sup> (MG)
	Operational	Fire Flow	Emergency	Total	
44.96 <sup>1</sup>	13.35	0.96 <sup>2</sup>	23.40	37.71	7.25

<sup>1</sup> Available storage from groundwater wells. Based on the production of 80% of City wells minus Average Day Demand. 20% of City wells assumed out of service.

<sup>2</sup> Based on required institutional fire flow of 4,000 gpm flowing for four hours.

<sup>3</sup> Calculated as required storage minus available storage.

➤ **Excess storage capacity = 7.25 MG**

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## Demand Analysis

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- Maximum day demand: Capable of meeting maximum day demand with 3,000 gpm fire flow per Master Plan analysis.
- Peak hour demand: Capable of meeting peak hour demand per Master Plan analysis.

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## Merced Water System Excess Capacity

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- Merced has an excess firm supply capacity of 15,782 gpm<sup>1</sup> during maximum day demand plus fire flow with largest well out of service.
- Merced has an excess firm supply capacity of 5,440 gpm<sup>2</sup> during peak hour demands.

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<sup>1</sup> 20,892 gpm when Wells 20 and 22 are completed and equipped.

<sup>2</sup> 10,440 gpm when Wells 20 and 22 are completed and equipped.

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## Merced Intertie Locations

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Figure 7 shows two options, with **Option M-1** being preferred.

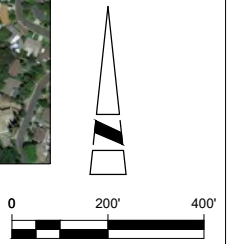
### Parameters for Intertie to City of Merced

Option	Size (in.)	Length (ft)	Pressure Loss at 1,250 gpm (psi)	Pipe Sizes at Connection
<b>M-1</b>	<b>12</b>	<b>3,612</b>	10	One 10-in. dia
M-2	12	1,511	7	Two 6-in. dia



PROPOSED WATER MAIN LENGTHS

OPTION	DISTANCE (FT.)
M-1	3612.0
M-2	1511.0



REV	DATE	DESCRIPTION	APPR

<b>VERIFY SCALES</b> BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY	DESIGNED BY	PROJECT ENGINEER
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	CHECKED BY	PROJECT NUMBER      60612644
	DATE	CADD STANDARDS      AECOM

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MEADOWBROOK
MERCED/MEADOWBROOK POTENTIAL CONNECTION POINTS
FIG. 7

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 USER: Phillip Boren  
 XREFS: 0000000-REF-C-BD - MERCED  
 AECOM-logofR IMAGES:

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# Estimated Construction Costs for Interties

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- **Atwater**
  - Option A-1: \$2,404,550
  - Option A-2: \$2,725,600
  
- **Merced**
  - Option M-1: \$1,185,800
  - Option M-2: \$ 764,300