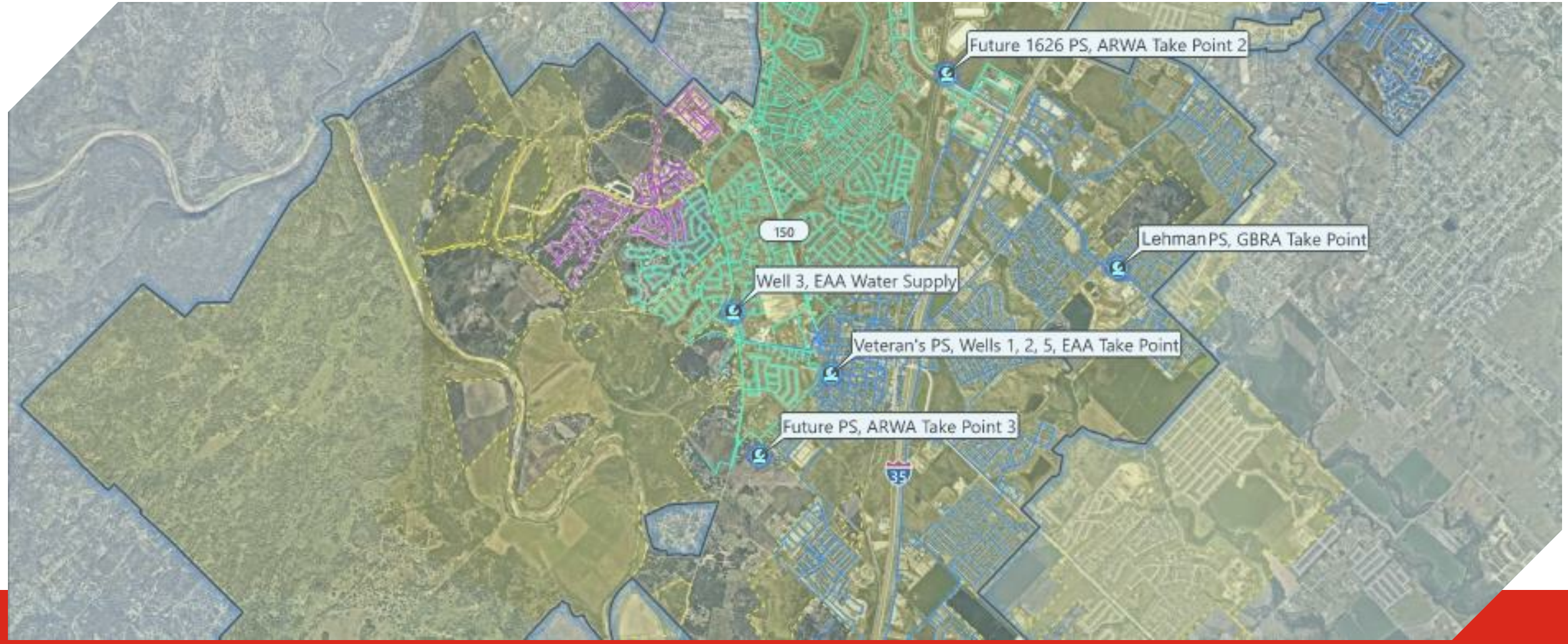


Water Master Plan Workshop

March 29, 2025

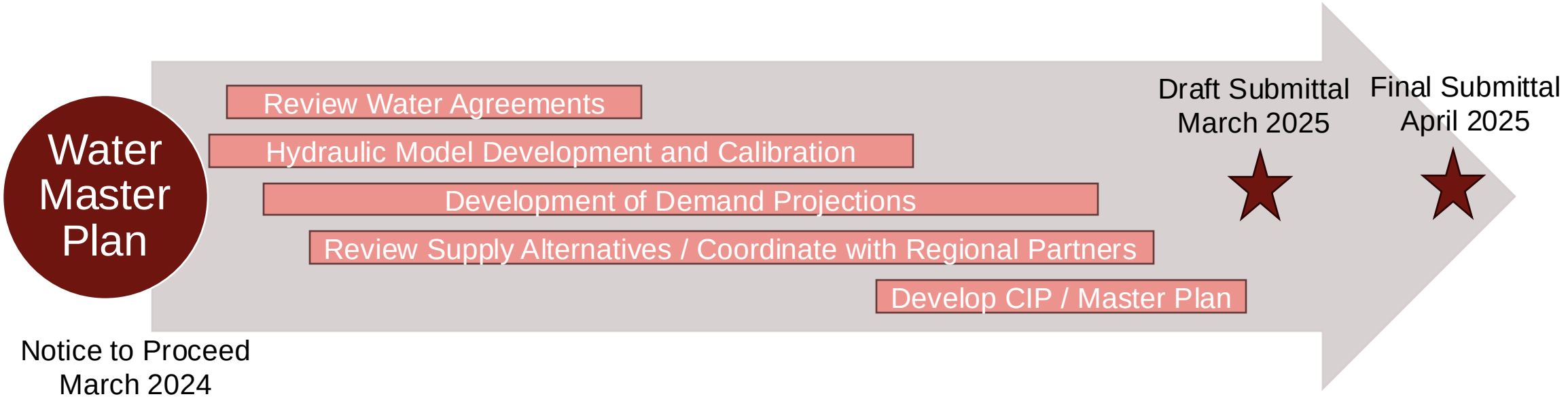
Agenda

1. Overview
2. Water Supply
3. Infrastructure
4. Recommendations and Next Steps

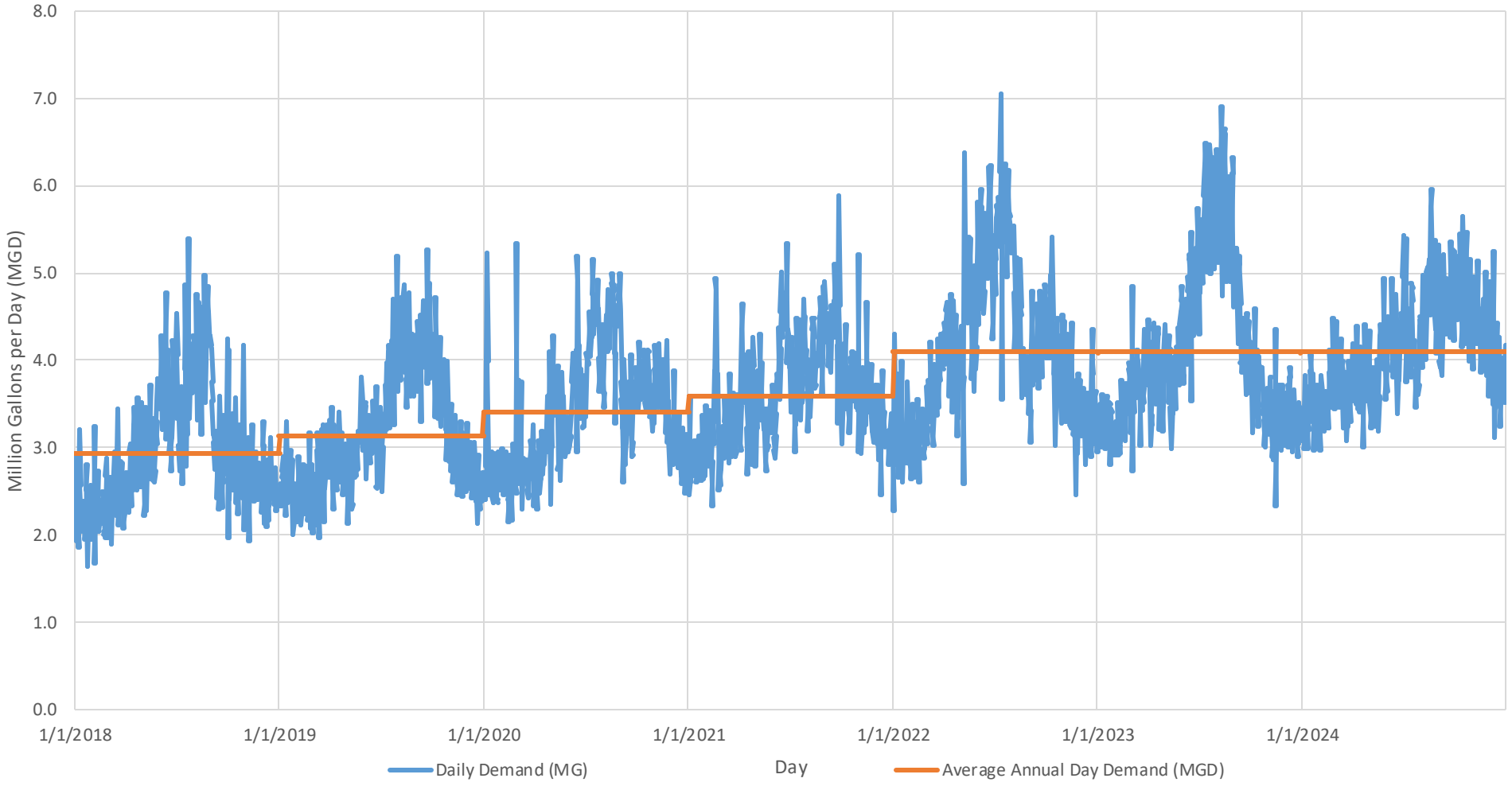
Purpose of Water Master Plan

- Evaluate current water sources
- Evaluate the existing water distribution system and make recommendations for improvements to meet future conditions
- Explore framework to acquire additional water to meet the demands at full buildout of the City
- Provide guidance for future capital projects

Project Timeline



Historical Water Use



Water Supply

Terminology

SUPPLY

- **Permitted Supply:** Total permitted water supply available to City in a calendar year
- **Firm Supply:** Total permitted water supply available to the City in a calendar year with maximum drought reductions in place

DEMAND

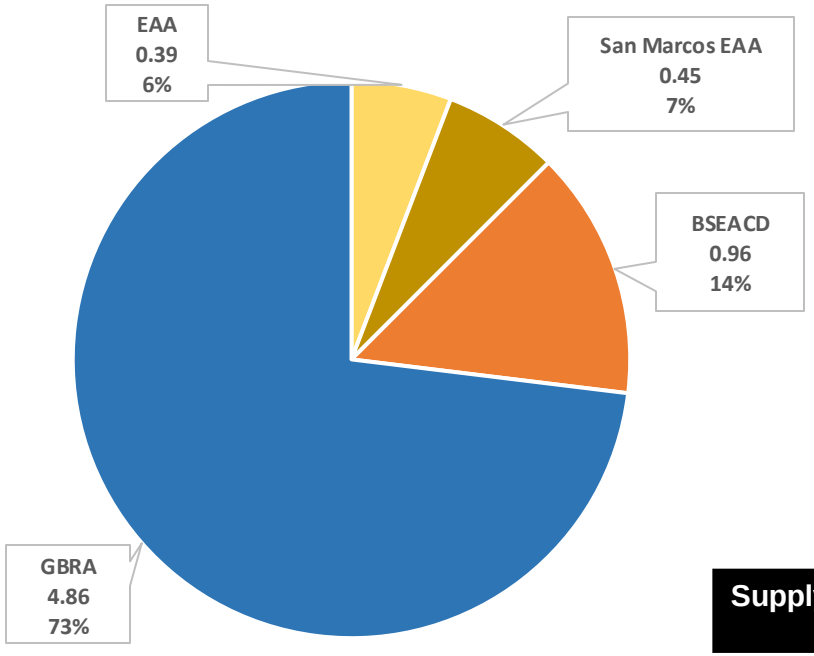
- **Annual Demand:** Total water usage in a calendar year
- **Maximum Day Demand:** Highest water usage day in a calendar year

UNITS

- **Million Gallons Per Day (MGD)**
- **Acre-Feet per Year (Ac-Ft/yr)**

Current Water Supply Portfolio

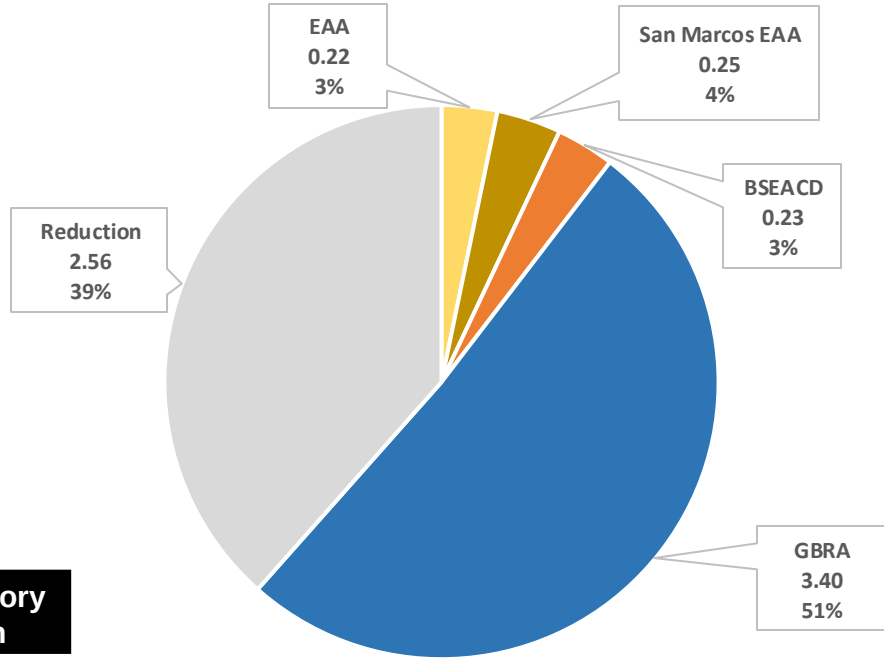
Total Permitted Supply



6.65 MGD
7,450 Ac-Ft/Year

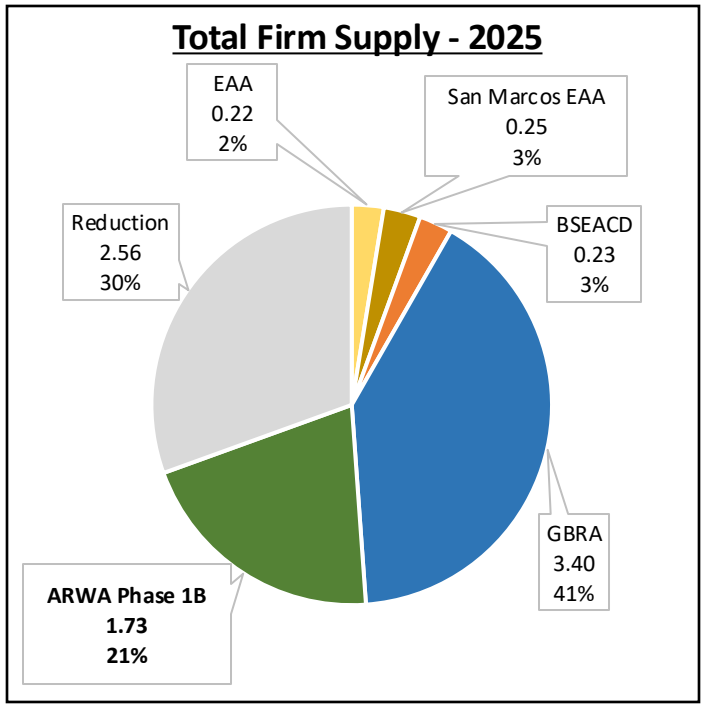
Supply	Max. Mandatory Reduction
Edwards Aquifer Authority (EAA)	44%
Barton Springs Edwards Aquifer Conservation District (BSEACD)	76.4%
Guadalupe-Blanco River Authority (GBRA)	30%

Total Firm Supply

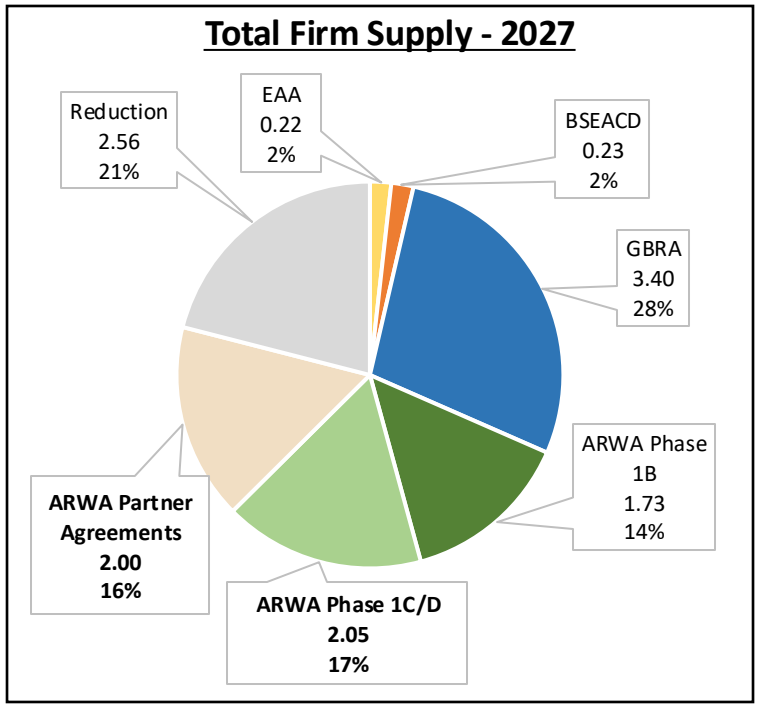


4.09 MGD
4,585 Ac-Ft/Year
61% of permitted supply

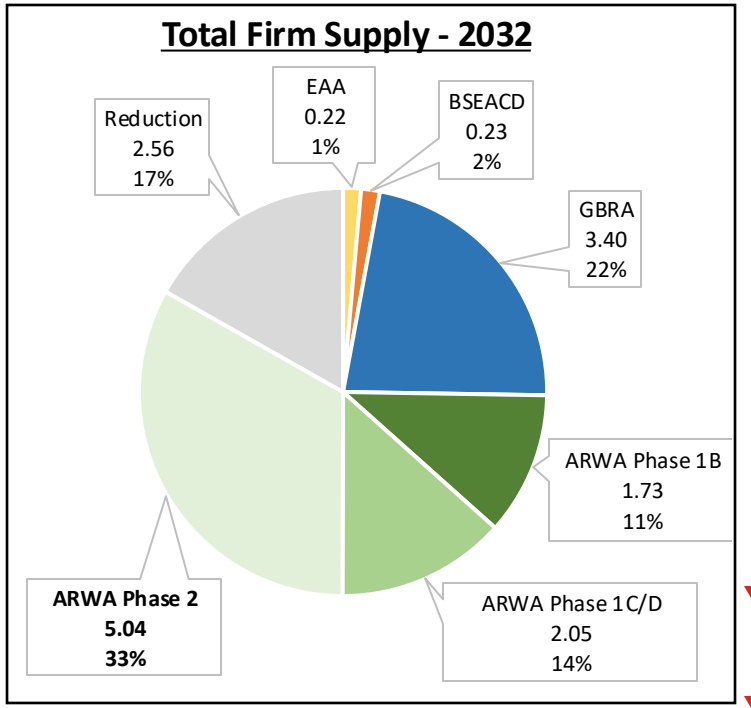
Planned Water Supply Portfolio - ARWA



5.82 MGD
6,520 Ac-Ft/Year
70% of permitted supply



9.62 MGD
10,779 Ac-Ft/Year
79% of permitted supply



12.66 MGD
14,180 Ac-Ft/Year
83% of permitted supply

ARWA Phase 1B Online
42% increase in firm supply

ARWA Phase 1C/D Online
ARWA Partner Agreements
31% increase in firm supply
Currently in Design

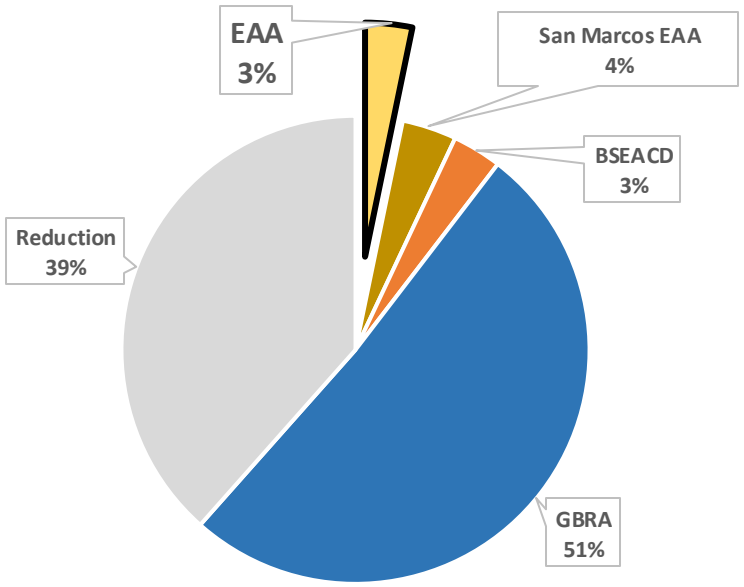
ARWA Phase 2 Online
66% increase in firm supply

Opportunity to Increase Supply

Current Water Supply Portfolio

- Edwards Aquifer Authority Permit (Wells 1, 2, 3 & 5)
  - Up to 432 Acre-Feet per Year (0.39 MGD) Permitted
  - Permit based on calendar year, allowing for more usage during peak months
  - Up to 44% Reduction based on aquifer levels of the San Antonio Pool
  - Currently in Stage 4 – 40% Reduction

DROUGHT STAGES % REDUCTION	
STAGE I	20
STAGE II	30
STAGE III	35
STAGE IV	40
STAGE V	44



Current Water Supply Portfolio

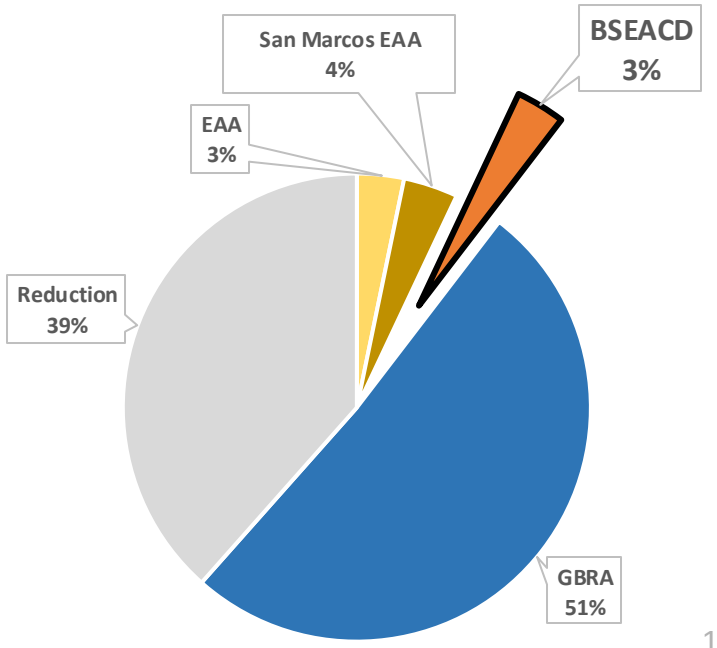
- Barton Springs Edwards Aquifer Conservation District (Well 4)
  - Up to 1,074 Acre-Feet per Year (0.96 MGD) Permitted
  - Up to 76.4% total reduction, based on monthly allocations
  - Currently in Stage 3 – 53.8% total reduction

Historic/Conditional B Edwards Production Permit - City of Kyle

Historical Permitted Pumpage: 165,000,000 gpy
Conditional B Permitted Pumpage: 185,000,000 gpy

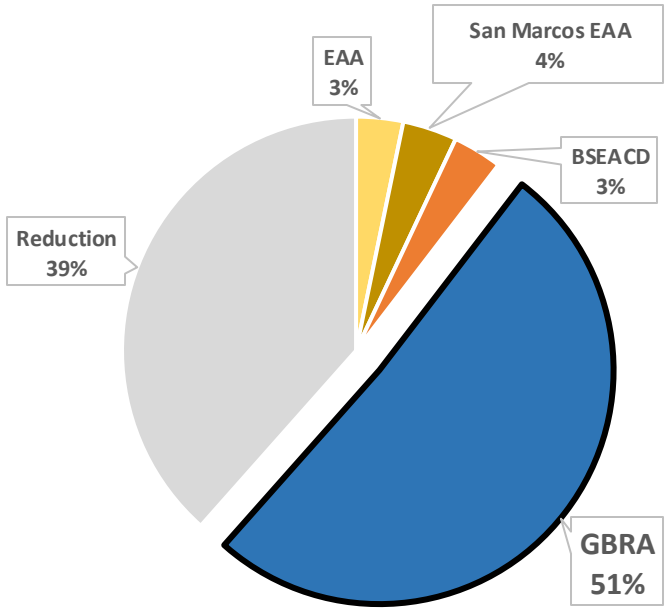
Water Use: PWS — UDCP Approved in Fiscal Year: 2019

		Fresh Edwards Management Zone Pumpage Volume Targets During Drought Stages					
	Monthly Volume Allocation	No Drought Baseline	Stage I Water Con. Period	Stage II Alarm	Stage III Critical	Stage IV Exceptional	(ERP) Emergency Response Period
		Cond B	(Voluntary) 10% Reduction	(Mandatory) 50% Reduction	(Mandatory) 75% Reduction	(Mandatory) 100% Reduction	(Mandatory) 100% Reduction
Fiscal Year		Historic	10% Reduction	20% Reduction	30% Reduction	40% Reduction	50% Reduction
September	10.00%	35,000,000	31,500,000	22,450,000	16,175,000	9,900,000	8,250,000
October	8.30%	29,050,000	26,145,000	18,633,500	13,425,250	8,217,000	6,847,500
November	7.00%	24,500,000	22,050,000	15,715,000	11,322,500	6,930,000	5,775,000
December	6.30%	22,050,000	19,845,000	14,143,500	10,190,250	6,237,000	5,197,500
January	6.30%	22,050,000	19,845,000	14,143,500	10,190,250	6,237,000	5,197,500
February	6.50%	22,750,000	20,475,000	14,592,500	10,513,750	6,435,000	5,362,500
March	6.60%	23,100,000	20,790,000	14,817,000	10,675,500	6,534,000	5,445,000
April	7.40%	25,900,000	23,310,000	16,613,000	11,969,500	7,326,000	6,105,000
May	8.00%	28,000,000	25,200,000	17,960,000	12,940,000	7,920,000	6,600,000
June	9.50%	33,250,000	29,925,000	21,327,500	15,366,250	9,405,000	7,837,500
July	12.10%	42,350,000	38,115,000	27,164,500	19,571,750	11,979,000	9,982,500
August	12.00%	42,000,000	37,800,000	26,940,000	19,410,000	11,880,000	9,900,000
Annual Totals:	100.00%	350,000,000	315,000,000	224,500,000	161,750,000	99,000,000	82,500,000



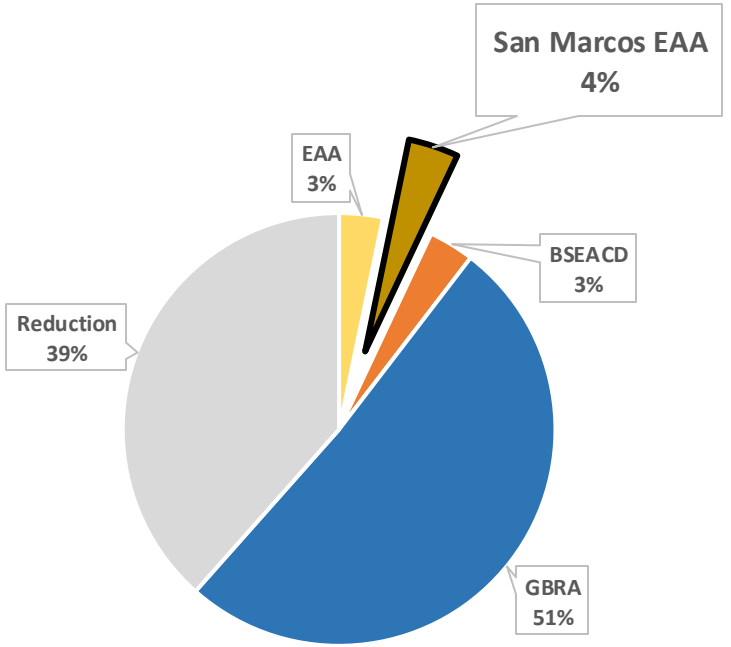
Current Water Supply Portfolio

- Guadalupe-Blanco River Authority Surface Water
  - Up to 5,443 Acre Feet per Year (4.86 MGD) from Canyon Lake Reservoir
  - Permit based on daily limits
  - Up to 30% total reduction in stage 5, based on water elevation in Canyon Reservoir
  - Currently in Stage 4 – 15% total reduction



Current Water Supply Portfolio

- San Marcos Agreements
  - EAA Agreement allows for usage of up to 500 acre-feet per year of City of San Marcos' water rights, subject to reductions equal to City's EAA Permit
    - *Agreement in place through 2026*
  - Interconnect agreement allows up to 0.5 million gallons per day if needed for peak flows, in coordination with the City
    - *Not included as additional annual supply source*

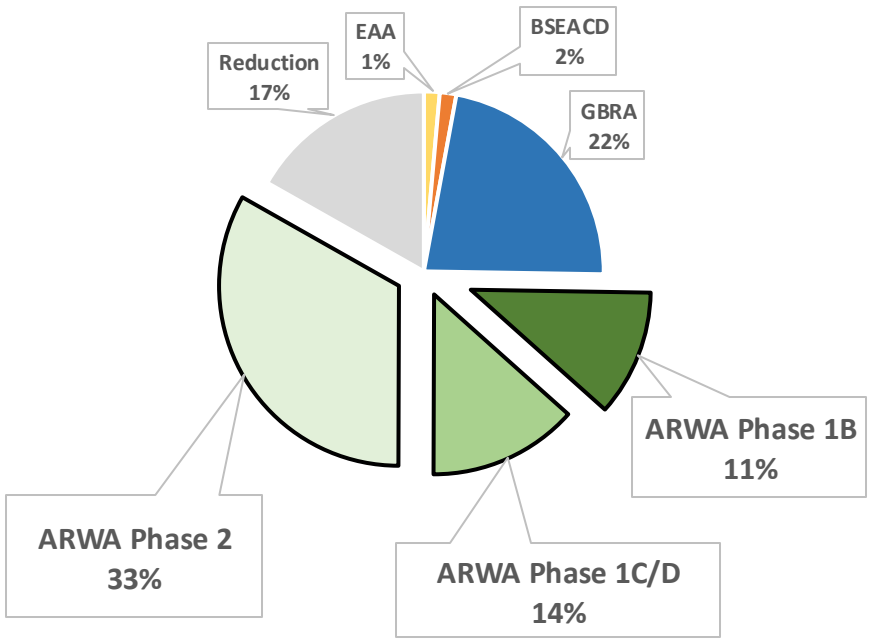


Current Water Supply Portfolio

- Alliance Regional Water Authority

Planned Permitted Supply

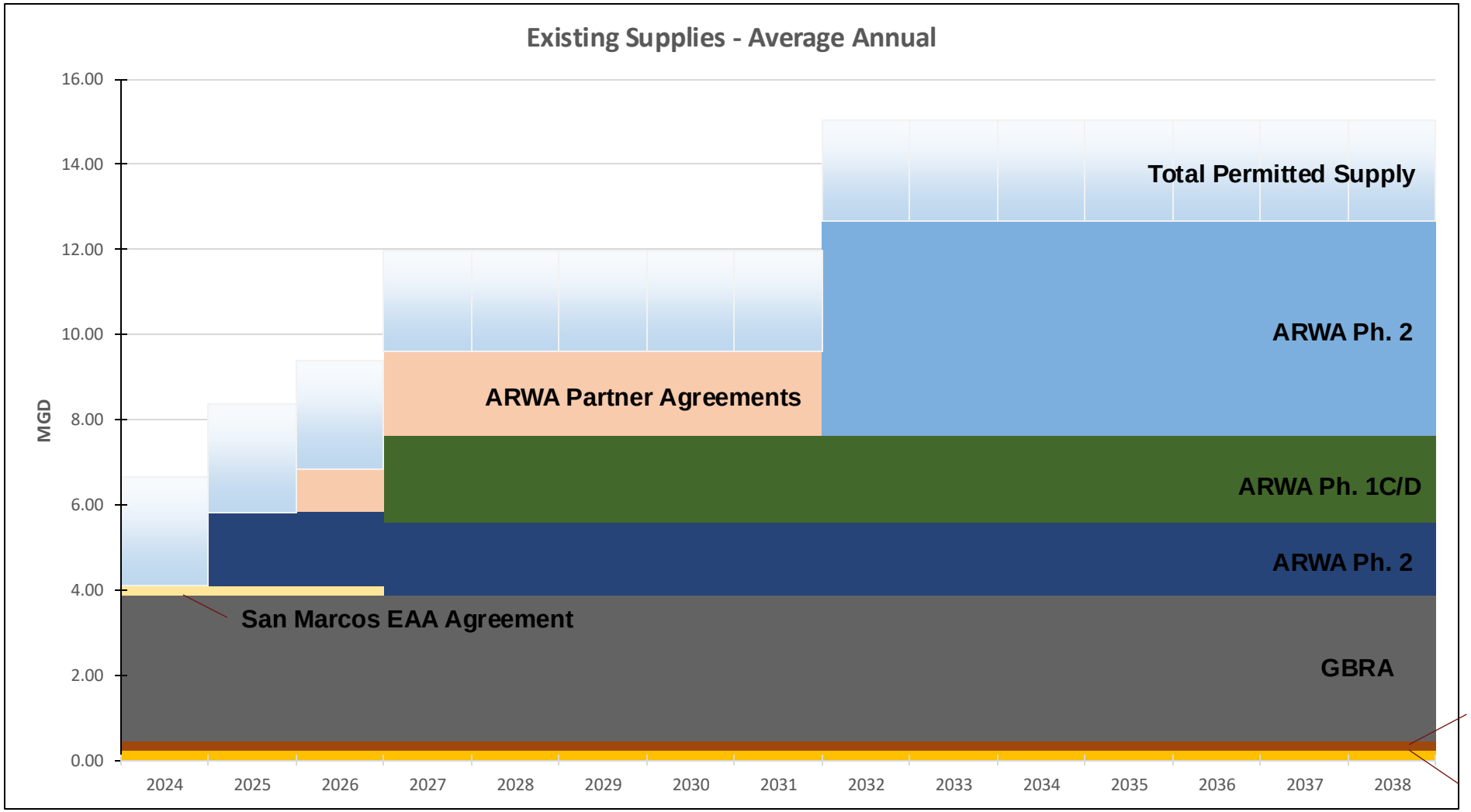
Source	Year Online	Total Permitted Capacity	Max. Mandatory Reduction	Total Firm Capacity
		acre-feet/year		acre-feet/year
ARWA Phase 1B	2025	1934.0	0%	1934.0
ARWA Phase 1C/1D	2027	2292.0	0%	2292.0
ARWA Phase 2	2032	5650.0	0%	5650.0
	Total	**9876.0**		**9876.0**



Planned Water Supply Portfolio

- Agreements with Alliance Regional Water Authority (ARWA) Partners
  - City team met with ARWA partners and GBRA to discuss near-term water agreements for additional supply
  - Partners have indicated near-term availability of a portion of their share of Phases 1B and 1C/D water supply
  - Discussions led by City staff are currently advancing; indicate approximately 1.0 MGD available in 2026; increasing to 2.0 MGD from 2027 to 2031

Existing and Planned Water Supply



Existing and Planned Water Supply

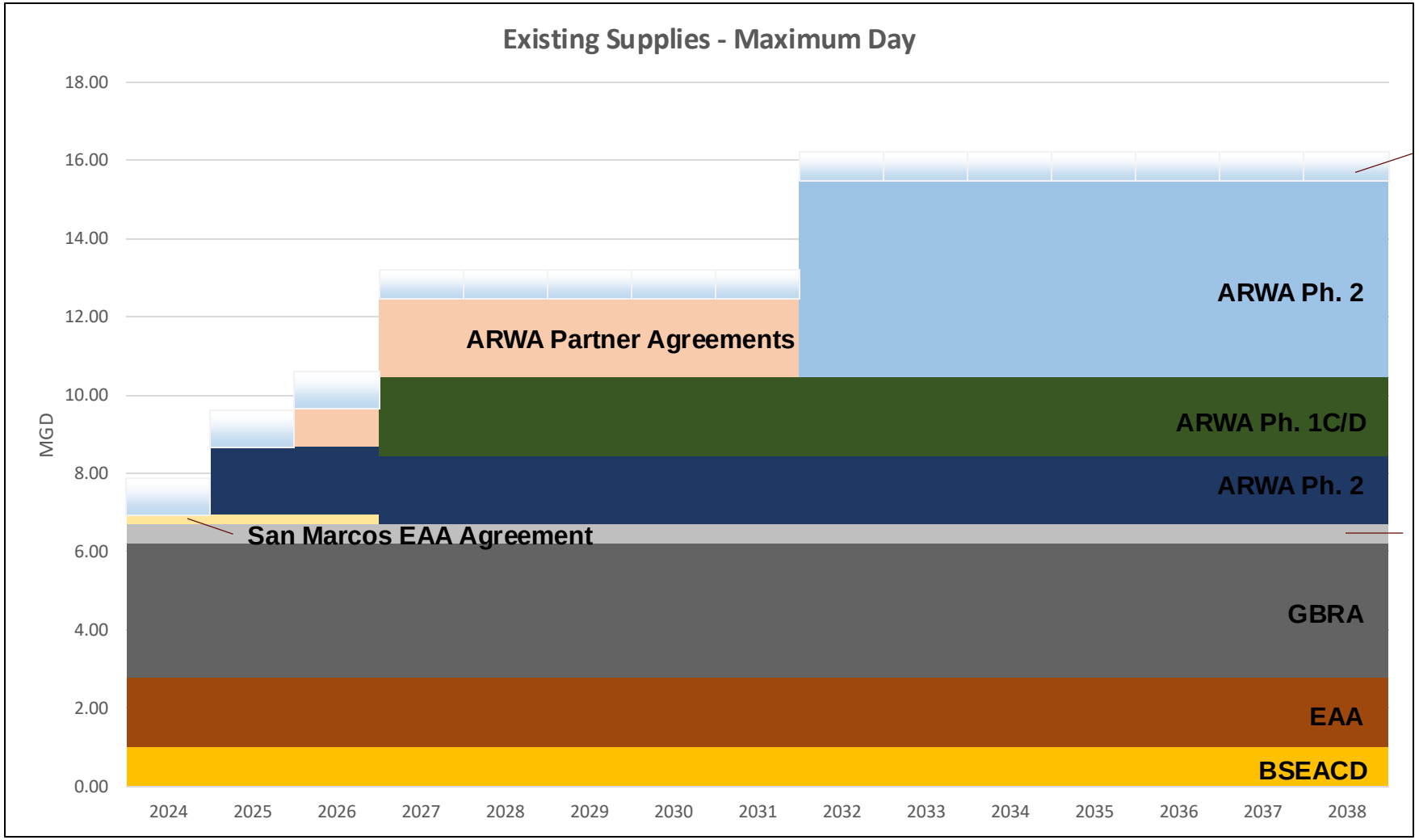
- In additional to annual permitted supply, need to meet maximum day demands
- Permit language differs for each individual permit
  - EAA permit based on annual total
  - BSEACD permit based on established monthly totals
  - GBRA permit based on daily totals
  - ARWA permit based on daily totals
- Optimize EAA and BSEACD permits to meet maximum day demands

Existing and Planned Water Supply

- Maximum Day Supply by Source

Source	Average Annual Firm Supply (MGD)	Maximum Day Firm Supply (MGD)
Edwards Aquifer Authority	0.22	1.78
BSEACD	0.23	1.01
GBRA Surface Water	3.40	4.86
San Marcos EAA Agreement (2024 - 2026)	0.25	0.25
San Marcos Interconnect Agreement	0.50	0.50
ARWA Partner Agreements (2027 - 2031)	2.00	2.00
ARWA Phase 1B	1.73	1.73
ARWA Phase 1C/D	2.05	2.05
ARWA Phase 2	5.04	5.04

Existing and Planned Water Supply



Water Demand Projections

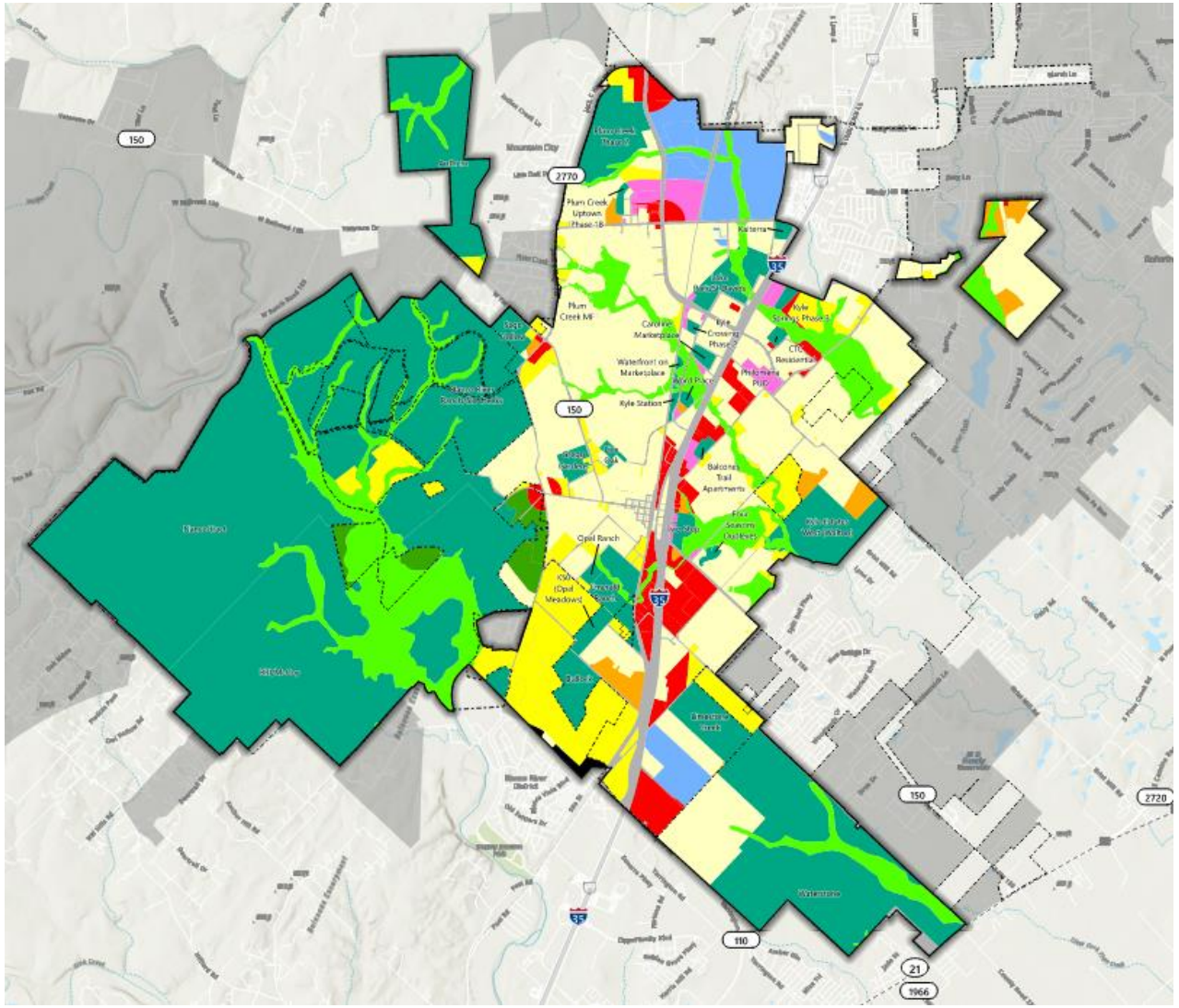
- City of Kyle Water Service Area (CCN) differs from City Limits boundary
- Coordinated development locations and growth rates through 2038 with City Planning and Development teams
- Beyond 2038 to ultimate buildout based on Future Land Use Map in Kyle 2030 Comprehensive Plan
- Estimated based on Living Unit Equivalents

Water Demand Projections

- LUE (Living Unit Equivalent)
  - Single Family Home = 1 LUE
  - 3 persons per LUE
- Planning determines projected units, converts to LUEs, converts to gpm water demand.

Metric	Value	Units
Water Usage per Person	90	gpcd
# persons per LUE	3	persons
Water Usage per LUE	270	gpd
example		
Total LUEs	1,000	
Water Usage (LUEs x 270 gpd/LUE)	270,000	gpd
Average Day Demand (gpd/1440)	187.5	gpm
Maximum Day Demand (ADD x 1.69)	317	gpm

Water Demand Projections



- Water CCN Boundary
- City of Kyle Limits
- Kyle ETJ
- Future Development
- Active Cases
- Existing Development
- Flood Plain

Land Use 2030

- Industrial Warehouse
- Regional Commercial
- Rural Estate
- Traditional Neighborhood
- Urban Mixed Use

Water Demand Projections

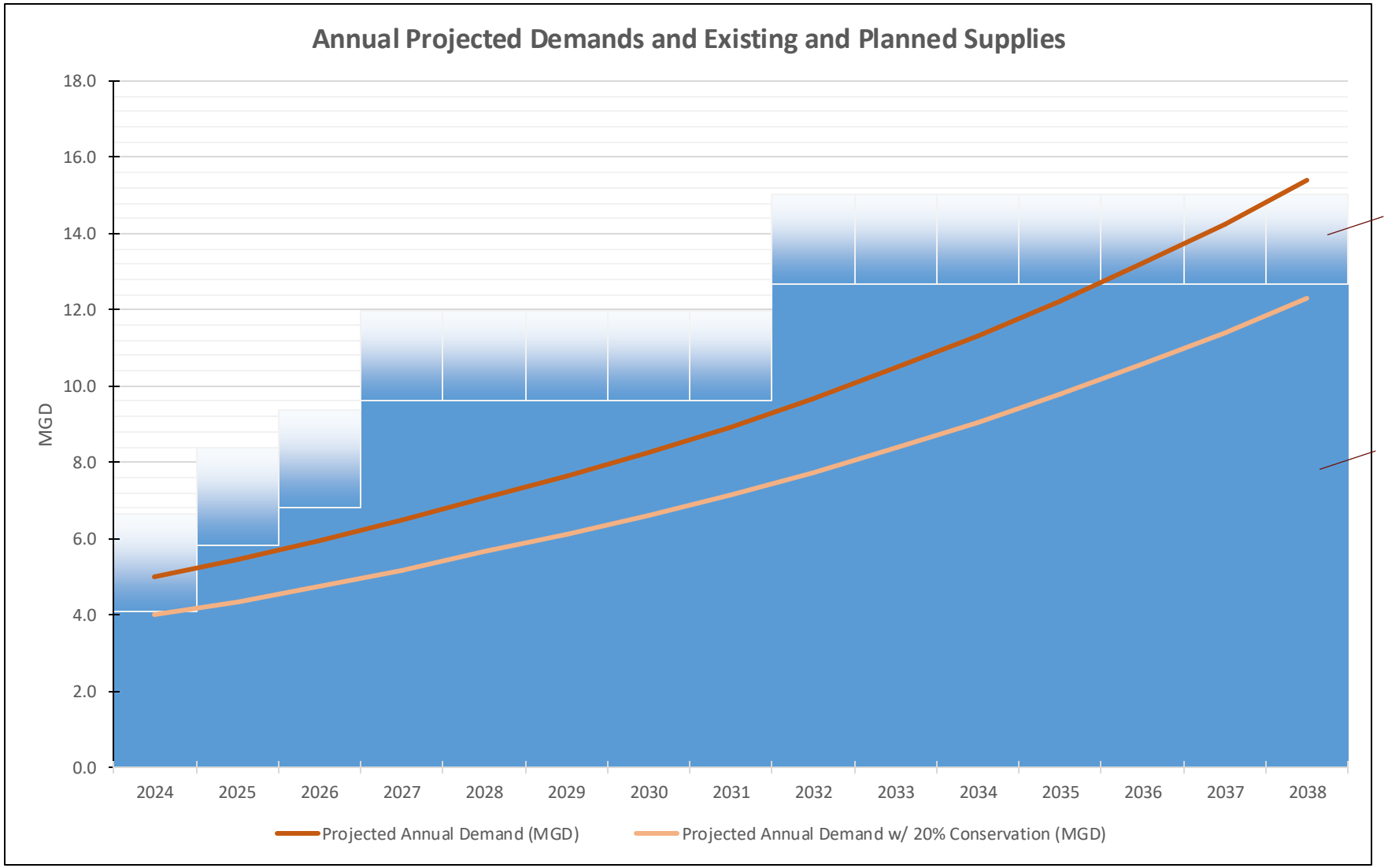
- Resulting Growth Rates

Years	% Growth	Additional LUE	Basis
2024 - 2028	9.00%	8,941	Known Developments
2029 - 2033	8.25%	12,691	Known Developments
2034 - 2038	8.00%	18,202	Known Developments
2039 - 2043	3.00%	9,076	Land Use from 2030 Comprehensive Plan
2044 - 2048	2.00%	6,065	Land Use from 2030 Comprehensive Plan

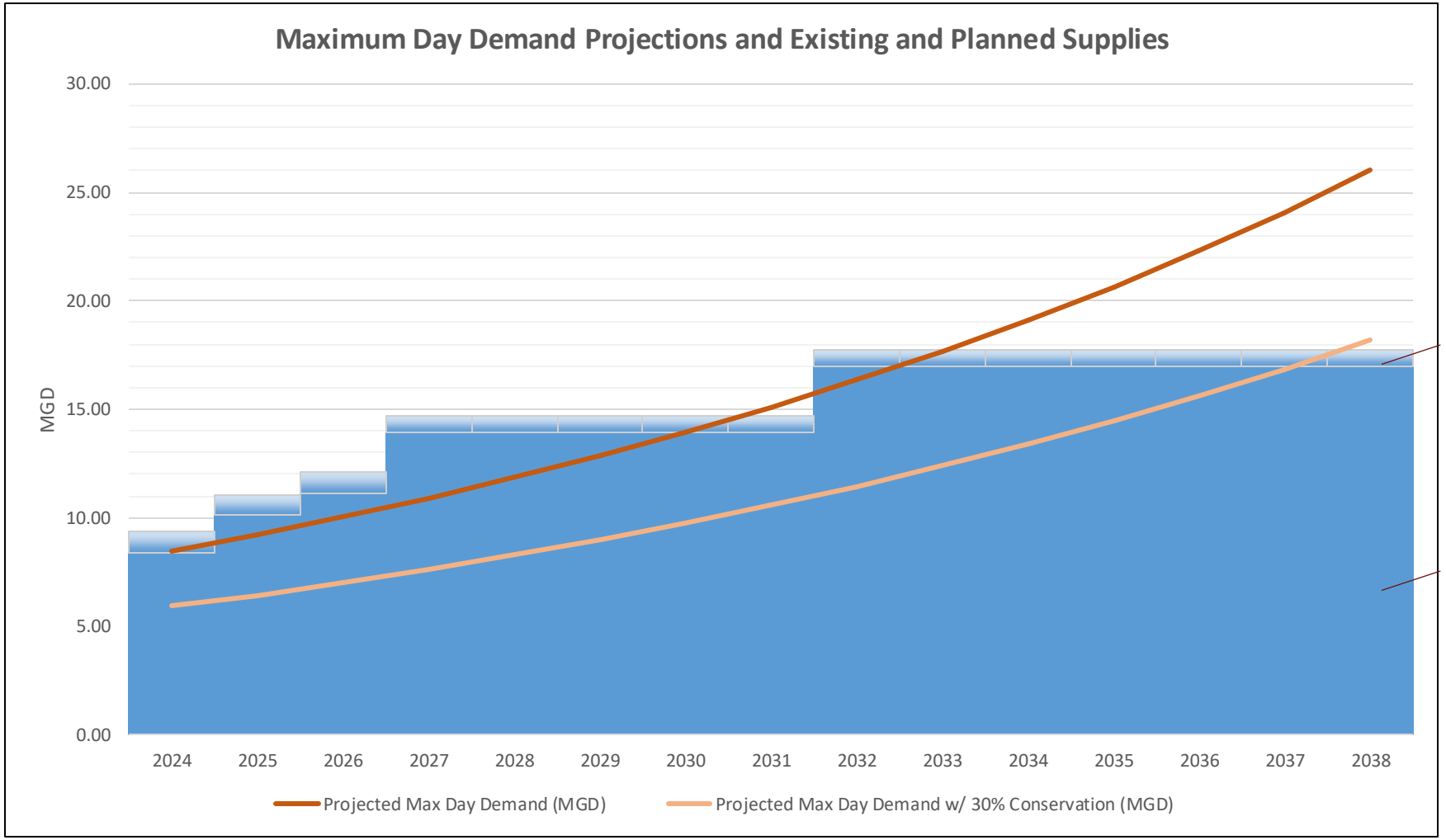
- Water Demand Projections

Year	Total LUE	Additional LUE	Average Day Demand (MGD)	Maximum Day Demand (MGD)
2024	18,484		4.99	8.43
2025	20,148	1,664	5.44	9.19
2026	21,961	1,813	5.93	10.02
2027	23,937	1,976	6.46	10.92
2028	26,092	2,154	7.04	11.91
2029 - 2033	38,783	12,691	10.47	17.70
2034 - 2038	56,985	18,202	15.39	26.00
2039 - 2043	66,061	9,076	17.84	30.14
2044 - 2048	72,126	6,065	19.47	32.91

Water Demand Projections



Water Demand Projections



Total Permitted Supply

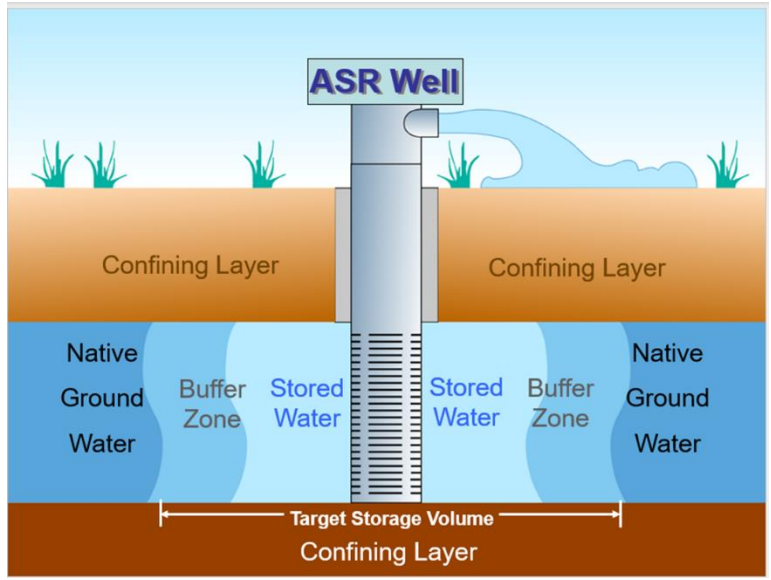
Firm Supply

Key Water Supply Takeaways

- Based on current and planned water supply strategies and demand projections, the City of Kyle has adequate annual water supply for the next 10 years
- Plan for additional operational strategies to be in place by 2030 to manage projected maximum day demands
- Plan for additional supply to be online by 2034

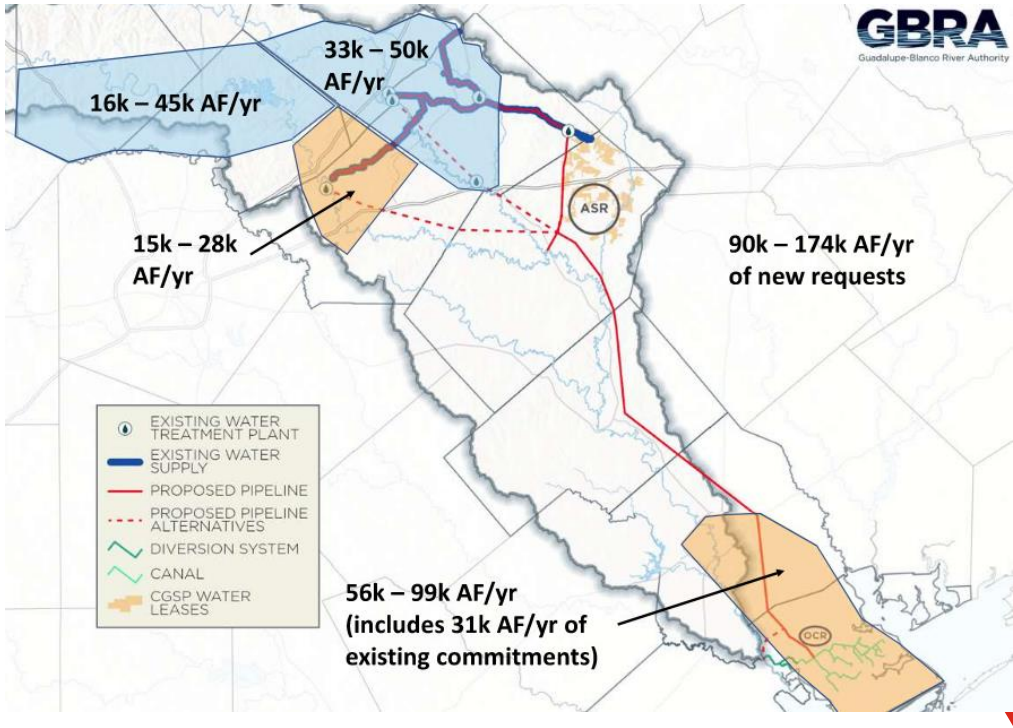
Water Supply Planning Strategies

- **Aquifer Storage and Recovery (ASR)**
  - Anticipate 1 – 2 MGD System to store water during low demand periods to use during high demand periods
  - Appears feasible in middle and lower Trinity Aquifer in vicinity of Kyle
  - System assumed to include 6 wells (300-400 gpm each), piping and storage
  - Test wells would need to be completed to confirm production capacity and water quality
  - Recharge could take 2 – 4 years prior to recovery
- **Benefit:** Operational strategy to manage maximum day demand with existing permitted supply



Water Supply Planning Strategies

- **GBRA WaterSECURE**
  - City is in coordination with GBRA for participation in WaterSECURE program
  - Costs of program participation are still being finalized
  - Up to 4.1 MGD of additional supply anticipated to be available in 2033
  - Recommend continued coordination in regional water supply program
- **Benefit:** Increase diversification of water resources and regional cost sharing



Water Supply Planning Strategies

- **Evaluate Indirect/Direct Potable Reuse**
  - Amend Reclaimed Water Master plan to include feasibility of indirect or direct potable reuse as water supply source
  - Evaluate potential environmental buffers, facility locations, water quantity and quality, public involvement, and development of more detailed cost estimate based on findings
  - Assumed 2 phases, 3.0 MGD expandable to 6.0 MGD for planning purposes
  - Expandable supply that increases as the City grows

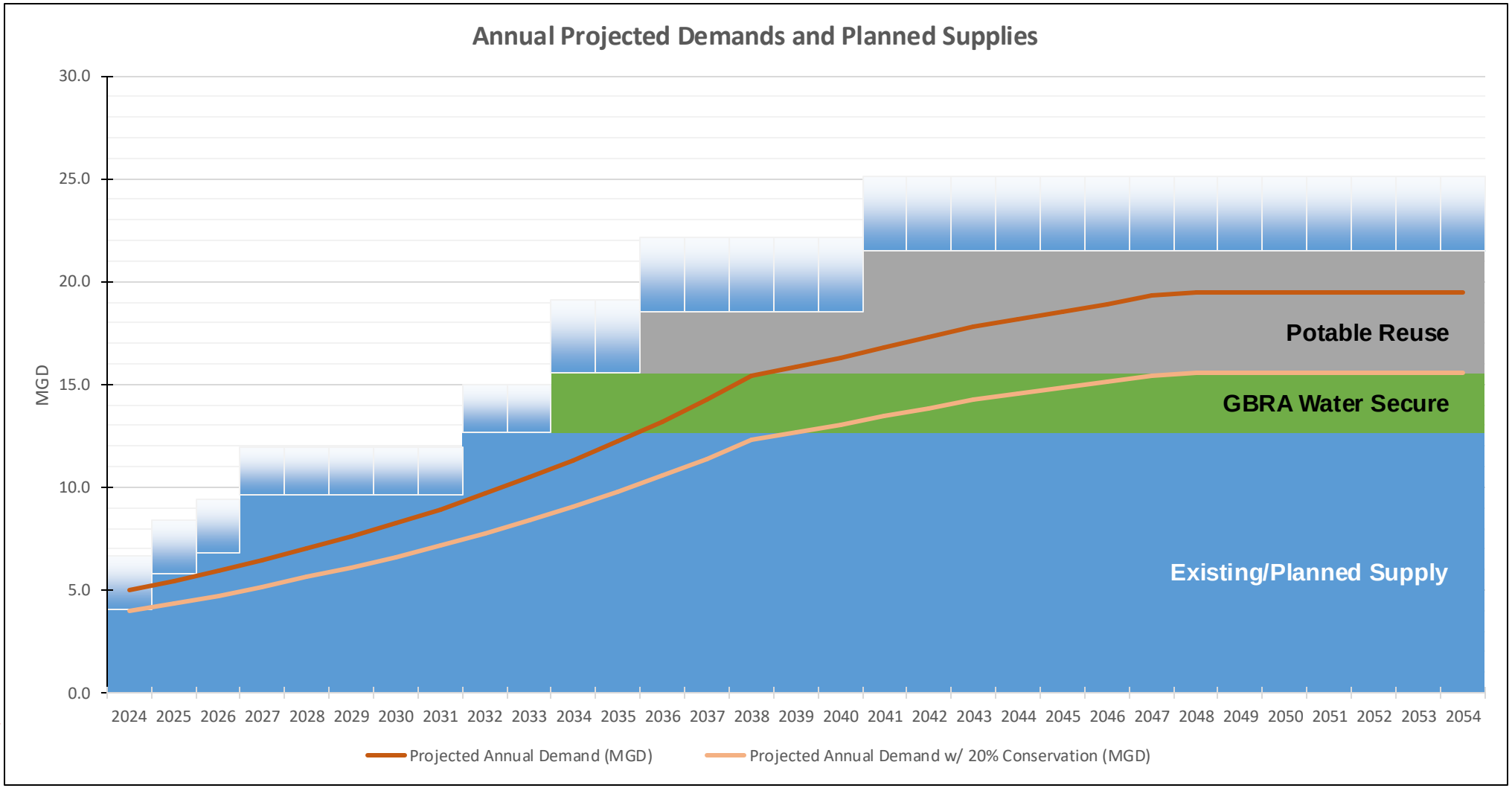
- **Benefit:** Enhances sustainability and utilizes a valuable existing water resource

Water Supply Planning Strategies

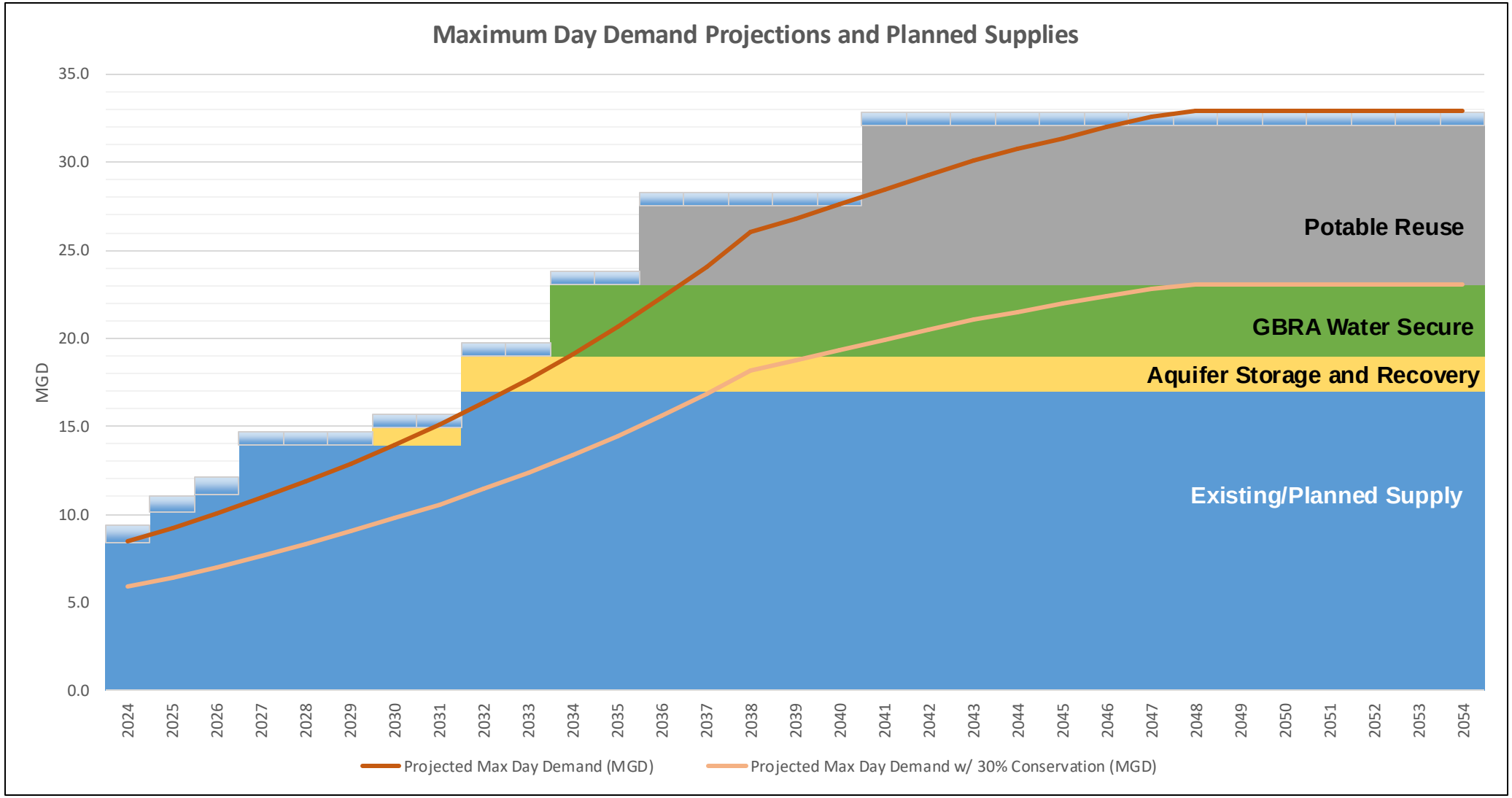
Supply Option	Supply	Capital Cost ($)	Unit Cost ($/ac-ft)	Year Available
Coordination with ARWA Partners	Negotiable		Negotiable	2026
Aquifer Storage and Recovery*	2.0 MGD*	$48,500,000	$21,650	2030
GBRA WaterSECURE	4.1 MGD 4,600 Acre-Ft./Year	-	$55,000	2034
Indirect/Direct Potable Reuse	3.0 MGD (Ph. 1) 3,360 Acre-Ft./Year (Expandable)	$143,000,000	$42,600	2036

* Not an additional supply. This operational strategy stores water received during low demand periods for use during dry and higher demand periods.

Water Supply Planning Strategies



Water Supply Planning Strategies



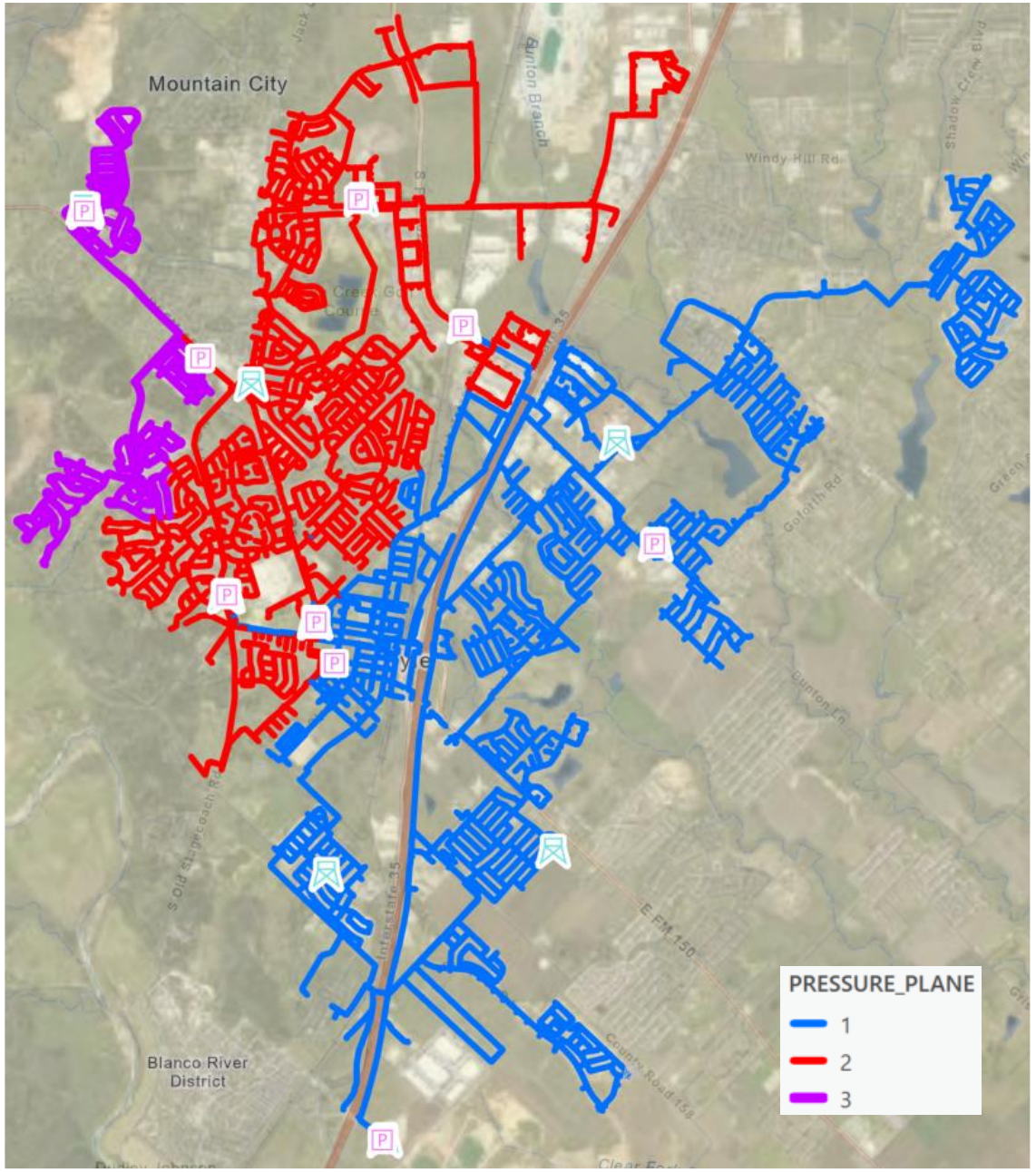
Water Supply Planning Recommendations

- Initiate Feasibility study, field testing, demonstration program, and permitting coordination for Aquifer Storage and Recovery (ASR) strategy
- Amend the Reclaimed Water Master Plan to include a Feasibility Study for Indirect and Direct Potable Reuse strategy
- Continue coordination with GBRA for participation in the WaterSECURE program, including potential to increase supply share
- Continue coordination with ARWA Phase 2 project, including Kyle taking a leadership role in advancing this phase and potential to increase supply share
- Update Water Conservation Plan and Drought Contingency Plan

Infrastructure Improvements

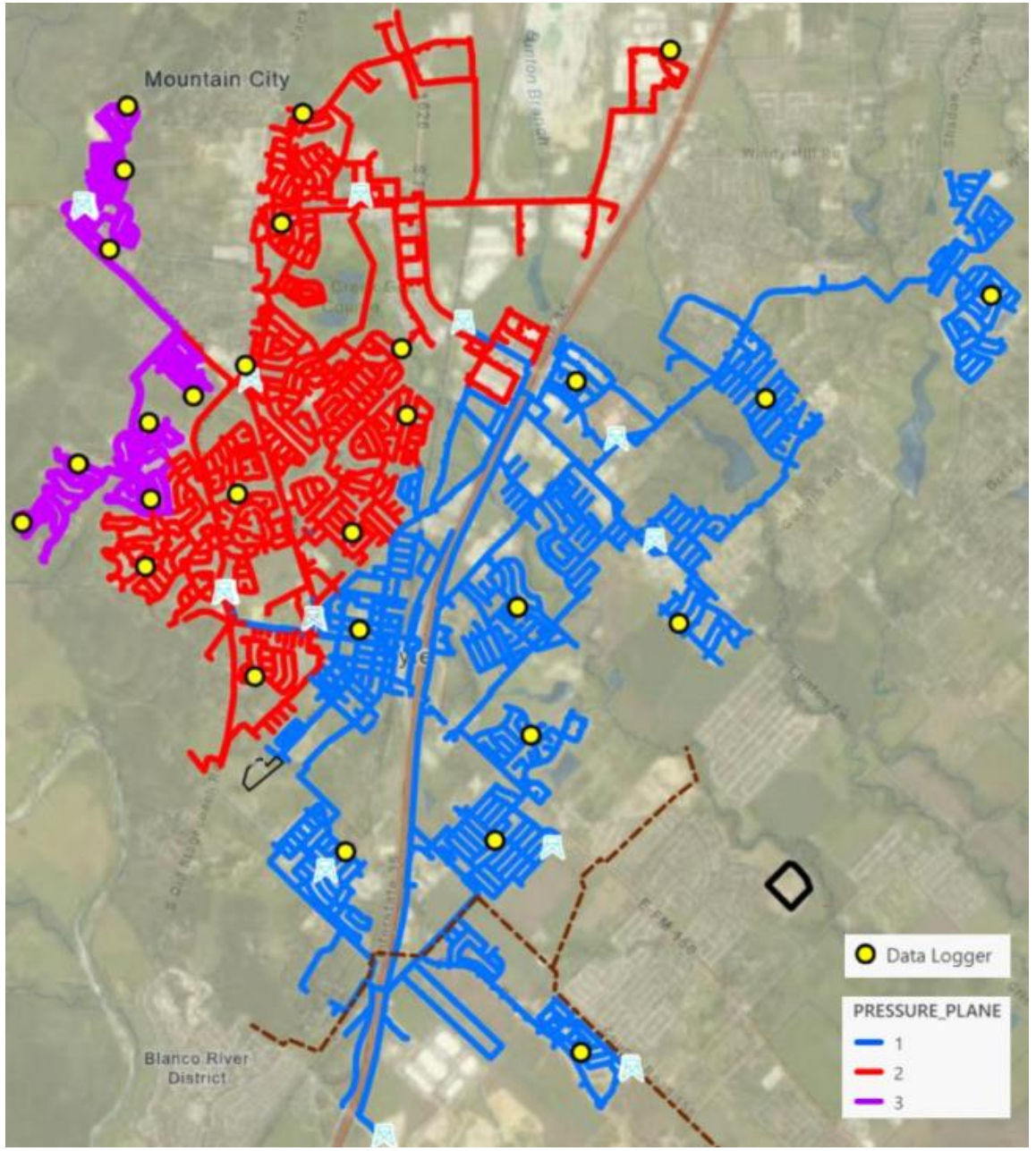
Water Model Update

- Water Model Update and Technical Memorandum completed October 2024
- 3 years billing/water usage reviewed to develop current demand
- Model Calibration completed with July and August conditions



Water Model Update

- Calibration
- Executed by Pressure Plane
- Accuracy within 5%



Water Model Update

Calibrated model utilized to evaluate existing system

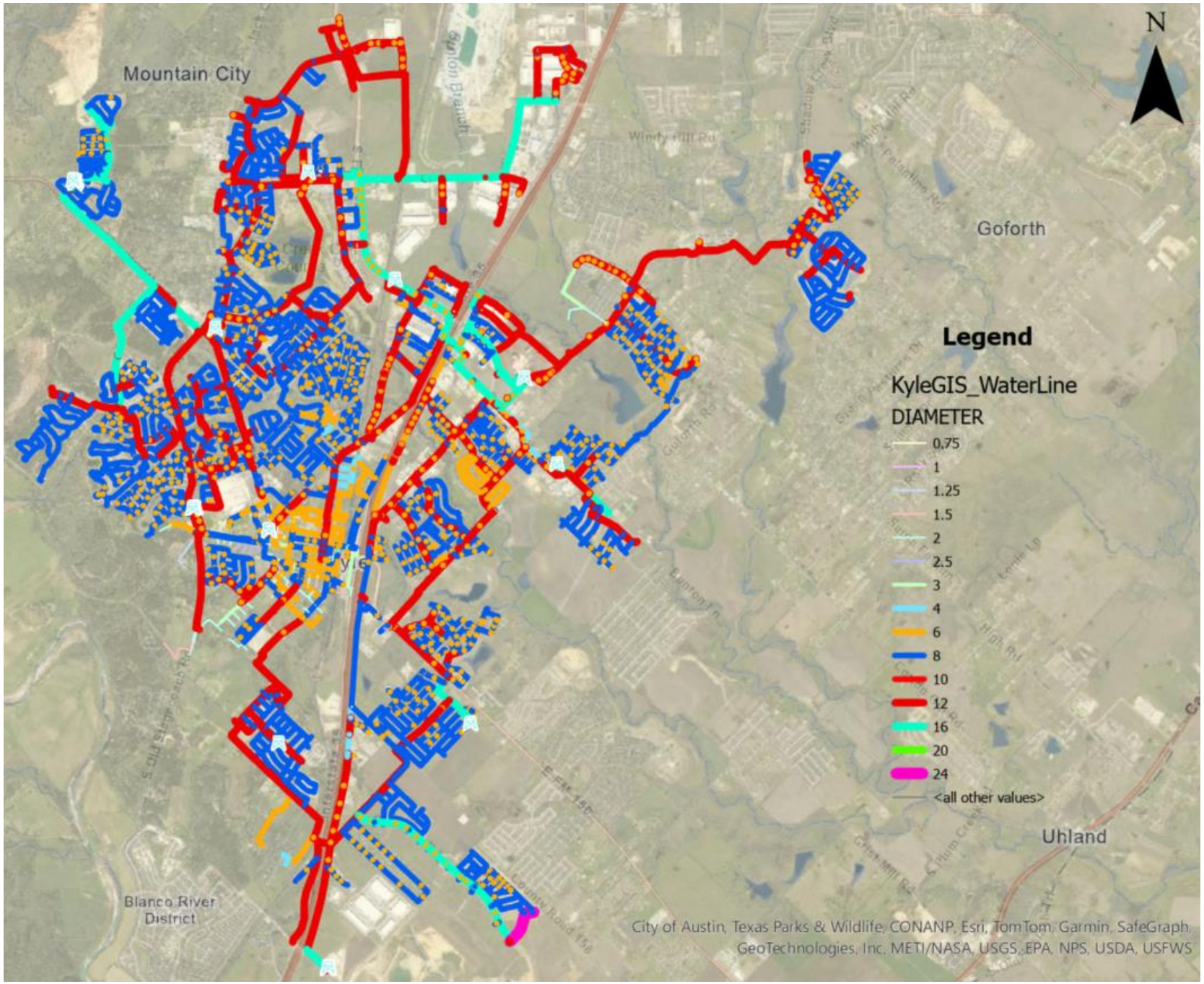
- Pipe diameters evaluated
- Typical system pressures
- Fire Flow available
- Water Age

Pipe Diameters

Pipe improvements will be needed with water demand growth in next 2 years.

ESTs in Pressure Plane 1 will not operate in sync with water demands above current levels.

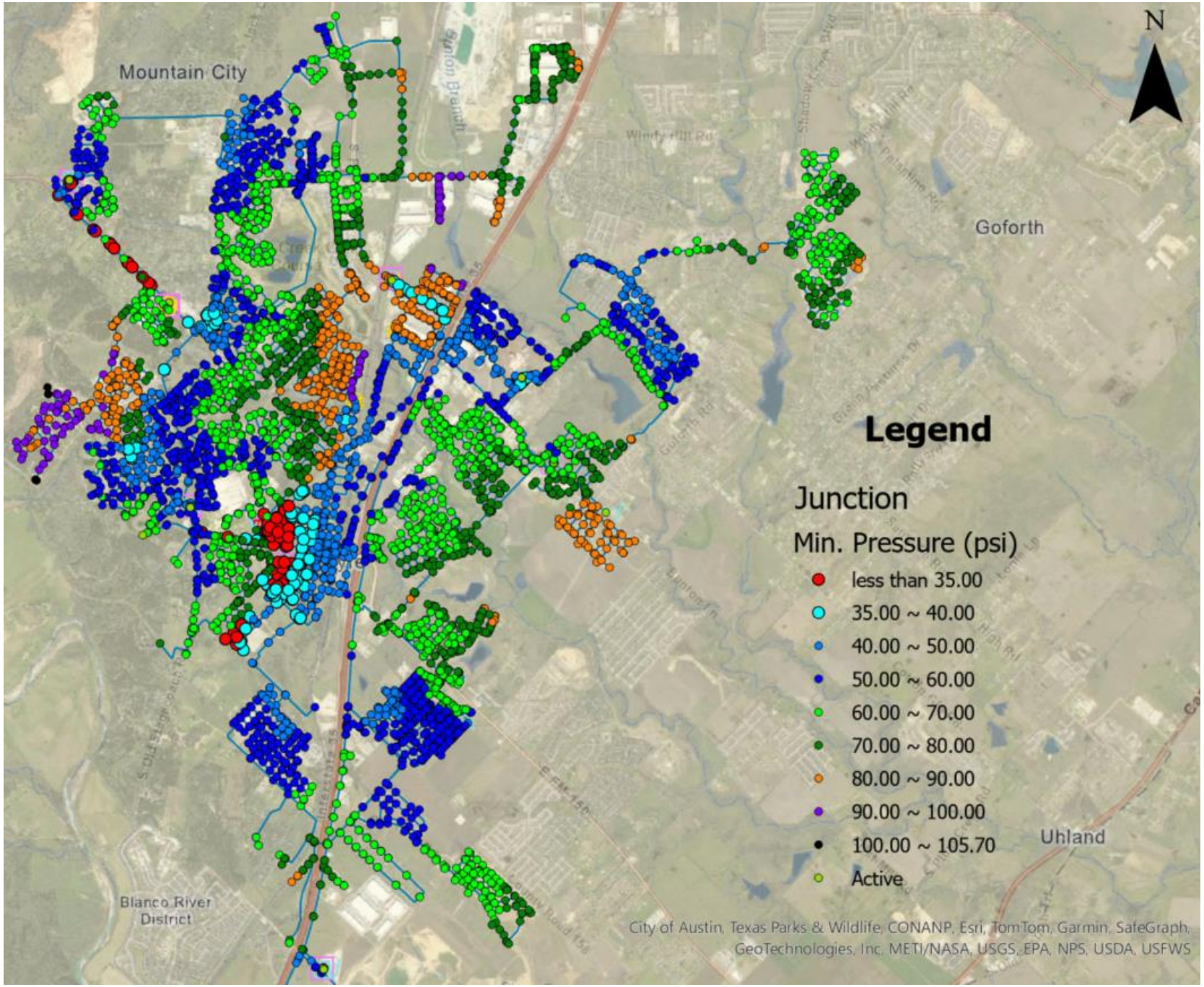
Emergency pipeline projects initiated late 2024, early 2025.



System Pressures

Low pressure conditions in downtown area, Pressure Plane 1.

Propose boundary modifications between PP1 and PP2.



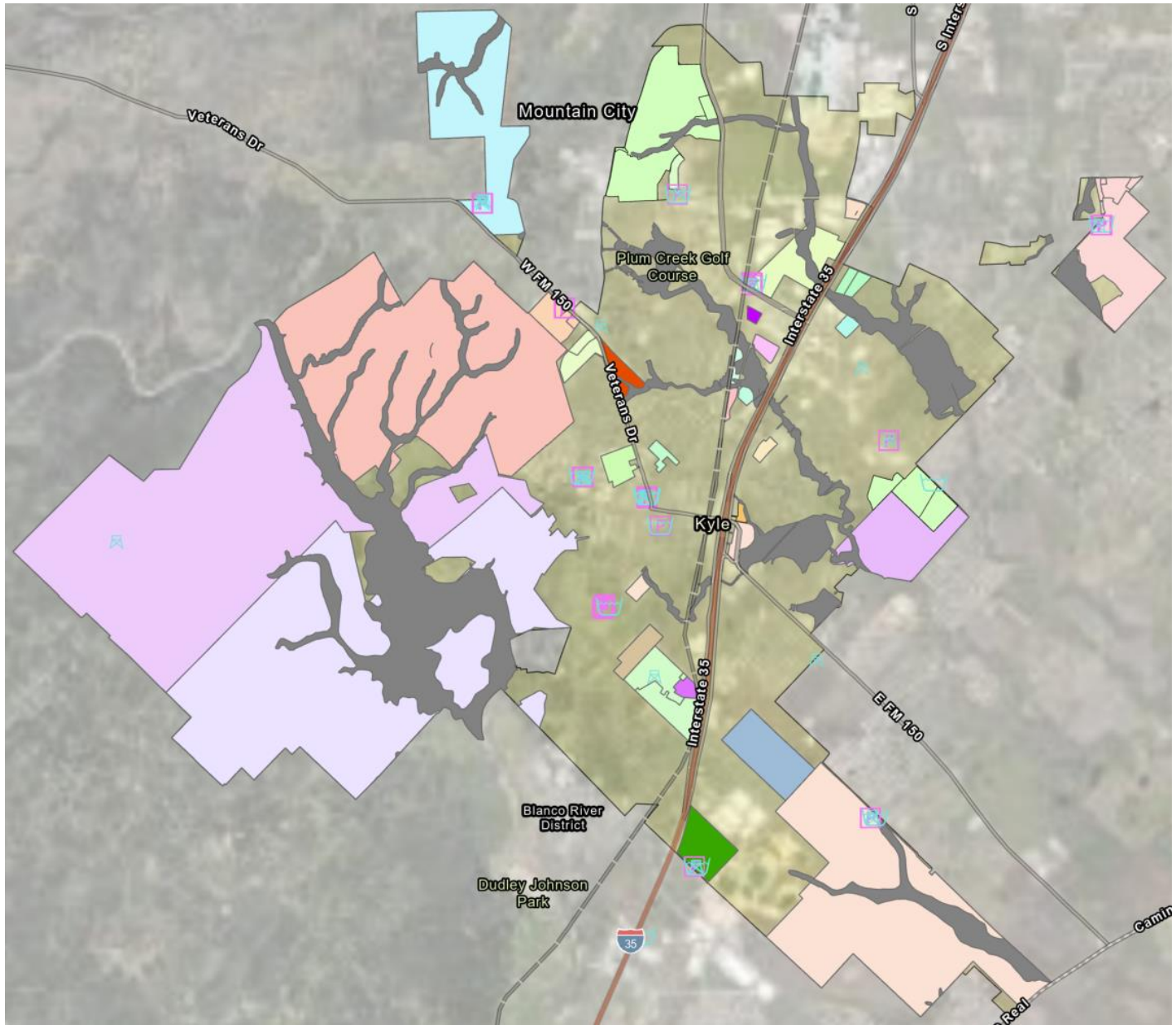
Water Model – Future Scenarios

- 2028
- 2038
- Ultimate

- Max Day Demand
- Peak Hour Demand

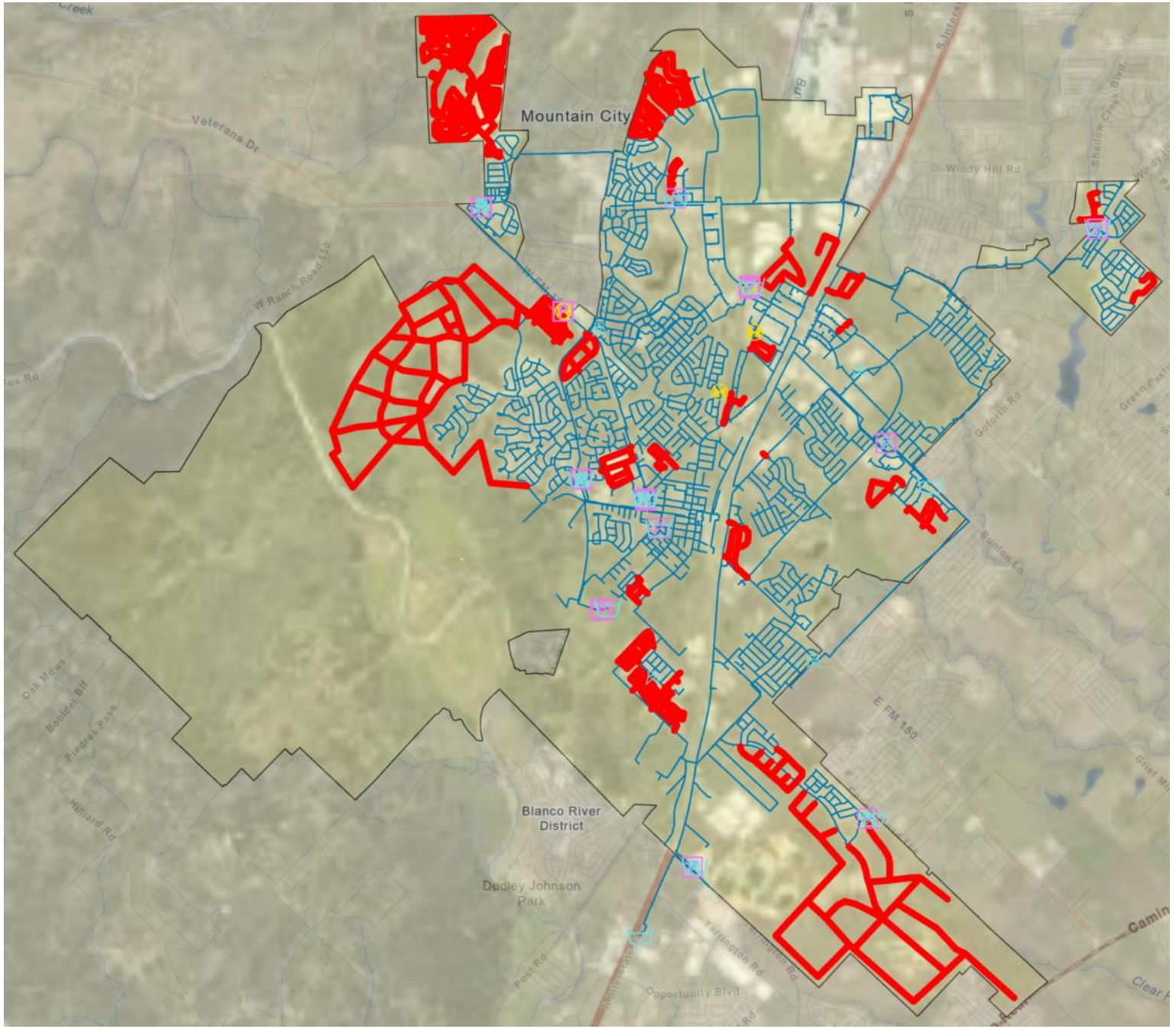
Water Model – Future Scenarios

- 2028 and 2038 Growth Identified in 36 Developments



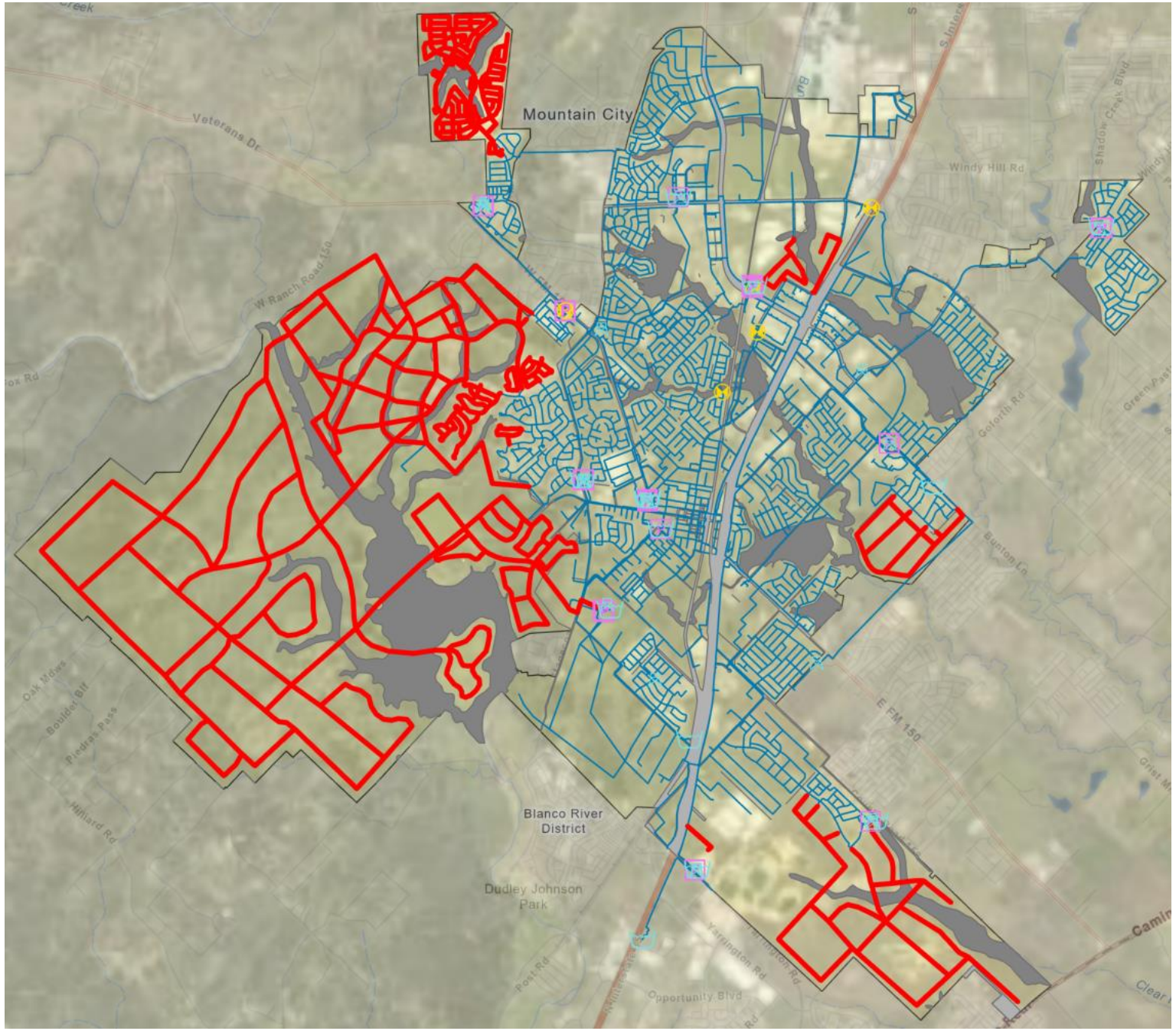
Growth by 2028

- 2024 and
- Development Growth by 2028



Growth by 2038

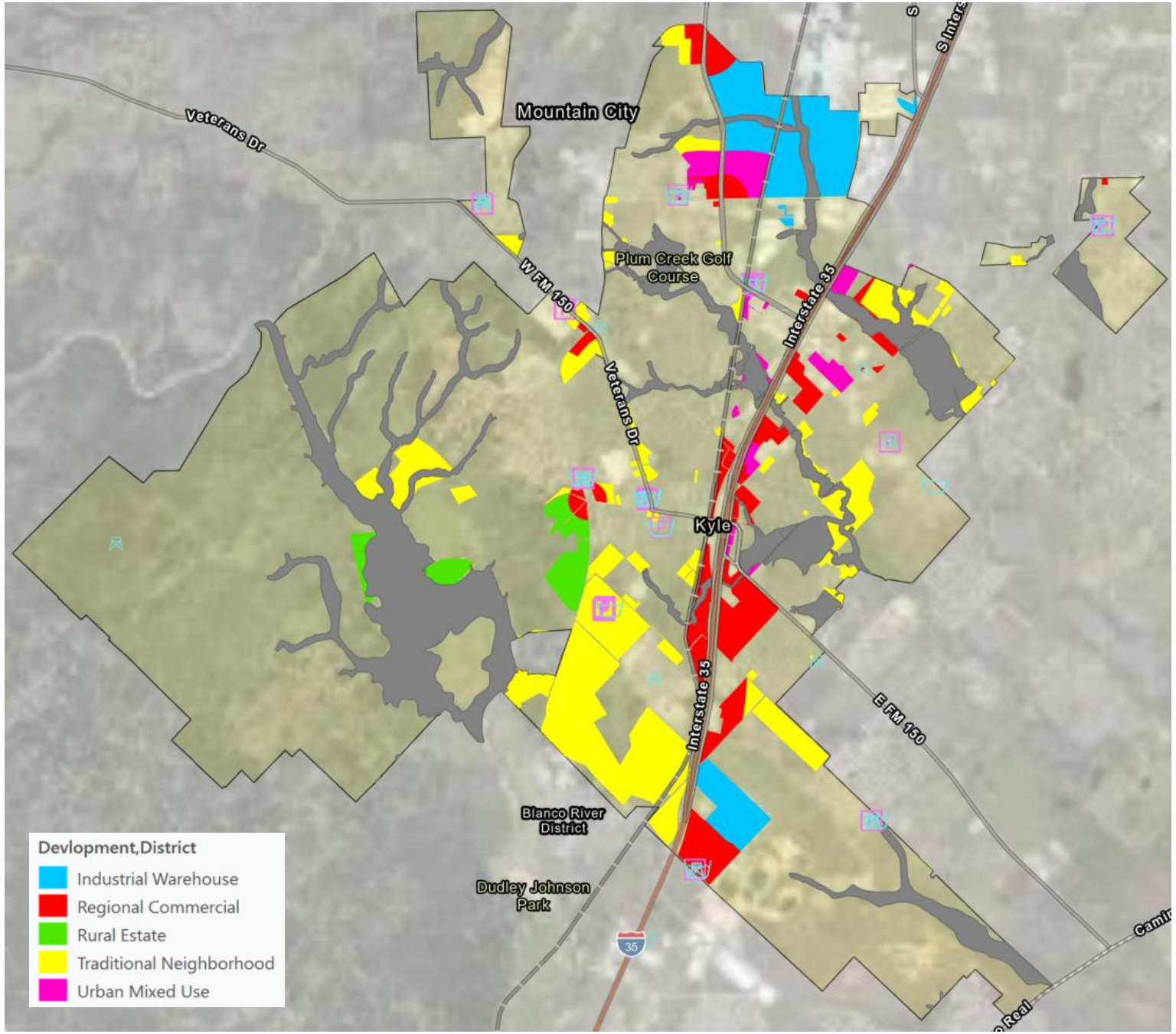
- New Development and Growth in prior Developments by 2038



Additional Growth to Buildout

- Growth projected by land use and size in acres

Land Use	Acres	Estimated LUE/Acre	LUEs
Industrial Warehouse	624	4	2,496
Regional Commercial	630	5	3,150
Rural Estate	213	3	639
Traditional Neighborhood	1,571	4	6,284
Urban Mixed Use	169	15	2,535
Total			**15,104**



System Improvements - Projects Summary

5-Year Timeframe	15-Year Timeframe	Buildout
1. Waterstone PS 2. Waterstone EST 3. Hoover EST 4. Lehman to Post Oak Transmission – 24” 5. Dacy and Seton Extensions 6. Lehman PS 7. 1626 PS to Veteran’s Rd – 16” 8. Waterstone to Post Oak Transmission 9. Pressure Plane Modification 10. ARWA 3 North Transmission 11. ARWA 3 PS 12. Lehman Rd Extension	13. Nance Tract Transmission Line 14. Old Stagecoach Rd Improvements – 16” 15. Nance Tract EST 16. PP4 PS and EST	1. Final expansions of – 1626 PS, Waterstone PS, Lehman PS, ARWA 3 PS 2. Additional GSTs at – 1626 PS, Waterstone PS, Lehman PS, ARWA 3 PS 3. Connect ARWA 3 PS to PP1 4. Additional EST 5. Plum Creek EST replacement

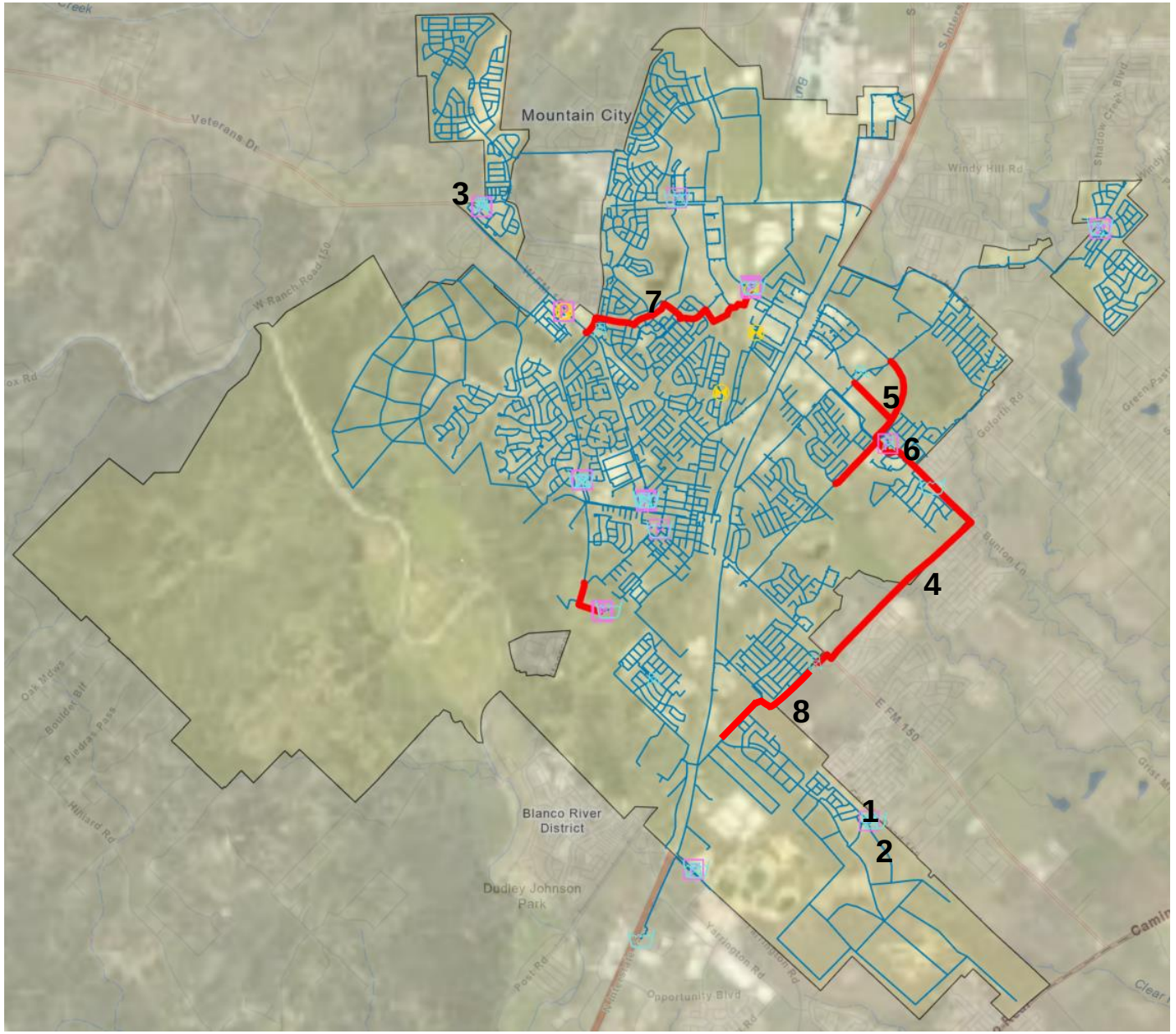
System Improvements - Projects Summary

CIP 2025 – 2029 5-year Timeframe	Start / Status	Completion	Cost Estimate ($)
1. Waterstone Pump Station	In Construction, 2025	2026	$10.08M
2. Waterstone EST	In Construction, 2025	2026	$5.04M
3. Hoover EST	In Construction, 2025	2026	$5.12M
4. Lehman to Post Oak Transmission Line	Design 2025	2028	$19.34M
5. Dacy and Seton Extensions	Design 2025	2028	$8.92M
6. Lehman PS Improvements	Design 2025	2028	$20.65M
7. 1626 to Veteran's Road Transmission Line	2025	2028	$10.95M
8. Waterstone to Post Oak Transmission Line	2025 (2026)	2028 (2029)	$6.38M
9. Pressure Plane Boundary Modification	2026	2029	$10.06M
10. Lehman Road Extension	2028	2032	$3.55M
11. ARWA 3 PS North Transmission Line	2027	2032	$2.78M
12. ARWA 3 Pump Station (plus 30" supply line)	2027	2032	$34.38M

5-Year CIP Total = $137.24M

Capital Improvement Plan

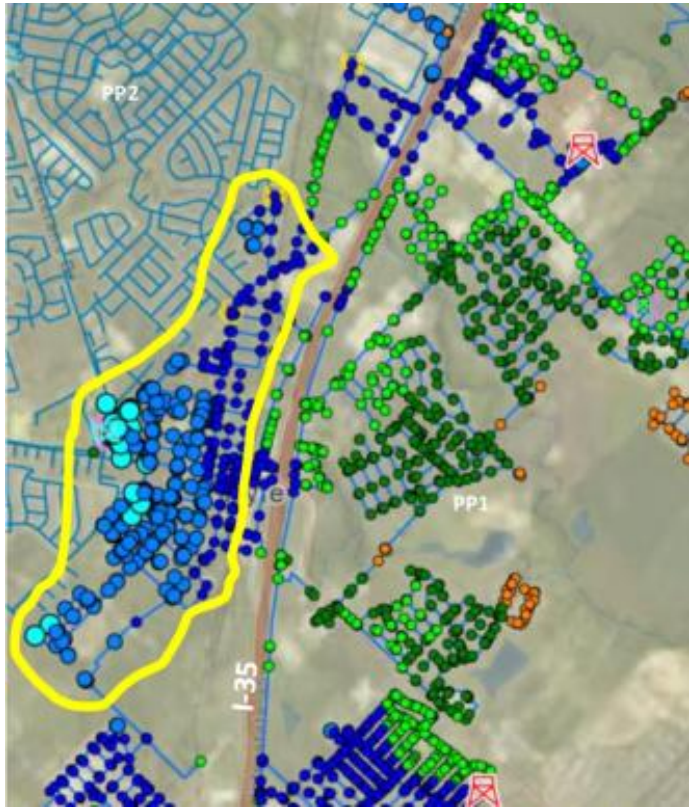
- 2025 to 2029
  - 1 - Waterstone PS
  - 2 – Waterstone EST
  - 3 – Hoover EST
  - 4 – Lehman to Post Oak Transmission Line
  - 5 - Dacy and Seton Extensions
  - 6 – Lehman PS Improvements
  - 7 – 1626 to Veteran's Rd
  - 8 – Waterstone to Post Oak Trans Line

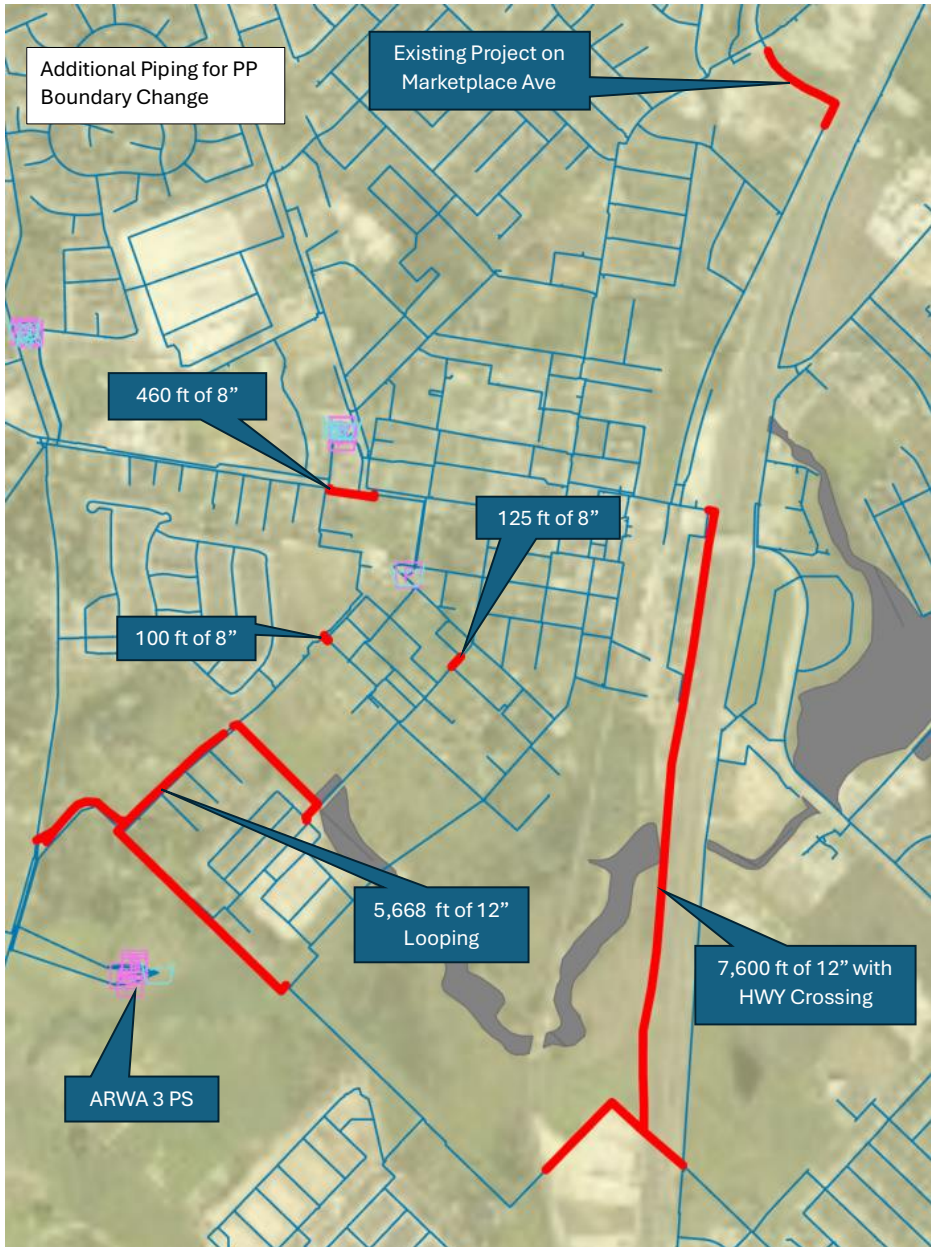


Capital Improvement Plan

- 9. Pressure Plane Modification

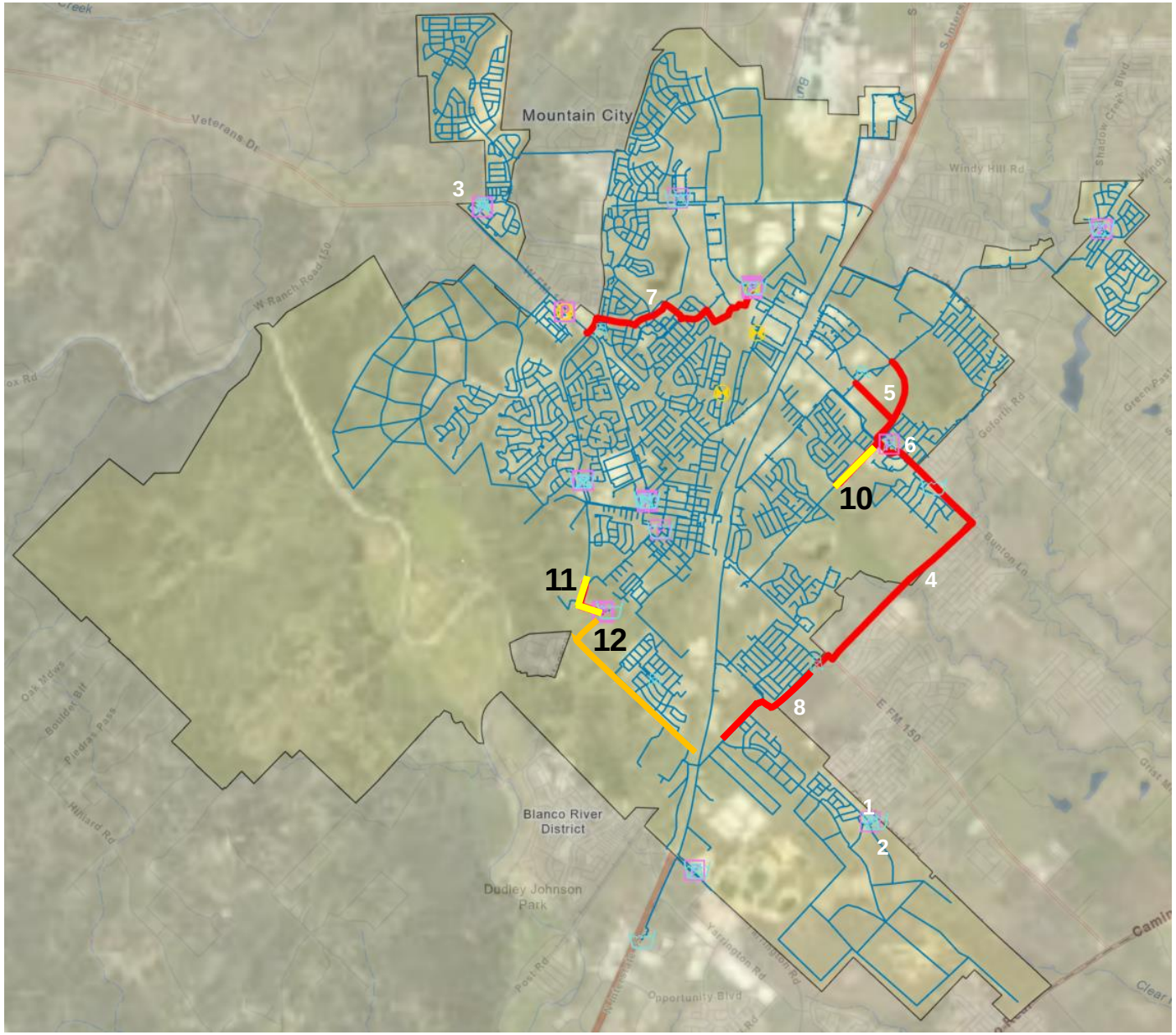
Part of PP1
moved to PP2





Capital Improvement Plan

- 2025 to 2029
  - 10 – Lehman Road Extension
  - 11 – ARWA 3 PS North Transmission Line
  - 12 – ARWA 3 PS (plus 30” Supply Line)



System Improvements - Projects Summary

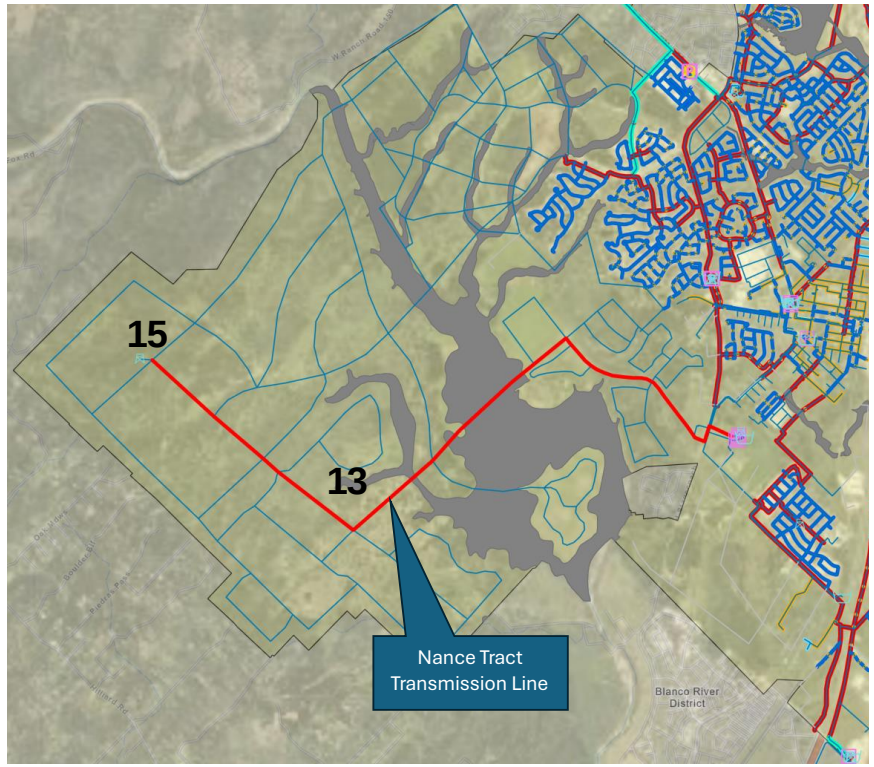
CIP 2030 – 2039 15-Year Timeframe	Cost Estimate ($)
13. Nance Tract Transmission Line	$37.63M
14. Old Stagecoach Road Improvements	$12.67M
15. Nance Tract EST	$6.94M
16. Pressure Plane 4 pump station and EST	$4.63M

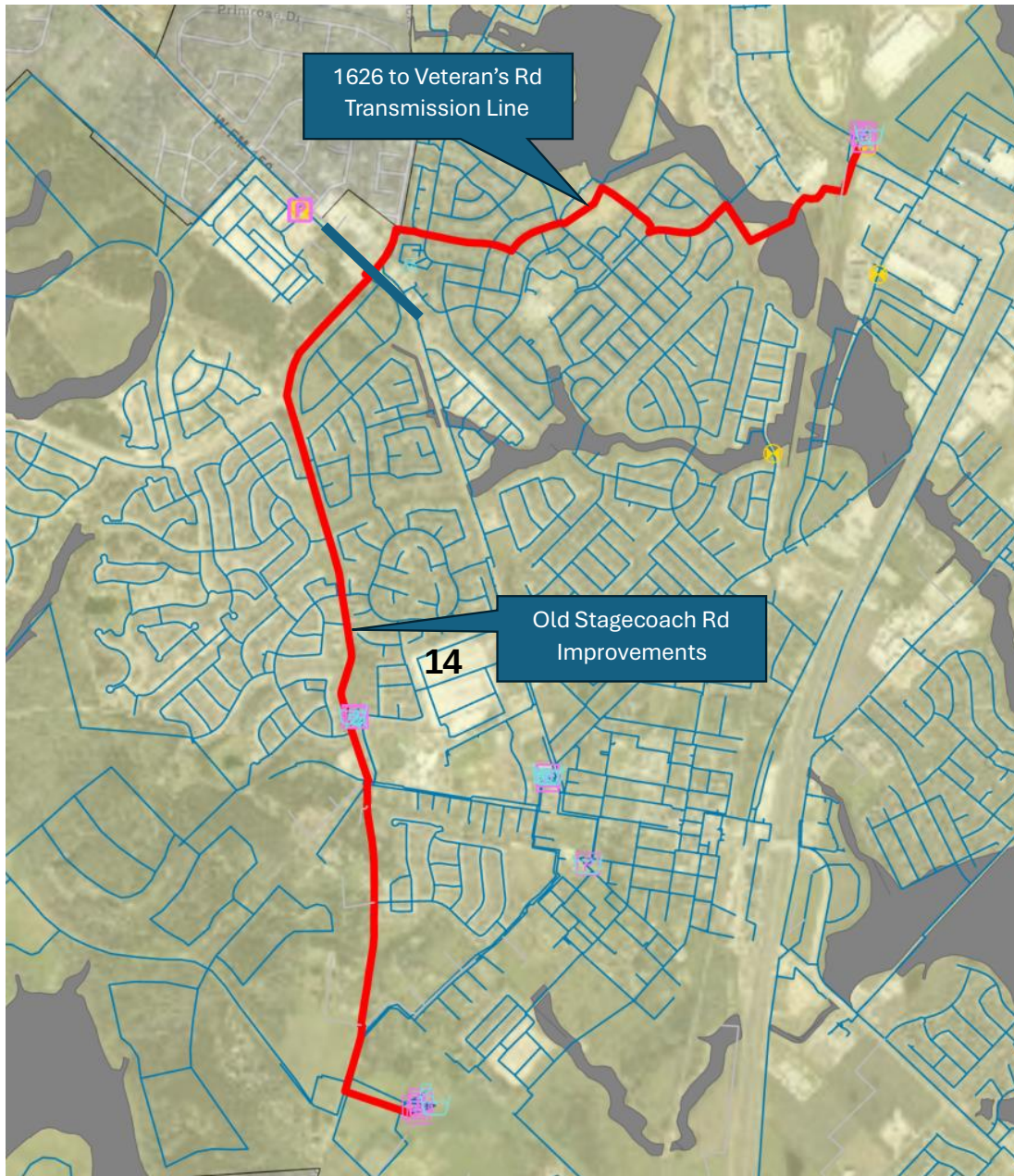
15-Year CIP Total = $61.87M

- Project schedules will be confirmed when project is needed within 5-year timeframe

Capital Improvement Plan

- 2028 to 2039
  - 13 - Nance Tract Transmission Line
  - 14 - Old Stagecoach Rd Improvements
  - 15 – Nance Tract EST

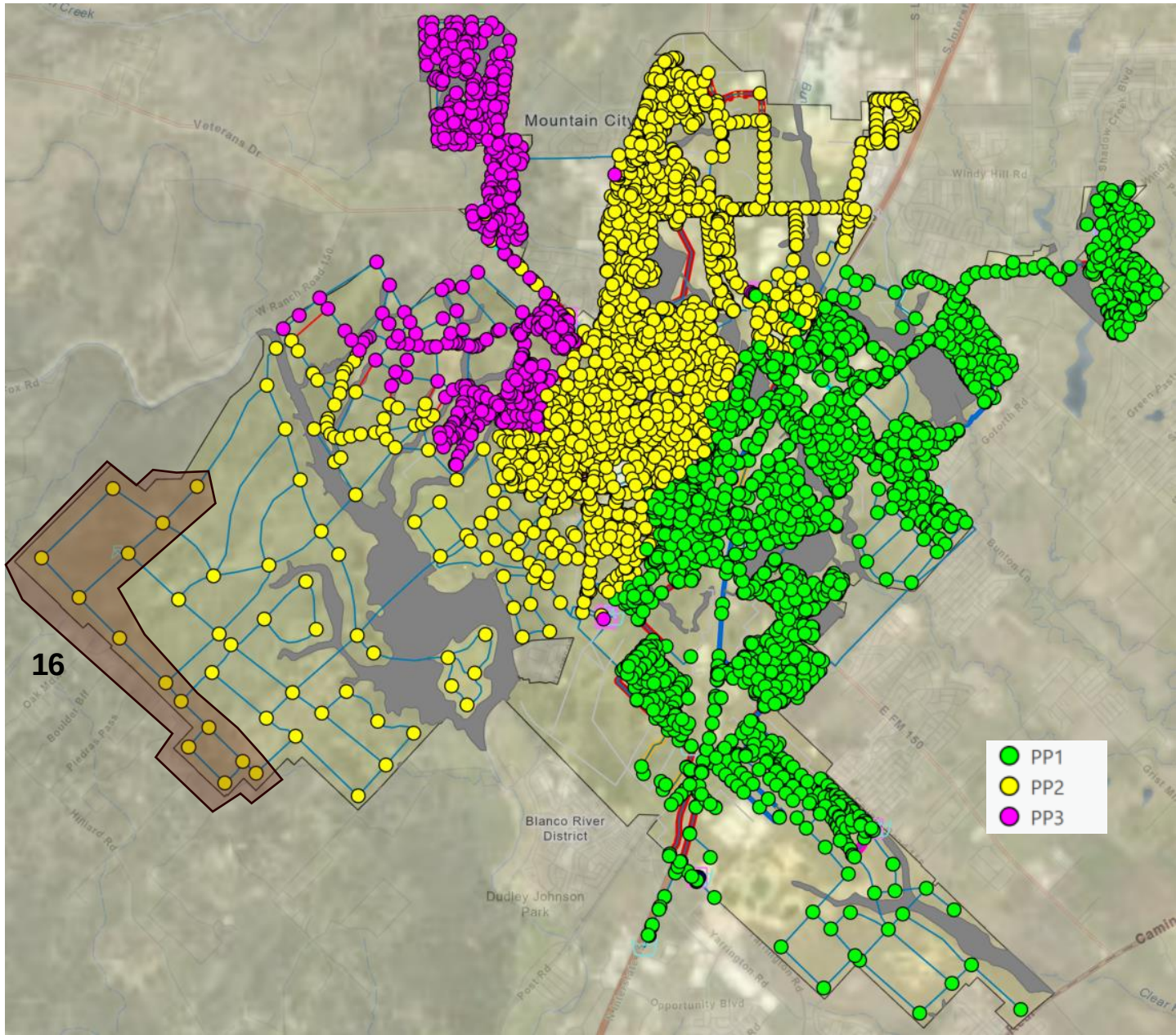




Capital Improvement Plan

- 16 – Pressure Plane 4 pump station and EST

(or hydropneumatic Tank if total connections remain below 2500)

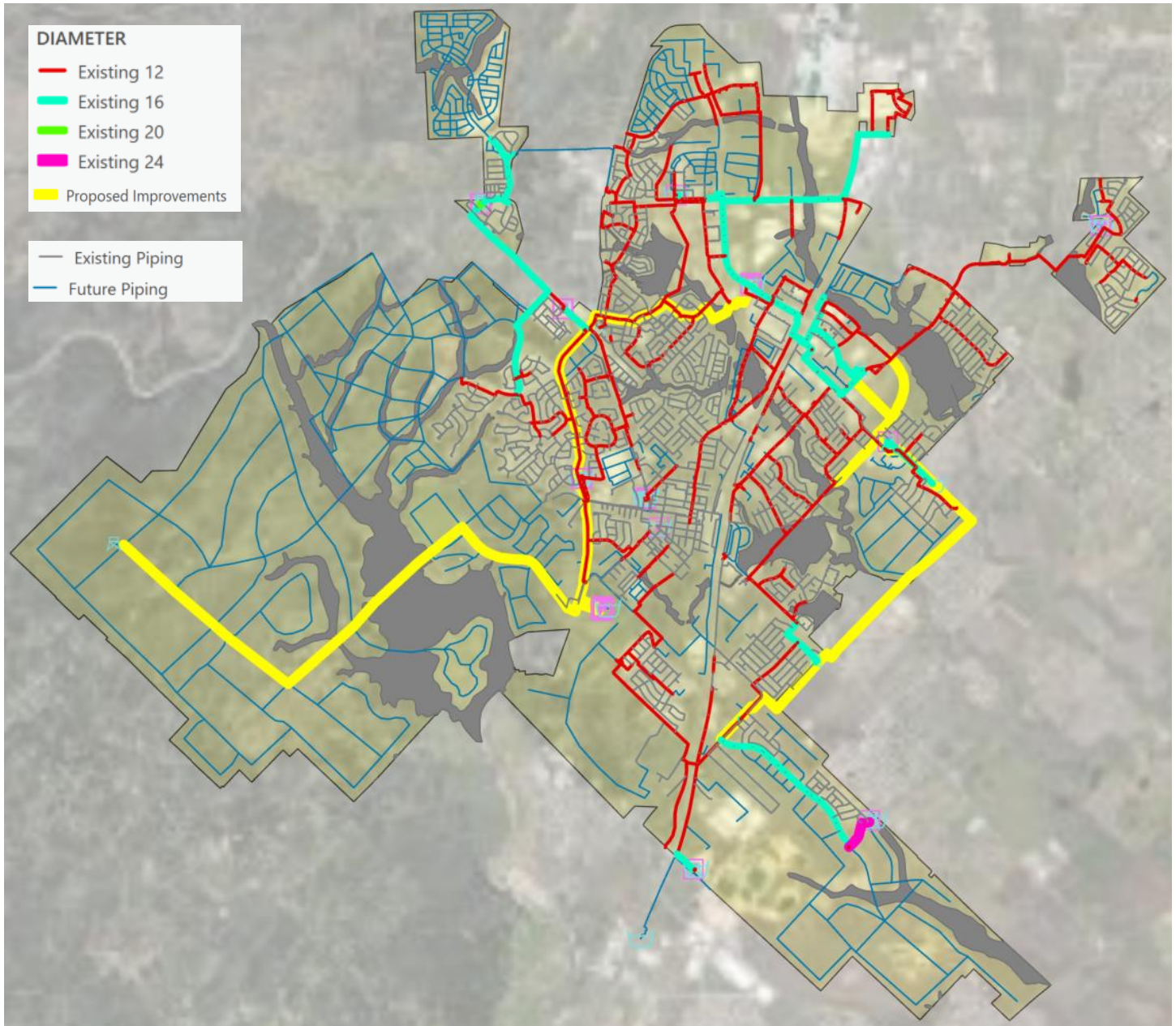


Capital Improvement Plan

- Overview of distribution piping to ultimate buildout.

Other:

1. Plum Creek EST
2. ARWA 3 PS connect to PP1
3. PS Improvements -buildout
   a. 1626 PS
   b. Waterstone PS
   c. Lehman PS
   d. ARWA 3 PS
4. Additional EST



Infrastructure Improvement Recommendations

5-Year Timeframe	15-Year Timeframe	Beyond 15-Year
Population growth planned in 31 developments by 2028. 12 CIP Projects needed to provide system capacity: 1. Waterstone PS 2. Waterstone EST 3. Hoover EST 4. Lehman to Post Oak Transmission – 24” 5. Dacy and Seton Extensions 6. Lehman PS 7. 1626 PS to Veteran’s Rd – 16” 8. Waterstone to Post Oak Transmission 9. Pressure Plane Modification 10. Lehman Rd Extension 11. ARWA 3 North Transmission 12. ARWA 3 PS Total Estimated Cost = $ 137.24M	Population growth planned in 36 developments. 36 Developments planned to be fully built out by 2038. 4 CIP Projects needed to provide system capacity: 13. Nance Tract Transmission Line 14. Old Stagecoach Rd Improvements – 16” 15. Nance Tract EST 16. PP4 PS and EST Total Estimated Cost = $ 61.87M	Population Growth primarily in acreage not identified as specific development to date. Located internal, not on the edges of the CCN. 1. Final expansions of – 1626 PS, Waterstone PS, Lehman PS, ARWA 3 PS 2. Additional GSTs at – 1626 PS, Waterstone PS, Lehman PS, ARWA 3 PS 3. Connect ARWA 3 PS to PP1 4. Additional EST 5. Plum Creek EST replacement

Conclusions and Recommendations

- Initiate Feasibility study, field testing, demonstration program, and permitting coordination for Aquifer Storage and Recovery (ASR) strategy
- Amend the Reclaimed Water Master Plan to include a Feasibility Study for Indirect and Direct Potable Reuse strategy
- Continue coordination with GBRA for participation in the WaterSECURE program, including potential to increase supply share
- Continue coordination with ARWA Phase 2 project, including Kyle taking a leadership role in advancing this phase and potential to increase supply share
- Update Water Conservation Plan and Drought Contingency Plan
- Incorporate Capital Improvement Projects into 5-year CIP
- Consider Federal and State Funding assistance programs for water supply projects
- Update demand projections annually to confirm water strategies and capital program align with current priorities and schedules
- Update Water Master Plan periodically (every 3 to 5 years) to review and update overall strategies and update capital improvement plan

Questions?

Next Steps

- Director will go over next steps towards the development of the water master plan to include comments from City Council.