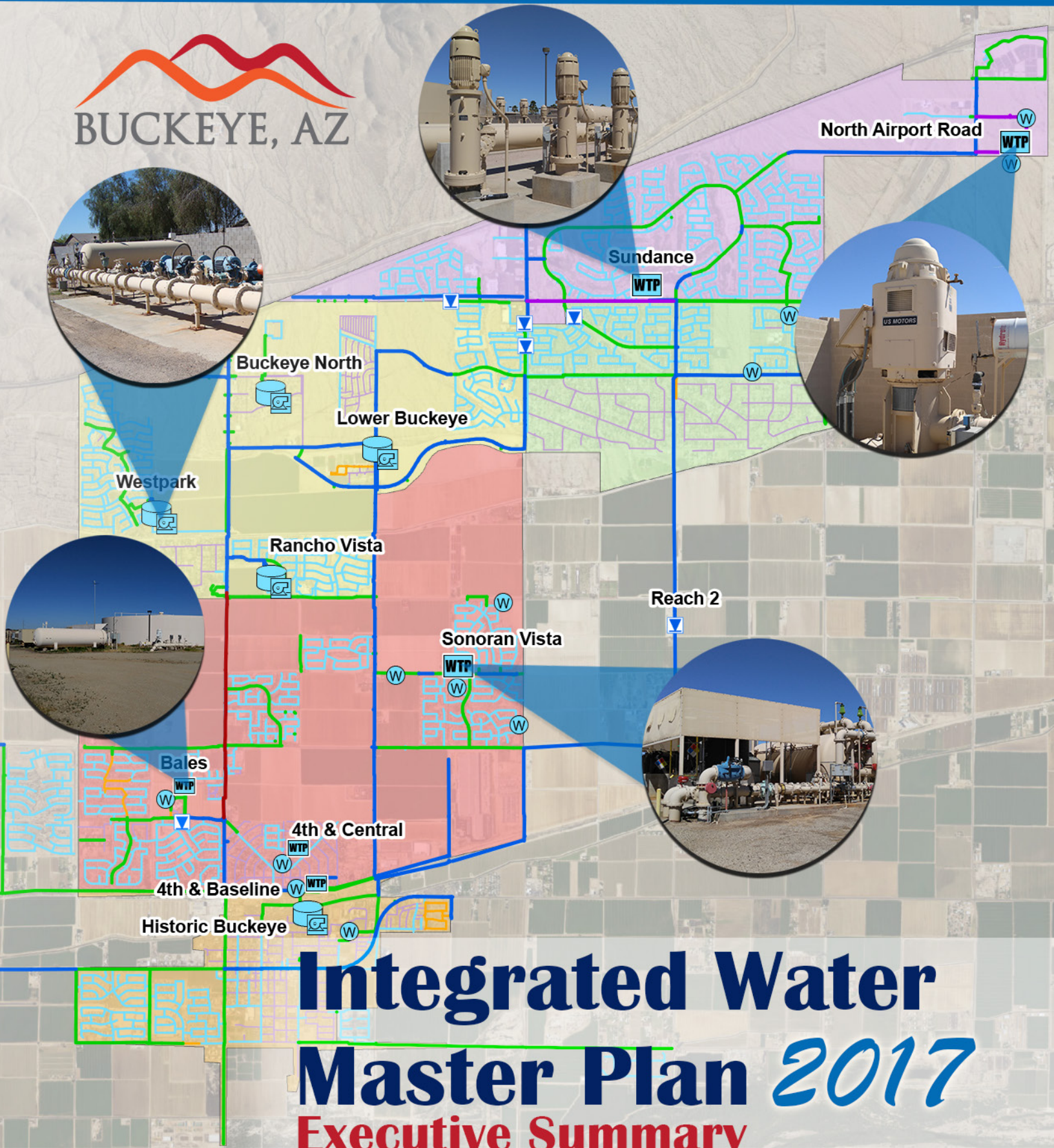



BUCKEYE, AZ



Integrated Water Master Plan 2017

Executive Summary

Final

June 2017


Engineers...Working Wonders With Water®

Water Resources Master Plan

Buckeye’s approach to managing water resources is critical to planning future development.

Arizona water law requires a 100-year assured water supply before a development can be constructed. The two paths that can be taken to obtain an assured water supply are summarized below. The City of Buckeye should carefully consider the water resource recommendations that can prepare the City for future growth.

Path 1 - CAWS	Path 2 - DAWS
Developers obtain a Certificate of Assured Water Supply (CAWS) from the Arizona Department of Water Resources (ADWR). This is the path currently taken by Buckeye.	The City of Buckeye obtains a Designation of Assured Water Supply (DAWS) from ADWR. Buckeye has applied for a DAWS but ADWR has not completed its review.
City Benefits	
The City does not need to comply with DAWS management requirements.	<ul style="list-style-type: none"> • The City has greater control over its destiny. • The new development process is simplified, especially for commercial, and industrial customers. • The City manages growth, not ADWR. • Aquifer replenishment costs may be reduced. • Water conservation can be used to serve a larger population for the same water supply. • Exempt well drilling can be regulated.
Actions, Authority, Responsibilities	
Developers enroll in the Central Arizona Groundwater Replenishment District (CAGRDR) to become a member land and obtain a 100-year CAWS from ADWR.	The City finalizes its application once approved by ADWR, then renews the application every 15 years. The City enrolls in the CAGRDR to become member service area to show consistency with ADWR management goals and to pump groundwater to the extent that other water supplies are not available.
Water customers pay annual CAGRDR fees through property taxes based on the customer’s actual water use.	The City pays annual CAGRDR fees that are recovered via the water bill of every customer. The City takes actions to reduce replenishment costs.
The City is not required to build a water resource portfolio, but may choose to implement recharge facilities and water conservation measures.	The City is responsible for purchasing or leasing water supplies as well as implementing water conservation measures to ensure a sufficient water supply.
The CAGRDR and ADWR can limit growth using the CAWS application process.	The City manages growth so that water demand is less than the available supply.
The CAGRDR is responsible for aquifer recharge, but currently does not recharge in Buckeye. The City may recharge reclaimed and Central Arizona Project (CAP) water in Buckeye to sustain the aquifer and lower CAGRDR fees. CAP groundwater credits are limited to annual storage and recovery.	The City will implement recharge facilities to sustain the aquifer and to use reclaimed water as a reliable water resource in its portfolio. The City can accrue long-term storage credits with CAP water.

Path 1 - CAWS	Path 2 - DAWS
Cost Line Items	
CAGRDR enrollment (\$700/commercial lot, \$285/residential lot) and activation (\$610/lot) fees are paid by developer and pass to the homeowner.	CAGRDR enrollment fees are already paid by the City (\$5,000). Activation fees (\$610/lot) are paid by developers and passed to customers in the home price.
CAGRDR annual membership (\$22.63/lot) and annual replenishment/taxes (\$697/AF) are paid by customers via property tax.	CAGRDR annual membership (\$74.44/AF) and annual replenishment assessment/taxes (\$697/AF) are paid through water rates by all customers.
—	The customer is not able to deduct annual CAGRDR fees from State and Federal income tax at customer's marginal tax rates.
Customers pay recharge facility capital and O&M costs, possibly with CAGRDR participation.	Recharge facility capital and operating costs are paid by customers.
CAGRDR annual fees can be reduced by: <ul style="list-style-type: none"> • Water conservation on the customer's property. • Use of "phase-in" groundwater credits. • Recharging reclaimed water at a lower cost. • Acquire surface water at a lower cost. 	CAGRDR fees can be reduced by: <ul style="list-style-type: none"> • Water conservation citywide. • Cost sharing with customers not enrolled in CAGRDR. • Recharging reclaimed water at a lower cost. • Acquire surface water at a lower cost.
Recommendations	
Quantify the reclaimed water commitments the City has already made to developers.	
Revise current policies to commit as much future reclaimed water as possible for recharge.	
Revise development policies on landscaping to reduce outdoor water use.	
Construct a recharge facility to store the City's CAP water allocation to offset groundwater pumping. If the City is successful in obtaining a CAP NIA allocation, the recharge facility would be sized to recharge the CAP-NIA water as well.	
Purchase CAP NIA water if it becomes available.	
Complete an investigation into additional water resources that could be obtained to enable continued growth while minimizing the commitment to the CAGRDR.	
Construct recharge facilities to sustain the aquifer and reduce CAGRDR annual assessments.	Construct recharge facilities to sustain the aquifer and provide a reliable water source in the City's water resource portfolio.
Continue to maximize the use of "Phase in" groundwater credits.	—
—	Work with ADWR to determine if groundwater in the Buckeye water logged area can be designed for a 100-year assured water supply.
—	Revisit the decision to obtain a DAWS when the recommendations listed above have been completed.

Note: CAGRDR costs are based on 2016/2017 rates

With recharge facilities, reclaimed water would provide 1/3 of Buckeye's renewable water supply. Revised water conservation and development policies could significantly increase the value of reclaimed water.

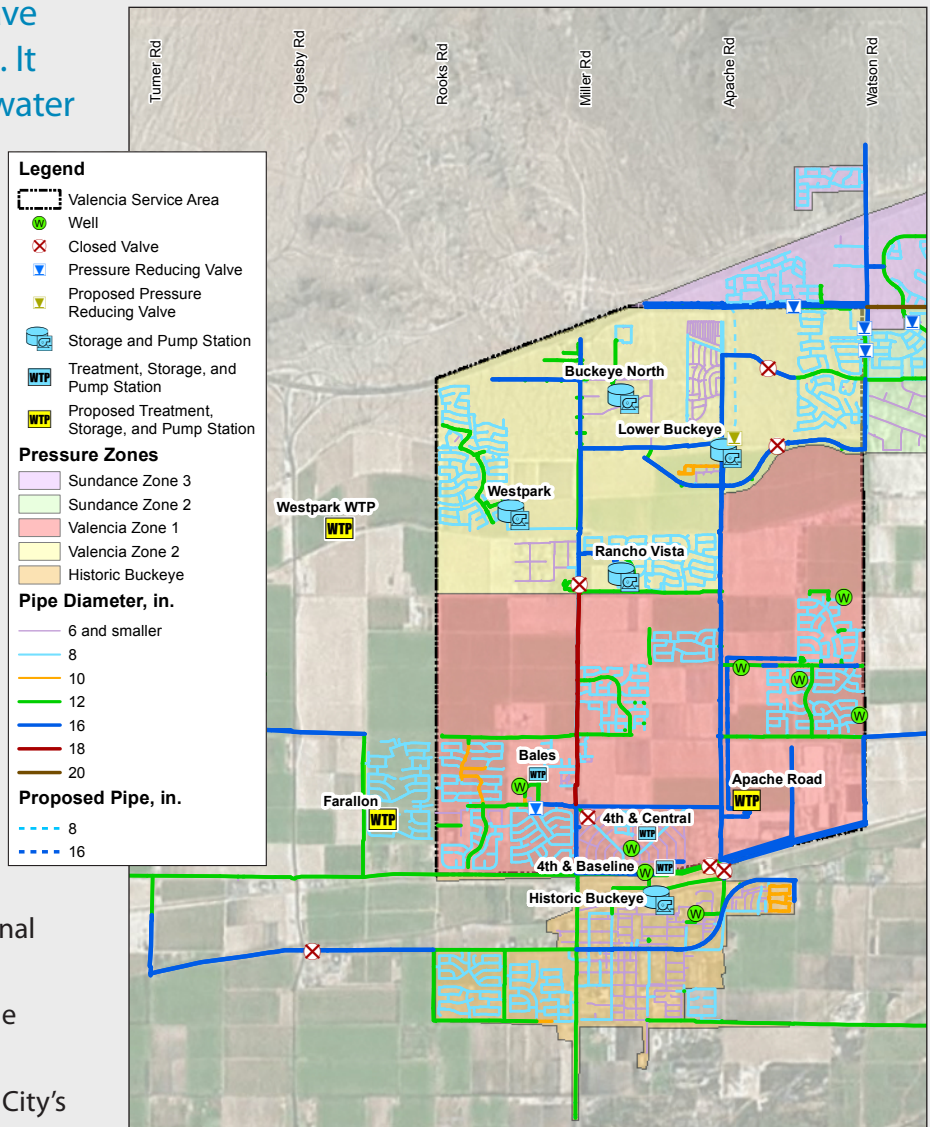
Valencia Water System Master Plan

The Valencia Water System will have a new treatment facility and wells. It will be aligned with the Buckeye water distribution system.

The City of Buckeye purchased the Valencia water system in 2015. This purchase provides Buckeye with the opportunity to create an interconnected municipal water system to provide improved reliability. By buildout, the Valencia service area will be served by the Apache Road, Farallon, and Westpark Water Treatment Plants (WTPs).

Buckeye is committed to improving service to customers in the Valencia service area and is working to accomplish the following objectives to provide better service:

- ▶ Construct new wells and the new regional Apache Road WTP.
- ▶ Align the Valencia water system with the Buckeye pressure zones.
- ▶ Bring the Valencia water system up the City's design criteria standards.



Valencia Water System with Phase 1 infrastructure, including the Apache Road WTP.

Valencia Service Area Capital Project Summary

Capital improvements for the Valencia water system through buildout are grouped into four phases: Phases 1 and 2 focus primarily on upgrading and aligning the current water system, with some capacity for growth, while Phases 3 and 4 are completely dependent on growth. Phase 1 improvements are underway.

	Capital Project Summary	Planning Level Cost
Phase 1	Construct Apache Road WTP and additional wells to provide 8 mgd of water supply	\$73,616,000
Phase 2	Convert the Valencia Water System to Buckeye pressure zones	\$22,516,000
Phase 3	Construct the portion of Farrallon WTP with wells to provide 8 mgd of water supply	\$65,078,000
Phase 4	Construct the remaining water supply and transmission mains for buildout	\$112,892,000
Total		\$274,102,000

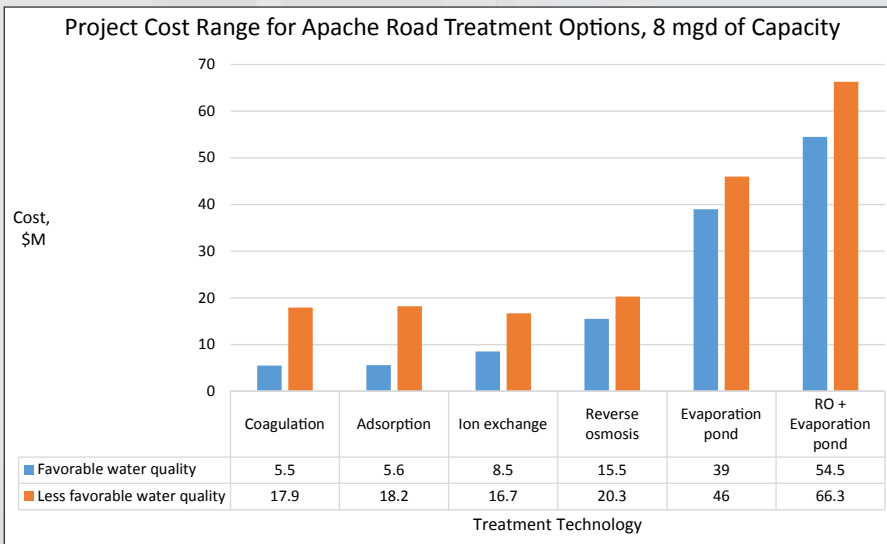
Water Quality Plan

Regional well water treatment provides the best opportunity to improve water quality.

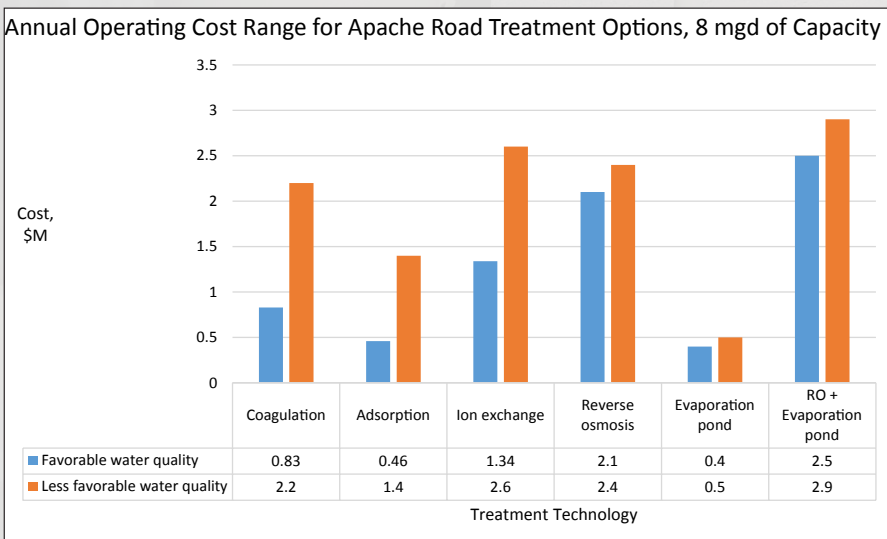
The treatment technology and cost for the proposed Apache Road WTP in Valencia will depend on well water quality. The table below lists potential treatment technologies that would be appropriate for Buckeye’s ground water.

Treatment Technology	Constituents Removed
Coagulation	Arsenic
Adsorption	Arsenic
Ion Exchange	Arsenic, Nitrates
Reverse Osmosis (RO) (including evaporation ponds for brine disposal)	Arsenic, Nitrates, Fluoride, TDS

Although Reverse Osmosis (RO) treatment removes Total Dissolved Solids (TDS) in addition to arsenic, nitrates, and fluoride, it is more expensive and brine disposal costs are high. RO treatment and brine disposal costs will need to become more affordable before Buckeye can exploit its waterlogged area as a potable water resource. The figures below present a range of capital and operating costs for 8 mgd of treated potable water. In the figures below, a favorable well water quality corresponds to the 50th percentile of average Valencia well water quality. The less favorable well water quality corresponds to the 90th percentile of Valencia well water quality.



* Evaporation pond size range: 234 - 271 acres



Water Quality Recommendations

- ▶ Where possible, drill and screen wells to minimize TDS levels. Transporting well water with lower TDS levels several miles is less expensive than RO treatment.
- ▶ Use regional treatment facilities to blend, where possible, to benefit from economies of scale in minimizing treatment costs.
- ▶ Seek teaming arrangements to lower the cost of treating high salinity costs in the Buckeye water-logged area.

Water Infrastructure Master Plan

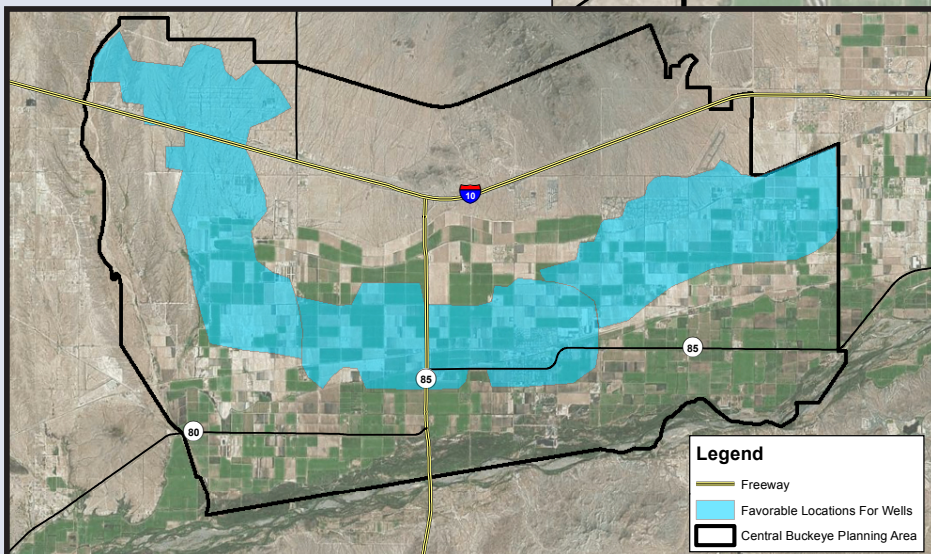
Buckeye is transitioning towards regional water treatment and distribution facilities.

Regional water service areas with regional treatment plants have been identified throughout Central Buckeye. The regional infrastructure plan covers development in Central Buckeye, at any future time. Some negotiations may be required for developments with existing development agreements.

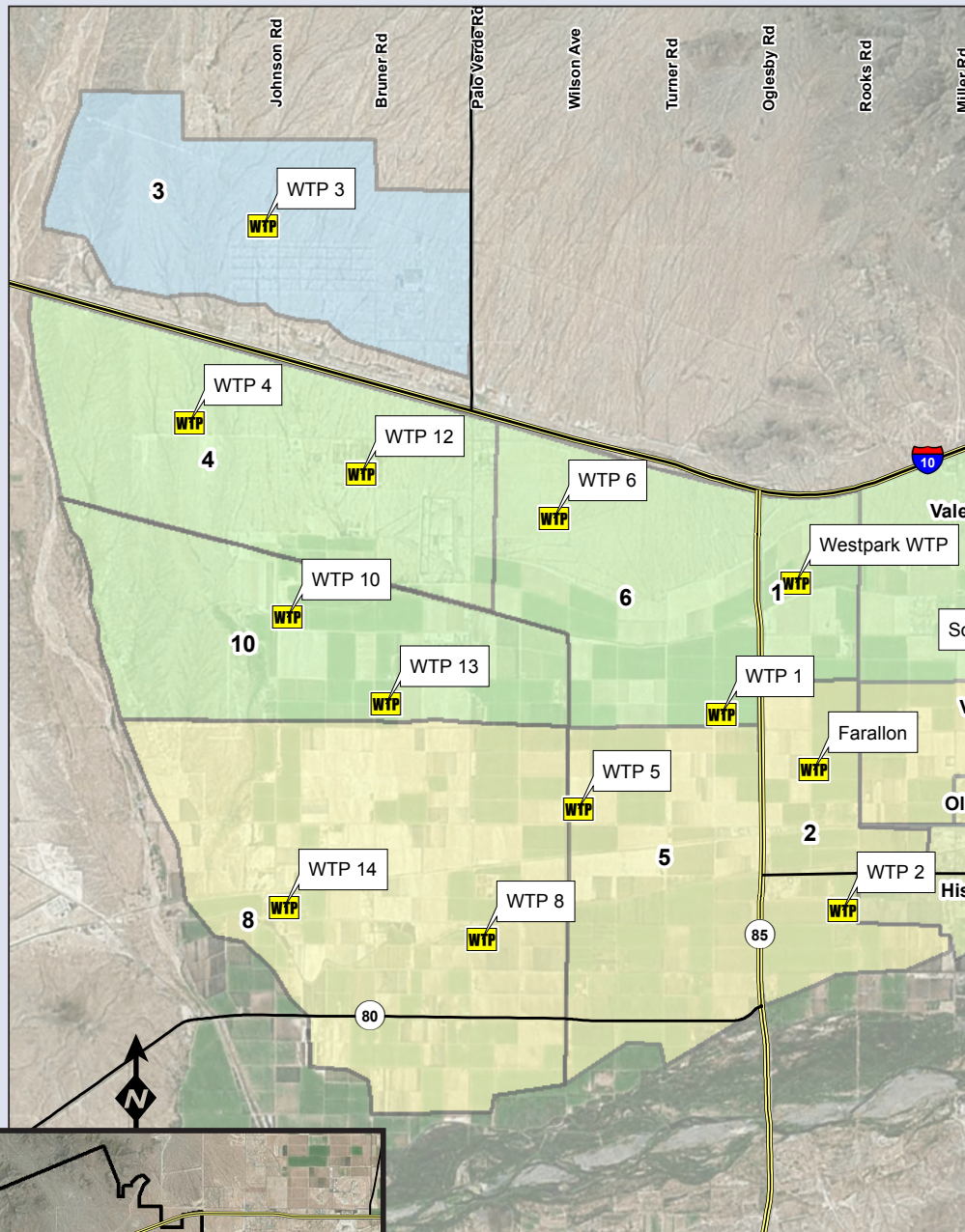
Depending on water resource constraints and location, some WTPs may not be constructed to the full planned capacity, if constructed at all.

A well siting study was conducted to identify more favorable areas to locate wells. The blue areas in the figure below are more likely to have productive wells. The eastern and western areas are more likely to have lower TDS levels.

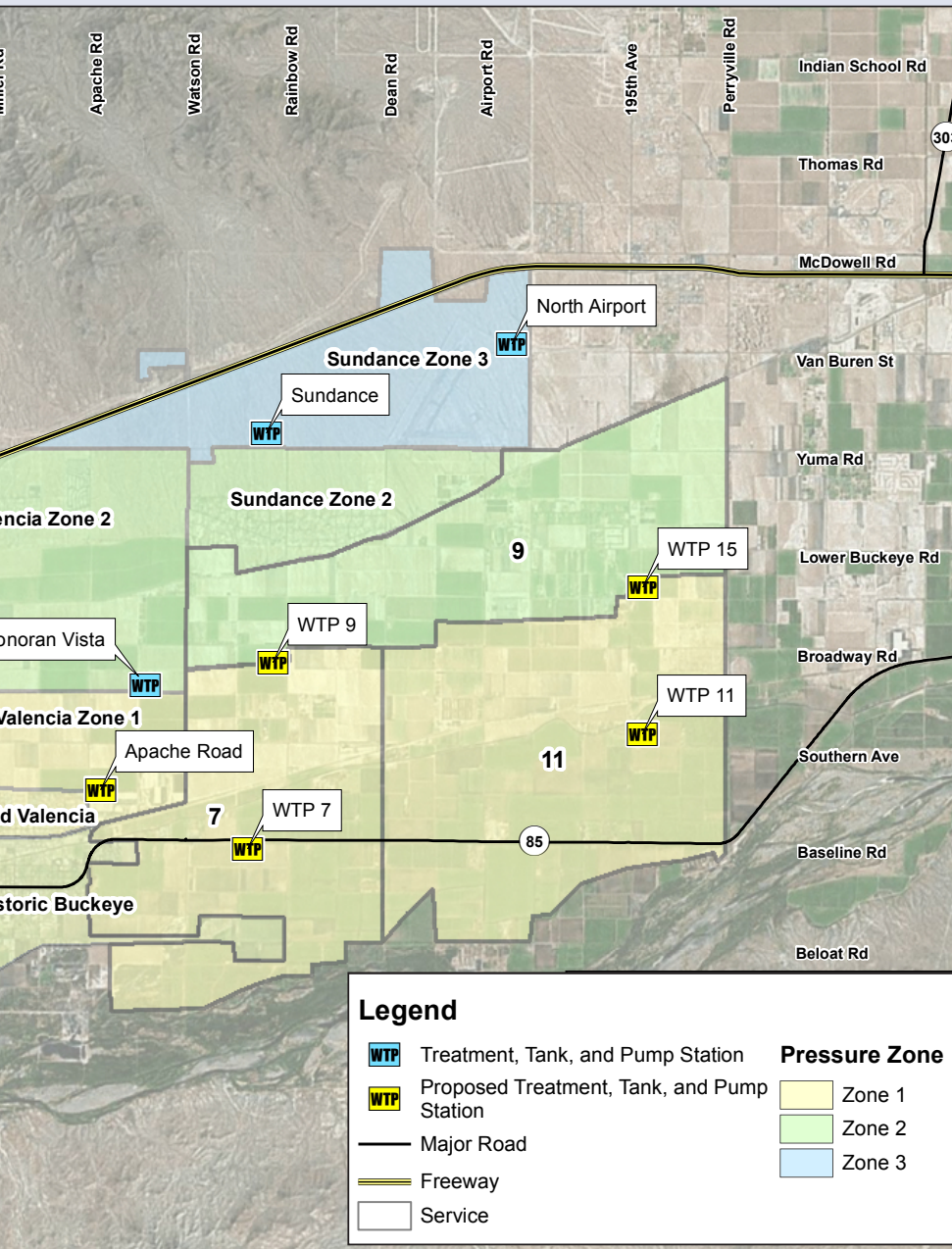
Central Buckeye Favorable Well Location Areas



Proposed Central Buckeye Water Service Areas and Water Treatment Plants



Plants



A water infrastructure condition assessment on current infrastructure resulted in capital improvement recommendations of:

\$4,435,000 over 5 years

Proposed Regional Water Treatment Plants

Treatment Plant	Treatment Plant Capacity (mgd)
Sundance	12
North Airport Road	8
Apache Road	16
Farallon	8
Westpark	8
WTP 1	8
WTP 2	16
WTP 3	12
WTP 4	12
WTP 5	12
WTP 6	12
WTP 7	12
WTP 8	12
WTP 9	16
WTP 10	12
WTP 11	12
WTP 12	12
WTP 13	12
WTP 14	12
WTP 15	16

Benefits of Regional Water Service Areas

- ▶ Improves water supply reliability and efficiency.
- ▶ Provides a foundation for Buckeye and developers to collaborate to build water infrastructure.
- ▶ Standardization improves infrastructure quality.
- ▶ Regional well treatment facilities are more efficient, can use blending to reduce treatment costs, and have the potential to improve water quality.

Wastewater Infrastructure Master Plan

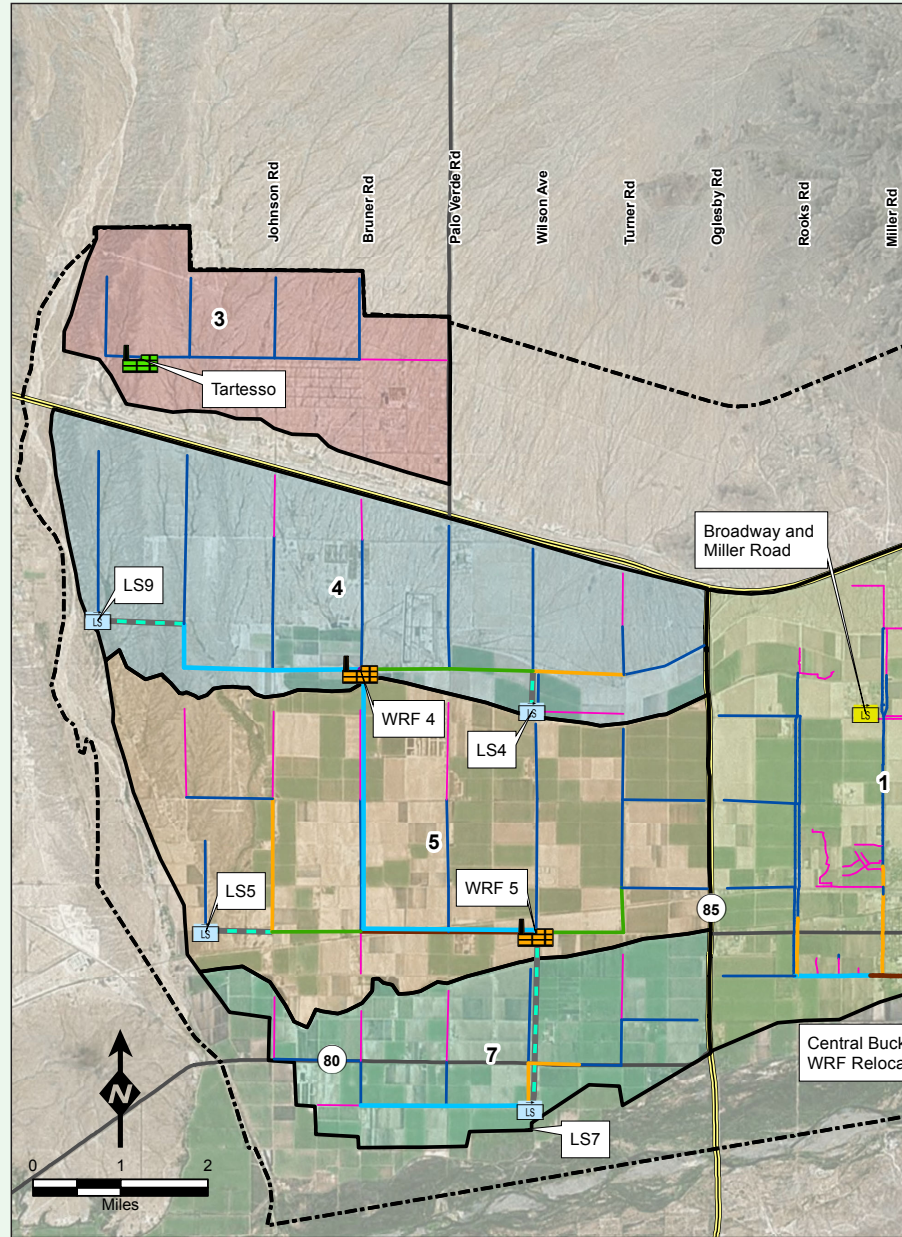
Buckeye is planning regional wastewater collection and treatment facilities.

Planning regional wastewater reclamation facilities (WRF) is the preferred way for the City to plan wastewater collection systems. Proposed water reclamation facilities are located to support growth along the I-10 corridor. Proposed wastewater collection basins provide wastewater solutions at many central Buckeye locations. Developers that have existing development agreements may need to negotiate with the City on refinements to the collection system plan.

WRFs are located outside of the 100-year flood zone, and where reclaimed water can be pumped above the Roosevelt Irrigation District (RID) canal for recharge.

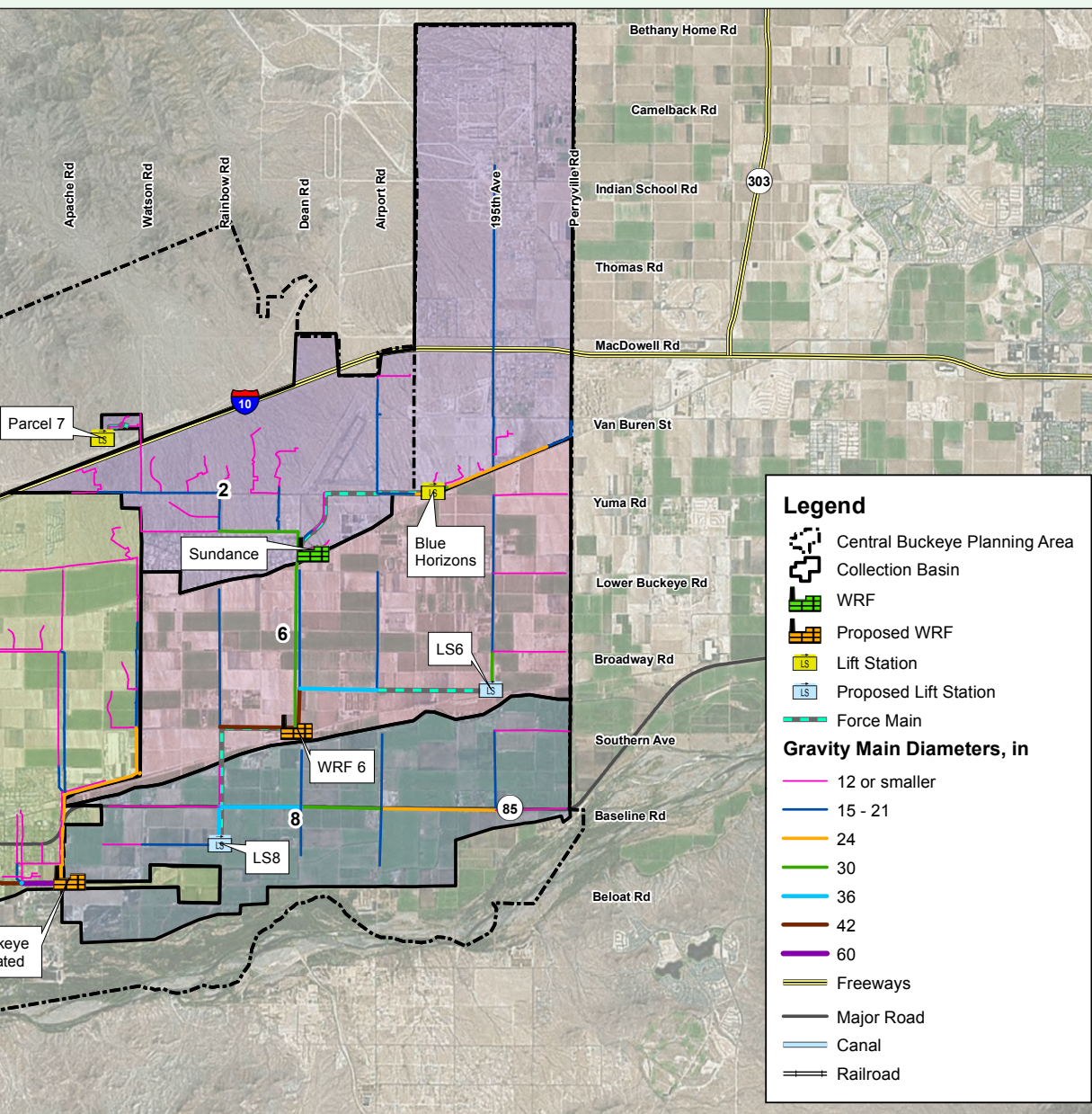
WRFs are expected to be phased beginning with package plants at initial development stages, then transitioning to conventional WRFs as flows increase.

The number of WRFs required is dependent on how Central Buckeye develops. The table below identifies the collection basins served by each WRF under different buildout strategies.



Collection Basin Served by Each WRF

Water Reclamation Facility	Buildout Strategy	Collection Basins Served	Required Capacity (mgd)
Relocated Central Buckeye	-	1	13
Sundance	-	2	21
Tartesso (Basin 3 flows only)	-	3	6
WRF 4	-	4	14
WRF 5	1	5	17
	2	5 and 7	23
	3	4, 5 and 7	38
WRF 6	1	6	12
	2	6 and 8	20
	3	2, 6 and 8	26



A condition assessment of current wastewater facilities resulted in capital project recommendations over 5 years:

Central Water Reclamation Facility
\$1,715,000

Sundance Water Reclamation Facility
\$1,386,000

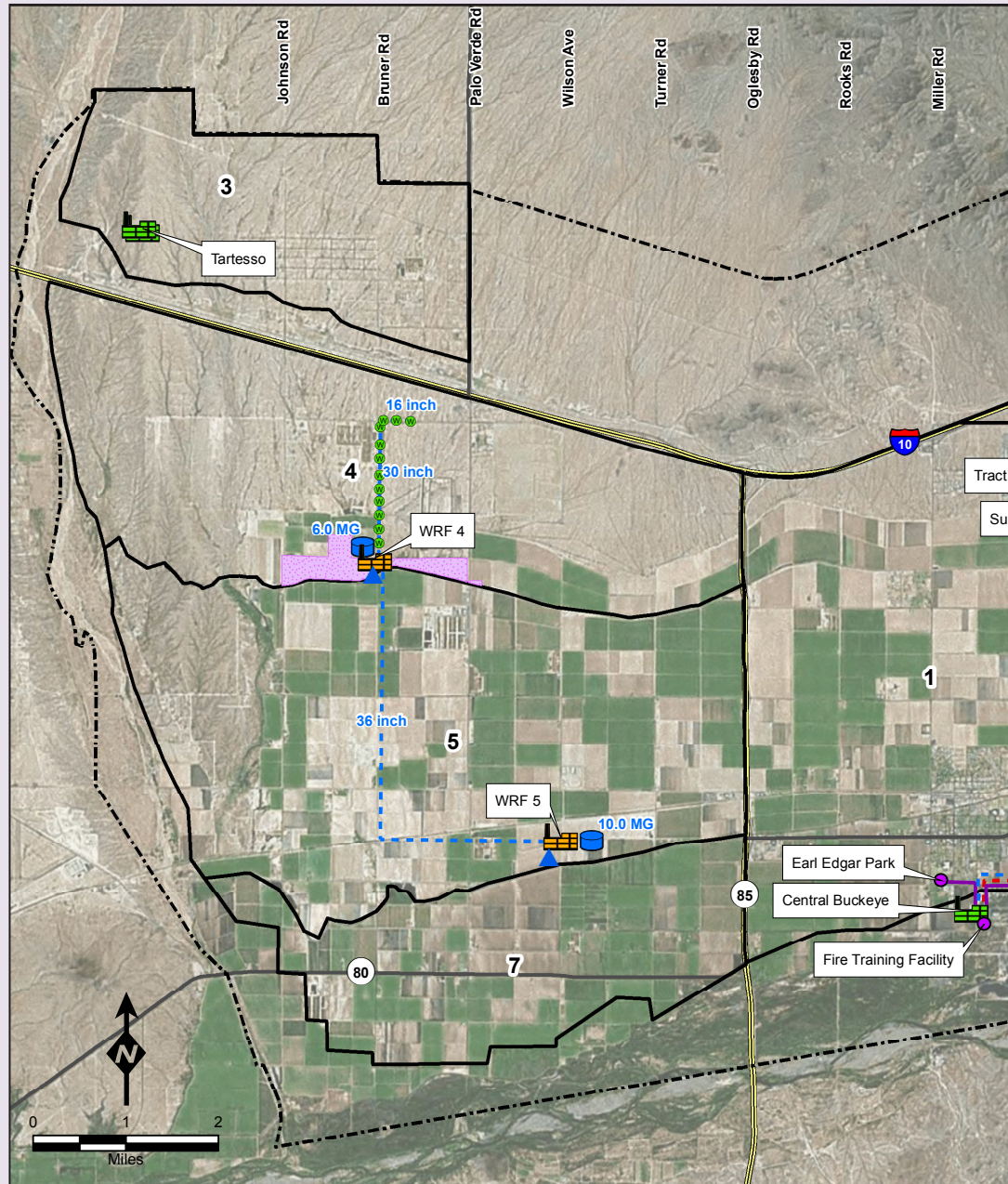
- ### Benefits of Regional Wastewater Collection and Treatment Facilities
- ▶ Fewer water reclamation plants to manage.
 - ▶ More economical to develop reclaimed water systems to recharge groundwater.
 - ▶ Lower treatment costs.
 - ▶ Better infrastructure quality.

Reclaimed Water Master Plan

The City of Buckeye will be expanding water recharge facilities to enhance aquifer sustainability and to provide a reliable water source.

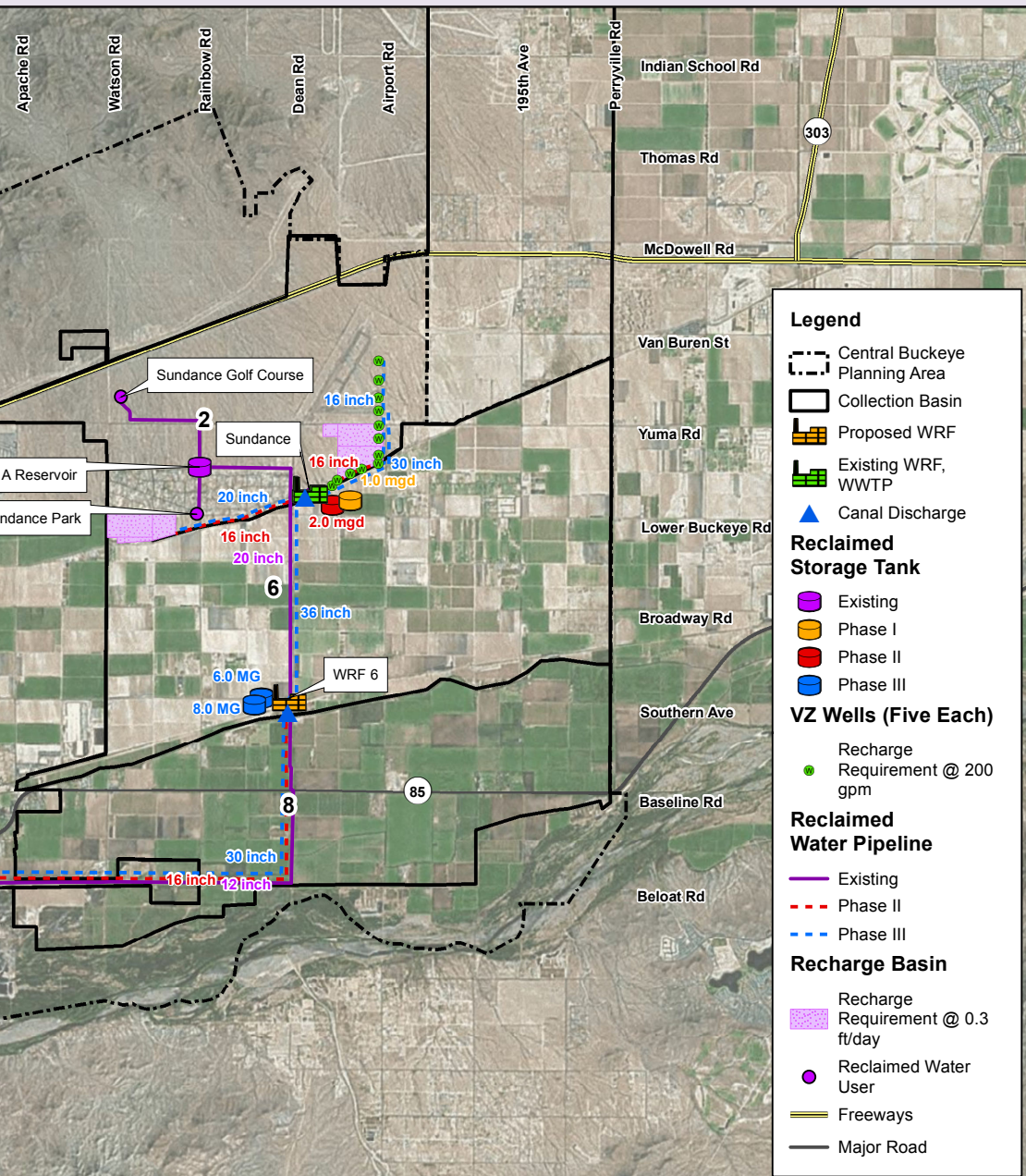
The City of Buckeye currently provides reclaimed water to a golf course, schools, park, and fire training facilities. 1,000 gpm may be discharged into the RID canal for recharge credits. Land areas north of the RID canal can be permitted for recharge because these lands are a sufficient distance from the Buckeye waterlogged area. In the future, Buckeye should use new reclaimed water only for aquifer recharge, which will require constructing recharge facilities. If the City does not obtain a DAWS, then a partnership with the CAGR D may reduce the cost of recharge facilities.

The reclaimed water master plan identifies four phases of reclaimed water system development. Phase 1 contains the infrastructure for current wastewater flows. Phase 2 is the plan for reclaimed water flows corresponding with the current design capacity of Sundance and Central WRF. Phases 2 - 4 are completely growth related. Reclaimed water infrastructure costs will vary depending on the recharge technology used.



Costs for Phases of Reclaimed Water System Development

Reclaimed Water Infrastructure Costs		
Phase 1	Management of Current Reclaimed Water Flows	\$12,000,000
Phase 2	Management of 7 mgd of reclaimed water capacity (ie., capacity of Sundance and Central WRFs)	\$34,000,000
Phase 3	Buildout - East Central Buckeye	\$179,000,000
Phase 4	Buildout - West Central Buckeye	\$249,000,000



Recommended Actions:

1. Select recharge sites.
2. Determine recharge methods: spreading basins, trenches, vadose zone wells or injection wells.
3. Construct and permit recharge facilities.
4. Establish policies to maximize reclaimed water available for recharge.

Benefits of Using Reclaimed Water for Aquifer Recharge

- ▶ Helps maintain water level in the aquifer.
- ▶ Recharge offsets a portion of the groundwater replenishment obligation. With or without a DAWS, recharge helps to maintain groundwater levels.
- ▶ Spreading basin recharge facilities provides the opportunity to create public parks that enhance Buckeye's appeal.

Acknowledgments

The following City of Buckeye departments or entities have provided support to this project:

- ▶ Mayor and City Council
- ▶ City Manager's Office
- ▶ Procurement and Contract Management
- ▶ Water Resources
- ▶ Engineering
- ▶ Public Works

