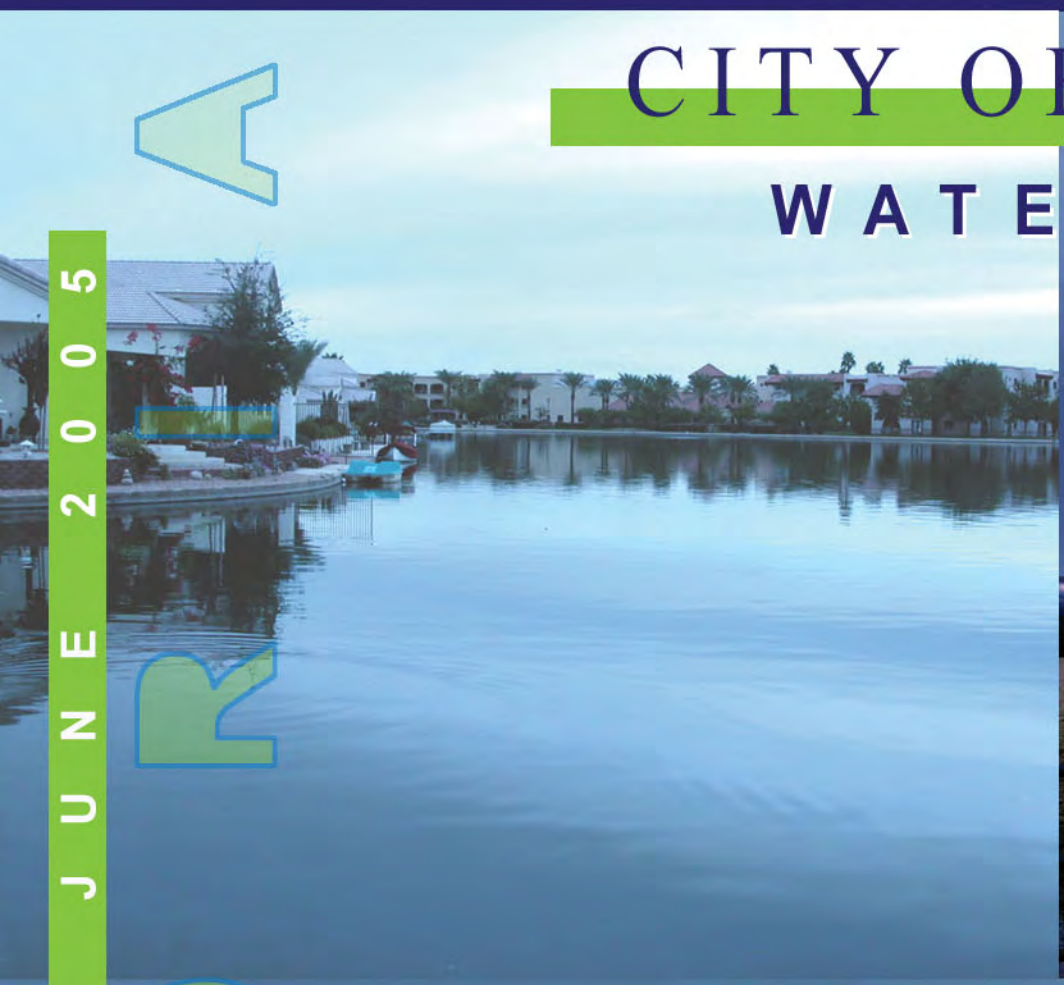
CITY OF PEORIA

WATER REUSE MASTER PLAN

EXECUTIVE SUMMARY



FINAL REPORT JUNE 2005

CITY OF PEORIA

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In association with:

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EXECUTIVE SUMMARY

INTRODUCTION

The City of Peoria Utilities Department wishes to develop a master plan for strategic use of the City's reclaimed water resource and to guide expansion of the City's water reclamation and reuse program. The *Water Reuse Master Plan* provides guidelines for a reclaimed water capital improvement program (CIP) and will provide the basis for City policies and procedures for water reuse within its service area.

The purpose of the *Water Reuse Master Plan* was to investigate the reuse opportunities available to the City and use the opportunities to formulate a master plan strategy. The study area for this project included all of the Peoria city limits and the Municipal Planning Areas (MPAs) that lie east of Citrus Road, west of 67th Avenue, north of Northern Avenue, and south of Lake Pleasant (Figure ES-1).

Water reuse occurs when wastewater collected from homes and businesses is treated to a quality that allows for use in applications not requiring potable water, such as turf and landscape irrigation, decorative lakes, commercial and industrial uses, and groundwater recharge. Water reuse reduces the demand on other potable water resources and may defer costly expansions of potable water treatment and distribution systems. Reclaimed water is a renewable and drought-resistant water supply that will increase with population growth.

WATER REUSE PLANNING PROCESS

Unlike traditional water and wastewater infrastructure master planning, water reuse planning must consider many uncertainties outside of typical population, potable water demand, and wastewater flow projections. To develop strategies that will be successful despite the uncertainties, a process called ***Scenario Planning*** was used. Scenario Planning helps to envision alternative futures (or scenarios) that are equally likely to play out in Peoria's future with respect to the role of water reuse. Scenario Planning is a disciplined

way of describing and anticipating future outcomes and making choices today with an understanding of how things might turn out, without trying to predict the future outcomes. The process recognizes that the significant influences of the future typically cannot be controlled nor can they be reliably predicted. Instead, it is a thought process that seeks to identify strategies that will be successful no matter what the future holds.

Scenario Planning identified the over-arching question that this project should seek to answer: ***How do we develop our water reuse system to best use reclaimed water as a component of a sustainable water resources portfolio?*** The process also identified the two most significant influences that are subject to considerable uncertainty and will dictate the manner in which the City's reclaimed water system will develop: ***Public Acceptance of Reclaimed Water*** and ***Water Supply Portfolio***. Public Acceptance encompasses critical uncertainties dealing with safety, public perception and support for use, political priorities, etc., and it effectively determines how reclaimed water can be used. Water Supply Portfolio encompasses critical uncertainties dealing with future availability of water supplies, drought, and other water supply issues. The two critical uncertainties defined four equally plausible futures (scenarios) to serve as the framework for identifying and evaluating alternative water reuse master plan strategies:

- Scenario I is defined by abundant water resource availability and broad public support for the use of reclaimed water.
- Scenario II is defined by abundant water resource availability and very limited public support for the use of reclaimed water.
- Scenario III is defined by limited water resource availability and very limited public support for the use of reclaimed water.
- Scenario IV is defined by limited water resource availability and broad public support for the use of reclaimed water.

SUMMARY OF SIGNIFICANT MASTER PLAN ASSUMPTIONS AND FINDINGS

The following are the significant factors and assumptions used to develop and evaluate master plan alternatives:

Existing and Planned Water Reclamation Facilities

- The Southern planning area is presently served by the City's 9.4 million gallon per day (mgd) capacity ownership in the Tolleson Wastewater Treatment Plant. In order to realize the benefits of water reuse, the City has embarked on implementation of the 10 mgd Butler Drive Water Reclamation Facility (WRF), which is expandable to 13 mgd, to provide future service to this area.

- The North-Central planning area is presently served by the 4 mgd Beardsley WRF and aquifer recharge facilities that are planned for expansion to 16 mgd to accommodate all future wastewater flows from the area.

- The Northwest planning area is presently served by the 0.75 mgd Jomax WRF that is planned for expansion to 9.0 mgd as the area grows. Other facilities in the area have been identified for potential service depending on the timing and extent of development in the area: Quintero WRF (0.2 mgd) and Paddleford WRF (1.0 mgd).

Reclaimed Water Availability

- The table below shows the projected reclaimed water availability in each of the City's wastewater planning areas on an annual average basis through 2025:

Planning Area	Annual Average Projected Reclaimed Water Availability (mgd)				
	2005	**2010**	**2015**	**2020**	**2025**
Southern	9.5	10.1	10.4	10.4	10.3
North-Central	2.9	4.6	6.7	7.6	8.3
Northwest	0.1	0.2	0.8	1.7	2.6
Total	**12.5**	**14.8**	**17.9**	**19.7**	**21.2**

Water Reuse Opportunities

- Three categories of water reuse opportunities are available to the City: direct use of reclaimed water, groundwater recharge, and water exchanges:
  - Direct use refers to using reclaimed water in place of potable water for irrigation of parks, golf courses, and other landscaped areas.
  - Groundwater recharge reduces the effects of groundwater pumping on the groundwater table, and it can store water for future use. Recharge opportunities available to the City include regional facilities (e.g., Salt River Project (SRP) New River Agua Fria Underground Storage Project (NAUSP) and Sub-Regional Operating Group (SROG) Agua Fria Linear

Recharge Project) and City-owned facilities (e.g., recharge at the WRF sites and along the New River).

- o Water exchanges refer to trading reclaimed water for potable water and/or for rights to potable water. Water exchanges may be available to the City with SRP, Central Arizona Groundwater Replenishment District (CAGRD), and the Roosevelt Irrigation District (RID).

- The estimated potential direct use demands, including existing water reuse customers and anticipated future development, are as follows:

Planning Area	**Potential Existing and Future Direct Use Demands in 2025**	
	(acre-feet/year)	**(mgd)**
Southern (On-Project)	3,800	3.4
Southern (Off-Project)	2,700	2.4
North-Central	1,200	1.1
Northwest	5,900	5.3
Total	**13,600**	**12.2**

Water Reuse Strategies for Future Scenarios

- Scenario I (abundant water resources and broad public support for water reuse): the water reuse program was envisioned to give high priority to providing service to large open-access and restricted-access direct reuse customers. Groundwater recharge and water exchanges were lower priority.

- Scenario II (abundant water resources and limited public support for water reuse): the water reuse program was envisioned to give high priority to regional groundwater recharge projects and water exchanges. Direct use of reclaimed water was a lower priority and included providing service to only large restricted-access direct reuse customers.

- Scenario III (limited water resources and limited public support for water reuse): the water reuse program was envisioned to give high priority to City-owned groundwater recharge projects and water exchanges. Direct use of reclaimed water was a lower priority and included providing service to only large restricted-access direct reuse customers, including industrial customers.

- Scenario IV (limited water resources and broad public support for water reuse): the water reuse program was envisioned to give high priority to direct use of reclaimed water, including providing service to all open-access and restricted-access direct reuse customers, and City-owned groundwater recharge. Regional groundwater recharge projects and water exchanges were lower priority.

Unit Cost of Water Reuse Strategies

- The range of unit costs for the alternative water reuse strategies in each scenario (excluding costs for treatment) are as follows:

	Unit Cost
Direct Use	$930/acre-ft – $1160/acre-ft
Groundwater Recharge	$110/acre-ft – $170/acre-ft
Total	$530/acre-ft – $630/acre-ft

- The above unit costs do not consider the potential effect of reclaimed water rates and connection fees for direct reuse customers. Cost recovery through reclaimed water revenues would offset a portion of the annualized costs and, hence, lower the overall unit cost of water reuse.

RECOMMENDATIONS

Infrastructure Recommendations

The work conducted in the *Water Reuse Master Plan* project has identified a strategy that will allow the City to develop its water reuse system to best use reclaimed water as a component of a sustainable water resources portfolio. The recommended *Water Reuse Master Plan* is developed around the elements in the decisions/courses of action that are common to most/all scenarios. Giving top priority to these common elements will lead to success under the majority of possible futures. The recommended master plan strategy, illustrated on Figure ES-2, provides specific recommendations for the near-term period (2005 – 2010) and more general and conceptual recommendations for the mid-term (2011 – 2015) and long-term (2016 – 2025) periods.

The details of the recommended near-term (2005 – 2010) strategy are presented on Figure ES-3 and Table ES-1. The near-term elements shown on Figure ES-3 should be considered "top priority" because these elements are common to most/all of the alternative futures (scenarios) envisioned during the Scenario Planning process.

Non-Infrastructure Recommendations

In addition to the recommended *Water Reuse Master Plan* strategy and near-term system improvements, the following specific actions are recommended to provide orderly growth of the reclaimed water system.

- **Implement a proactive public involvement program.** Ultimately, the extent reclaimed water can be used will depend on the level of public support for its use. It is recommended that the City continue to develop and implement a strategy for public education and involvement regarding the water reuse program, prior to making significant infrastructure investments.

- **Develop a City-wide reclaimed water pricing policy.** As the reuse system grows beyond the existing program in the Northwest Area, the City should develop a City-wide reclaimed water pricing policy that considers all treatment and infrastructure capital and operational costs, allocation of costs between the water and wastewater enterprises, and potential cost savings (avoided costs) to either enterprise due to the reuse program.

- **Periodically update the *Water Reuse Master Plan*.** Growth within the City is dynamic, and as new information becomes available (e.g., public awareness, development planning, implementation of reuse opportunities, etc.), the playing out of the significant influences governing reuse system development will change. At a minimum, the plan should be updated every five years.

- **Maintain database of potential reuse customers.** The City has expended resources to develop its GIS capabilities and provided a database of potential reuse customers for use in this project. The City should maintain the database developed in this project for use in future planning and marketing of its reuse program.

TABLE ES-1

CIP DETAILS FOR THE NEAR-TERM PERIOD

Pipe Label	Diameter (in)	Length (ft)	Unit Cost ($/ft)	Cost ($)
P-4	16	1,395	222	309,690
P-5	16	1,948	222	432,456
P-9	24	6,490	294	1,908,060
P-30	24	7,917	294	2,327,598
P-43	36	5,227	432	2,258,064
P-44	36	5,368	432	2,318,976
P-45	36	5,164	432	2,230,848
P-46	36	5,385	432	2,326,320
P-47	36	2,694	432	1,163,808
P-52	20	4,198	252	1,057,896
P-142	36	3,224	432	1,392,768
P-152	36	1,992	432	860,544
P-153	36	1,811	432	782,352
P-155	36	2,430	432	1,049,760
P-190	36	2,393	432	1,033,776
P-191	36	1,988	432	858,816
P-202	24	566	294	166,404
P-203	24	665	294	195,510
P-204	24	4,457	294	1,310,358
P-217	24	8,453	294	2,485,182
P-218	24	704	294	206,976
P-219	20	8,506	252	2,143,512
P-220	20	1,052	252	265,104
P-226	36	1,318	432	569,376
P-235	36	659	432	284,688
P-236	36	629	432	271,728
P-241	12	1,398	156	218,088
Pipe Subtotal				**30,428,658**

Pump Label [1]	TDH (ft)	Peak Flow [2] (gpm)	Cost [3] ($M)
601	100	5950	1.40
611	100	8650	1.76
612	100	3050	0.94
614	100	8500	1.76
Pump Subtotal			**5.85**

PRV Label [1] (Same as Pump)	Pipe Diameter (in)	Cost ($)
601	36	74,700
611	24	49,100
612	16	32,100
614	24	49,100
PRV Subtotal		**205,000**

TABLE ES-1 (CONTINUED)

CIP DETAILS FOR THE NEAR-TERM PERIOD

Recharge Site Name	Capacity (mgd)	Cost ($M)
NAUSP [4]	13	2.9
Butler Onsite [4]	3.6	5
New River [4,5]	11.2	5.33
Beardsley Onsite [6]	16	0
Jomax Constructed [4, 7]	6	2.86
Recharge Subtotal [8]		**13.19**

Totals	Total ($M)
Subtotal Pipes	**30.4**
Subtotal Pumps	**5.9**
Subtotal PRVs	**0.2**
Subtotal Recharge	**13.2**
Total	**49.7**

[1] Pumps 600, 603, and 608 are not included because their cost is assumed to be part of the WRF facility costs

[2] Peak flow is maximum size given all scenarios

[3] Cost estimated using curve shown on Figure B-2 and updated to ENR CCI of 7355 (April 2005)

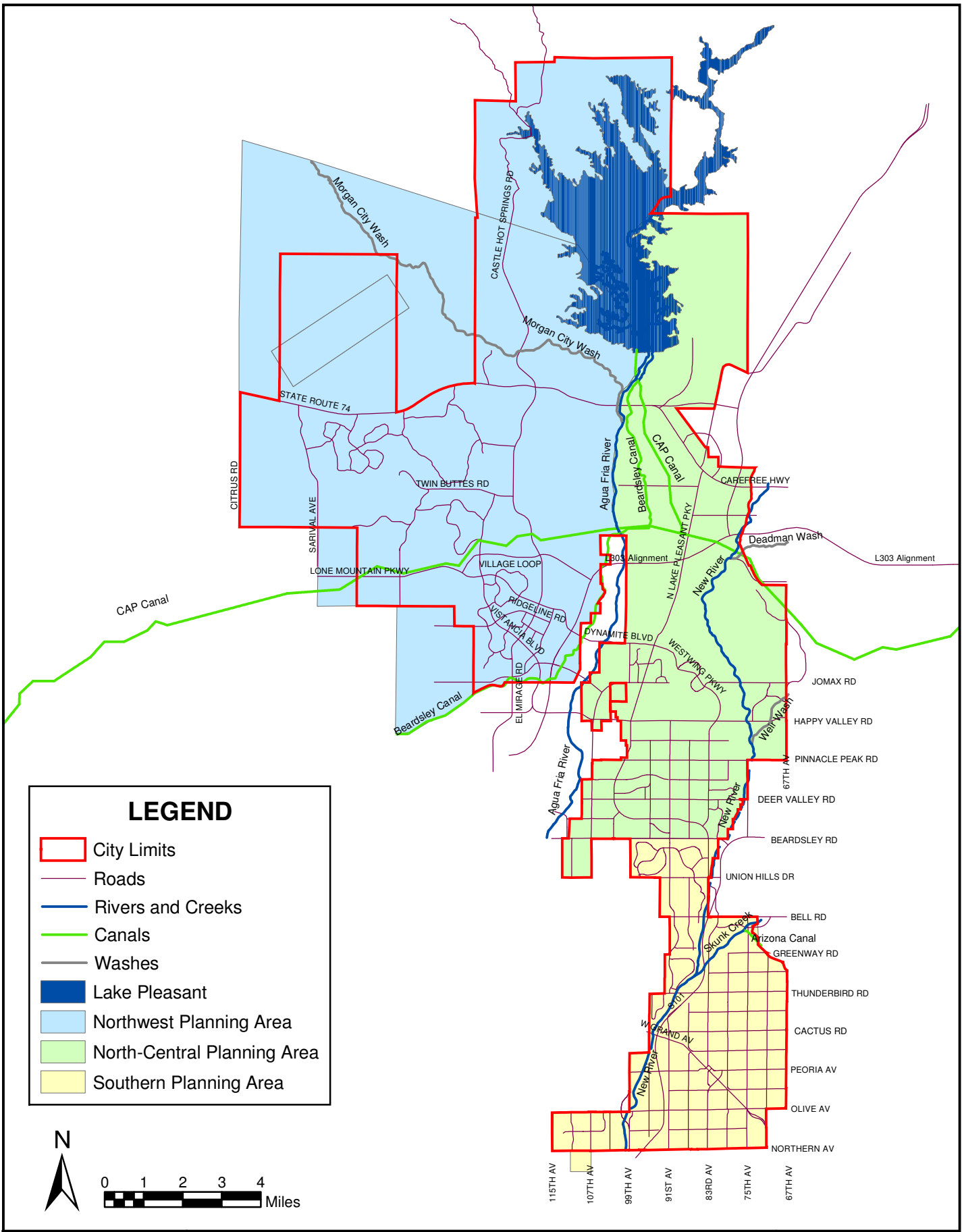
[4] Cost estimated using data from the Butler Recharge Study

[5] Assumes the "North Site" in the Butler Recharge Study

[6] Facility already operational - No additional cost anticipated

[7] Based on same unit rate as New River Recharge

[8] Assumes only one of NAUSP and New River will be operational - Highest cost alternative was used



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CITY OF PEORIA, ARIZONA
WATER REUSE MASTER PLAN

STUDY AREA

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FIGURE ES-1

	Near-Term 2005 - 2010	Mid-Term 2011 - 2015	Long-Term 2016 - 2025
Southern Area	**NAUSP** • Finalize IGA and purchase capacity • Obtain WS Permit • Design and construct Butler Drive WRF and 36-inch pipeline **New River Outfall** • Obtain Permits (AZPDES, floodplain, and possibly ACOE404) • Design and construct outfall **New River North Recharge** • Acquire Site(s) • Obtain Permits (AZPDES, floodplain, USF, WS, and possibly ACOE 404) • Design and construct 36-inch pipeline and recharge facility	**Agua Fria Linear Recharge Project** • If participation in NAUSP is not possible, explore participation in SROG project. • Obtain WS Permit • Design and construct pipeline to deliver water from Butler WRF to SROG **Direct Use of Reclaimed Water** • Begin connecting customers along existing pipelines • Construct pipelines to connect large-demand restricted-access users	**Direct Use of Reclaimed Water** • Construct pipelines to connect all customers that are permitted based on public acceptance
North-Central Area	**Beardsley Road WRF Recharge** • Expand Recharge Facility • Modify Permits (USF and WS)	**Direct Use of Reclaimed Water** • Construct pipeline along Lake Pleasant Road ahead of development and connect users if they exist • Connect Beardsley Road WRF to the Southern area reclaimed distribution system to increase system reliability	**Direct Use of Reclaimed Water** • Connect users along Lake Pleasant Road • Construct pipelines to connect all customers that are permitted based on public acceptance
Northwest Area	**Jomax Road WRF Recharge** • Acquire Site(s) • Obtain Permits (AZPDES, USF, WS, and possibly floodplain and ACOE 404) • Design and construct recharge facility **Direct Use of Reclaimed Water** • Continue use in Northern Peoria Subdivisions • Plan for use in future developments	**Direct Use of Reclaimed Water** • Expand use in Northern Peoria Subdivisions • Connect to the Loop 303 irrigation system	**Direct Use of Reclaimed Water** • Connect all new developments (including Quintero) • Construct pipelines to connect all other customers that are permitted based on public acceptance
Direct Use of Reclaimed Water (all areas)	• Design and implement public involvement/education program • Finalize reuse policies, ordinances, and standard customer agreements • Obtain permit(s) as Reclaimed Water Agent • Develop reclaimed water pricing	• Continue implementing public involvement and education to maximize potential reuse customers	• Continue implementing public involvement and education to maximize potential reuse customers

Notes:
IGA = Inter-Governmental Agreement
WS = Water Storage
WRF = Water Reclamation Facility
AZPDES = Arizona Pollutiant Discharge Elimination System
ACOE = Army Corps of Engineers
USF = Underground StorageFacility
NAUSP = New River – Agua Fria River Underground Storage Project
SROG = Sub-Regional Operating Group

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WATER REUSE MASTER PLAN

IMPLEMENTATION STRATEGY

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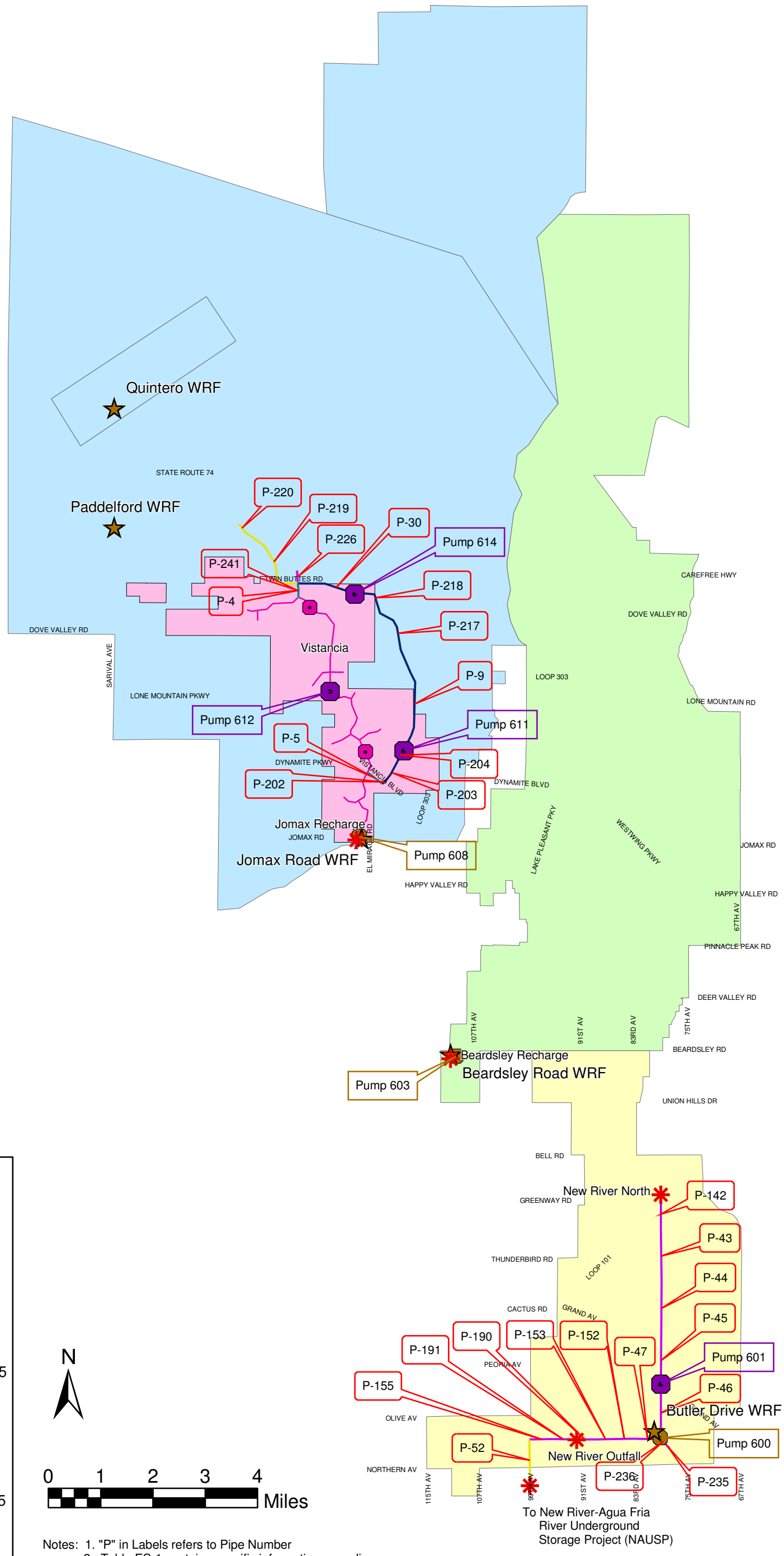
FIGURE ES-2



LEGEND

Pipelines

- New 12-inch
- New 16-inch
- New 20-inch
- New 24-inch
- New 36-inch
- Existing/Planned as of 2005

Pumps

- New in Near-Term Period
- WRF Pumps
- Existing/Planned as of 2005

Recharge Locations

- New in Near-Term Period

Notes: 1. "P" in Labels refers to Pipe Number
2. Table ES-1 contains specific inforamtion regarding new pipe, pump, PRV, and recharge sizing and costs.

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CITY OF PEORIA, ARIZONA
WATER REUSE MASTER PLAN

CIP DETAILS FOR THE NEAR-TERM PERIOD (2005-2010)

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FIGURE ES-3