Central Yavapai Highlands Water Resource Management Study (CYHWRMS)
Phase 3
Alternatives Overview

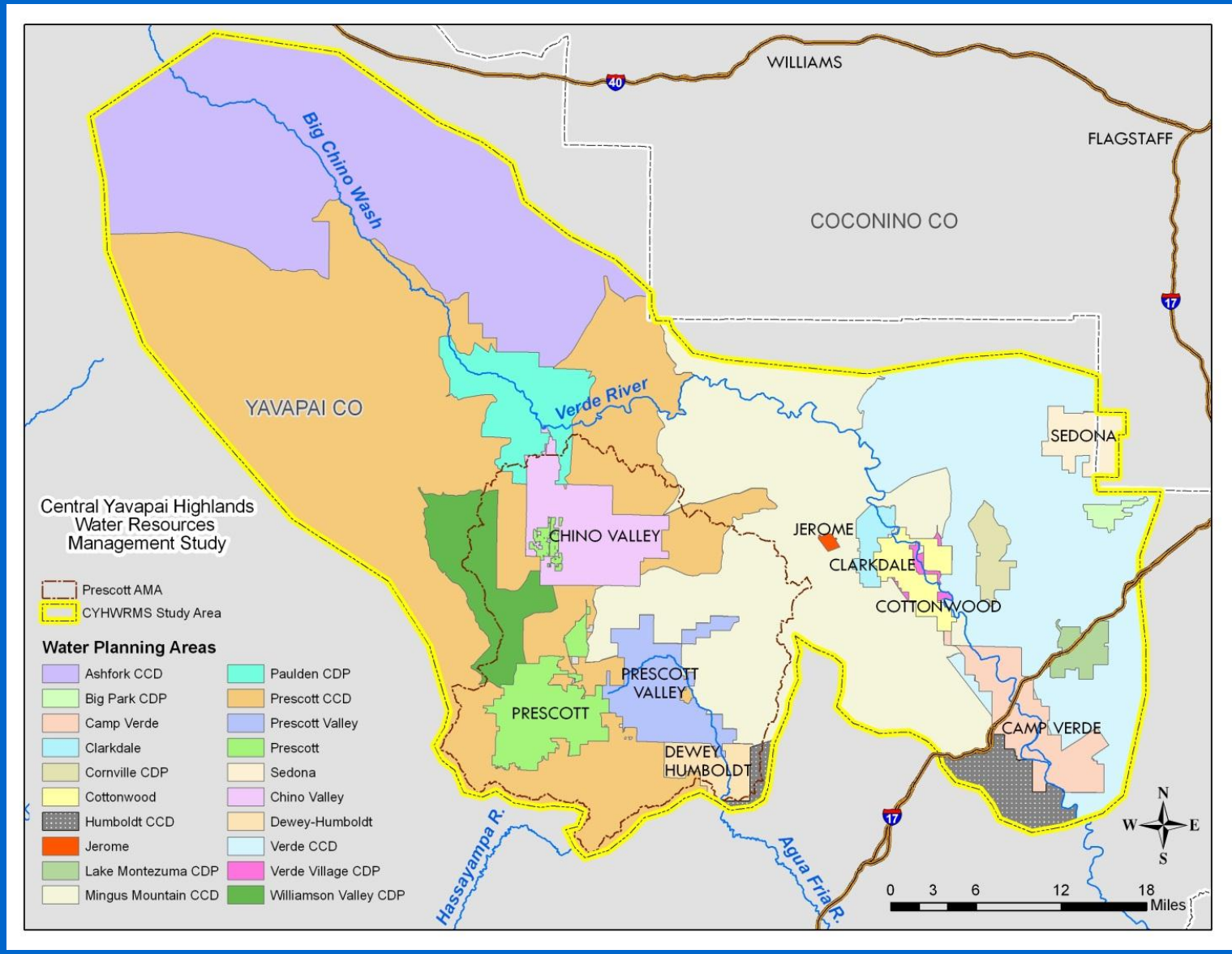
Yavapai County Water Advisory Committee

February 19, 2014

Outline for 2-19-14 WAC meeting

- (very) Brief review of Phases 1 & 2
- Phase 3 process and process plans for WAC (potential action items)
- Overview of Alternatives (Introduction to all alternatives)
- Next Meeting Objectives

CYHWRMS - Study Area



- **STUDY AREA: Big Chino, PrAMA, and Verde Valley; High Potential Growth Areas; With increased water demands**

Bottom Line Need by WPA

- **This table represents the amount of additional supplies each planning area needs to find to satisfy 2050 demands.**

- **Understand assumptions built in to Phase 1 table (such as Population estimates, GPPD, conservation and agricultural transfers, etc)**

- **Phase 2 assessed where there may be water to use in alternatives to meet those needs**

Water Planning Area	2050 Water Supply +/- (AF/yr)
Camp Verde	1,782
Dewey Humboldt	-478
Clarkdale	-1,706
Cottonwood	-7,123
Jerome	-23
Prescott Valley	-13,875
Chino Valley	-6,976
Prescott	-6,702
Sedona	-3,028
Paulden CDP	-733
Big Park CDP	-593
Cornville CDP	326
Lake Montezuma CDP	-309
Ctn-Verde Village CDP	-1,147
Verde CCD	-248
Prescott CCD	-1,361
Mingus Mtn CCD	-469
Humboldt CCD	185
Ashfork CCD	-4,017
Total	-46,472

CYHWRMS: Demand Analysis – Estimated Supplies and Demands, using components from existing water budgets

SUB-BASIN "Water Balance 1" APPROACH -

Verde Valley Sub-basin:
Inflow (167,000) – Outflow (baseflow out 144,100) = 22,900 AF available
22,900 – 48,558 (2050 Demand) = -25,658 (unmet 2050 demand)

Little Chino/Upper Agua Fria (PrAMA):
Inflow Natural Recharge (8,070) – Outflow (4,850) = 3,220 AF available
3,220 – 57,402 (2050 Demand) = -54,182 (unmet 2050 demand)

Big Chino Sub-basin:
Inflow (30,300) – Outflow (17,900 baseflow out) = 12,400 AF available
12,400 – 12,601 (2050 Demand) = -201 (unmet 2050 demand)

= Total for Study area about 80,000 acft

Phase 3 Process

- List and Describe Alternatives
- Describe Environmental issues associated with Alternatives (document/maps)
- Describe Legal and Institutional issues associated with the Alternatives (document)
- Calculate potential water volume associated with each alternative
- Prepare appraisal level costs (tables/documentation) (to serve as relative comparison of alternatives – not absolute costs)
- Consider Viability (Four tests of Viability)

Phase 3 Process

(Eventually lead to decision on what to do with the information)

- **Explain, Understand and Evaluate the study**
- **Meetings & Outreach**
  - **WAC meetings (ongoing)**
  - **Speaking engagements**
  - **POTENTIAL WAC ACTION: Direct TAC to form a small "Technical Team" to meet with key technical people in water planning areas (meet with not only WAC members but with water system operators, city engineers, water company representatives etc)**
  - **POTENTIAL WAC ACTION: Direct TAC to investigate a "Decision Support System" approach to evaluating the study**
  - **Public Process ("open house") (WAC meetings are currently where conversation is mostly occurring and are open to public)**

Phase 3 - Alternatives

- **Phase 3 (Alternative Development and Evaluation) Identifies, describe and analyze various potential alternatives to meet the future unmet demands identified in Phase 1 (using the Phase 2 water sources). Ways to tie the available resources to the identified needs**

- **Question: Is there at least one alternative that can meet the unmet demands? (Yes, but alternatives only meet a portion of the deficit – potential combinations)**

- **Question: Is there a Federal Interest in the identified alternatives? (yes)**

- **Question: Do communities (WAC) want to pursue any alternative(s)?**

Are there alternatives to meet the 2050 unmet demands?

YES

CYHWRMS Alternatives Considered (13)

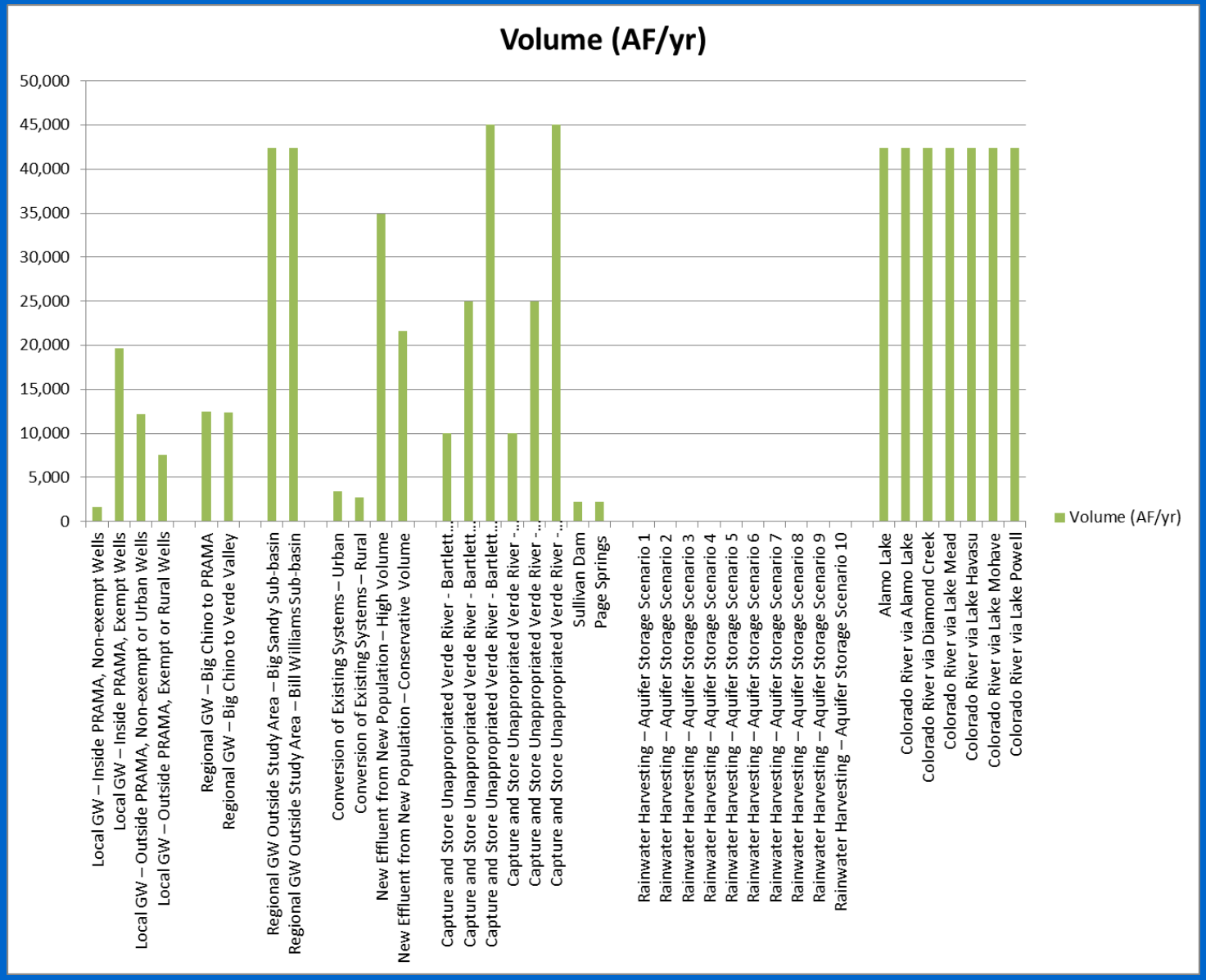
Water Supply	Alternative	Alternative Description
Groundwater	1	Local Groundwater Development within the WPA (Inside and outside PRAMA)
	2	Regional Groundwater Development – Big Chino Pipelines (PRAMA and Verde Valley)
	3	Regional Groundwater Development Outside Study Area - Bill Williams Sub-basin and Big Sandy Sub-basin
Effluent	4	Conversion of Existing Systems - Urban
	5	Conversion of Existing Systems - Rural
	6	Additional Effluent from Increased Population
Flood Water	7	Capture and Store Unappropriated Verde River or tributary water
Storm Water	8	Rainwater Harvesting – Aquifer Storage
Conservation	9	Implement Conservation (e.g. low flow toilets, turf restrictions, educational programs, etc.)
Surface Water	10	Alamo Lake
	11	Colorado River via (a) Alamo Lake, (b) Diamond Creek, (c) Lake Mead, (d) Lake Havasu, (e) Lake Mohave, and (f) Lake Powell
Other	12	Weather Modification – Cloud Seeding
	13	Watershed Management

Table 1: List of considered alternatives (grouped by supply type) and those which were evaluated for costs and volumes

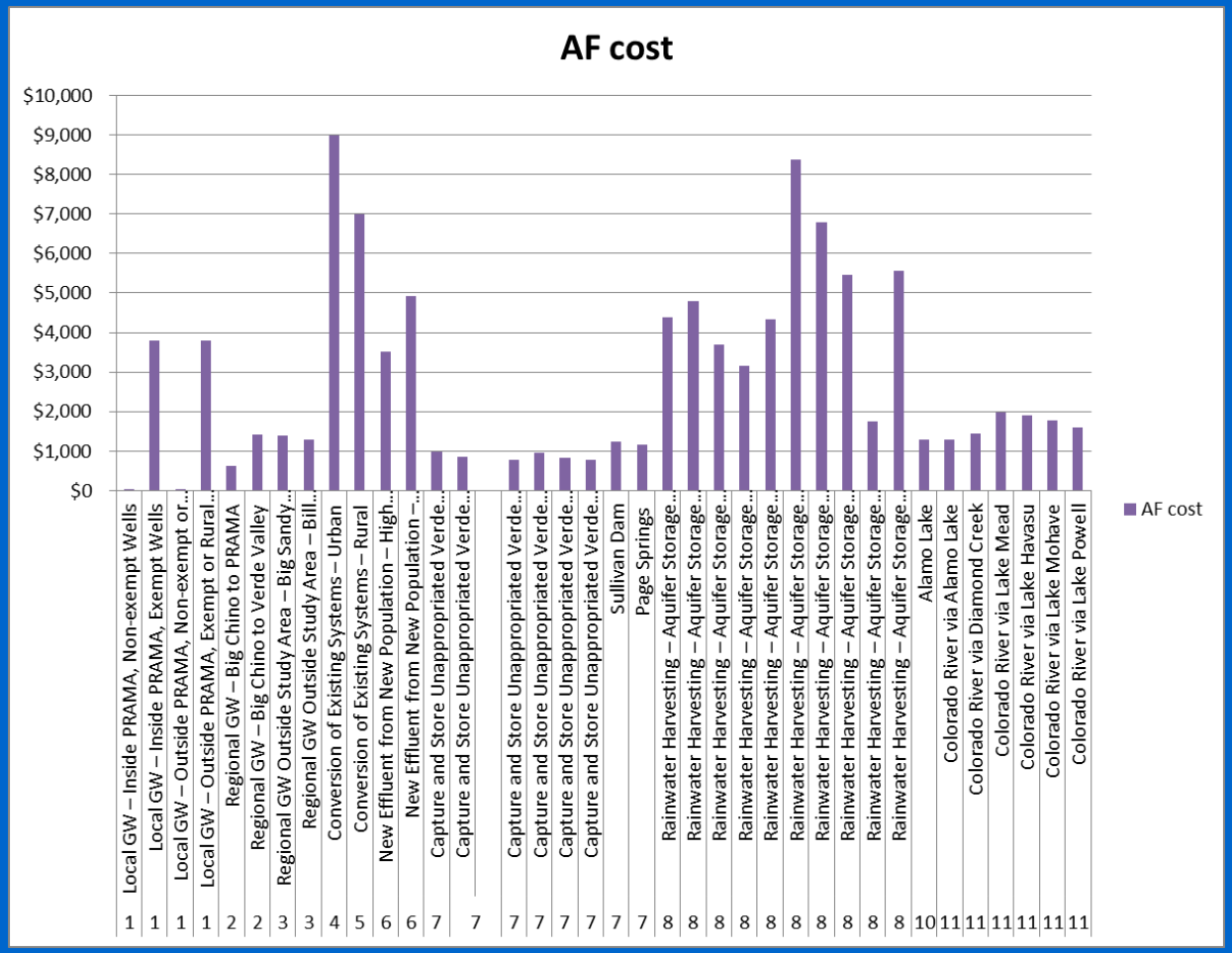
Water Supply	Alternative	Alternative Description
Groundwater	1	Local Groundwater Development within the WPA (Inside and outside PRAMA)
	2	Regional Groundwater Development – Big Chino Pipelines (PRAMA and Verde Valley)
	3	Regional Groundwater Development Outside Study Area - Bill Williams Sub-basin and Big Sandy Sub-basin
Effluent	4	Conversion of Existing Systems - Urban
	5	Conversion of Existing Systems - Rural
	6	Additional Effluent from Increased Population
Flood Water	7	Capture and Store Unappropriated Verde River or tributary water
Storm Water	8	Rainwater Harvesting – Aquifer Storage
*Conservation**	*9*	Implement Conservation (e.g. low flow toilets, turf restrictions, educational programs, etc.)*
Surface Water	10	Alamo Lake
	11	Colorado River via (a) Alamo Lake, (b) Diamond Creek, (c) Lake Mead, (d) Lake Havasu, (e) Lake Mohave, and (f) Lake Powell
*Other**	~~12~~	~~Weather Modification – Cloud Seeding~~
	13	Watershed Management*

*Conservation and Watershed Management are important components of water resource management and will be utilized by water managers in the CYHWRMS planning areas. However, these alternatives were not evaluated for costs and volumes in CYHWRMS because some conservation is already included in Phase 1 (and the Phase 1 conservation assumptions varied between the Water Planning Areas), and it was not possible to make comparable cost estimates for infrastructure requirements and field costs for “conservation” and “watershed management”.

Potential Water Volume Associated with each Alternative



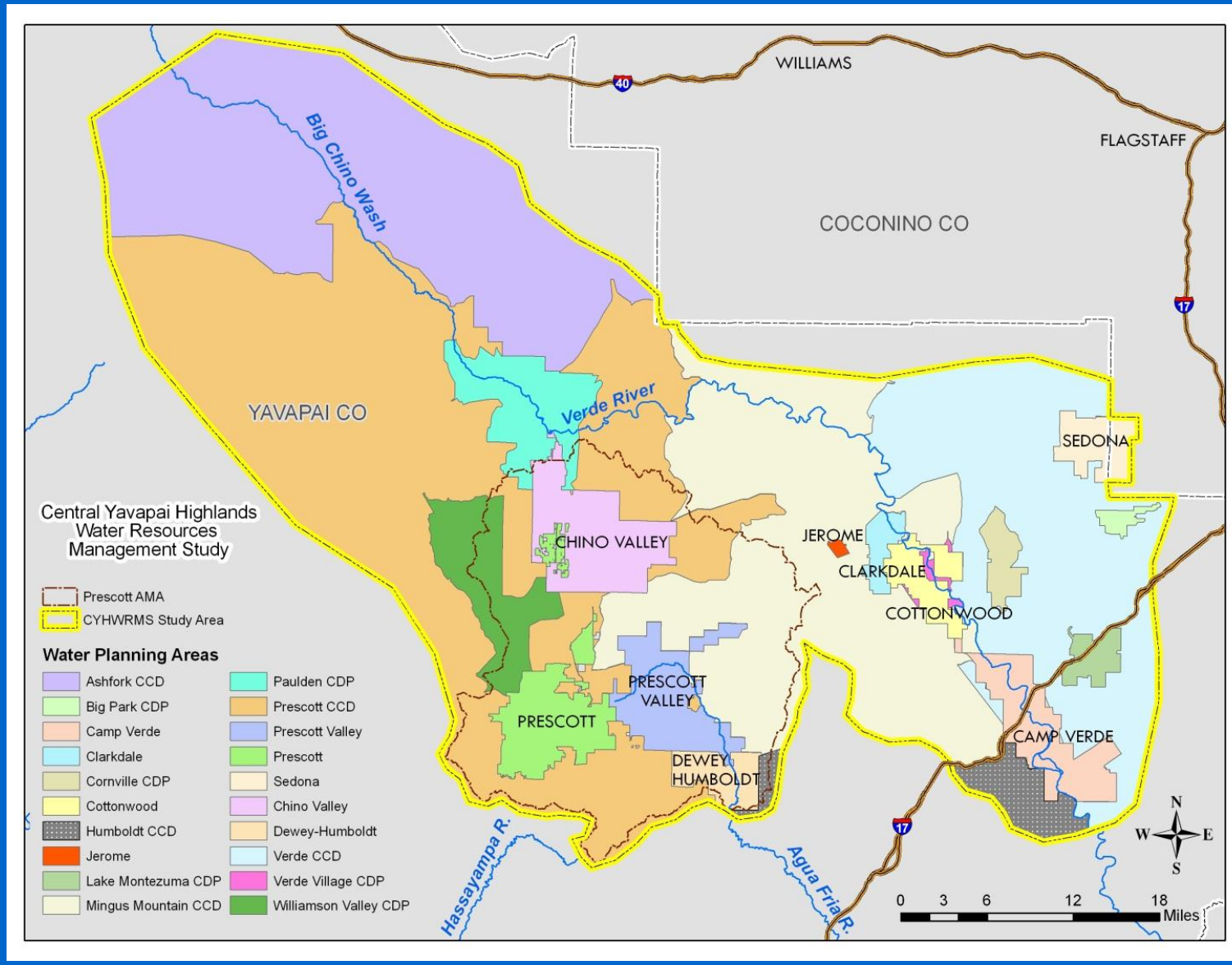
Appraisal Level Cost per acre foot (relative)



Alt. #1 Local Groundwater Development within the WPA (Outside the PRAMA)

- This alternative relies solely on the continued development of groundwater to meet the water supply deficit in 2050 with either urban non-exempt wells, rural exempt wells or a combination thereof for WPAs outside the Prescott AMA (PRAMA).
- It was assumed that groundwater in rural areas is generally accessed by private domestic wells that are referred to as exempt wells. Conversely, it was assumed that urban areas are generally served by water providers of varying sizes by non-exempt wells.
- For this option, WPAs considered in this alternative are those that show a 2050 water supply deficit and are outside the PRAMA. There are thirteen WPA's considered; Clarkdale, Cottonwood, Jerome, Paulden, Sedona, Big Park, Lake Montezuma, Cottonwood-Verde Village, Williamson, Verde CCD, Prescott CCD, Mingus Mtn. CCD and Ashfork CCD.

CYHWRMS - Study Area



Alt. #1 Local Groundwater Development within the WPA (Outside the PRAMA)

- **Environmental Issues**
- **Potential impacts to surface water supplies where there is a groundwater-surface water connection.**
- **Eventual declines and loss of stream and spring flows, changes in stream flow magnitude, duration and flood events, and the impact to groundwater availability.**
- **Biologic dynamics of the riparian and spring systems.**
- **land subsidence, and increasing issues in water quality including concentration of contaminants.**
- **Legal and Institutional Issues**
- **right of way; adjudication; NOI requirements, and well spacing requirements. Potable water deliveries would be subject to potable water facilities, SDWA and Water Treatment regulations; Federal Reserved Rights for Indian Tribes.**

Alt. #1 Local Groundwater Development within the WPA (Inside the PRAMA)

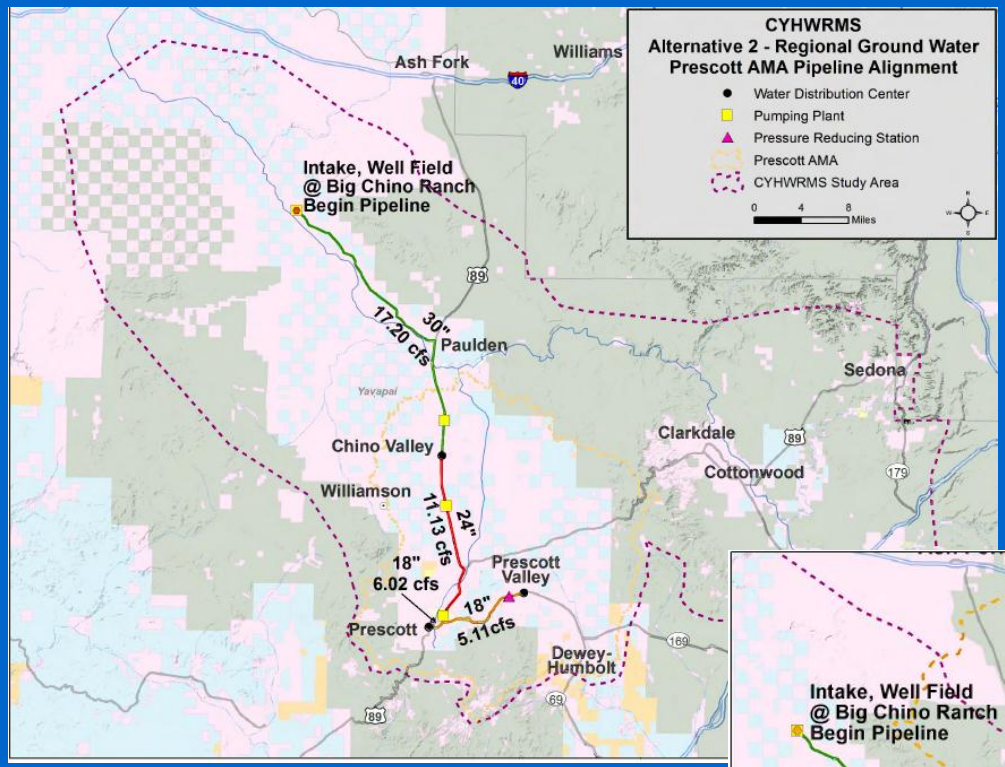
- **This alternative relies solely on the development of groundwater to meet the water supply deficit in 2050 with urban non-exempt wells and rural exempt wells for WPAs inside the Prescott AMA (PRAMA). For this option, WPAs considered are City of Prescott, Chino Valley, Dewey-Humboldt and Prescott Valley.**
- **It was determined that there is existing well capacity to meet the Prescott WPA 2050 water supply deficit.**
- **For Chino Valley, Dewey-Humboldt and Prescott Valley WPAs, The maximum groundwater allowance volume associated with currently undeveloped subdivisions lots was assumed to be met by new non-exempt, municipal wells. Any volume of groundwater in excess of the maximum groundwater allowance, or the 2050 water supply deficit must be met by exempt wells or by an alternative water supply.**
- ***Considered not viable*.**

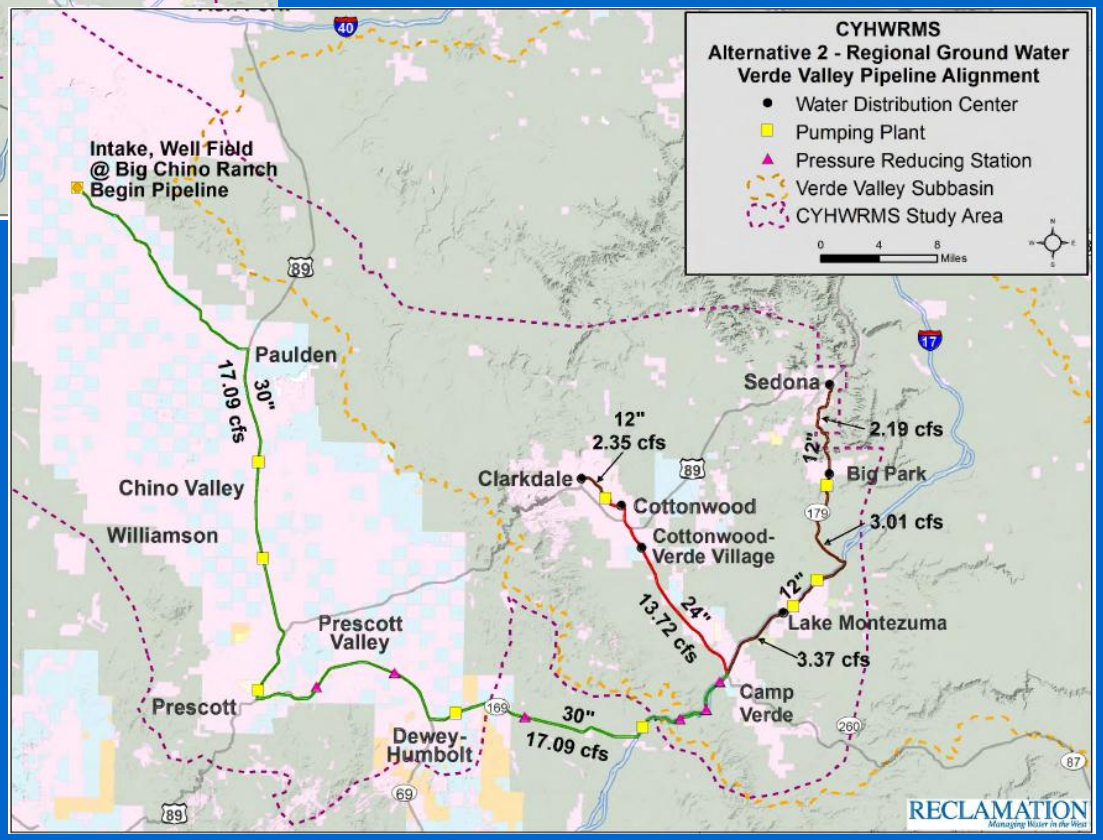
Alt. #2 Regional Groundwater Development
Big Chino Pipelines (PRAMA & Verde Valley)

- This alternative proposes two versions that rely on development of groundwater supplies from the Big Chino Sub-basin for transportation via pipeline to either specific WPAs within the PRAMA or to specific WPAs within the Verde Valley. This alternative is considered to be regional groundwater development because it requires development of groundwater supply from the Big Chino Water Ranch, within the study area.

- The WPAs considered in the PRAMA version of this alternative are: City of Prescott, Prescott Valley and Town of Chino Valley.
- Rural WPAs that are primarily served from private, domestic wells were not included within this alternative.

- The WPAs considered in the Verde Valley version of this alternative are: Clarkdale, Cottonwood, Sedona, Big Park CDP, Lake Montezuma CDP and Ctn-Verde Village CDP.


CYHWRMS
Alternative 2 - Regional Ground Water
Prescott AMA Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
Prescott AMA
CYHWRMS Study Area
0 4 8 Miles
Ash Fork
Williams
Intake, Well Field
@ Big Chino Ranch
Begin Pipeline
17.20 cfs
30"
Paulden
Sedona
Yavapai
Chino Valley
Clarkdale
Cottonwood
Williamson
11.13 cfs
24"
18"
6.02 cfs
Prescott Valley
18"
5.11cfs
Prescott
Dewey-
Humbolt


CYHWRMS
Alternative 2 - Regional Ground Water
Verde Valley Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
Verde Valley Subbasin
CYHWRMS Study Area
0 4 8 Miles
Intake, Well Field
@ Big Chino Ranch
Begin Pipeline
Paulden
17.09 cfs
30"
Chino Valley
Williamson
Prescott Valley
Prescott
Dewey-
Humbolt
Sedona
12"
2.35 cfs
2.19 cfs
Clarkdale
Big Park
Cottonwood
3.01 cfs
Cottonwood-
Verde Village
13.72 cfs
24"
Lake Montezuma
3.37 cfs
Camp
Verde
30"
17.09 cfs
RECLAMATION
Managing Water in the West

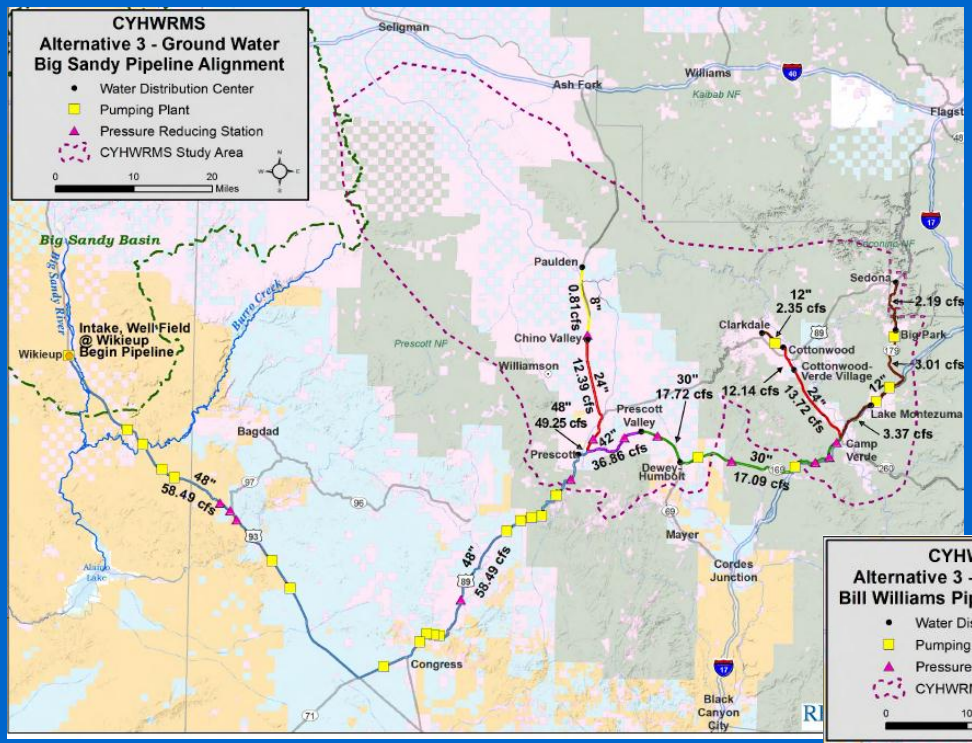
Alt. #2 Regional Groundwater Development
Big Chino Pipelines (PRAMA & Verde Valley)

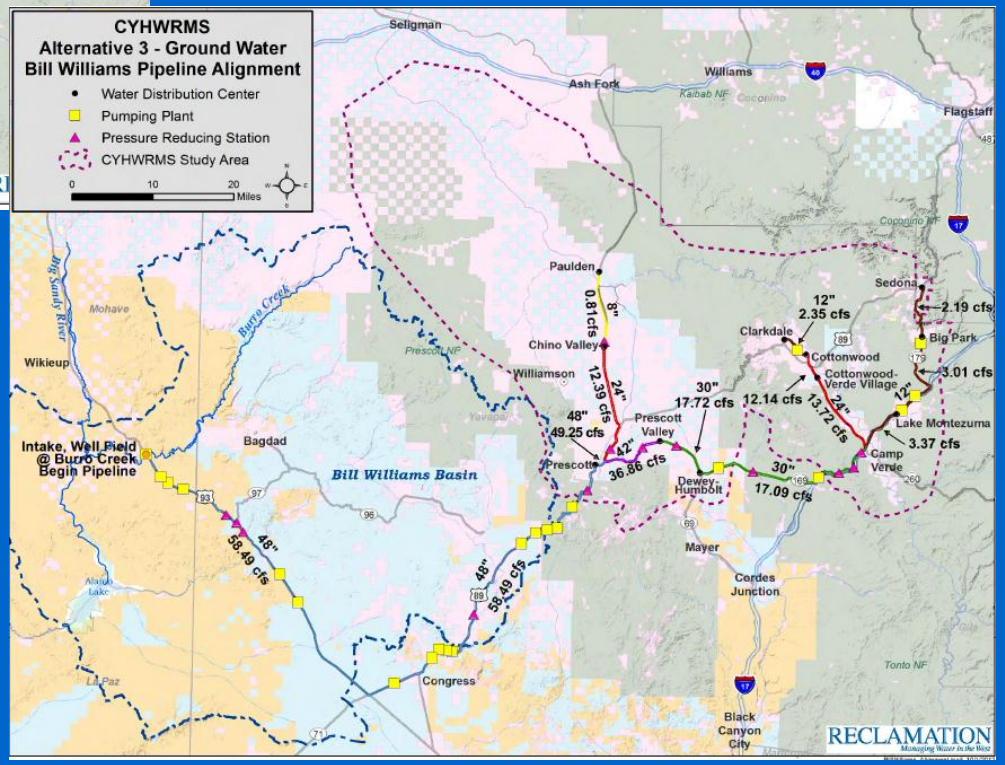
- **Environmental Issues**
- **Potential impacts to surface water supplies (has mitigation framework)**
- **Eventual declines and loss of stream and spring flows, changes in stream flow magnitude, duration and flood events, and the impact to groundwater availability.**
- **Biologic dynamics of the riparian and spring systems.**
- ***Benefits* to basin where transported (safe yield, alternative to groundwater, maintain streams and springs)**
- **Legal and Institutional Issues**
- **Flood plain ordinances, SHPA, NEPA, right of way; adjudication; NOI requirements, statutory limits on groundwater transportation, and well spacing requirements. Potable water deliveries would be subject to potable water facilities, SDWA (EPA) and Water Treatment regulations; Federal Reserved Rights for Indian Tribes.**

Alt. #3 Regional Groundwater Development Outside Study Area (Bill Williams & Big Sandy)

- This alternative proposes two options that rely on the development of groundwater supplies from either the Bill Williams Sub-basin or the Big Sandy Sub-basin for transportation via pipeline to the WPAs. In the Big Sandy version of the alternative, the groundwater is developed near Wikieup, Arizona and in the Bill Williams version the groundwater is developed at Burro Creek.

- The WPAs considered in this alternative are those that show a 2050 water supply deficit with the exception of Jerome and rural WPAs that are primarily served from private, domestic wells. The following WPAs were <u>not</u> included within this alternative: Jerome, Verde CCD, Prescott CCD, Mingus Mountain CCD, Humboldt CCD and Ashfork CCD.


CYHWRMS
Alternative 3 - Ground Water
Big Sandy Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Big Sandy Basin
Big Sandy River
Burro Creek
Intake, Well Field
@ Wikieup
Begin Pipeline
Wikieup
Seligman
Ash Fork
Williams
Kaibab NF
Flagst
Paulden
Sedona
Clarkdale
Chino Valley
Williamson
Prescott NF
Cottonwood
Cottonwood-
Verde Village
Big Park
Lake Montezuma
Camp
Verde
Prescott
Prescott
Valley
Dewey
Humbolt
Bagdad
Mayer
Cordes
Junction
Congress
Black
Canyon
City
Alamo
Lake
0.81 cfs
8"
12.39 cfs
24"
48"
49.25 cfs
42"
36.86 cfs
30"
17.72 cfs
30"
17.09 cfs
12"
2.35 cfs
12.14 cfs
13.72 cfs
24"
12"
2.19 cfs
3.01 cfs
3.37 cfs
48"
58.49 cfs
48"
58.49 cfs


CYHWRMS
Alternative 3 - Ground Water
Bill Williams Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Bill Williams Basin
Big Sandy River
Burro Creek
Intake, Well Field
@ Burro Creek
Begin Pipeline
Wikieup
Seligman
Ash Fork
Williams
Kaibab NF
Coconino NF
Flagstaff
Paulden
Sedona
Clarkdale
Chino Valley
Williamson
Prescott NF
Cottonwood
Cottonwood-
Verde Village
Big Park
Lake Montezuma
Camp
Verde
Prescott
Prescott
Valley
Dewey
Humbolt
Bagdad
Mayer
Cordes
Junction
Congress
Black
Canyon
City
Mohave
Alamo
Lake
La Paz
Tonto NF
0.81 cfs
8"
12.39 cfs
24"
48"
49.25 cfs
42"
36.86 cfs
30"
17.72 cfs
30"
17.09 cfs
12"
2.35 cfs
12.14 cfs
13.72 cfs
24"
12"
2.19 cfs
3.01 cfs
3.37 cfs
48"
58.49 cfs
48"
58.49 cfs
RECLAMATION
Managing Water in the West

Alt. #4 Conversion of Existing Septic Systems - Urban

- This alternative considers conversion of urban residential septic systems to sewer connections. For the purposes of this study, "Urban" refers to a WPA that is serviced by a water provider, sewer provider, or is within the boundary of a Certificates of Convenience and Necessity (CC&N). A CC&N defines an area where an entity holds exclusive rights to supply water or wastewater services within a specified geographic area.

- This analysis estimated the number of residential properties in urban areas that use on-site septic systems. Under this alternative, residential septic systems would be converted to connections with sewer conveyance infrastructure. This would involve extending sewer conveyance infrastructure into areas where residences are currently on septic systems. For this option, eleven WPA's are considered urban; Camp Verde, Chino Valley, Clarkdale, Cottonwood, Jerome, Prescott, Prescott Valley, Sedona, Big Park, Lake Montezuma and Paulden.

Alt. #5 Conversion of Existing Septic Systems - Rural

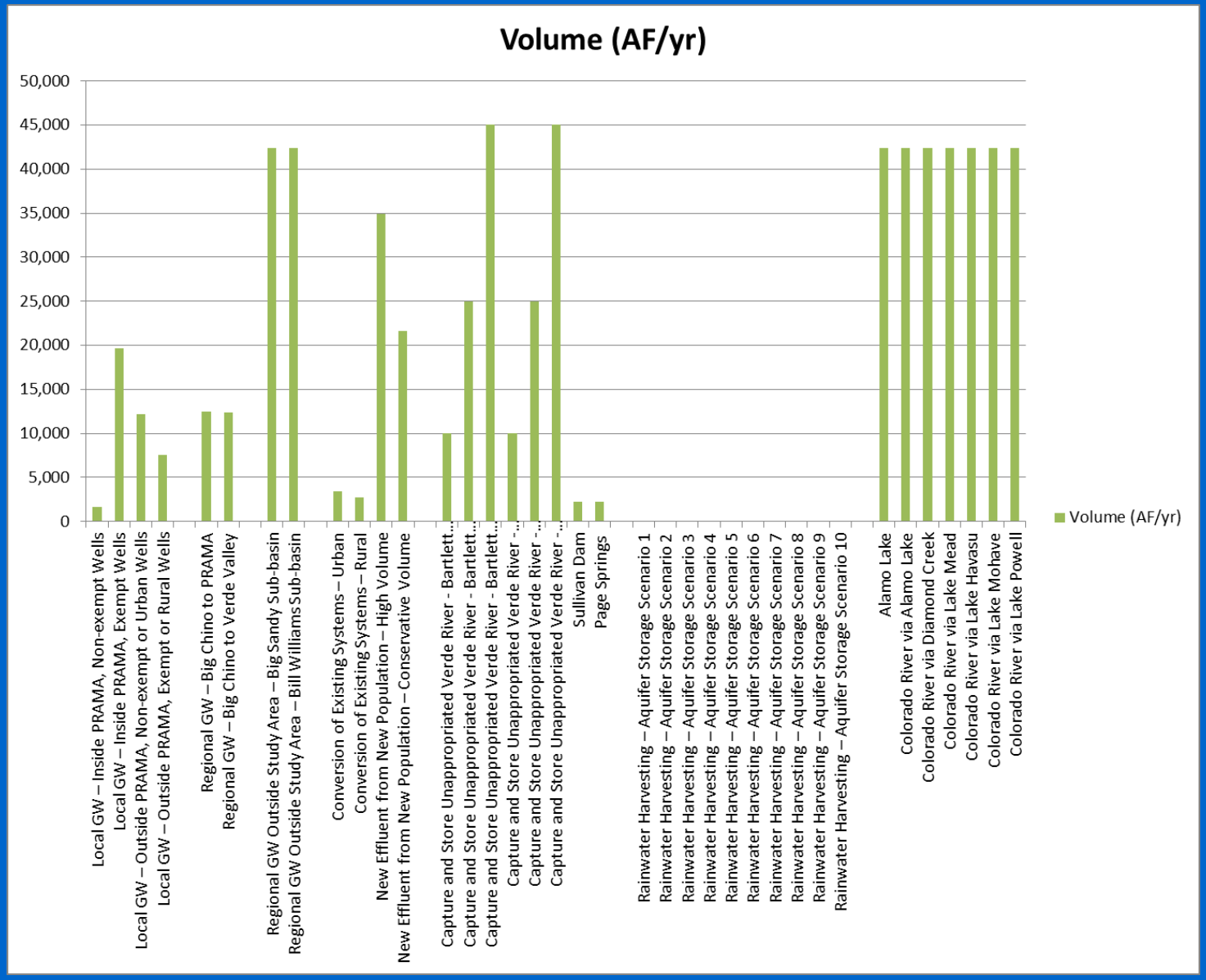
- **This alternative involves conversion of residential septic systems to sewer service to increase the availability of effluent for reuse, in rural areas. This assessment considers rural areas to be outside of a water provider service area, a sewer service area or a CC&N. Rural areas tend to have larger lots and lower household density than urban areas. The WPA's are assessed individually.**

- **Rural wastewater volumes were calculated using the number of rural parcels (2007 Yavapai County Geographic Information System), population (US Census 2000), and an average wastewater production of 69 gallons per person per day. Only residential parcels are considered for conversion of septic systems to a sewer system. This process yielded a rural population estimate by planning area. For this option, thirteen WPA's are considered having rural population; Ashfork, Cornville, Cottonwood, Humboldt, Lake Montezuma, Mingus Mountain, Paulden, Prescott CD, Prescott Valley, Prescott, Verde Cottonwood-Verde Village and Williamson.**
- ***Considered not viable***

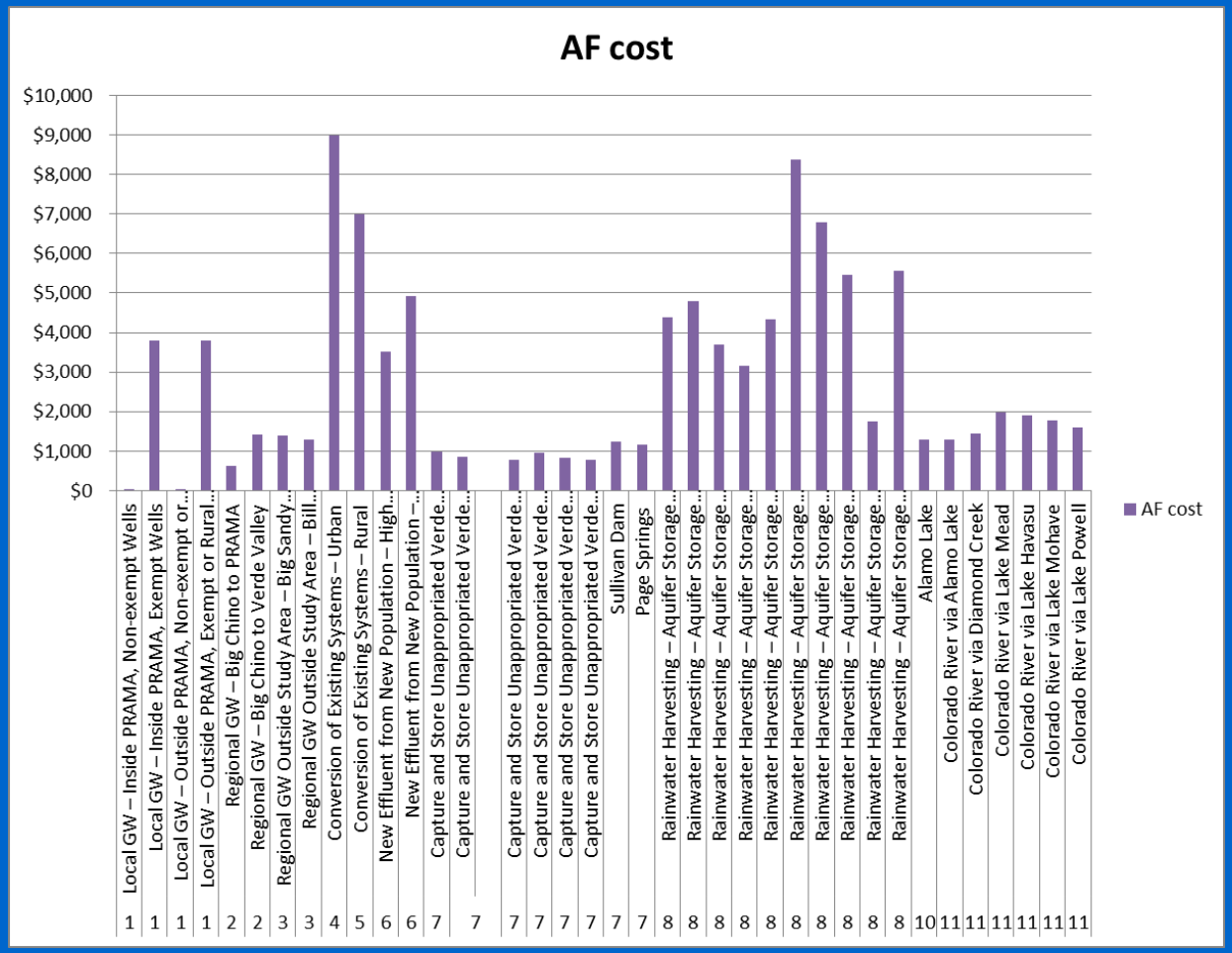
Alt. #6 New Effluent from New Population

- This alternative focuses on new wastewater volumes as a result of new population in each of the twenty WPA's from 2006 to 2050 and identifies the potential volume of water that would be available. The new population was determined during the Phase I - Demand Analysis conducted for this Study. The new population was multiplied by an average wastewater production of 69 gallons per day per person to estimate the new wastewater volume available in 2050.
- The volume of effluent generated from the new wastewater is presented as a range of high and conservative volumes (high = 100%; conservative = 45%).
- Group A – Existing WWTF can accommodate additional wastewater capacity. Expansion of sewer conveyance infrastructure is required.
- Group B – Existing WWTF requires expansion to accommodate additional wastewater capacity Expansion of sewer conveyance infrastructure is required.
- Group C – Construction of new WWTF and sewer conveyance infrastructure is required.
- Under Alternative 6, all WPA's were considered.

Potential Water Volume Associated with each Alternative

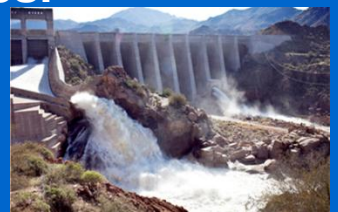


Appraisal Level Cost per acre foot (relative)



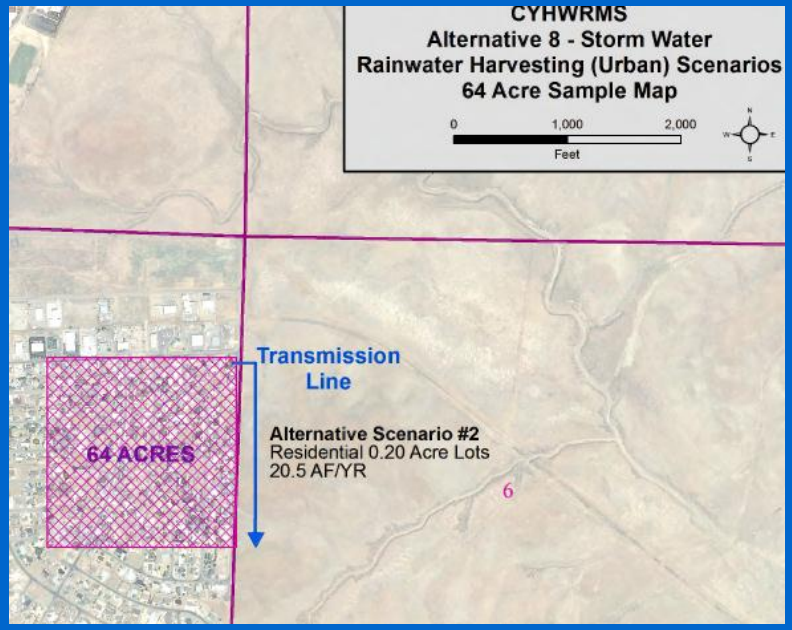
Alt. #7 Capture and Store Unappropriated Verde River flood water

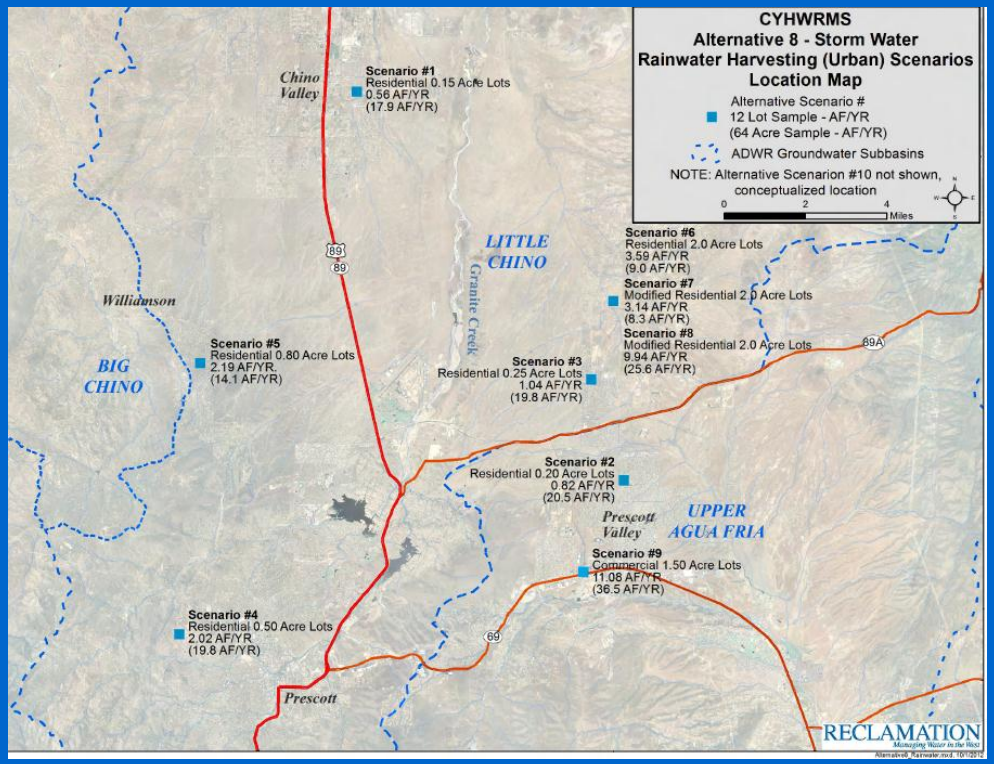
- This alternative proposes as a source of supply the capture of unappropriated water from the Verde River watershed during a spill condition. This volume of floodwater is an intermittent source that is only available when all senior downstream water rights are being satisfied and storage capacity is being exceeded at Salt River Project's (SRP) reservoirs. There are a number of versions of this alternative but all include either increasing or creating additional reservoir storage. The increased reservoir storage would result in the ability to store water within the system that would normally be lost during the occasional spill condition. Water supply credits would accrue in the new space and designated for the WPA participants, and then debited when the water is used upstream.
- In both Alternatives 7.1 and 7.2, the proposed reservoir volume increases are based on the reservoir yield potential concept: 10,000 AF\yr., 25,000 AF/yr., and 45,000 AF/yr. Versions 7.1 and 7.2 of this alternative require modifications to existing SRP dams in addition to construction of upstream catchments and transmission facilities.



Alt. #8 Rainwater Harvesting-Aquifer Storage

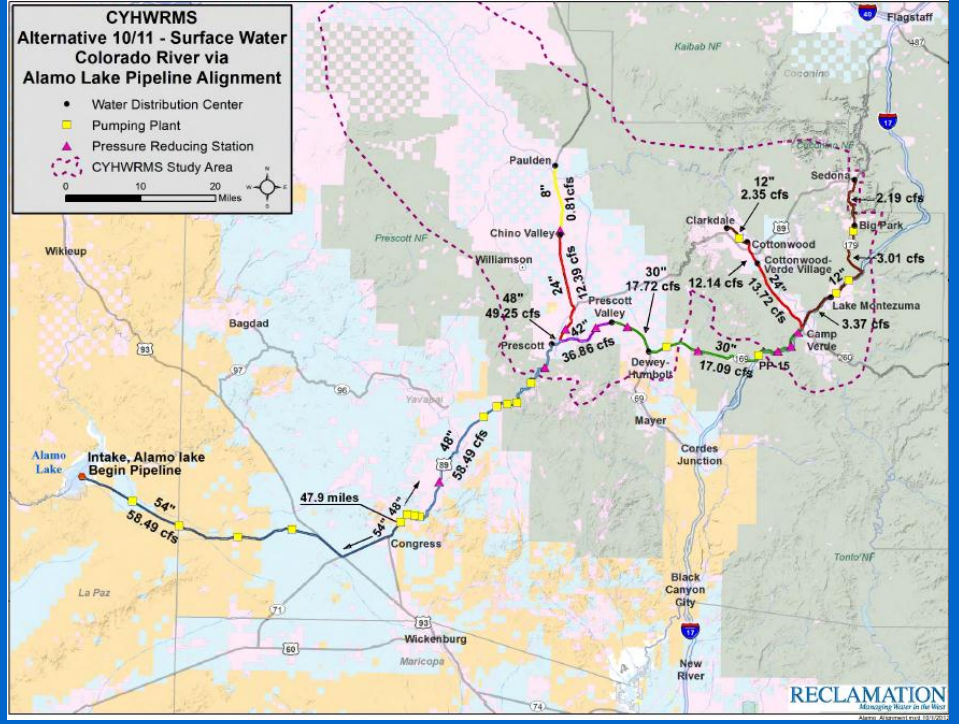
- This alternative evaluates a variety of rainwater harvesting methods to capture rainwater that would normally be lost to evaporation and transpiration. The methods evaluated in this alternative are considered large-scale, or macro-rainwater harvesting methods, that capture storm water and re-direct a portion of the rainwater to recharge facilities. It assumes that the water gathered via rainwater harvesting efforts is water that would not be considered appropriable as surface water.

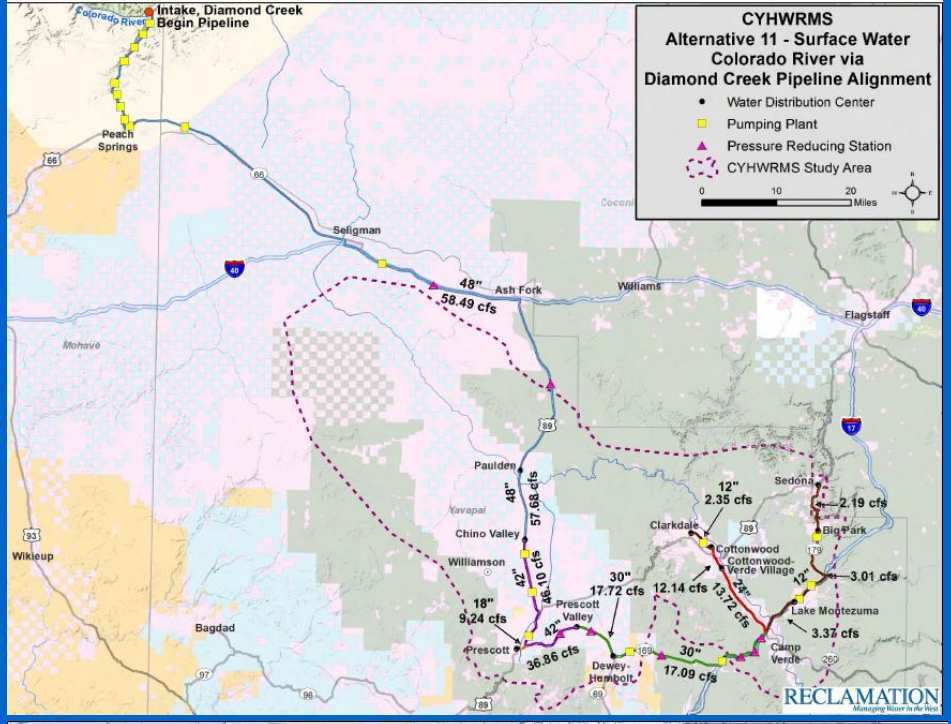


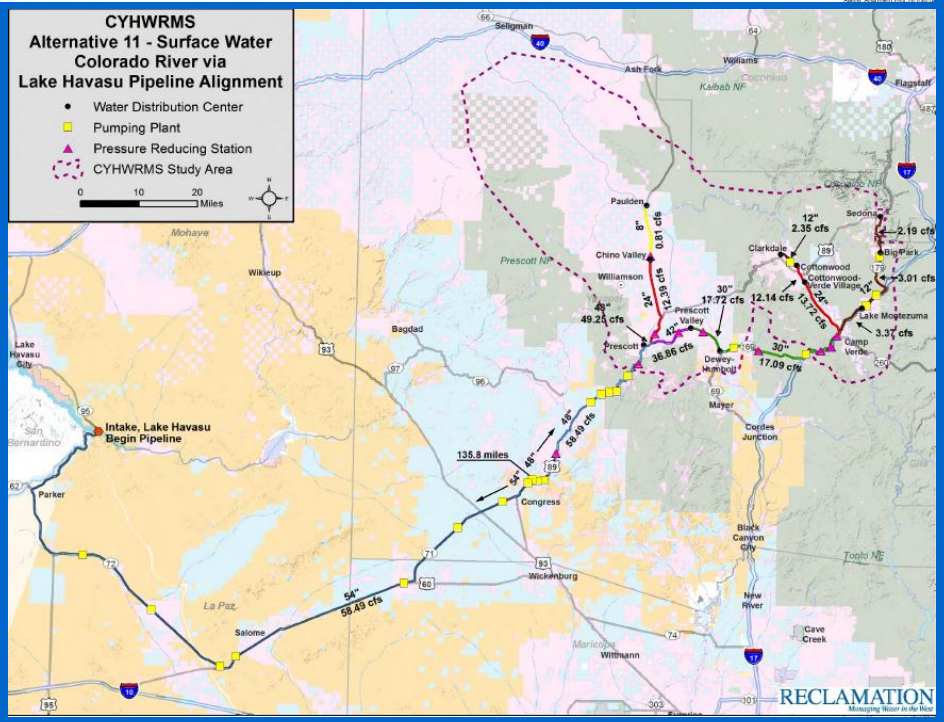


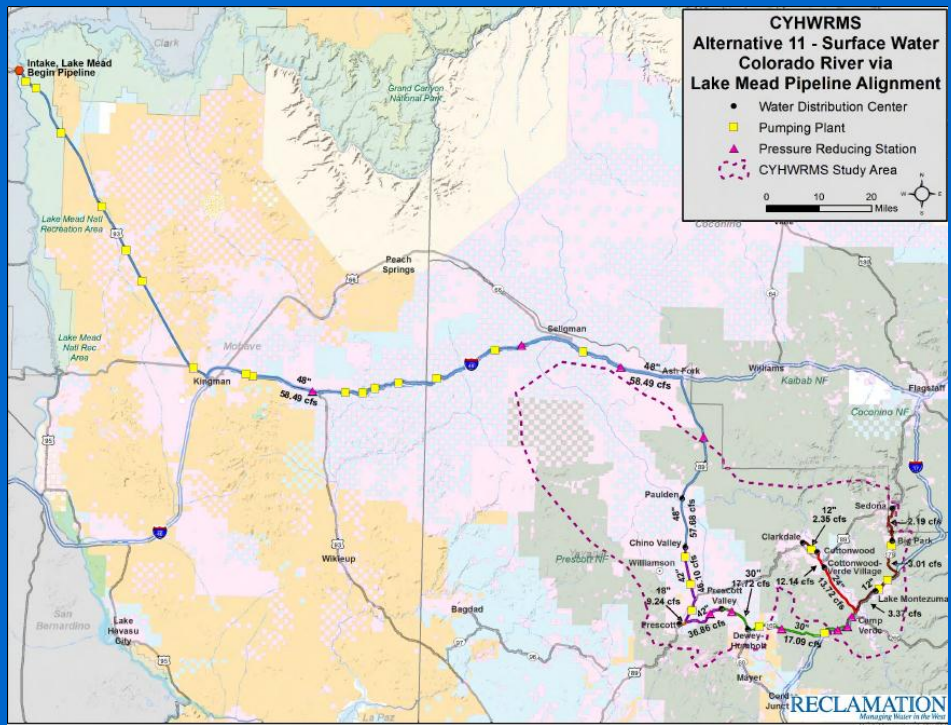
Alts. 10 & 11- Surface Water in Alamo Lake and Colorado River water via Alamo Lake, Diamond Creek, Lake Mead, Lake Havasu, Lake Mohave and Lake Powell

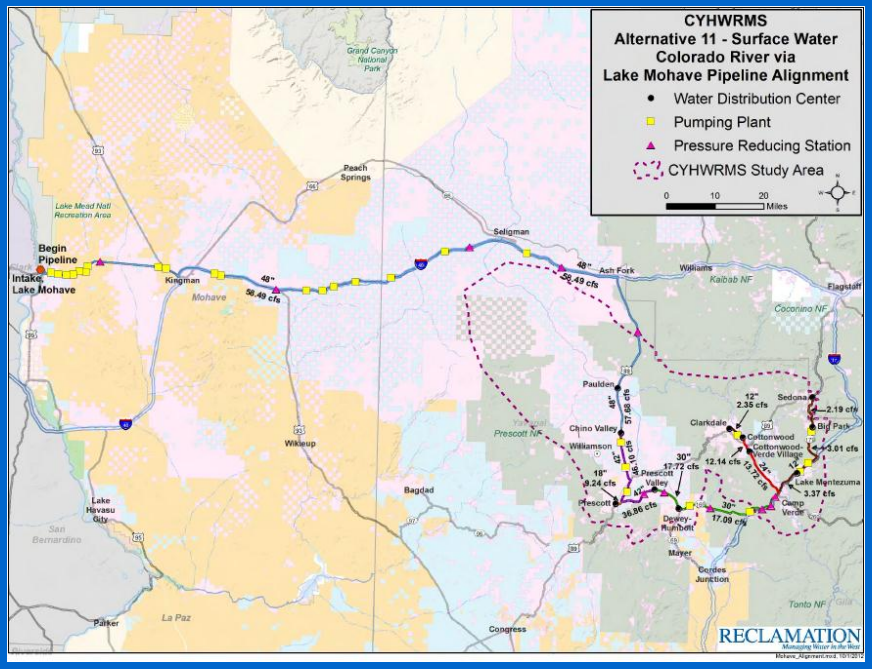
- This alternative proposes use of surface water obtained from outside of the study area in the volume of 42,379 AF/yr. Alternative 10 proposes delivery of water from Alamo Lake via pipeline. The variations of Alternative 11 propose delivery of water from the Colorado River via pipelines from several different locations: Alamo Lake, Diamond Creek, Lake Mead, Lake Havasu, Lake Mohave and Lake Powell.
- The WPAs considered in this alternative are those that show a 2050 water supply deficit with the exception of Jerome and rural WPAs that are primarily served from private domestic wells. The following WPAs were not included within this alternative: Jerome, Verde CCD, Prescott CCD, Mingus Mountain CCD, Humboldt CCD and Ashfork CCD.

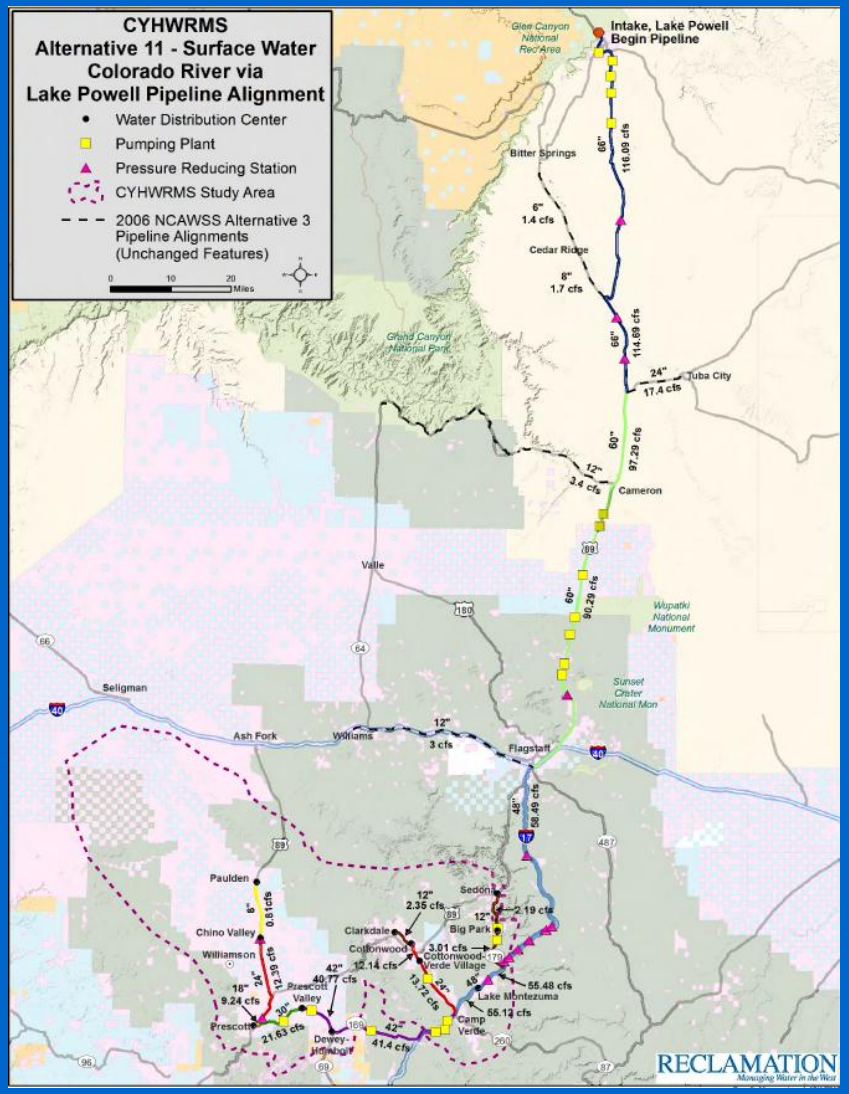

CYHWRMS
Alternative 10/11 - Surface Water
Colorado River via
Alamo Lake Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Intake, Alamo lake
Begin Pipeline
Alamo Lake
54"
58.49 cfs
47.9 miles
54" 48"
48"
58.49 cfs
Congress
Wickenburg
Black Canyon City
New River
Cordes Junction
Mayer
Wickieup
Bagdad
Chino Valley
Williamson
Paulden
Prescott
Prescott Valley
Dewey-Humbolt
PP-15
Camp Verde
Lake Montezuma
Cottonwood
Cottonwood-Verde Village
Clarkdale
Sedona
Big Park
Flagstaff
Williams
Seligman
Peach Springs
Kingman
Lake Havasu City
Parker
Salome
Wittmann
Cave Creek
Black Canyon City
Yavapai
Mohave
Maricopa
La Paz
Kaibab NF
Prescott NF
Coconino
Tonto NF
8" 0.81cfs
24" 12.39 cfs
48" 49.25 cfs
42" 36.86 cfs
30" 17.72 cfs
30" 17.09 cfs
12" 2.35 cfs
12" 12.14 cfs
24" 13.72 cfs
12" 3.37 cfs
12" 3.01 cfs
2.19 cfs
RECLAMATION
Managing Water in the West


CYHWRMS
Alternative 11 - Surface Water
Colorado River via
Diamond Creek Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Intake, Diamond Creek
Begin Pipeline
Colorado River
Peach Springs
Seligman
48"
58.49 cfs
Ash Fork
Williams
Flagstaff
Wikieup
Bagdad
Chino Valley
Williamson
Paulden
Prescott
Prescott Valley
Dewey-Humbolt
Camp Verde
Lake Montezuma
Cottonwood
Cottonwood-Verde Village
Clarkdale
Sedona
Big Park
Yavapai
Mohave
48" 57.68 cfs
42" 46.10 cfs
18" 9.24 cfs
42" 36.86 cfs
30" 17.72 cfs
30" 17.09 cfs
12" 2.35 cfs
12" 12.14 cfs
24" 13.72 cfs
12" 3.37 cfs
12" 3.01 cfs
2.19 cfs
RECLAMATION
Managing Water in the West

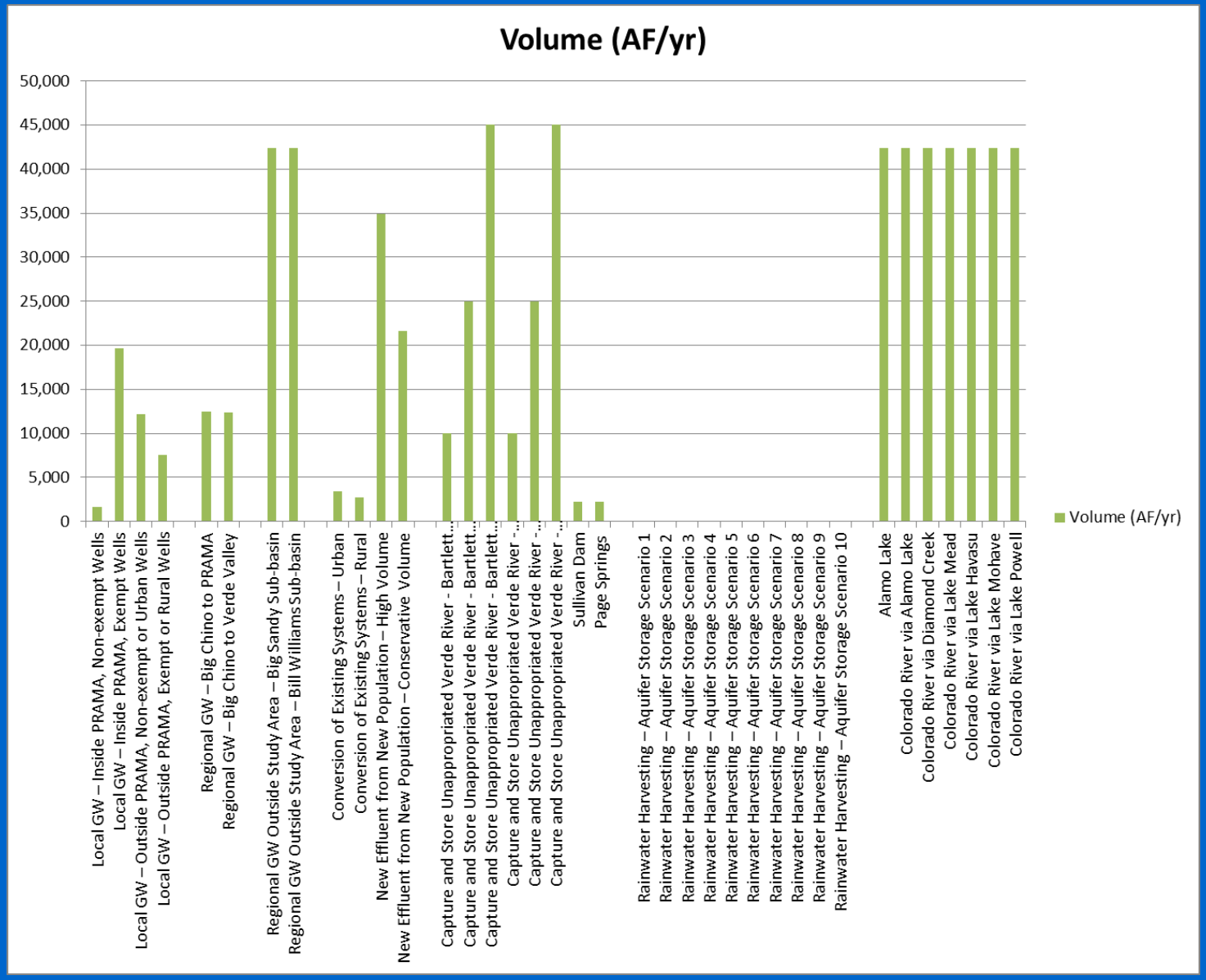

CYHWRMS
Alternative 11 - Surface Water
Colorado River via
Lake Havasu Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Intake, Lake Havasu
Begin Pipeline
Lake Havasu City
135.8 miles
54"
58.49 cfs
48" 54"
48"
58.49 cfs
Congress
Wickenburg
Black Canyon City
New River
Cave Creek
Cordes Junction
Mayer
Wittmann
Salome
Parker
Wickieup
Bagdad
Chino Valley
Williamson
Paulden
Prescott
Prescott Valley
Dewey-Humbolt
Camp Verde
Lake Montezuma
Cottonwood
Cottonwood-Verde Village
Clarkdale
Sedona
Big Park
Flagstaff
Williams
Seligman
Ash Fork
Yavapai
Mohave
Maricopa
La Paz
Kaibab NF
Prescott NF
Coconino
Tonto NF
8" 0.81cfs
24" 12.39 cfs
48" 49.25 cfs
42" 36.86 cfs
30" 17.72 cfs
30" 17.09 cfs
12" 2.35 cfs
12" 12.14 cfs
24" 13.72 cfs
12" 3.37 cfs
12" 3.01 cfs
2.19 cfs
RECLAMATION
Managing Water in the West


CYHWRMS
Alternative 11 - Surface Water
Colorado River via
Lake Mead Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Intake, Lake Mead
Begin Pipeline
Lake Mead Natl Recreation Area
Grand Canyon National Park
Peach Springs
Seligman
Kingman
48"
58.49 cfs
Ash Fork
Williams
Flagstaff
Wikieup
Bagdad
Chino Valley
Williamson
Paulden
Prescott
Prescott Valley
Dewey-Humbolt
Camp Verde
Lake Montezuma
Cottonwood
Cottonwood-Verde Village
Clarkdale
Sedona
Big Park
Lake Havasu City
San Bernardino
Mohave
Clark
Coconino
Kaibab NF
Prescott NF
48" 57.68 cfs
42" 46.10 cfs
18" 9.24 cfs
42" 36.86 cfs
30" 17.72 cfs
30" 17.09 cfs
12" 2.35 cfs
12" 12.14 cfs
24" 13.72 cfs
12" 3.37 cfs
12" 3.01 cfs
2.19 cfs
RECLAMATION
Managing Water in the West

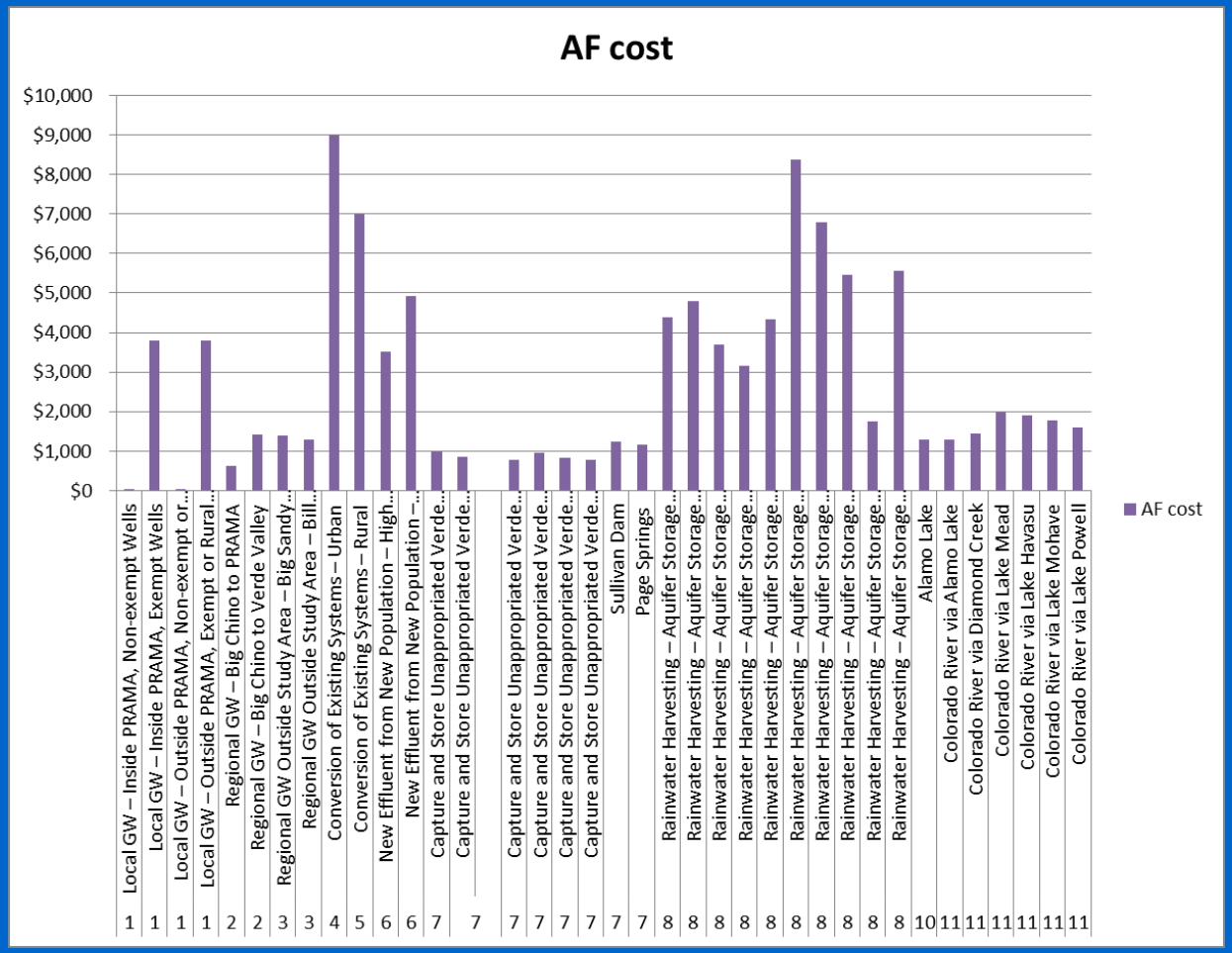

CYHWRMS
Alternative 11 - Surface Water
Colorado River via
Lake Mohave Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
0 10 20 Miles
Begin Pipeline
Intake, Lake Mohave
Kingman
Mohave
Peach Springs
Seligman
Ash Fork
Williams
Kaibab NF
Flagstaff
Coconino NF
Paulden
Sedona
Clarkdale
Chino Valley
Cottonwood
Cottonwood-Verde Village
Big Park
Williamson
Prescott NF
Prescott Valley
Prescott
Lake Montezuma
Camp Verde
Dewey-Humboldt
Mayer
Cordes Junction
Wikieup
Bagdad
Lake Havasu City
Parker
La Paz
Congress
RECLAMATION


CYHWRMS
Alternative 11 - Surface Water
Colorado River via
Lake Powell Pipeline Alignment
Water Distribution Center
Pumping Plant
Pressure Reducing Station
CYHWRMS Study Area
2006 NCAWSS Alternative 3
Pipeline Alignments
(Unchanged Features)
0 10 20 Miles
Intake, Lake Powell
Begin Pipeline
Glen Canyon National Rec Area
Bitter Springs
Cedar Ridge
Grand Canyon National Park
Tuba City
Cameron
Valle
Wupatki National Monument
Sunset Crater National Mon
Seligman
Ash Fork
Williams
Flagstaff
Paulden
Sedona
Clarkdale
Chino Valley
Cottonwood
Cottonwood-Verde Village
Big Park
Williamson
Prescott Valley
Prescott
Lake Montezuma
Camp Verde
Dewey-Humboldt
RECLAMATION

Potential Water Volume Associated with each Alternative



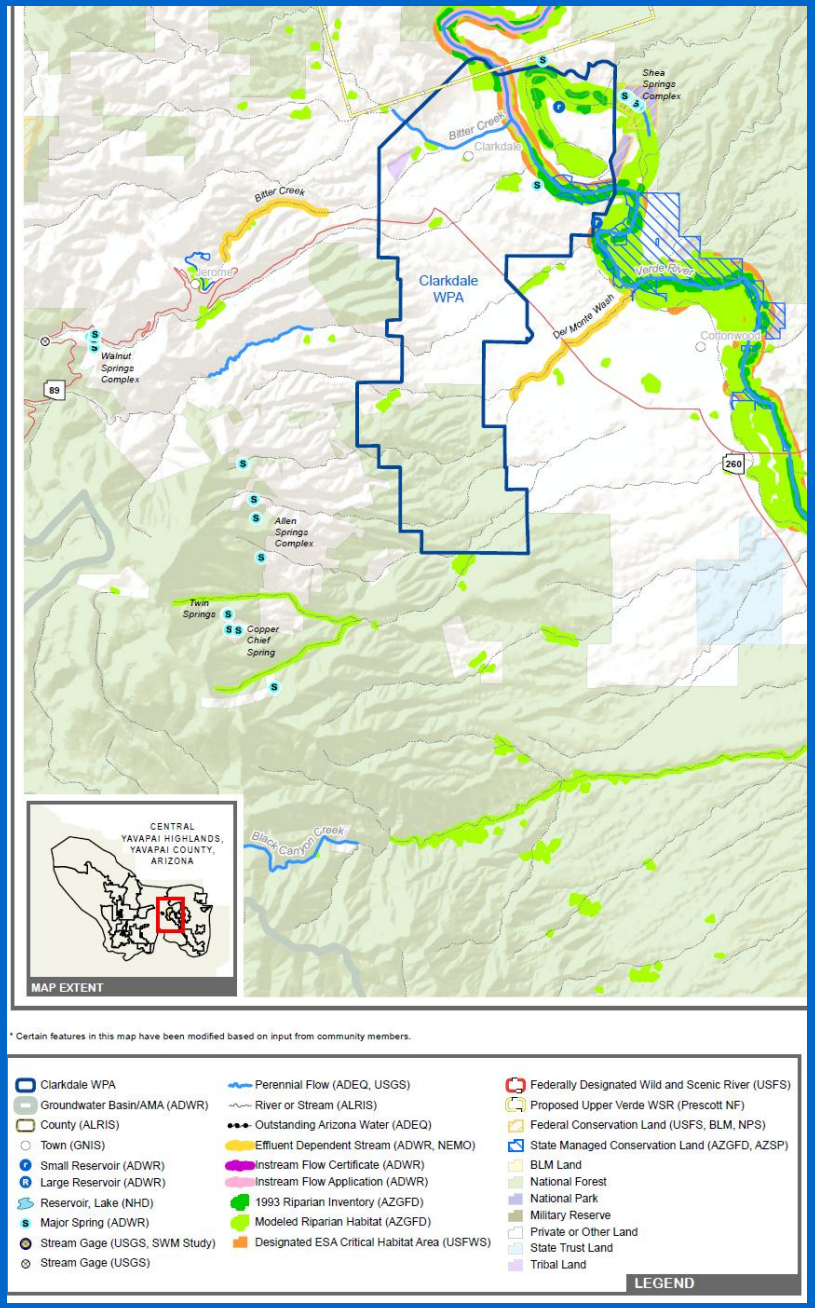
Appraisal Level Cost per acre foot (relative)



Alternative Evaluations

- <u>Environmental</u>: potential environmental issues associated with each alternative were discussed and documented.

- <u>Legal & Institutional</u>: intent to develop and document potential significant issues or obstacles relative to Federal, sate or local regulations.



Viability Testing

- **Each alternative is screened based on four evaluation criteria: completeness, effectiveness, efficiency, and acceptability.**

- **Minimum standards are established to assess viability for four criteria to determine if an alternative is worthy of further consideration.**

- **The standards are subjective and each alternative is measured relative to other proposed alternatives.**

- **As long as an alternative exceeds the minimum standard for each criterion it qualifies for further consideration and comparison with other alternatives.**

Viability: 8 alternatives are considered viable

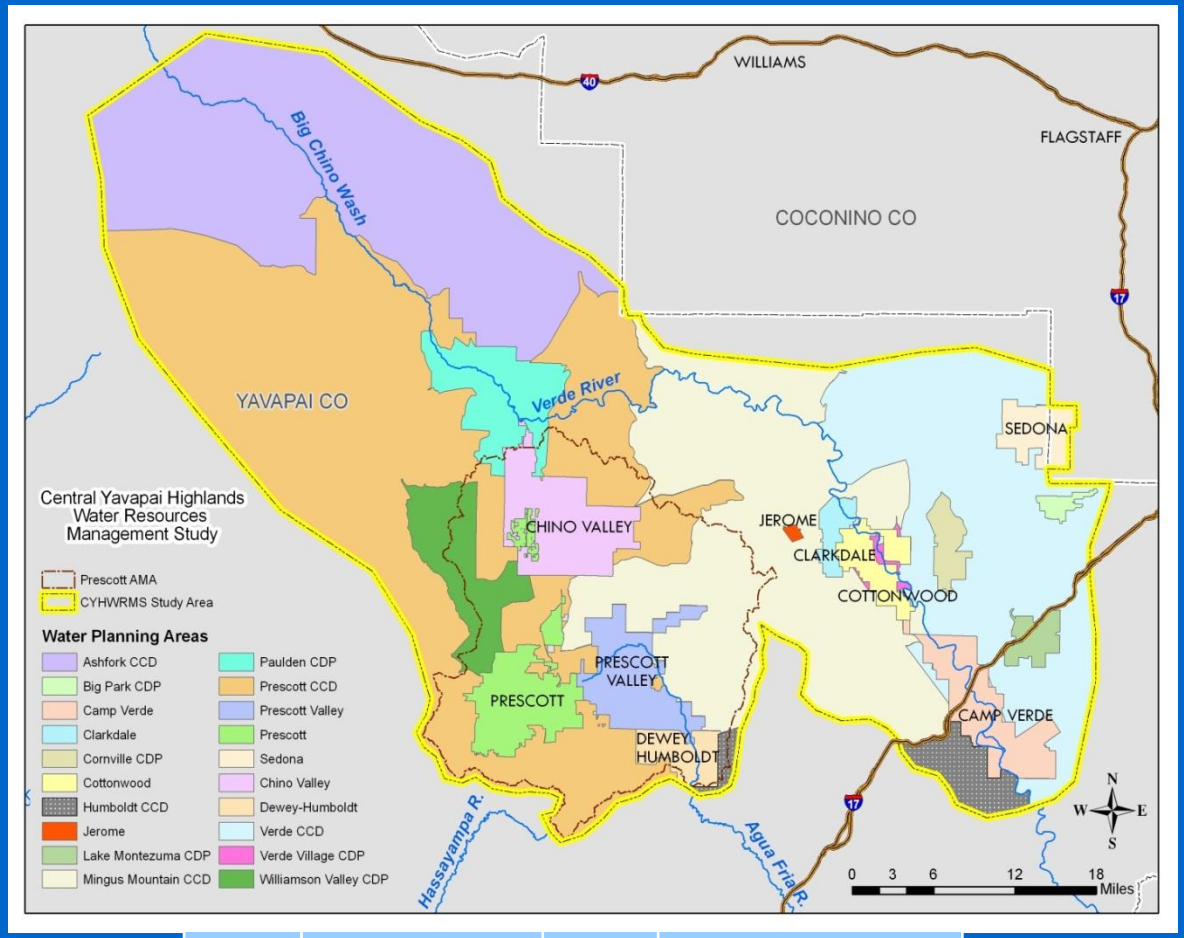
Viability	Alternative
Viable	Alt. 1 Local Groundwater Development within the WPA (Outside the PRAMA)
Not Viable	~~Alt. 1 Local Groundwater Development within the WPA (Inside the PRAMA)~~
Viable	Alt. 2 Regional Groundwater Development Big Chino Pipelines (PRAMA)
Viable	Alt. 2 Regional Groundwater Development Big Chino Pipelines (Verde)
Viable	Alt. 3 Regional Groundwater Development Outside Study Area (Bill Williams & Big Sandy Sub-basins)
Viable	Alt. 4 Conversion of Existing Septic Systems (Urban)
Not Viable	~~Alt. 5 Conversion of Existing Septic Systems (Rural)~~
Viable	Alt. 6 New Effluent From New Population
Viable	Alt. 7 Capture and Store Unappropriated Verde River
Viable	Alt. 8 Rainwater Harvesting-Aquifer Storage
Viable	Alt. 10 & 11 Surface Water in Alamo Lake and Colorado River Water via Alamo Lake, Diamond Creek, lake Mead, lake Havasu, lake Mohave and Lake Powell

Analysis done by Technical Working Group

Table 1: List of considered alternatives (grouped by supply type) and those which were evaluated for costs and volumes

Water Supply	Alternative	Alternative Description
Groundwater	1	Local Groundwater Development within the WPA (Inside and outside PRAMA)
	2	Regional Groundwater Development – Big Chino Pipelines (PRAMA and Verde Valley)
	3	Regional Groundwater Development Outside Study Area - Bill Williams Sub-basin and Big Sandy Sub-basin
Effluent	4	Conversion of Existing Systems - Urban
	5	Conversion of Existing Systems - Rural
	6	Additional Effluent from Increased Population
Flood Water	7	Capture and Store Unappropriated Verde River or tributary water
Storm Water	8	Rainwater Harvesting – Aquifer Storage
*Conservation**	*9*	Implement Conservation (e.g. low flow toilets, turf restrictions, educational programs, etc.)*
Surface Water	10	Alamo Lake
	11	Colorado River via (a) Alamo Lake, (b) Diamond Creek, (c) Lake Mead, (d) Lake Havasu, (e) Lake Mohave, and (f) Lake Powell
*Other**	~~12~~	~~Weather Modification – Cloud Seeding~~
	13	Watershed Management*

*Conservation and Watershed Management are important components of water resource management and will be utilized by water managers in the CYHWRMS planning areas. However, these alternatives were not evaluated for costs and volumes in CYHWRMS because some conservation is already included in Phase 1 (and the Phase 1 conservation assumptions varied between the Water Planning Areas), and it was not possible to make comparable cost estimates for infrastructure requirements and field costs for “conservation” and “watershed management”.



WPA #	Water Planning Area	WPA #	Water Planning Area
1	Camp Verde	11	Cornville CDP
2	Chino Valley	12	Ctn-Verde Villages CDP
3	Clarkdale	13	Lake Montezuma CDP
4	Cottonwood	14	Paulden CDP
5	Dewey Humboldt	15	Williamson CDP
6	Jerome	16	Ashfork CCD
7	Prescott	17	Humboldt CCD
8	Prescott Valley	18	Mingus Mtn CCD
9	Sedona	19	Prescott CCD
10	Big Park CDP	20	Verde CCD

Water Planning Area	2050 Water Supply +/- (AF/yr)
Camp Verde	1,782
Dewey Humboldt	-478
Clarkdale	-1,706
Cottonwood	-7,123
Jerome	-23
Prescott Valley	-13,875
Chino Valley	-6,976
Prescott	-6,702
Sedona	-3,028
Paulden CDP	-733
Big Park CDP	-593
Cornville CDP	326
Lake Montezuma CDP	-309
Ctn-Verde Village CDP	-1,147
Verde CCD	-248
Prescott CCD	-1,361
Mingus Mtn CCD	-469
Humboldt CCD	185
Ashfork CCD	-4,017
Total	-46,472

Phase 3 Process

(Eventually lead to decision on what to do with the information)

- **Explain, Understand and Evaluate the study**
- **Meetings & Outreach**
  - **WAC meetings (ongoing)**
  - **Speaking engagements**
  - **POTENTIAL WAC ACTION: Direct TAC to form a small "Technical Team" to meet with key technical people in water planning areas (meet with not only WAC members but with water system operators, city engineers, water company representatives etc)**
  - **POTENTIAL WAC ACTION: Direct TAC to investigate a "Decision Support System" approach to evaluating the study**
  - **Public Process ("open house") (WAC meetings are currently where conversation is mostly occurring and are open to public)**