Executive Summary

Appraisal Studies are preliminary investigations to determine the desirability of proceeding to a feasibility study. Three over-arching water resource related questions are answered by the study:

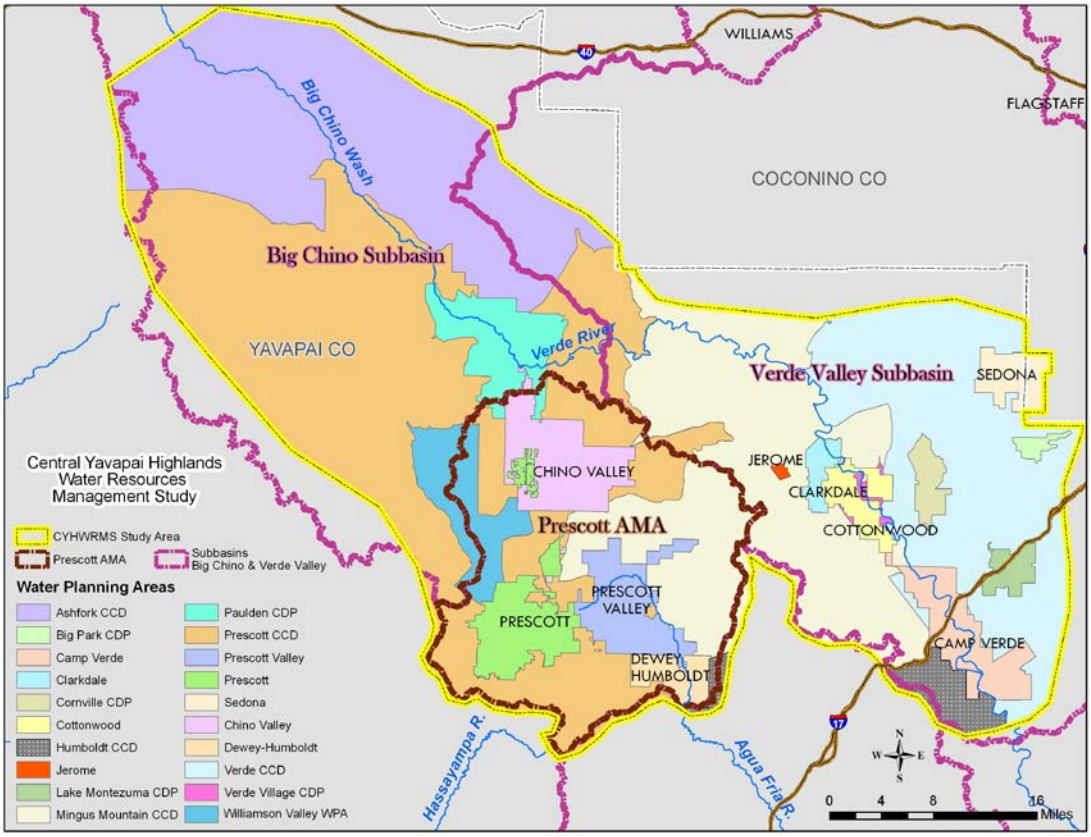
1. Is there a problem (i.e. unmet water demand)?
2. Is there at least one potential solution (alternative) to the problem?
3. Is there a Federal interest?

The Central Yavapai Highlands Water Resources Management Study (CYHWRMS) was initiated by local communities in Yavapai County to assess future water supply and demands issues. In order to identify the problem, existing (2006) demands and population were defined and projected to 2050. Future demands (2050) were then compared to two supply scenarios to identify future unmet demands (the problem). Alternatives were developed, analyzed and evaluated for viability and a Federal interest was established.

Background

The study area encompasses a part of central Yavapai County that includes communities within the Prescott Active Management Area, the Big Chino area and the Verde Valley area. There are 20 Water Planning Areas (WPA) identified in this study in which water supply and demand were assessed (Figure 1.)

Figure 1. CYHWRMS Study Area and WPAs



The study area represents regions of high potential growth and commensurate water demands which are complicated by water supply challenges and environmental and legal issues. Some of these challenges include the more stringent assured water supply requirements within the Prescott Active Management Area (PRAMA), the ongoing stream adjudication of the Gila River System which includes the rivers and streams within the study area and concern over the potential impacts of groundwater pumping.

Study Team

The study partners, Reclamation, the Yavapai County Water Advisory Committee (WAC) and Arizona Department of Water Resources (ADWR), assembled a Technical Working Group (TWG) to support the study through technical assistance/information and product reviews. Designated representatives have provided the technical expertise necessary to meet the requirements of the study. The TWG is made up of technical experts in various disciplines and consists of staff from the approximately 75 entities and organizations that have participated in the stakeholder process.

Study Components

The completion of this study relied on a phased plan to reach the intended endpoints. These phases are described below.

Phase I – Demand Analysis

Phase I had two main tasks. First, the study area and WPAs were defined. Second the location and amount of future demand was calculated by present population, future population, present and future water demands and present water resources for the WPAs.

Future water supply available was determined to be the 2006 water demand which was referred to as "status quo." Although not used, a second future water supply was calculated by using the net natural recharge for each sub-basin which was referred to as the "water balance method."

Phase II – Water Supply Assessment

Phase II identified potential sources of water to satisfy unmet demands. Those supplies consisted of surface water, ground water, storm water, reuse, conservation and others both within and outside of the study area.

Phase III – Alternatives

Phase III was designed to describe and assess alternatives that match the potential sources identified in Phase II with the needs identified in Phase I. The alternatives considered potential water supplies both within the study area and outside of the study area. Each supply alternative was analyzed relative to the environment, costs, public perception and legal and institution issues.

The final evaluations for alternate viability were based on the information generated in the analysis phase, study partner input, and in accordance with the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&Gs). The Federal guidelines include the "four tests of viability" which are

acceptability, effectiveness, efficiency and completeness. For an alternative to be viable, it must pass all four.

Results

Population

Table 1. shows estimated total population increases almost three times from 2006 to 2050.

Table 1. Population Change 2006 to 2050 from Phase I – Demand Analysis

Water Planning Area	2006 Population	2050 Population	Population Change
Camp Verde	12,497	23,277	10,780
Dewey Humboldt	4,134	6,943	2,809
Clarkdale	3,999	22,460	18,461
Cottonwood	20,400	77,630	57,230
Jerome	510	800	290
Prescott Valley	41,610	146,000	104,390
Chino Valley	12,690	63,690	51,000
Prescott	49,072	100,000	50,928
Sedona	11,080	16,300	5,220
Paulden CDP	5,342	14,099	8,757
Big Park CDP	7,731	8,810	1,079
Cornville CDP	4,075	7,448	3,373
Lake Montezuma CDP	4,237	8,308	4,071
Ctn-Verde Village CDP	3,373	11,706	8,333
Williamson CDP	5,228	11,845	6,617
Verde CCD	1,644	4,377	2,733
Prescott CCD	11,012	29,312	18,300
Mingus Mtn CCD	1,700	4,525	2,825
Humboldt CCD	230	612	382
Ashfork CCD	471	36,250	35,779
Total	201,035	594,392	393,357

Water Supply Excess or Deficit in 2050

Table 1.1 shows the 2050 water supply excess or deficit for the WPAs; only three WPAs show a supply excess in 2050; Camp Verde, Cornville CDP and Humboldt CCD. It should be noted that the volumes in Table 2. are the result of assumptions used in the Phase I Demand Analysis. Specifically, conservation measures and reduction of future agriculture were incorporated into the Phase I methodology. The 2050 water supply excess or deficit was determined by calculating the difference between the 2006 total demand (which is assumed to be the 2006 supply or status quo) and the 2050 total demand. The total estimated 2050 water supply deficit is 45,279 AF/yr.

Table 2.Water Supply Excesses or Deficits in 2050 from Phase I – Demand Analysis

Water Planning Area	2050 Water Supply (AF/yr)	Water Planning Area	2050 Water Supply (AF/yr)
Camp Verde	1,887	Big Park CDP	-591
Dewey-Humboldt	-456	Cornville CDP	356
Clarkdale	-1,706	Lake Montezuma CDP	-264
Cottonwood	-7,092	Ctn-Verde Village CDP	-1,145
Jerome	-0[1]	Williamson CDP	-1,441
Prescott Valley	-13,869	Verde CCD	-170
Chino Valley	-6,946	Prescott CCD	-712
Prescott	-6,695	Mingus Mountain CCD	-444
Sedona	-1,584	Humboldt CCD	190
Paulden CDP	-590	Ashfork CCD	-4,007

Water Supply Alternatives

In the water supply assessment, categories of water supply were identified and assessed as potential sources for augmenting water supply (Table 3.). The Phase II analysis concluded that existing claims for surface water far exceed available supply within the study area. Therefore, surface water inside the study area was not a potential alternative supply.

Through the stakeholder process, 13 potential water supply alternatives were developed. Upon further consideration and investigation, three of the alternatives were removed from the list because, although considered, they were not evaluated because either there was a demand side reduction which incorporated conservation measures into the 2050 GPPD (Alt. 9 Implement Conservation) or resulted in increased or restored volumes of surface water flow (Alt. 12 Weather Modification/Cloud Seeding and Alt. 13 Watershed Management) and they did not have a component for collecting the water supply. All of the alternatives only meet a portion of the total 2050 water supply deficit.

Table 3. Water Supply Alternatives and Description Grouped by Water Supply Type

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)

[1]Jerome's 2050 Water Supply Deficit has been updated from 0 in Phase I Demand Analysis to -23 as requested by Jane Moore, Jerome WPA Representative.

Water Supply	Alternative	Alternative Description
	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

*Alternatives 9, 12 & 13 were not evaluated which leaves a total of 10 alternatives to be evaluated.

Alternative Evaluation

Table 4. shows the 10 alternatives evaluated for viability. Two alternatives were considered not viable.

Table 4. Viability of Water Supply Alternatives

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 Surface Water in Alamo Lake
Viable	Alt. 11 Colorado River Water via Alamo Lake, Diamond Creek, lake Mead, lake Havasu, lake Mohave and Lake Powell

Conclusions

- The estimated total population increase is 393,357 from 2006 to 2050.
- The estimated total unmet water supply demand is 45,279 AF/yr for 2050.
- Of the 13 potential water supply alternatives developed, 10 alternatives were evaluated.
- Of the 10 alternatives evaluated, 2 alternatives were not considered viable:
    - *Alternative 1 Local Groundwater Development with the WPA (Inside the PRAMA)* was not considered viable because it is contrary to the 1980 Groundwater Management Act and the safe yield goals.
    - *Alternative 5 Conversion of Existing Septic Systems (Rural)* was not considered viable because rural housing is too dispersed to be cost effective for the small amount of effluent supply collected and because of insufficient existing infrastructure.
- The 8 alternatives that were deemed viable are recommended for further study and may be considered for feasibility.
- There are Federal interests that are vital to a regional plan that justify Reclamation's future involvement in a feasibility study of the viable alternatives.
    - Study area is located within the Verde River Watershed which contains Reclamation projects and an alternative that proposes improvements to Reclamation facilities.
    - Federal lands are within the study area and include the Bureau of Land Management, the Forest Service and the National Park Service.
    - Trust Responsibilities to Yavapai Apache and Yavapai Prescott Indian Nations.