

Lower Santa Cruz River Basin Study April 24, 2017 Stakeholder Advisors Meeting Responses to Comments and Questions

Basin Study Overview: The goal of the Lower Santa Cruz River Basin (LSCRB) Study is to identify where physical water resources are needed in order to mitigate supply-demand imbalances and develop a strategy to improve water reliability for the municipal, industrial, agricultural and environmental sectors. The basin study area encompasses the groundwater basin designated as the Tucson Active Management Area (TAMA). The study will:

- Project future water demand under selected scenarios (subject of the 4/24/2017 Stakeholder Advisor Meeting).
- Develop future supply projections under a range of climate change scenarios. Supply scenarios will include potential Colorado River shortages and changes in the water supplies received locally.
- Input demand scenarios into the Central Arizona Project Service Area Model (CAP:SAM) to evaluate which resources water providers will use to meet customers' needs under each scenario.
- Use the Arizona Department of Water Resources (ADWR) TAMA Groundwater Model to examine potential changes in water supplies and demands. The results will allow an evaluation of the risks to groundwater levels, including shallow groundwater (riparian) areas.
- Formulate strategies to adapt to risks to water supplies, including those supporting groundwater dependent (riparian) ecosystems.
- Assess adaptation strategies and perform a trade-off analysis

The purpose of the Stakeholder Advisors Meeting was to solicit input from stakeholders on the driving forces that affect water demand from their perspectives. Stakeholders were asked to provide input on the following questions:

1. Do the five proposed Demand Scenarios represent the primary factors (driving forces) affecting water demand in the Lower Santa Cruz River Basin (Tucson Active Management Area)?
2. Are the five proposed Demand Scenarios reasonable?
3. Within each of the scenarios, are the descriptions for each driving force consistent and logical?

The meeting agenda, draft demand scenarios and presentations can be found on the [study website](#).

Stakeholder Advisor Attendees	Organization
Evan Canfield	Pima County Regional Flood Control
Josefina Cardenas	
Fatima Chaudhary	NextGen
Mark Day	
Tres English	Sustainable Tucson
John Feather	Watershed Management Group
Fred Felix	Tucson Dept. of Transportation
Chuck Freitas	Falcon Pools / Tucson Water Citizens Water Advisory Committee
Hoshin Gupta	University of Arizona
Pat Jacobs	Central Arizona Project
Heide Kocsis	Arizona State Land Department
Val Little	TAMA Groundwater Users' Advisory Council
Robert Medler	Tucson Metro Chamber
Beth Scully	Brown and Caldwell
Mark Taylor	Westland Resources
Elzbieta Wisniewski	University of Arizona
Claire Zucker	University of Arizona Water Resources Research Center

LSCRB Study Attendees	Organization
Melanie Alvarez	Pima Association of Governments
Kathy Chavez	Pima County
Eve Halper	Bureau of Reclamation
Bailey Kennett	University of Arizona Water Resources Research Center
Marie Light	Pima County Dept. of Environmental Quality
Sharon Megdal	University of Arizona Water Resources Research Center
Mead Mier	Pima Association of Governments
Asia Philbin	Marana Water
Candice Rupprecht	Tucson Water
Ken Seasholes	Central Arizona Project
Dick Thompson	Tucson Water
Wally Wilson	Metro Water
Brian Wong	BKW Farms

Questions and Comments Received at Stakeholder Meeting		Response
A	How does CAP:SAM respond to dramatic increases in 1) urban water use for urban farming 2) major efforts to recharge and 3) use of stormwater for urban farming?	The modeling systems used by the LSCRB Study can simulate changes in water use, stormwater recharge and availability by adjusting assumptions for gallons per household per day (GPHUD), runoff from rainfall and natural recharge. Recharge and stormwater utilization will likely be included as potential Adaptation Strategies in a later phase of the LSCRB Study.
B	How would the City of Tucson's Agua Dulce Project or effluent under the Southern Arizona Water Rights Settlement Act (use of effluent) affect the model?	Currently, effluent recharge is included in the groundwater model. Future effluent recharge projects could be incorporated into the LSCRB Study as Adaptation Strategies.

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C	Where is the water for power generation (i.e., Tucson Electric Power (TEP) natural gas power plant) accounted for in the Demand Scenarios Matrix?	<p>The five draft Demand Scenarios account for water demand for electrical power generation in the industrial demand row. CAP:SAM can differentiate between typical industrial growth, which includes electrical power, and discrete industrial uses such as mining. These discrete demands are specifically noted in the Demand Scenarios Matrix because they do not behave like typical industrial users.</p> <p>In 2015, TEP stopped burning coal at one of its local power plants, which resulted in decreased water use the following year. TEP uses that plant to meet peak power demand and uses 2,000 - 5,000 acre-feet of water per year. TEP does not expect water demand for that plant to change. The Demand Scenarios Matrix includes water uses that are expected to change, otherwise, the demand is held constant.</p>
D	How is the allocation of water types into supply or demand broken out for consumptive versus non-consumptive water uses?	<p>Within CAP:SAM, a portion of municipal water demand is assumed to generate effluent, and the remaining portion is considered to be consumptive (lost to evaporation, such as water used outdoors). When municipal use changes, consumptive and non-consumptive uses change in the proportions specified within the model. Water used for agriculture is also considered consumptive, except for the small amount of water that returns to the aquifer.</p>
E	For some sectors, water demands and supplies are interconnected.	<p>This is true; increased temperatures are associated with reduced supply and increased demand. The study will consider this interconnection.</p>
F	The Lower Santa Cruz Basin has multiple sub-basins; will these be accounted for in CAP:SAM?	<p>Yes, the geography of the region is a major factor; the LSCRB Study will examine the area and provide results for each of the sub-regions (Water Accounting Areas) developed by the Tucson AMA Groundwater Users Advisory Council.</p>
G	Some of these variables (driving forces) are related and others are inversely related; can CAP:SAM account for these relationships?	<p>CAP:SAM can account for opposing relationships. The five draft demand scenarios were constructed to encompass a wide range of risks to infrastructure and the environment while also being internally consistent.</p>
H	How are exempt wells accounted for in CAP:SAM? Some assumptions could be made about future development based on current land ownership.	<p>CAP:SAM will use data from Pima Association of Governments (PAG) that projects changes in land use patterns. Within the Basin, there is a significant amount of developable State land that is not served by water or wastewater providers. The scenarios will consider 1) Will these areas be served by an adjacent water provider? 2) Will a new water utility (public or private) be established? 3) Will the anticipated developments be low density and rely on exempt wells? The LSCRB Study will evaluate a high-risk scenario where some future development will be supported by exempt wells.</p>

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I	To what extent has the Basin Study Project Team looked at long-range plans from the different sectors and jurisdictions?	The Demand Sub-Team has been receiving input from various water demand sectors and has representatives from multiple jurisdictions. In order to incorporate the long-range plans, the project team will continue to seek input from all jurisdictions in the study area.
J	All of the demand scenarios assume GPHUD is decreasing. Should we consider scenarios with increases? There are reports of water demand being higher in the last few months than in recent years, which could be from increasing incomes or from an influx of people with higher incomes moving to the area.	CAP:SAM can make adjustments to account for increases or decreases in the gallons per housing unit per day (GPHUD) within water service areas. CAP:SAM can also distinguish between increases in water demand in new homes versus existing homes. Increases in GPHUD can also be linked to climate change projections because higher temperatures will increase municipal demands. This suggestion will be added to the list of possible scenarios for the project team to consider.
K	How does the model account for CAP water cost? With a water consumption decline, there is an inflection point. The decline in per capita water use parallels decline in income. A migration of Californians with a higher income could increase the per capita demand. Can the model address an increase in gallons per capita per day (GPCD) associated with an income increase?	CAP:SAM indirectly accounts for changes in income and CAP water costs through household water use and can be adjusted as needed. Increases in per capita use may also be a result of higher temperatures. For example, increased consumptive use increases proportionally as the temperature increases, which subsequently increases urban water demand.
L	The Basin Study final report should include the Arizona and the TAMA regulatory contexts as an appendix.	This suggestion will be forwarded to the Project Team for consideration.
M	The “driving forces” column does not include new increases of 10,000 acre-feet in demand for urban food production. How can this new demand be represented in the model?	The demand associated with increased urban food production could be incorporated as an Adaptation Strategy.
N	How will the “building blocks” of the matrix be combined? There are many possible factor combinations and they may not necessarily reflect a spectrum from low risk to high risk. Is it possible to assign weights to particular variables to illustrate the importance of those conditions to a specific scenario?	Within each model, certain factors may have more influence on projected supplies and demands than others. When initial outputs are generated, the project team will work with stakeholders to further evaluate the weight or importance of specific variables. The scenarios can then be fine-tuned to account for the importance of specific variables. The goal of the five Demand Scenarios was to capture the range of possibilities as well as define the major differences between each demand scenario.
O	Given that the models are at different scales and granularity, how are they integrated?	CAP:SAM estimates supply and demand at the scale of the water provider. After CAP:SAM demands are generated, the project team will work with water providers to determine how demand would translate into pumping. Pumping can then be

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		translated into demand within the groundwater model, which has a one-quarter mile square grid.
P	Are the driving forces inter-related? Will economic growth and municipal growth be tied together?	Yes, CAP:SAM accounts for this. It will also be important to test the relationships between the driving forces and demands.
Q	How do you plan to collect data from stakeholders?	Data will be collected from stakeholders at meetings such as this one. The Project team and sub-teams also include representatives from major water sectors who will provide data, as needed, throughout the project. Additionally, the LSCRB Study will use data that ADWR currently collects. Stakeholders are also welcomed to provide data via email to the study email address: bor-pxa-lscrbs@usbr.gov
R	How will the study address exempt wells, like Altar Valley? Given the high potential for wildcat development, is there also an issue with on-site treatment?	The study is coordinating with regional water providers, the agricultural sector, Green Valley groups and others to project demand. The land use modeling from PAG is integrated into CAP:SAM and accounts for planned development. There is a significant amount of developable State Land that has a high projected growth. The question is how water demand will be served - either by adjacent water providers or by exempt wells. The LSCRB Study will evaluate a high-risk scenario where some future development will be supported by exempt wells.
S	Are there regulations to control water use?	Water use in Arizona is regulated by the Groundwater Management Act. The current management plan for the Tucson AMA mandates conservation measures for each sector. However, new uses and industry could add to the water demand. The LSCRB Study report will include an appendix on the Basin's regulatory context.
T	Is it fair to say infrastructure will keep pace with the increase in demand?	The purpose of this study is to give water providers the tools to assess whether infrastructure can keep pace with demand. The demand scenarios include varying assumptions about the timing of future infrastructure expansion. The supply-demand assessment can serve as a reference point to evaluate the reliability of current infrastructure.
U	How does the study address supply in the demand matrix and scenarios?	Because climate primarily affects supply, it will be estimated after climate scenarios are selected.

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<p>Email #1</p> <p>Please include these in the comments for the LSCRBS. These positions were approved by the Sustainable Tucson Core Team at our last meeting on May 3.</p> <p>While I believe they should be included in the initial considerations, I also believe they are critical to a valid consideration of how we adapt to the challenges ahead. One scenario the LSCRBS Study needs to explore would include the implications of creating a sustainable Tucson, meaning we permanently live within our means (not until 2060) and sustainably use water for the benefit of the people and environment that is here.</p> <p>Several features that need to be considered in a Sustainability Scenario are:</p> <ul style="list-style-type: none"> • Define an expected maximum, regional water supply based solely on assured, renewable, sustainable sources. Non-sustainable, nonrenewable sources are not counted. In particular, paper water should not be used in supply calculations • Use a CAP calculation that includes an estimated allocation of the acknowledged "Structural Deficit" of 1.2 million acre-feet. • High volume, mass urban recharge should be included in supply calculations • Include an assessment of the impacts of prolonged mega-droughts • Calculate one or more presumed rights to a quantified amount of renewable, sustainable water supply on a per household basis • Calculate an obligation to provide a quantified amount of renewable, sustainable water supply for additional housing on a per household basis • Priorities should be set for municipal water uses 	<ol style="list-style-type: none"> 1) The study will estimate the availability of local water supplies in our region under alternative climate futures, based on high and low risk climate conditions. Specifically, our modelers will be projecting the volume and timing of local precipitation events that produce stormwater runoff and recharge the basin's aquifer, as well as changes in temperatures. We will project the range of local water supplies from these modeling results. 2) Estimates of shortages to Central Arizona Project (CAP) water will incorporate the <i>Structural Deficit</i> and the impacts of climate change on river flows. CAP defines the <i>Structural Deficit</i> as the difference between the amount of water released into Lake Mead and the amount of water delivered from Lake Mead to the Lower Basin states and Mexico. The study team is working with CAP personnel to estimate a range of potential shortages to CAP water supplies, and will use the Central Arizona Project Service Area Model (CAP:SAM) to simulate how these shortages could affect our basin under a variety of conditions. 3) The study will assess the risks posed by high-impact, low-probability events, such as mega-droughts. We are creating a high-risk scenario that combines high demands and low supplies. We are also using newly available climate projections, developed at the University of Arizona, to better estimate future hydrologic trends. These climate projections are produced with a method called dynamical downscaling. Dynamical downscaling does not assume that statistical relationships observed in the past will continue in the future. Instead, it uses a physical model of regional atmospheric processes to project temperature and precipitation. This method is able to produce climate projections outside the limits of past observations. We will estimate the future likelihood of extreme events, such as floods and droughts, in addition to averages. 4) We will inquire into the possibility of quantifying the amount of energy used for pumping under each scenario. The feasibility of developing this information

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<ul style="list-style-type: none"> • Establish a high priority for water consumption by high-efficiency urban food production and another high priority for wildlife habitat • Pumping energy should be expressly calculated and minimized, with carbon-based energy distinguished from renewable energy • New developments are to be required to meet assured, renewable, sustainable water supply requirements in order to receive a certificate of occupancy from local governments and utilities • Certain policies need to be included in a valid Sustainability Scenario. For water, these policies would include: <ul style="list-style-type: none"> ○ We will "live within our means" and depend only of proven, sustainable and reliable water supplies. ○ The water supplies of Tucson are a shared resource that supports the entire community, including nature. ○ We will publically establish priorities for water uses and monitor our progress in following them. ○ We will prepare for disruptions, known as "Black Swans". <p>-----*</p> <p><u>Email #2</u></p> <p>I would like this brief note to serve as my preliminary comment on the new PAG/Bureau of Reclamation project framed as the "Lower Santa Cruz River Basin Study." It is in dire need of an additional scenario or two by the time the adaptation phase is activated, as alternatives to those already in draft form.</p> <p>These other scenarios should be designed as having 1) the expressed objective of moving toward full sustainability, and the other prioritizing the use of water not for more urban growth, but for food security on a reduced water budget facing the challenges of climate change. If this LSCRB study is to truly have as its goal a plan for a reliable water supply for the Tucson region from now to 2060, it must do more to address the possibility of sustainable yields and controlled growth as Sustainable Tucson suggests. I endorse the scenario being proposed as being equally valid to the other four. As the founding</p>	<p>will depend on the cost of performing this task and the availability of study funds.</p> <p>5) Food production can be addressed through the analysis of climate impacts to existing agriculture, as well as by estimating the sources of water available for food production under changing precipitation and temperature conditions.</p> <p>Many of these suggestions include adaptation measures that address projected water supply-demand imbalances. This is the focus of a later part of the study and the study team would be happy to work with our Stakeholder Advisors to develop such an adaptation measure. When fully defined, the details of this scenario could be presented to the study's Project Team for consideration</p>

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<p>director of the Center for Regional Food Studies at the University of Arizona, and Kellogg Endowed Chair in Borderlands Food and Water Security, I also request that PAG address the links between water security, food security and energy security in the face of the dramatic climatic changes that will occur between now and 2060. The presumption that there will never be a water crisis in our area must be temporarily put aside and a scenario considered that describes or analyzes the probability that either climatic or seismologic disruption of Colorado River water supplies to southern Arizona, in addition to geopolitical shifts in access to Colorado River water. If such other scenarios are not considered, you are assuming "business as usual" at the expense of our communities, especially our poor. I WELCOME FURTHER DISCUSSION WITH YOU.</p>	