Phoenix AMA Groundwater Model

June 2, 2023

If you are on the webinar, please have microphones on mute.
At the end of the meeting, we will take questions.
If you are online, please submit a question via the online comment form available in the chat.
Phoenix AMA Groundwater Model
Calibration and 100-year AWS Projection

Arizona Department of Water Resources
June 2, 2023
Agenda

• AWS Program Overview
• Development of the Phoenix AMA Groundwater Model
• Description & Results of the 100-year AWS Projection
• Key Takeaways
Adequacy program created statewide in 1973 to provide consumer protection

Evaluates the availability of a 100-year water supply considering existing, approved and project demands

AWS program developed in 1980 to add groundwater management components to adequacy program

Operates in Arizona’s Active Management Areas (AMAs)
Within AMAs, a developer of a proposed subdivision must have a 100-year Assured Water Supply to obtain plat approval and offer lots for sale.

Two ways for a developer to demonstrate an AWS:

- Obtain a commitment of water service from a water provider that has been designated by ADWR as having an AWS.
- Obtain a Certificate of AWS from ADWR by demonstrating that the subdivision will have a 100-year AWS.
AWS Criteria

• Physical, continuous, and legal availability for 100 years
• Other requirements related to financial capability, water quality, and consistency with Management Plan/Goal
• Physical availability of groundwater is demonstrated with a model
History of Model Development

• 1990s ADWR created a MODFLOW model of the Salt River Valley (ESRV and WSRV)
• Most recently updated in 2009
• Brown and Caldwell 2006 Lower Hassayampa model
• ADWR updated/recalibrated the 2023 Lower Hassayampa model and 100-year AWS projection
• 2023 release of Phoenix AMA model, which combines the SRV with the Lower Hassayampa
Calibration period of pre-1900 to 2021 (122 years)

Multiple types of calibration targets
- 40,577 WLEs from wells
- 325 aquifer tests
- Streamflow from 5 gaging stations
- Baseflow from historical observations

Peer-reviewed
Industry standard robust calibration
Consistent with conceptual model
Best-available science for use with the AWS program
• Distinction between the calibrated model and the 100-year projection
• “Build the tool; use the tool”
• Run the model with the AWS program requirements for supply and demand based on:
  ▪ Historical recharge rates (calibrated model)
  ▪ Existing demands (reported pumping)
  ▪ Issued demand (AWS program)
INFLOWS (SUPPLY)

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount (Acre-Feet per Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boundary Underflow</td>
<td>50,000</td>
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Legend

- Boundary Underflow
- Phoenix AMA Model

Sources: Esri, USGS, NOAA. Sources: Esri, Garmin, USGS, NPS
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<thead>
<tr>
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<tr>
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<tr>
<td>Recharge</td>
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<td><strong>Total Inflows</strong></td>
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**Legend**
- Recharge
- Streams
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OUTFLOWS (DEMAND)

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Legend
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Legend
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<td>Total Outflows</td>
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Outflows > Inflows by a factor of 1.4
Assigned Pumping in Projection

Total Assigned Pumping = 1,350,000 AFY

- Assigned Historical Demand (1900 to 2021)
- Assigned Agricultural Demand (2022 to 2121)
- Assigned Agricultural/Municipal Demand (2022 to 2121)
- Assigned Drainage Demand (2022 to 2121)
- Assigned Industrial Demand (2022 to 2121)
- Assigned Municipal Demand (2022 to 2121)
- Assigned Designation Demand (2022 to 2121)
- Assigned Certificate Demand (2022 to 2121)
- Assigned Analysis Demand (2022 to 2121)
- Assigned Water Report Demand (2022 to 2121)
- Assigned LTSC Demand (2022 to 2121)
- Assigned Other Demand (2022 to 2121)

- Agriculture = 345,000 AFY
- Designations = 295,000 AFY
- Certificates = 195,000 AFY
- Analyses = 135,000 AFY
- All Other Categories = 380,000 AFY
Aquifer storage loss projected to be 39 MAF out of 128 MAF estimated currently in storage above 1,000 ft (30%)
• Total future demand ≈ 140 MAF over 100 years
• Unmet demand from:
  ▪ Existing ag = 2.7 MAF
  ▪ Analyses = 1.3 MAF
  ▪ Certificates = 0.7 MAF
  ▪ Designations = 0.1 MAF

All unmet demand = 4.9 MAF
(4% of total)
Cumulative Modeled Storage Change

Cumulative Modeled Storage Change in Phoenix AMA

Year

Historical period

Projection period
• AWS Program is working as intended
  ▪ We have time to make water management decisions
  ▪ This is an inflection point
• Projected future outflows exceed projected future inflows by a factor of 1.4
• At the end of 100 years, depth to water in areas near the edges of the groundwater basin is projected to exceed 1,000 ft or hit bedrock
• Unmet demand in existing and AWS wells is projected to be 4.9 MAF over the 100-year period (4% of total demand)
Key Takeaways (2)

• Existing homes built pursuant to the AWS program have secure water supplies
• Significant volumes of groundwater and other water supplies are available for continued growth
• Water providers in the Phoenix AMA have diverse water supplies and are not solely reliant on groundwater
• People are not running out of water