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Leslie M. Hoffman
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CITY OF PRESCOTT 2012-0058080

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Caption: Comprehensive agreement No. 1 dated City of Prescott Agreement No. 2013-058 w/ City of Prescott, Town of Prescott Valley, Salt River Valley Water Users' Association, and Salt River Project Agricultural Improvement and Power District

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COMPREHENSIVE AGREEMENT NO. 1

CITY OF PRESCOTT, TOWN OF PRESCOTT VALLEY, SALT RIVER VALLEY WATER USERS' ASSOCIATION, AND SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT

This Comprehensive Agreement No. 1 is entered into among the City of Prescott, the Town of Prescott Valley, and the Salt River Valley Water Users' Association and Salt River Project Agricultural Improvement and Power District. Capitalized terms used herein are defined in Section 2 below.

RECITALS

A. **Effectiveness.** This Agreement shall become effective upon the Execution Date.

B. **Background.** The Parties entered into an Agreement in Principle on or about February 11, 2010, as a first step toward resolution of longstanding differences with respect to water rights in the Big Chino. The AIP sets forth, among other things, conceptual understandings among the Parties regarding the withdrawal and transportation of water from the Big Chino for use in the Prescott AMA pursuant to the rights granted in A.R.S. § 45-555. It anticipates additional, more detailed and comprehensive agreements among the Parties implementing the conceptual understandings reached in the AIP. This Agreement is one such agreement.

C. **Purpose.** The purpose of this Agreement is to implement the conceptual understandings reached by the Parties in Subsection 2A(3) of the AIP pertaining to the monitoring of water in the Big Chino and surface flows in the Verde River and modeling any impacts of withdrawals of water from the Big Chino on the current and future surface flows of the Verde River and to implement, in part, the conceptual understandings reached by the Parties in Section 2C(2) of the AIP. With regard to Section 2C(2) of the AIP, this Agreement pertains to the recognition and confirmation of certain of the Parties' rights to Water Arising From Within The Prescott AMA and a mutual agreement by all Parties not to challenge those rights. The Parties anticipate that they will enter into subsequent agreements regarding the confirmation of each other's rights to water other than Waters Arising From Within The Prescott AMA.

D. **Authorization.** Mayor Marlin D. Kuykendall is authorized to execute this Agreement on behalf of Prescott under City Charter Article VIII Section 1. Mayor Harvey Skoog is authorized to execute this Agreement on behalf of Prescott Valley under Town Code § 2-02-040(E). President David Rousseau is authorized to execute this Agreement on behalf of the District and the Association by resolutions of their respective governing bodies.

NOW, THEREFORE, in consideration of the mutual promises, covenants, and agreements hereinafter set forth, and for other good and valuable consideration (the receipt and sufficiency of which are hereby acknowledged), the Parties agree as follows:

MUTUAL AGREEMENTS AND RESPONSIBILITIES OF THE PARTIES

1. Incorporation by Reference. Paragraphs A through D above and all exhibits attached hereto are incorporated herein by this reference.

2. Definitions.

2.1 "Adjudication" shall mean *In re the General Adjudication of All Rights to Use Water in the Gila River System and Source*, Maricopa County Superior Court Cause Nos. W-1 through W-4 consolidated.

2.2 "Adjudication Court" shall mean the Maricopa County Superior Court, and any appellate court or successor court (including federal courts) with jurisdiction over the adjudication of rights to the Verde River system and source.

2.3 "ADWR" shall mean the Arizona Department of Water Resources, an agency of the State of Arizona.

2.4 "Agreement" or "this Agreement" shall mean this Comprehensive Agreement No. 1 among the Parties, including all exhibits attached hereto.

2.5 "Agreement in Principle" or "AIP" shall mean "An Agreement in Principle Among the City of Prescott, the Town of Prescott Valley, and the Salt River Valley Water Users' Association and the Salt River Project Agricultural Improvement and Power District" executed by the Parties on or about February 11, 2010, a true and correct copy of which is attached hereto as Exhibit 1.

2.6 "Association" shall mean the Salt River Valley Water Users' Association, an Arizona territorial corporation.

2.7 "Big Chino" shall mean the Big Chino Sub-basin of the Verde River Groundwater Basin, as depicted on Exhibit 2.

2.8 "Big Chino Model" shall mean a groundwater flow model for the Big Chino, the framework for which is set forth in the document entitled, "Proposal to Test Conceptual Models using Numerical Models and to Develop an Improved Hydrogeologic Framework and Numerical Model of the Big Chino Sub-basin, Central Arizona, July 7, 2010," a true and correct copy of which is attached hereto as Exhibit 3.

2.9 "Big Chino Modeling Fund" shall mean that fund created by the Parties and administered by the Modeling Committee pursuant to Section 7 hereof.

2.10 "Big Chino Monitoring Fund" shall mean that fund created by the Parties and administered by the Monitoring Committee pursuant to Section 6 hereof.

2.11 "Big Chino Monitoring Plan" shall mean that plan for monitoring underground water and surface water at specific locations to generate data to be applied to the Big Chino Model and/or otherwise used for the purpose of predicting potential impacts on the flows of the Upper Verde River, the framework for which is set forth in a draft report entitled "Big Chino Sub-Basin Data Collection and Monitoring Plan, Yavapai County, January 25, 2011 prepared for Mayors of the City of Prescott, Town of Prescott Valley, and Town of Chino Valley; Salt River Project;," a true and correct copy of which is attached as Exhibit 4.

2.12 "Big Chino Water Ranch" or "BCWR" shall mean that property in the Big Chino owned by Prescott from which the Communities intend to withdraw and transport underground water, as depicted on Exhibit 2.

2.13 "Communities" shall mean Prescott and Prescott Valley.

2.14 "District" shall mean the Salt River Project Agricultural Improvement and Power District, an Arizona agricultural improvement district formed pursuant to Title 48 of the Arizona Revised Statutes.

2.15 "Effluent" shall have the meaning set forth in A.R.S. § 45-101, as amended.

2.16 "Execution Date" shall mean the date upon which this Agreement is fully approved and signed by all Parties.

2.17 "Modeling Committee" shall mean that committee composed of representatives of each Party and acting pursuant to Section 7.

2.18 "Monitoring Committee" shall mean that committee composed of representatives of each Party and acting pursuant to Section 6.

2.19 "Monitoring Point" shall mean each location established by the Monitoring Committee pursuant to Section 6.

2.20 "Party" or "Parties" shall mean Prescott, Prescott Valley, and SRP.

2.21 "Prescott" shall mean the City of Prescott, Arizona.

2.22 "Prescott AMA" shall mean the Prescott Active Management Area, as depicted on Exhibit 2 and as recognized by ADWR on the Execution Date.

2.23 "Prescott Valley" shall mean the Town of Prescott Valley, Arizona.

2.24 "Service Area" shall have the meaning set forth in A.R.S. § 45-402, as amended.

2.25 "SRP" or "Salt River Project" shall collectively mean the District and the Association.

2.26 "USGS" shall mean the United States Geological Survey, an agency of the United States Government.

2.27 "Water Arising From Within The Prescott AMA" shall mean those waters that are found within, or naturally flow into or through the Prescott AMA, either above or below ground (including Effluent), and shall include waters within the Prescott AMA that are consumptively used within the Prescott AMA or waters that discharge from the Prescott AMA to other watersheds or groundwater basins, but shall not include waters that are not naturally found within or through the Prescott AMA.

3. Term. Except to the extent provided in Section 5, this Agreement shall continue in force for a period of twenty-five (25) years, and shall thereafter be automatically renewed for additional periods of twenty-five (25) years, unless and until terminated as follows:

3.1 This Agreement may be terminated at any time upon mutual written consent of all Parties. In preparing their written consent, the Parties also shall agree upon procedures for payment of any outstanding expenses and liabilities of the Big Chino Monitoring Fund, the Big Chino Modeling Fund, and distribution of any remaining balance in such funds.

3.2 This Agreement may be terminated by the Communities if SRP is in breach of a material provision of this Agreement or by SRP if one or both of the Communities are in breach of a material provision of this Agreement, as specified in Section 3.3.

3.3 A Party may terminate this Agreement pursuant to Section 3.2 only if the breach has not been (a) cured within forty-five (45) days after receipt of written notice reasonably detailing the breach or (b) waived in writing by the non-breaching Party(ies). Notwithstanding the foregoing, the non-breaching Party(ies) may not terminate this Agreement if the material breach is curable but cannot be cured within the forty-five (45) day period set forth above for reasons beyond the control of the breaching Party(ies), the breaching Party(ies) is/are diligently pursuing reasonable efforts to cure such breach, and extending the time for the Party(ies) to cure the breach does not materially harm any Party to this Agreement; provided, however, that the maximum cure period shall not exceed ninety (90) days from the date of receipt of written notice of the breach.

3.4 If the Communities' legal authority to withdraw water from the Big Chino has been repealed by the State of Arizona, or the Communities are otherwise rendered unable to withdraw and transport water from the Big Chino due to the acts of any other

governmental entity with jurisdiction or other legal inability of the Communities to withdraw water from the Big Chino or the Communities elect to not construct the infrastructure necessary to withdraw and transport water from the Big Chino, the Communities may terminate this Agreement at any time prior to construction of said infrastructure; provided, however, that in such event, any future construction of such a project by Prescott or Prescott Valley shall require as a precondition the readdressing of the mutual objectives and understandings set forth in the AIP. Such acts that would render the Communities unable to withdraw water from the Big Chino may include the United States Fish and Wildlife Service or other federal or state agency adopting or requiring the adoption of a habitat conservation plan or other species or habitat protection program that materially impacts the Communities' ability to withdraw water from the Big Chino for importation to and use within the Prescott AMA.

3.5 In the event that either the voters of Prescott and/or Prescott Valley, pursuant to Prescott's Proposition 401 (adopted in November 2009) or any similar measure, elect to not authorize a project to withdraw and transport water from the Big Chino, or the Communities otherwise elect to not construct the infrastructure necessary to withdraw and transport water from the Big Chino or otherwise elect not to pursue the project, the Communities may terminate this Agreement at any time prior to construction of said infrastructure; provided, however, that in such event any future construction of such a project by Prescott or Prescott Valley shall require as a precondition the readdressing of the mutual objectives and understandings set forth in the AIP. Nothing in this Section 3 is intended to modify, amend or alter any prior intergovernmental agreements between Prescott and Prescott Valley.

3.6 If, after the infrastructure necessary to withdraw and transport water from the Big Chino has been constructed, the Communities' legal ability to withdraw water from the Big Chino has been permanently enjoined for any reason, the Communities may terminate this Agreement under the following conditions:

3.6.1 If the Communities have not yet physically withdrawn or transported any water from the Big Chino, the Communities may terminate this Agreement under the terms set forth in Section 3.4; or

3.6.2 If one or both Communities have physically withdrawn or transported any water from the Big Chino, one or both Communities may terminate this Agreement only if they both agree, in writing, to continue to perform all of their obligations imposed by Sections 6 and 7 after the date of termination for the same number of years that have elapsed since such withdrawal and transportation was commenced and provided that any future resumption of operation of the project by Prescott or Prescott Valley would require as a precondition the readdressing of the mutual objectives and understandings set forth in the AIP.

3.7 Upon termination of this Agreement pursuant to this Section 3, each Party, shall, within ninety (90) days after the terminating Party provides notice of such termination to the other Parties, bring current its financial obligations to the Big Chino

Monitoring Fund as specified herein by Subsection 6.5 and the Big Chino Modeling Fund as specified herein by Subsection 7.5, through the effective date of termination. Upon payment of all expenses and liabilities of the Big Chino Monitoring Fund and the Big Chino Modeling Fund outstanding as of the effective date of termination, any remaining balance in each fund shall be refunded to the Parties on a pro rata basis.

3.8 In the event of termination of this Agreement, each Party who has met its payment and performance obligations as set forth herein shall have equal access to and full use of the data and reports generated from implementation of the Big Chino Monitoring Plan and the Big Chino Model as those data and reports existed on the effective date of termination.

4. Meet and Confer to Address Future Events. In the event any governmental entity with jurisdiction which is not a Party adopts new requirements that might affect the Communities' ability to withdraw water from the Big Chino and transport it to the Prescott AMA not otherwise addressed by the provisions herein, the Parties shall enter into good-faith discussions and/or negotiations to address the effect(s) of such events on the continuation of this Agreement.

5. Survival of Certain Provisions.

5.1 Each of the following provisions of this Agreement shall survive the termination of this Agreement: Section 3, Section 9, Section 10, and Section 11.

5.2 If this Agreement is terminated pursuant to Section 3, unless otherwise provided in Section 3, each Party's obligations to make payments for any costs incurred pursuant to Sections 6 and 7 prior to the date of termination shall survive such termination and remain a binding obligation of that Party, except to the extent that such costs can be avoided or lessened by the Parties collectively.

6. Monitoring of Water Levels and Stream Flows.

6.1 The Parties shall fund, develop, and implement the Big Chino Monitoring Plan, as set forth in this Section 6.

6.2 Within fifteen (15) days after the Execution Date, each Party shall designate one person to represent its organization to work cooperatively with ADWR and the USGS to oversee development and implementation of the Big Chino Monitoring Plan. For Prescott and Prescott Valley, the committee member shall be designated by the entity's respective City/Town Manager. The respective managers shall periodically update their governing bodies of pertinent events pertaining to the monitoring plan. Each Party shall notify each other Party, in the manner provided in Section 12.9, of the name of its designee. Those representatives shall comprise the Monitoring Committee. Any Party may change its designee by giving notice to each other Party in the manner provided in Section 12.9.

6.3 The members of the Monitoring Committee shall authorize and designate a chairperson at their first meeting. The chairperson shall serve a one-year term, commencing on the Execution Date. The office of chair shall rotate each year on the anniversary of the Execution Date among the Parties, with the chairperson being a representative of Prescott in the first year, a representative of SRP in the second year, and a representative of Prescott Valley in the third year. The office of chair shall thereafter rotate each year in the same manner. The chairperson shall be responsible for initiating and chairing all meetings and generally ensuring that the Parties' efforts in developing and implementing the Big Chino Monitoring Plan continue in an efficient manner.

6.4 The total costs of developing and implementing the Big Chino Data Collection and Monitoring Plan, including eligible expenditures to date, as described and set forth by Exhibit 5, are anticipated to exceed four million, three hundred thousand dollars ($4.3 million). The Parties hereby agree to budget for and to appropriate said costs in accordance with applicable laws and ordinances and the Parties' respective budgeting and fiscal processes and procedures.

6.5 Within sixty (60) days after the Execution Date, the Parties shall obtain approval by formal resolution from their respective governing bodies to allocate the costs of developing and implementing the Big Chino Monitoring Plan as follows: Prescott 36.066%; Prescott Valley 30.600%; SRP 33.333%.

6.5.1 Such allocation, once approved, shall apply to all capital and ongoing operation and maintenance costs associated with the Big Chino Monitoring Plan.

6.5.2 Each Party shall make its initial contribution to the Big Chino Monitoring Fund within ninety (90) days after the Execution Date and shall make additional contributions at such subsequent times as determined by the Monitoring Committee.

6.5.3 Subsequent to the initial contributions made pursuant to Section 6.5.2, the Parties shall contribute their respective shares of the estimated costs of implementing the Big Chino Monitoring Plan and shall deposit those sums into the Big Chino Monitoring Fund at such times as determined by the Monitoring Committee. Such fund shall be administered by the Monitoring Committee, pursuant to the terms of this Agreement.

6.5.4 The Parties' initial contributions to the Big Chino Monitoring Fund shall take into account eligible prior costs incurred by each Party recognized by Section 6.5.6, and such initial contributions shall be greater or lesser for each Party in order to make the total amount spent to date by each Party equal to the Party's respective percentage obligation as set forth in this Section 6.5.

6.5.5 The Parties shall work cooperatively to seek funding from other persons or entities that have an interest in the water resource information to be developed from the Big Chino Monitoring Plan. To the extent that the Parties obtain such funding

from other sources, those sums shall be deposited into the Big Chino Monitoring Fund and the respective contributions of each Party shall be reduced proportionately.

6.5.6 Those monitoring costs listed in Exhibit 5 that have been incurred by one or more Parties prior to the Execution Date shall be treated as eligible prior costs and shall be credited against that Party's cost allocation.

6.6 All costs incurred after the Execution Date and associated with the activities described in this Section 6 shall be considered annual costs and shall be allocated among the Parties pursuant to Section 6.5; provided, however, that any costs incurred by a Party in having a consultant or other person represent it on the Monitoring Committee shall be borne solely by that Party.

6.7 The Monitoring Committee shall establish no less than three (3) Monitoring Points to monitor any impacts of pumping from the Big Chino on the Verde River base flows. Each Monitoring Point shall be located between the BCWR wells and the Verde River Springs, as those springs are shown on Exhibit 2.

6.8 To the extent that the Monitoring Committee determines that the Big Chino Monitoring Plan requires expansion or enhancement to effectively monitor the effects of water withdrawals from the Big Chino, the Parties shall work cooperatively with ADWR and the USGS to fund the expansion and enhancement of the Big Chino Monitoring Plan and determine the nature and location of any necessary additional Monitoring Points.

6.9 At least once each calendar year, the Monitoring Committee shall provide each Party data and any other information collected under the Big Chino Monitoring Plan to update the Big Chino Model with new pumping estimates and any other relevant data and information used in the Big Chino Model.

6.10 The Monitoring Committee shall cause an annual written report containing the monitoring data, summaries, and analysis to be prepared and distributed to the Parties, ADWR, and the USGS by March 30 of each calendar year, with the initial report to be issued for the first full calendar year.

6.11 Within one hundred and eighty (180) days after the Execution Date, the Monitoring Committee shall develop and adopt a set of guidelines for the implementation of the Big Chino Monitoring Plan and this Section 6. Those guidelines shall address topics including, but not limited to, administration of the Big Chino Monitoring Fund and hiring and payment of consultants and contractors. Once adopted, the Monitoring Committee shall revise and amend those guidelines as necessary to ensure proper and efficient implementation of the Big Chino Monitoring Plan.

6.12 All decisions and actions taken by the Monitoring Committee shall be by unanimous consent. Any disagreements among the Parties regarding development or

implementation of the Big Chino Monitoring Plan shall be resolved pursuant to Sections 10 and 11.

6.13 The Monitoring Committee shall keep, or cause to be kept, good and accurate books and records in sufficient detail to verify payments to and disbursements from the Big Chino Monitoring Fund ("Monitoring Fund Books"). The Monitoring Fund Books shall be made available for review, upon prior reasonable notice during regular office hours, by any Party. The Monitoring Committee shall retain, or cause to be retained, the Monitoring Fund Books for a period of three years after the date of each payment or disbursement. Any Party may audit, upon prior reasonable notice, the Monitoring Fund Books at its own expense (an "Audit"). If, as a result of an Audit, it is determined that any Party has paid more than its respective share of the costs of developing and implementing the Big Chino Monitoring Plan as set forth in Section 6.5, the Monitoring Committee shall cause that Party to be reimbursed for its overpayment. If, as a result of an Audit, it is determined that any Party has paid less than its respective share of the costs of developing and implementing the Big Chino Monitoring Plan as set forth in Section 6.5, the Monitoring Committee shall require that Party to make additional contributions up to its respective share of the costs.

7. Modeling of Water Levels and Stream Flows.

7.1 The Parties shall fund, develop, and implement the Big Chino Model, as set forth in this Section 7.

7.2 Within fifteen (15) days after the Execution Date, each Party shall designate one person to represent its organization to work cooperatively with ADWR to oversee development and implementation of the Big Chino Model. For Prescott and Prescott Valley, the committee member shall be designated by the entity's respective City/Town Manager. Each Party shall notify each other Party, in the manner provided in Section 12.9, of the name of its designee. Those representatives shall comprise the Modeling Committee. Any Party may change its designee by giving notice to each other Party in the manner provided in Section 12.9.

7.3 The members of the Modeling Committee shall designate a chairperson at their first meeting. The chairperson shall serve a one-year term commencing on the Execution Date. The office of chair shall rotate each year between the Parties on the anniversary of the Execution Date, with the chairperson being a representative of SRP in the first year, a representative of Prescott Valley in the second year, and a representative of Prescott in the third year. The office of chair shall thereafter rotate each year in the same manner. The chairperson shall be responsible for initiating and chairing all meetings and generally ensuring that the Parties' efforts in developing and implementing the Big Chino Model continue in an efficient manner.

7.4 The total costs of developing and implementing the Big Chino Model, as described and set forth in Exhibit 5, are anticipated to exceed one million, two hundred thousand dollars ($1.2 million). The Parties herby agree to budget for and to appropriate

said costs in accordance with applicable laws and ordinances and the Parties' respective budgeting and fiscal processes and procedures.

7.5 Within sixty (60) days after the Execution Date, the Parties shall obtain approval by formal resolution from their respective governing bodies to allocate the costs of developing and implementing the Big Chino Model as follows: Prescott 36.066%; Prescott Valley 30.600%; SRP 33.333%.

7.5.1 Such allocation, once approved, shall apply to all capital and ongoing operation and maintenance costs associated with the Big Chino Model.

7.5.2 Each Party shall make its initial contribution to the Big Chino Modeling Fund within ninety (90) days after the Execution Date and shall make additional contributions at such subsequent times as determined by the Modeling Committee.

7.5.3 Subsequent to the initial contributions made pursuant to Section 7.5.2, the Parties shall contribute their respective shares of the estimated costs of implementing the Big Chino Model and shall deposit those sums into the Big Chino Modeling Fund at such times as determined by the Modeling Committee. Such fund shall be administered by the Modeling Committee, pursuant to the terms of this Agreement.

7.5.4 The Parties shall work cooperatively to seek funding from other persons or entities that have an interest in the water resource information to be developed from the Big Chino Model. To the extent that the Parties obtain such funding from other sources, those sums shall be deposited into the Big Chino Modeling Fund and the respective contributions of each Party shall be reduced proportionately.

7.6 All costs incurred after the Execution Date and associated with the activities described in this Section 7 shall be considered annual costs and shall be allocated among the Parties pursuant to Subsection 7.5; provided, however, that any costs incurred by a Party in having a consultant or other person represent it on the Modeling Committee shall be borne solely by that Party.

7.7 The Modeling Committee shall cause the Big Chino Model to be run no less than every three (3) years. Upon completion of the model runs, the Modeling Committee shall prepare and issue to the Parties and ADWR a written report containing the monitoring data, summaries, analysis, and any recommendations for future enhancements to the model.

7.8 At least once every three (3) years, the Modeling Committee shall cause the assumptions in Big Chino Model to be reassessed and the model to be recalibrated, incorporating any new or revised data obtained through implementation of the Big Chino Monitoring Plan and from other sources.

7.9 To the extent that the Modeling Committee determines that the Big Chino Model requires expansion or enhancement to effectively model the effects of water withdrawals from the Big Chino, the Parties shall work cooperatively with each other and with ADWR to fund the expansion and enhancement of the Big Chino Model.

7.10 Within one hundred and eighty (180) days after the Execution Date, the Modeling Committee shall develop and adopt a set of guidelines for the implementation of the Big Chino Model and this Section 7. Those guidelines shall address topics such as, for example, administration of the Big Chino Modeling Fund and hiring and payment of consultants and contractors. Once adopted, the Modeling Committee shall revise and amend those guidelines as necessary to ensure proper and efficient implementation of the Big Chino Model.

7.11 All decisions and actions taken by the Modeling Committee shall be by unanimous consent. Any disagreements among the Parties regarding development or implementation of the Big Chino Model shall be resolved pursuant to Sections 10 and 11.

7.12 The Modeling Committee shall keep, or cause to be kept, good and accurate books and records in sufficient detail to verify payments to and disbursements from the Big Chino Modeling Fund ("Modeling Fund Books"). The Modeling Fund Books shall be made available for review, upon prior reasonable notice during regular office hours, by any Party. The Modeling Committee shall retain, or cause to be retained, the Modeling Fund Books for a period of three years after the date of each payment or disbursement. Any Party may audit, upon prior reasonable notice, the Modeling Fund Books at its own expense (an "Audit"). If, as a result of an Audit, it is determined that any Party has paid more than its respective share of the costs of developing and implementing the Big Chino Modeling Plan as set forth in Section 7.5, the Modeling Committee shall cause that Party to be reimbursed for its overpayment. If, as a result of an Audit, it is determined that any Party has paid less than its respective share of the costs of developing and implementing the Big Chino Modeling Plan as set forth in Section 7.5, the Modeling Committee shall require that Party to make additional contributions up to its respective share of the costs.

8. Confirmation of Water Rights in the Prescott AMA.

8.1 This Section lists a portion of the Parties' asserted water rights deemed material for purposes of this Agreement under Section 2C(2) of the AIP, including some of those rights arguably at issue in the Adjudication. This initial listing of water rights is limited to certain specific rights and may be amended from time to time, with the written consent of the Parties. This list shall not be construed as a waiver or limitation on any other water rights a Party may possess not specified herein. The rights confirmed herein shall be limited to Waters Arising From Within The Prescott AMA.

8.2 Commencing on the Execution Date through the term hereof, the Parties expressly recognize and confirm the water rights of the Parties set forth in Sections 8.3, 8.4, and 8.5 herein and agree not to challenge those rights, either directly or indirectly,

and agree not to support, in any way any third party(ies) in any challenge of those rights (including any decree, decision, designation, order, notice, statement, agreement, application, contract or other document purporting to establish those rights) in any administrative or judicial proceeding, including the Adjudication; provided, however, that this covenant shall not apply to any water rights deemed to be invalid or unenforceable by a final, non-appealable judgment of a duly-authorized tribunal as a result of the independent actions of a third party.

8.3 Prescott's Water Rights Confirmed by Other Parties.

8.3.1 The right of Prescott to withdraw water from within the Prescott AMA and deliver that water within its Service Area pursuant to its Service Area Right No. 56-003017.0000;

8.3.2 The right of Prescott to withdraw from within the Prescott AMA and use or deliver within its Service Area that water included in Type 2 Non-Irrigation Grandfathered Right No. 58-117627.000 issued by ADWR;

8.3.3 The right of Prescott to withdraw and use waters from Granite and Willow Creeks pursuant to severance and transfer order No. ST-98-001 issued by ADWR and Certificate of Water Right No. 593.002;

8.3.4 The right of Prescott to store water in Willow Lake pursuant to severance and transfer order No. ST-98-001 issued by ADWR and Certificate of Water Right No. 1674.0001;

8.3.5 The right of Prescott to withdraw and use water for the Weston Ranch stockpond within the Prescott AMA pursuant to Stockpond Right No. 38-15341.0000 issued by ADWR;

8.3.6 The right of Prescott to use within the Prescott AMA all Effluent generated as a result of water service provided by Prescott;

8.3.7 The right of Prescott to divert or withdraw and use water pursuant to Permit to Appropriate No. 33-96435 issued by ADWR;

8.3.8 The right of Prescott to divert or withdraw and use water flowing in Willow Creek pursuant to Notice of Appropriation by David M. Wynship and M. Anna Wynship dated January 4, 1911 and by Geo. A. Thayer dated January 24, 1911;

8.3.9 The rights of Prescott to divert or withdraw and use the waters of Bannon Creek, Groom Creek, Wolf Creek, and Hassayampa Creek and to store water in Upper Bannon Creek Reservoir (also known as "Upper Goldwater Lake") pursuant to Permit No. 3R-432 and Certificate of Water Right No. 1659;

8.3.10 The rights of Prescott to divert or withdraw and use water pursuant to Water Rights Registration Act Statements of Claims Nos. 36-40301, 36-40302, 36-41650, and 36-60238; and

8.3.11 Those rights of Prescott to Waters Arising From Within The Prescott AMA as set forth in the assured water supply Decision and Order of the Director for the City of Prescott issued by ADWR and dated November 20, 2009 which document is hereby incorporated herein by this reference, but not including any rights to water arising from within the Big Chino.

8.4 Prescott Valley's Water Rights Confirmed by Other Parties.

8.4.1 The right of Prescott Valley to all water withdrawn from within the Prescott AMA and included in Service Area Right No. 56-003023.0000 issued by ADWR;

8.4.2 The right of Prescott Valley to use within the Prescott AMA all Effluent generated as a result of water service provided by Prescott Valley;

8.4.3 The right of Prescott Valley to use within the Prescott AMA all Effluent dedicated to the Town from any source;

8.4.4 The right of Prescott Valley to withdraw from within the Prescott AMA and use or deliver within its Service Area that water included in Type 2 Non-Irrigation Grandfathered Right No. 58-111699.0003 issued by ADWR; and

8.4.5 The right of Prescott Valley to provide water to Diamond Valley Water District (Service Area Right No. 56-003014.0000) and Bradshaw Water Company (Service Area Right No. 56-003019.0000) within the Prescott AMA under existing agreements with those entities.

8.5 SRP's Rights Confirmed by Other Parties.

8.5.1 The rights of SRP and its shareholders to Waters Arising From Within The Prescott AMA, which rights are appurtenant to the lands of SRP and its shareholders, and are described, stated, confirmed or established in the following documents:

8.5.1.1 The Federal Reclamation Act, 32 Stat. 388, and acts amendatory and supplementary thereto ("Reclamation Act"), as implemented by the United States and the Association through (1) the Association's Articles of Incorporation; (2) the Secretary of Interior's March 14, 1903 authorization of the Salt River Federal Reclamation Project; (3) Orders issued by the Secretary of Interior on March 2, 1903, March 7, 1903, July 18, 1903, July 20, 1905, July 27, 1903, December 14, 1904 and August 29, 1919, among other things, withdrawing public lands on the Verde River watershed from all forms of entry for the benefit of the Salt River Project as authorized by the Reclamation Act; (4) an

Agreement between the United States and the Association dated June 25, 1904, as amended; (5) an Agreement between the United States and the Association dated September 6, 1917, as amended; (6) Public Notices issued by the United States Department of Interior dated January 18, 1917, May 19, 1917, August 8, 1917, June 3, 1921, April 6, 1925, December 22, 1927, and April 10, 1928, which specify how lands described in the Notices can secure a permanent entitlement under federal law to receive federal reclamation water from the Association and the United States; (7) the completed Water Right Applications accepted and approved by authority of the Secretary of Interior for Homestead Lands Under the Reclamation Act and for Lands Other Than Homesteads Under the Reclamation Act between the United States and individual shareholders of the Association, which applications have been recorded in the Maricopa County, Arizona, Recorder's Office; (8) the contract between the Association and the United States, dated June 3, 1935, as amended (Verde River Storage Works), the contract between the Association and the United States, dated November 26, 1935, as amended (Construction of Bartlett Dam) and the agreement between the Association, Phelps Dodge Corporation and the Defense Plant Corporation, dated March 1, 1944 (Horseshoe Dam Construction and Operation); and (9) the contract between the Association and the Salt River Project Agricultural Improvement and Power District, dated March 22, 1937 and approved by the United States on May 18, 1937, as amended.

8.5.1.2 Notice of Appropriation of Water posted and recorded by Frank H. Parker, Secretary of the Salt River Valley Water Users' Association, with the Maricopa County, Arizona, Recorder's Office in Book of Canals No. 2 at page 155 on February 8, 1906.

8.5.1.3 Notice of Appropriation of Water posted on February 6, 1906 and recorded by Louis C. Hill, Supervising Engineer, United States Geological Survey, with the Maricopa County, Arizona, Recorder's Office in Book of Canals No. 2 at page 156 on February 8, 1906.

8.5.1.4 Notice of Appropriation of Water posted on March 4, 1914, and recorded by John P. Orme, President of the Salt River Valley Water Users' Association, with the Maricopa County, Arizona, Recorder's Office in Book of Canals No. 2 at page 379 on March 6, 1914.

8.5.1.5 The Decision and Decree, and all Decrees supplemental thereto, entered by the District Court of the Third Judicial District of the Territory of Arizona, In and For the County of Maricopa, in *United States v. Haggard*, No. 19, June 11, 1903 ("Haggard Decree"), solely for lands included within the Salt River Reservoir District as defined in the Association's Articles of Incorporation. The rights recognized in the Haggard Decree to the waters of the Verde River were perfected through the filing of various notices of appropriation and through the application of water for a beneficial use.

8.5.1.6 Decision and Decree, and all Decrees supplemental thereto, entered in *Hurley v. Abbott*, in the District Court of the Third Judicial District of the Territory of Arizona in and for the County of Maricopa, No. 4564, March 1, 1910.

8.5.1.7 The Decision and Decree, and all Decrees supplemental thereto, entered by the Superior Court, In and For the County of Maricopa, in *Benson v. Allison*, No. 7589, November 14, 1917 ("Benson-Allison Decree"), solely for lands included within the Salt River Reservoir District as defined in the Association's Articles of Incorporation. The rights recognized in the Benson-Allison Decree to the waters of the Verde River were perfected through the filing of various notices of appropriation and through the application of water for a beneficial use.

8.5.1.8 The Act of May 18, 1916, 39 Stat. 123, 130, which directed the Secretary of Interior to acquire water for 631 10-acre allotments on the Salt River Pima-Maricopa Indian Community Reservation. This Congressional mandate was carried out by the Secretary through contracts between the United States and the Association dated September 6, 1917, as amended, July 26, 1922, June 3, 1935, as amended (Verde River Storage Works), November 26, 1935, as amended (Construction of Bartlett Dam), and between the Association, Phelps Dodge Corporation, and the Defense Plant Corporation dated March 1, 1944 (Horseshoe Dam Construction and Operation), and through the Salt River Pima-Maricopa Indian Community Water Rights Settlement Act of 1988, Pub. L. 100-512, 102 Stat. 2549 (1988), and its implementing Settlement Agreement, and the Fort McDowell Indian Community Water Rights Settlement Act of 1990, Pub. L. 101-628, Title IV, 104 Stat. 4480 (1990), and its implementing Settlement Agreement.

8.5.1.9 Federal reserved water rights for reservoirs on the Verde River for the storage and use of water for the generation of hydroelectric energy based upon an express Congressional reservation to the United States in Section 28 of the New Mexico and Arizona Statehood Enabling Act of June 20, 1910, 36 Stat. 557, 575, of "all land actually or prospectively valuable for the development of water power or power for hydro-electric use or transmission. . . ."

8.5.1.10 In addition to the federal reserved rights described in Subsection 8.5.1.10 hereof, the Association, its shareholders and the District are also the express intended beneficiaries of the water rights reserved by the United States through the reservation of federal lands on the watershed of the Verde River and its tributaries, for National Forest preserves. The United States' federal entitlement to these reserved waters for the purpose of securing the water supply of the Salt River federal reclamation project was "turn[ed] over to and vest[ed] in the said Association" by the Contract between the United States and the Association dated September 6, 1917, as amended.

8.5.1.11 Amended Application for Permit to Construct a Reservoir and to Store for Beneficial Use the Unappropriated Waters of the State of Arizona, No. R-45, filed by the Salt River Valley Water Users' Association (February 2010).

8.5.1.12 Amended Application for a Permit to Appropriate the Public Waters of the State of Arizona, No. A-135, filed by the Salt River Valley Water Users' Association (February 2010).

8.5.1.13 Amended Application for a Permit to Appropriate the Public Waters of the State of Arizona, No E-11, filed by the Salt River Valley Water Users' Association (February 2010).

8.5.1.14 Water Rights Registration Act Statements of Claim Nos. 36-64086, 36-68097, 36-68098, 36-69451, and 36-69452 (all as amended) filed by the Association and the District on their own behalf and on behalf of the Association's shareholders, as those claims relate to the waters of the Verde River and its tributaries.

8.5.1.15 The Salt River Pima-Maricopa Indian Community Water Rights Settlement Act of 1988, Pub. L. 100-512, 102 Stat. 2549 (1988), which, among other things, Congressionally validated the Association's right to store and deliver water stored behind the reservoirs on the Verde River so it could be assured of its ability to provide water to the Salt River Pima-Maricopa Indian Community as required by this settlement and to the Association's shareholders.

8.5.1.16 The Fort McDowell Indian Community Water Rights Settlement Act of 1990, Pub. L. 101-628, Title IV, 104 Stat. 4480 (1990), which Congressionally validated the water storage rights of the United States and the Association for Bartlett and Horseshoe dams on the Verde River, and the Association's right to deliver water stored behind these dams to the Fort McDowell Indian Community as required by this settlement, as well as to the Association's shareholders.

8.5.1.17 The Gila River Indian Community Water Rights Settlement Act of 2004, Pub. L. 108-451, title II, 118 Stat. 3499, which, among other things, Congressionally validated the agreement between the United States and the Association, dated September 6, 1917, as amended, and the rights of SRP to store water from the Verde River at Horseshoe Dam and Bartlett Dam and to deliver the stored water to shareholders of SRP and others for all beneficial uses and purposes recognized under State law and to the Gila River Indian Community under the Gila River Indian Community Water Rights Settlement Agreement.

8.6 The Parties agree to continue to work together and to meet, negotiate, and discuss in good faith, with the purpose of reaching a mutually acceptable agreement among the parties that will include recognizing the rights of Prescott to withdraw water from the Big Chino aquifer and transport it to the Prescott AMA, as well as the Parties' overall respective rights in the Adjudication.

8.7 The Parties agree in good faith to (i) cooperate with one another and (ii) execute such further or additional documents as may be necessary or appropriate to fully carry out the intent and purpose of this Agreement.

8.8 In the event that any legal action is instituted by a third party against the Parties challenging the validity or enforceability of (i) any provision of this Section 8 or (ii) any action by a Party taken in performance of this Section 8, the Parties hereby agree to affirmatively cooperate in defending such action and to pay their own fees, costs, and

expenses associated with such defense. In the event of any litigation challenging the effectiveness of this Section 8 (or any portion hereof), this Section 8 shall remain in full force and effect while such litigation (including any appellate review) is pending. Provided, however, that nothing in this Section 8 shall require any Party to affirmatively defend the water rights claims of any other Party.

9. Remedies.

9.1 In the event of a breach or default by a Party, any non-breaching Party shall have the right to seek specific performance or other injunctive relief in lieu of termination.

9.2 Any Party that has not satisfied its financial obligations in full under this Agreement shall have its rights under this Agreement, including its voting rights, suspended during the time any such obligations remain unsatisfied.

9.3 There shall be no monetary damage remedy for breach of any of the provisions of this Agreement, nor shall there be any claim for special or consequential damages. Rather, the sole remedy available to the non-breaching Party shall be specific performance of this Agreement or other, similar injunctive relief. The prohibition on damages shall extend to the financial obligations set forth in this Agreement, and the Parties shall have the sole right to obtain specific performance to require each Party to satisfy its financial obligations under this Agreement. Any claim for attorneys' fees or other related litigation costs shall be limited as provided in Section 12.3 of this Agreement.

10. Informal Dispute Resolution.

10.1 If any dispute arising between the Parties concerning any of the terms or conditions of this Agreement or the implementation or interpretation of this Agreement remains unresolved for a period of fifteen (15) days after notice is given by a Party, such dispute shall be forwarded to the senior management representative of each Party, who shall meet within fifteen (15) days (or such shorter or longer time as shall be agreed upon by those representatives) to discuss and attempt to reach a resolution of the dispute. Any resolution mutually agreed upon in writing by the representatives and not in conflict with the terms and conditions of this Agreement shall be binding upon the Parties; provided, however, that such resolution is within the powers of such representatives and does not modify this Agreement or otherwise require any legislative approvals of the respective Parties.

10.2 If the Parties' senior management representatives cannot resolve the dispute within thirty (30) days after its submission to them (or within such shorter or longer time as shall be mutually agreed upon by those representatives), the Parties may, after first pursuing Arbitration as specified in Section 11 below, pursue declaratory judgment or seek specific performance of this Agreement and any remedies, in equity, or

under this Agreement to resolve the dispute subject to the prohibition on monetary damage in Section 9.3 and the attorneys' fees provisions of Section 12.3.

10.3 The requirements of Sections 10.1, 10.2 and 11 shall be deemed waived if and to the extent that a dispute under this Agreement constitutes a substantial threat to public health or safety that requires immediate resolution. In such instances, any Party may seek injunctive or other equitable relief as provided herein, but no monetary damages or attorneys' fees may be sought or obtained by any Party.

11. Arbitration.

11.1 Any issue or dispute among the Parties relating to this Agreement that is not resolved pursuant to Section 10 shall be submitted to arbitration pursuant to this Section 11.

11.2 Any Party may call for submission of disputes to arbitration. The Party calling for arbitration shall give notice to the other Parties, setting forth in adequate detail the issues to be arbitrated. Within twenty (20) days after receipt of such notice, each other Party shall by notice to the first Party set forth in adequate detail its own statement of the matter at issue to be arbitrated. Thereafter, the Party first submitting its statement of the matter at issue shall have ten (10) days in which to submit a rebuttal statement. All notices pursuant to this Section 11 shall be given in the manner prescribed in Section 12.9.

11.3 Within forty (40) days after any notice by one or both of the Communities calling for arbitration, the Communities shall jointly agree to appoint one person to serve as arbitrator, with notice to SRP of such appointment. Within fifteen (15) days after receipt of the Communities' notice of appointment of an arbitrator, SRP shall either agree to such appointment or object to the appointment and propose another arbitrator. Within fifteen (15) days after receipt of SRP's notice of appointment of an arbitrator, the Communities shall jointly either agree to such appointment or object to the appointment. In the event that the Communities object to SRP's appointed arbitrator, the Parties shall meet within five (five) days thereafter and shall in good faith attempt to unanimously select a mutually agreeable arbitrator. In the event the Parties cannot agree on an arbitrator, any Party may call for such appointment by the American Arbitration Association (or upon a similar organization if the American Arbitration Association does not at that time exist).

11.4 Within forty (40) days after any notice by SRP calling for arbitration, SRP shall appoint one person to serve as arbitrator, with notice to the Communities of such appointment. Within fifteen (15) days after receipt of SRP's notice of appointment of an arbitrator, the Communities shall jointly either agree to such appointment or object to the appointment and propose another arbitrator. Within fifteen (15) days after receipt of the Communities' notice of appointment of an arbitrator, SRP shall either agree to such appointment or object to the appointment. If SRP objects to the Communities' appointed arbitrator, the Parties shall meet within five (five) days thereafter and shall in good faith

attempt to unanimously select a mutually agreeable arbitrator. In the event the Parties cannot agree on an arbitrator, any Party may call for such appointment by the American Arbitration Association (or upon a similar organization if the American Arbitration Association does not at that time exist).

11.5 If notices are issued by more than one Party calling for arbitration pursuant to Section 11.3 or 11.4, the procedures for appointment of the arbitrator shall be governed by Section 11.3 or 11.4 based upon the first notice issued. Unless otherwise agreed by the Parties, the arbitrator appointed pursuant to those procedures shall be the arbitrator for all issues arising under any pending notices.

11.6 The arbitrator shall be an independent arbitrator, regardless of his or her method of selection, and the arbitrator shall be qualified by knowledge and experience in the field with respect to the subject matter out of which the dispute to be arbitrated arises. In no event shall the arbitrator be an officer, employee, or otherwise interested in any Party or in any other entity involved in the dispute to be arbitrated. No Party or its employee or agent shall have independent communications with the arbitrator once he or she is appointed, absent written consent of all other Parties.

11.7 The venue for any arbitration arising pursuant to this Section 11 shall be in Maricopa County, Arizona. Except as otherwise provided in this Section 11 or agreed to in writing by the Parties, the arbitration shall be governed by the rules and practices of the American Arbitration Association (or the rules and practices of a similar organization if the American Arbitration Association does not at that time exist) in effect as of the Execution Date.

11.8 The arbitrator shall receive and hear evidence submitted by the Parties and may call for additional information, which the Parties shall furnish. The decision of the arbitrators shall be non-binding upon the Parties.

11.9 This agreement to arbitrate shall be specifically enforceable. The award and findings of the arbitrators shall be non-binding upon the Parties. In the event that any Party is aggrieved by the decision of the arbitrator, such Party may then pursue its respective legal remedies pursuant to this Agreement in the Superior Court of Maricopa County.

11.10 All costs associated with any arbitration, including any fees charged by the arbitrator, shall be in equal one-half shares between SRP and the Communities, unless a decision of the arbitrator specifies a different allocation of any or all such costs and expenses. The arbitration hearing shall be limited in time and shall not exceed 10 (ten) hours, in any event, without agreement of all Parties. Additionally, costs associated with preparatory time and services of the arbitrator shall not exceed twenty (20) hours unless expressly agreed in writing by each of the Parties prior to the arbitration.

11.11 The provisions of this Section 11 shall be the arbitration provisions to be followed, rather than the procedures set out in Sections 12-1501 through 12-1517 of the

Arizona Revised Statutes. If the procedures set out in this Section 11 should for any reason be or become invalid under Arizona law, or if the decision of the arbitrator thereunder should be or become unenforceable under Arizona law, the Parties shall follow the procedures for arbitration then provided for under Arizona law most consistent with the provisions of this Section 11.

12. Miscellaneous Provisions.

12.1 Except as otherwise provided in this Agreement, each Party to this Agreement shall bear its respective fees and expenses incurred in connection with this Agreement.

12.2 This Agreement may be executed in counterparts, each of which shall be considered part of the whole. Further, the Parties agree that valid execution of this Agreement may be accomplished by signatures exchanged between the Parties by facsimile transmission and that such signatures shall be valid and binding as though they were original signatures.

12.3 The Parties expressly covenant and agree that in the event of litigation arising from this Agreement, no Party shall be entitled to an award of attorneys' fees, either pursuant to the Agreement, pursuant to A.R.S. §§ 12-341.01(A) and (B), or pursuant to any other state or federal statutes. Rather, each Party shall be responsible for its respective attorneys' fees and costs.

12.4 No Party may assign, in whole or in part, any of its rights or delegate any of its obligations under this Agreement. This Agreement shall apply to, be binding in all respects upon, and inure to the benefit of the successors of the Parties. Nothing expressed or referred to in this Agreement shall be construed to give any person other than the Parties to this Agreement any legal or equitable right, remedy, or claim under this Agreement, except such rights as shall inure to a successor pursuant to this Section 12.4.

12.5 No waiver of any of the provisions of this Agreement shall constitute a waiver of any other provision, whether or not similar, nor shall any waiver be a continuing waiver. No waiver shall be binding unless executed in writing by the Party making the waiver. A Party may waive any provision of this Agreement intended for its benefit; provided, however, such waiver shall in no way excuse the other Party from the performance of any of its other obligations under this Agreement.

12.6 This Agreement shall be governed and construed in accordance with the laws of the State of Arizona and shall be deemed made and entered into in Yavapai County. The Parties agree that any action brought to interpret, enforce, or construe any provision of this Agreement or to declare the rights of the Parties under this Agreement shall be commenced and maintained in the Superior Court of the State of Arizona in and for the County of Maricopa.

12.7 The Parties acknowledge that they were each represented by counsel in connection with this Agreement, that each of them (and their respective counsel) reviewed this Agreement, that any rule of construction to the effect that ambiguities are to be resolved against the drafting Party shall not be employed in the interpretation of this Agreement, and that the language in all parts of this Agreement shall in all cases be construed as a whole and in accordance with its fair meaning. Any provision of this Agreement which requires a Party to perform an action shall be construed so as to require the Party to perform the action or to cause the action to be performed. Any provision of this Agreement which prohibits a Party from performing an action shall be construed so as to prohibit the Party from performing the action or from permitting others to perform the action. Except to the extent, if any, to which this Agreement specifies otherwise, each Party shall be deemed to be required to perform its obligations under this Agreement at its own expense, and each Party shall be permitted to exercise its rights and privileges only at its own expense.

12.8 If any provision of this Agreement is held invalid or unenforceable by any court of competent jurisdiction, the other provisions of this Agreement shall remain in full force and effect and the Parties shall negotiate an equitable adjustment in the provisions of this Agreement with a view toward effecting the purpose of this Agreement. The validity and enforceability of the remaining provisions or portions, or applications thereof, shall not be affected thereby. This Agreement shall comply and be interpreted to conform with existing federal, state, and local laws to the extent they apply to this Agreement; provided, however, that no law, regulation, or ordinance enacted by one or more of the Parties after the Execution Date shall be used in interpreting the provisions of this Agreement.

12.9 Notices shall be in writing and shall be given by certified mail, return-receipt requested, postage prepaid. Notices shall be delivered or addressed to the Parties at the addresses set forth below, or at such other address as a Party may designate in writing. The date notice is deemed to have been given, received, and become effective shall be the date on which the notice is delivered or two (2) days following the date of deposit in the mail (if the notice is sent through the United States mail).

If to Prescott:

City of Prescott
City Manager
201 S. Cortez Street
Prescott, AZ 86303

With a copy to:
City of Prescott
City Attorney
221 S. Cortez Street
Prescott, AZ 86303

If to Prescott Valley: Town of Prescott Valley
c/o Town Manager
7501 E. Civic Circle
Prescott Valley, AZ 86314

With copies to:
Town of Prescott Valley
Town Attorney
7501 E. Civic Circle
Prescott Valley, AZ 86314

If to SRP: General Manager
Salt River Project, MS PAB 236
1521 Project Drive
Tempe, AZ 85281-1298

With copies to:
Frederic L. Beeson, Manager
Litigation and Claims Services
Salt River Project, MS PAB 142
1521 Project Drive
Tempe, AZ 85281-1298

Corporate Secretary's Office
Salt River Project
1521 Project Drive, MS PAB 215
Tempe, AZ 85281-1298

12.10 The Parties agree that the data or other information obtained or generated pursuant to Sections 6 and 7 will be applied to the Big Chino Model or otherwise used for purposes of implementing the AIP and this Agreement only. No Party may utilize any such data or information for any other purpose without the prior express written consent of all Parties.

12.11 Nothing contained in this Agreement shall create any partnership, joint venture, or agency relationship between or among the Parties.

12.12 If the time for performance of any obligation or taking any action under this Agreement falls or expires on a Saturday, Sunday, or legal holiday, the time for performance or taking such action shall be extended to the next succeeding day which is not a Saturday, Sunday, or legal holiday.

12.13 The headings of this Agreement are for purposes of reference only and shall not limit or define the meaning of any provision of this Agreement.

12.14 The AIP, this Agreement, and the exhibits attached to those agreements constitute the entire agreement between and among the Parties pertaining to the subject matter contained herein. All prior and contemporaneous agreements, representations, and understandings of the Parties pertaining to the subject matter contained herein, oral or written, are superseded by, and merged into, the AIP, this Agreement, and the exhibits attached to those agreements. This Agreement may be modified, changed, or amended only by a written agreement duly adopted by all of the Parties.

12.15 The signatories to this Agreement represent that they have been appropriately authorized to enter into this Agreement on behalf of the Party for which they sign, and that no further action or approvals (including actions by any Board or Council) are necessary before execution of this Agreement.

12.16 Notice is hereby given of the provisions of A.R.S. § 38-511, as amended. By this reference, the provisions of this statute are incorporated in this Agreement to the extent of their applicability to contracts of the nature of this Agreement under the laws of the State of Arizona.

12.17 Any and all references to a number of days herein, unless otherwise specified, shall refer to calendar days.

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IN WITNESS WHEREOF, the Parties hereto have executed this instrument by and through their authorized representatives.

SALT RIVER VALLEY WATER USERS' ASSOCIATION

DAVID ROUSSEAU, PRESIDENT

10-4-2012
DATE

ATTEST:

TERRILL A. LONON
CORPORATE SECRETARY

APPROVED AS TO FORM:

FREDERIC L. BEESON
ATTORNEY

SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT

DAVID ROUSSEAU, PRESIDENT

10-4-2012
DATE

ATTEST:

TERRILL A. LONON
CORPORATE SECRETARY

APPROVED AS TO FORM:

FREDERIC L. BEESON
ATTORNEY

CITY OF PRESCOTT

MARLIN D. KUYKENDALL, MAYOR

9.28.12
DATE

ATTEST:

LYNN MULHALL
CITY CLERK

APPROVED AS TO FORM:

G. EUGENE NEIL
INTERIM CITY ATTORNEY

TOWN OF PRESCOTT VALLEY

HARVEY SKOOG, MAYOR

9-25-12
DATE

ATTEST:

DIANE RUSSELL
TOWN CLERK

APPROVED AS TO FORM:

IVAN LEGLER
TOWN ATTORNEY

SEAL

Exhibit 1

Agreement in Principle

Withdrawal and Use of Water from the Big Chino Sub-Basin and the Protection of Stream Flow in the Upper Verde River

An Agreement in Principle Among the City of Prescott, the Town of Prescott Valley, and the Salt River Valley Water Users' Association and the Salt River Project Agricultural Improvement and Power District

1. The parties to this agreement are the City of Prescott (Prescott), the Town of Prescott Valley (Prescott Valley), and the Salt River Valley Water Users' Association and the Salt River Project Agricultural Improvement and Power District (SRP). Collectively Prescott, Prescott Valley, and SRP are the "Parties"; and Prescott and Prescott Valley are the "Communities."

2. The Parties desire to mutually address various interests and issues, and achieve certain objectives related to the withdrawal and use of water from the Big Chino Sub-Basin, including protection of stream flow in the Upper Verde River, in a responsible manner. The Parties understand and acknowledge that this agreement is intended to create a conceptual framework setting out the principles which will guide the Parties and form the basis for future agreements between the Parties which the Parties contemplate at this time. The Parties understand and agree that they will work together in a good faith manner to negotiate, draft and complete these more detailed and comprehensive agreement(s) addressing the specific details and terms necessary to facilitate and complete this conceptual framework and understanding. Accordingly, the Parties hereby commit to the following course of actions.

A. Legislative Amendment to ARS § 45-555(E); Groundwater Monitoring and Modeling.

(1) SRP will join and assist the Communities in obtaining a legislative amendment to ARS §45-555(E) during the current legislative session. This statute will be amended to: 1) settle the quantification of water which may be withdrawn from the Big Chino Sub-Basin by Prescott, as set forth by the Final Decision and Order of the Director, Arizona Department of Water Resources ("ADWR") relating to Prescott's current Application for Modification of Assured Water Supply dated October 12, 2007 (the "Application"); 2) modify the exemption, to the mutual satisfaction of the Parties, to remove any argument that this statute is an unconstitutional special law; and 3) make clear that any water imported into the Prescott Active Management Area ("PrAMA") by Prescott may be delivered for use anywhere within the PrAMA. The Communities acknowledge that the support of SRP for perfecting said amendment is expressly conditioned upon Subsections 2.A.(2) and 2.A.(3) hereinafter. In the event that said amendment is not achieved by sine die of the current regular session of the state legislature, the Parties may mutually agree to complete this agreement, or return to the status quo prior to this agreement. Upon enactment into law, SRP agrees that it shall defend, and cooperate with Prescott and Prescott Valley to defend, any challenge that is made to such legislation by any entity or person.

(2) The Communities agree that in the event the withdrawal of water from the Big Chino Sub-Basin is negatively affecting the minimum flow of water in the Upper Verde River, they will mitigate such impact proportionately to the extent of the effect of their combined withdrawals on the Upper Verde River as compared to the effect of the withdrawals by other water users in the Big Chino aquifer.

(3) The Communities further agree to participate with SRP, ADWR, and the United States Geologic Survey ("USGS") in the funding and implementation of the Big Chino Sub-Basin Monitoring Plan ("Monitoring Plan") set forth in the draft report entitled, "Big Chino Sub-Basin Monitoring Plan, Yavapai County, Arizona, prepared for Mayors of the City of Prescott, Town of Prescott Valley, and Town of Chino Valley; Salt River Project; Arizona Department of Water Resources, July 29, 2008"; and to participate with SRP, ADWR, and the USGS in the funding, creation, and implementation of a Big Chino Sub-Basin Groundwater Model, the framework for which is set forth in the document entitled, "Development of a nested ground-water flow model of the Big Chino Sub basin, Central Arizona, a proposal from the USGS Arizona Water Science Center, October 17, 2008."

B. Suspension/Cessation of Certain Requests and Litigation.

(1) The parties agree that while they continue to negotiate to resolve any outstanding issues in connection with the terms of Section 2.A.(1) of this Agreement:

(a) Prescott and Prescott Valley shall agree to a stay of further proceedings in the two pending lawsuits that concern SRP's response to the Public Records Act requests served on it by the Communities. Those two suits are: (i) the "auditor letters" suit, Prescott and Prescott Valley v. Salt River Project (Maricopa County Superior Court Cause No. No. LC20090-000799, filed November 16, 2009); and (ii) the "work product" suit, Prescott and Prescott Valley v. Salt River Project (Maricopa County Superior Court Cause No. LC2009-000833, filed November 16, 2009) (the "PRAR Suits").

(b) Prescott and Prescott Valley further agree to suspend and not make any additional demands in regard to any obligation on the part of SRP in regard to SRP's response to any pending Public Records Act requests. SRP likewise agrees to suspend and not make any new requests or additional demands on Prescott, Prescott Valley, and/or the Communities regarding existing Public Records Act requests.

(c) If legislation identified in Subsection 2.A.(1) is not passed by June 30, 2010, any of the parties may reinitiate the public records requests and/or litigation referred to herein, unless an extension is mutually agreed by the Parties.

(d) At such time as the legislation identified by Subsection 2.A.(1) has been passed and is in effect, Prescott and Prescott Valley agree to dismiss the PRAR Suits, and to withdraw all then pending Public Records Act requests.

(2) SRP, Prescott and Prescott Valley will agree to the quantities of water identified by the Final Decision and Order of the ADWR Director for purposes of preparing the legislative amendment contemplated by Subsection 2.A.(1) above. SRP, Prescott and Prescott Valley acknowledge that there are three pending judicial appeals of that administrative decision. Prescott reserves the right to challenge, defend, and/or appeal said Final Decision and Order in any such judicial appeal but, regardless of the outcome of such appeals, SRP, Prescott and Prescott Valley agree that it shall not change the quantity of water to be clarified in the legislative amendment contemplated by Subsection 2.A.(1) above. Likewise, SRP, Prescott and Prescott Valley acknowledge that litigation remains pending in Maricopa County Superior Court Cause No. CV2009-000947 regarding the quantification and use of Big Chino water. Prescott reserves the right to challenge, defend and/or appeal any claim made in such litigation but, regardless of the outcome of such action, SRP, Prescott and Prescott Valley agree that it shall not change the

quantity of water to be clarified in the legislative amendment contemplated by Subsection 2.A.(1) above. SRP will not object to withdrawal from the Big Chino Water Ranch and transport of HIA water which may be presently owned or acquired in the future by Prescott, Prescott Valley or the Communities or otherwise transported by Prescott in its pipeline, pursuant to state law.

(3) SRP will suspend all litigation, financial, and/or other support to other parties in the various lawsuits pertaining to the Application as well as any and all current lawsuits pertaining to the Big Chino Sub-Basin and/or Upper Verde River which involve SRP, Prescott, and/or Prescott Valley.

c. Resolution of Other Related Items. The Parties additionally agree to work cooperatively and in good faith to resolve and reach agreement on the following related items:

(1) Withdrawal of any and all objections to, and recognition by SRP of, the "Intergovernmental Agreement for the Sale of Water and Cost Participation" between Prescott and Prescott Valley dated December 7, 2004 (Book 4214, Page 98, Records of the Yavapai County, Arizona, Recorder).

(2) Confirmation of certain water rights of Prescott, Prescott Valley, and SRP, and agreement not to object to said water rights to be listed henceforth as an attachment to this Agreement.

(3) Creation and implementation of one or several water management, replenishment, or augmentation areas, districts, or other mechanisms to benefit the Big Chino Sub-Basin, to include working to establish a quantity cap for groundwater withdrawals from the Big Chino aquifer, and seeking the participation of owners of property and rights to HIA water within the Big Chino Sub-Basin.

(4) Measures for protecting the Upper Verde River which may include mitigation triggers and actions.

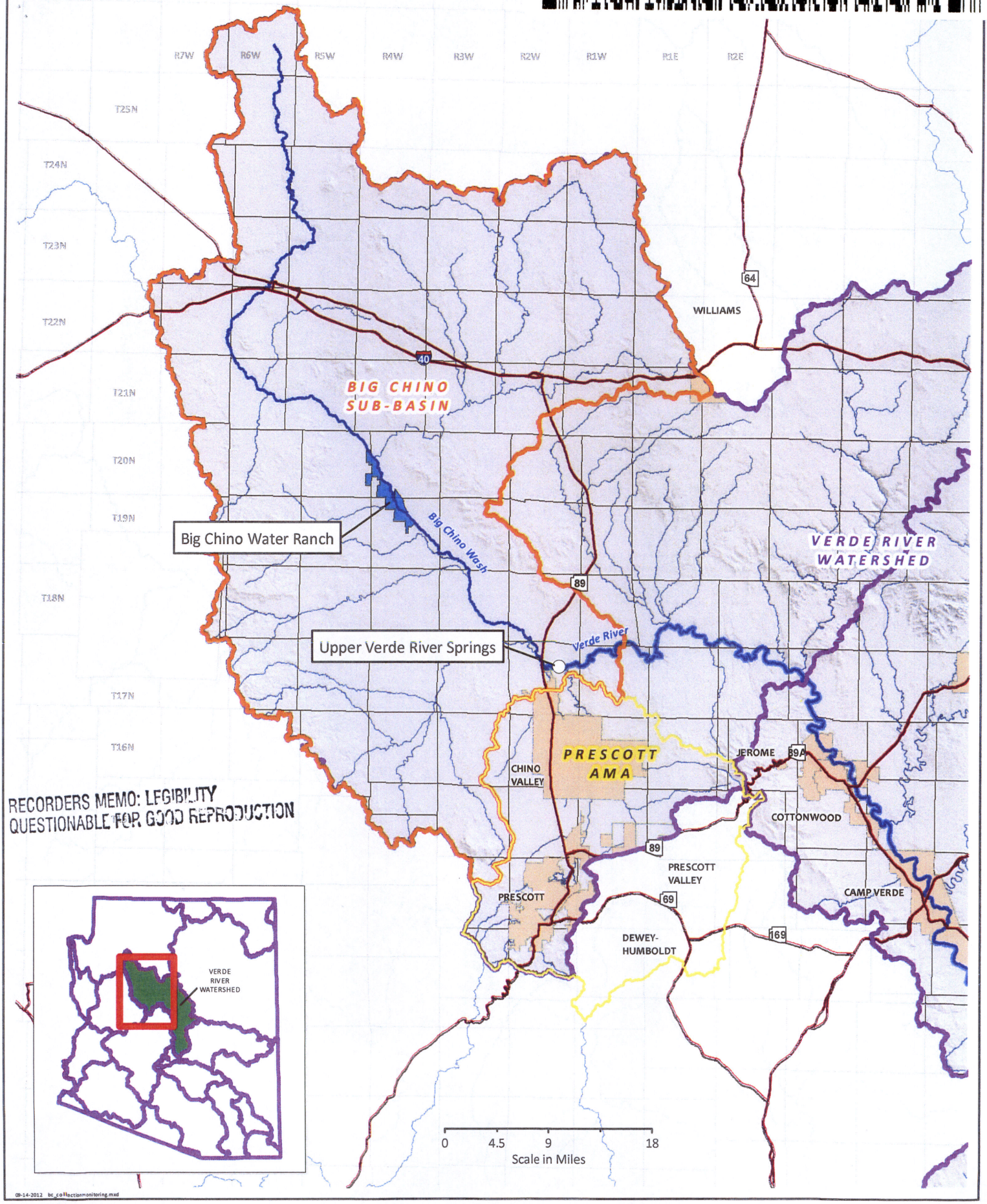
(5) "Wild and Scenic" designation for the headwaters of the Verde River and maintaining a minimum in-stream flow.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed this 11 day of FEBRUARY, 2010.

Signature Pages Follow

Exhibit 2

Map - Big Chino Data Collection and Monitoring Plan



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Prescott AMA
Big Chino Sub-Basin
Verde River Watershed
Cities, Towns

Exhibit 2

Big Chino Sub-Basin Data Collection and Monitoring Plan

Exhibit 3

Proposal to Test Conceptual Models using Numerical Models and to Develop an Improved Hydrogeologic Framework and Numerical Model of the Big Chino Sub-basin, Central Arizona, July 7, 2010

Proposal to Test Conceptual Models using Numerical Models and to Develop an Improved Hydrogeologic Framework and Numerical Model of the Big Chino Sub-basin, Central Arizona

A proposal from the USGS Arizona Water Science Center
July 7, 2010

Introduction

One of the main purposes of building a numerical groundwater flow model is to allow prediction of future water levels and changes in groundwater discharge based on assumptions regarding imposed stresses (changes in pumping and recharge). Another important use is to test an investigator's conceptual model of the hydrogeologic system in terms of how well it fits the observed data (Hill and Tiedeman 2007). In complex hydrogeologic systems, such as in the Big Chino sub-basin, there is often more than one plausible conceptual model. According to Hill and Tiedeman, the fact that there are "different interpretations of the incomplete data about (*hydrogeologic*) systems.... alternative models are fundamental to the study of any natural system."

The initial objective of the proposed project is to incorporate various conceptual models of the Big Chino sub-basin into numerical models and identify the conceptual flow-system model that provides the best fit with field data. This process of distinguishing the most reasonable among alternative conceptual models will help guide additional data collection that can be used to build an improved numerical model. The final objective is to use the model to make future predictions of changes in both water levels and groundwater discharge.

Background

Concern exists regarding how past, present, and future groundwater withdrawals from the Big Chino sub-basin will affect groundwater levels in the study area as well as the future discharge at the headwaters of the Verde River, specifically at the Upper Verde Springs (UVS), which is believed to be a major discharge zone of groundwater from the sub-basin. The relation of reduced base flow to increased withdrawals is largely a function of connections between hydrogeologic (aquifer) units, aquifer storage properties and transmissivity, and proximity of withdrawal locations to discharge areas. The theoretical ultimate impact on base flow will be a reduction equivalent to the increase in groundwater withdrawal rate minus any reduction in evapotranspiration and any increase in inflow. Depending on the pumping location in the sub-basin, the period of time to reach this new equilibrium condition could be on the order of years to several decades to centuries.

A variety of hydrogeologic assessments have been conducted and published for the area; much of that work has been synthesized in the Northern Arizona Regional Groundwater-Flow Model (NARGFM; Pool, in review). This model, although regional in scope, is a useful starting point to develop more detailed tools to address concerns about the effect of groundwater withdrawals in the Big Chino sub-basin on base flow in the Verde River.

Construction of the NARGFM provided the modelers with significant insights regarding plausible conceptual models of the Big Chino sub-basin as well as the types and locations of additional data that are needed to effectively test those models. A main benefit of use of this model is that its regional nature allows the study of the effects of development in the sub-basin without imposition of artificial boundaries in a less extensive model that would degrade model accuracy.

Water users and managers who rely on the Verde River system for water supplies have an intrinsic interest in developing the best possible tools for assessing the effects of groundwater withdrawals. A group of these managers and their technical staff (hence termed the "Cooperators") have requested this proposal from the USGS to develop a numerical groundwater-flow model to aid in the understanding and effective management of water resources in the Big Chino sub-basin.

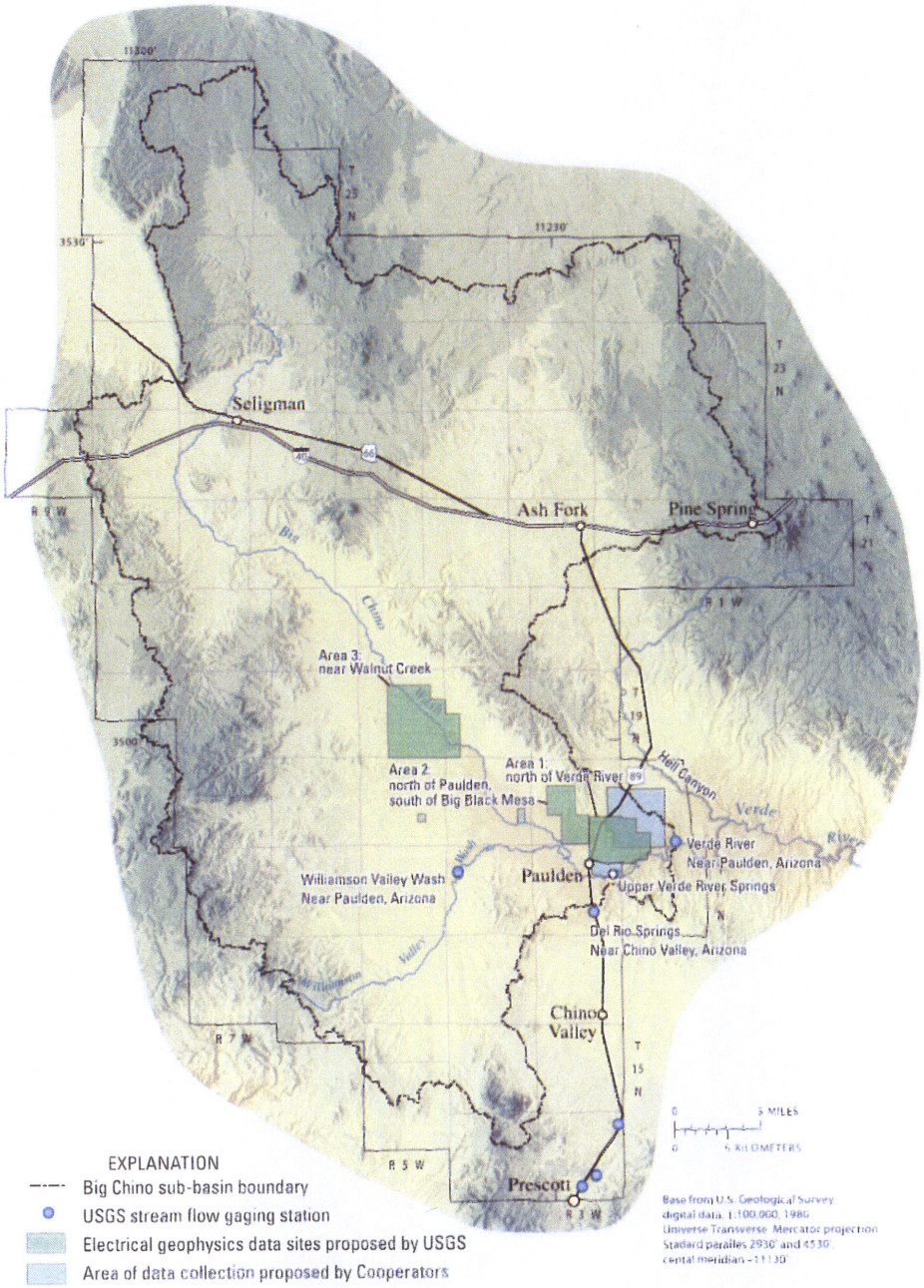


Figure 1. Approximate location of study area.

Objectives

The overall objective of this proposal is to develop a multilayered numerical groundwater flow model of the Big Chino sub-basin and surrounding area that can inform resource managers about potential effects of groundwater pumping on the potentiometric surface, evapotranspiration, stream base flow, and spring discharge. The Cooperators and USGS believe that there are several alternative conceptual hydrogeologic models describing the groundwater system through which water flows from recharge areas to points of discharge from the Big Chino sub-basin and to the UVS. They also believe that these conceptual models could result in different distributions of water-level change and different amounts of base-flow reduction and within different time frames. Specific objectives for the project are to:

1. Test the validity of alternative conceptual flow-system models using iterative recalibration of a specified region in the Northern Arizona Regional Groundwater Flow Model.
2. Define and collect the hydrogeologic data needed to discern between ambiguous conceptual models tested during the first objective.
3. Conduct a model-based analysis of stream- and spring-discharge depletion that may result from groundwater pumping at identified locations and specified amounts in the Big Chino sub-basin and from changes in climatic conditions.
4. Determine the proportional impacts to groundwater levels and discharge to surface water sources caused by various sources of pumping in the Big Chino sub-basin.
5. Use the model to select three or more locations for monitor wells that could be used, in conjunction with the model, as alert or action indicators for alternative management of groundwater resources in the sub-basin.

Approach

The first step in this effort will be to test a series of plausible conceptual groundwater flow-system models using the existing NARGFM. The process will evaluate the plausibility of the Cooperator and USGS conceptual models and define the additional data needed to help confirm or disprove those models. The second step will identify the data needs for refining our understanding of hydrogeologic framework and aquifer properties for development of more detailed models. Where those data are collected and what types are collected will be informed by the process of testing plausible conceptual models and by existing knowledge of data gaps. The third step will be to collect and interpret the data identified as needed in step two. The fourth step will include incorporation of new information into a refined hydrogeologic framework that will be used to construct an improved numerical model of the Big Chino sub-basin.

This proposal assumes that an essential component of new data collection (the drilling of new wells, performing of aquifer tests, and collection of water-level and water quality data) will be funded and completed as part of the Cooperators' Big Chino sub-basin Data Collection and Monitoring Plan.

The USGS will cooperate and communicate closely with the Cooperators throughout the project from the data definition task through the final analysis and presentation. This communication will be essential for informing the Cooperators of project progress and, as

importantly, for incorporating new data collected by the Cooperators, as well as, hearing and incorporating Cooperator needs with regard to project process and analysis of results.

Task 1. Test conceptual groundwater-flow models

USGS proposes to initiate this project with an evaluation of plausible conceptual groundwater flows models rather than with a more traditional literature review and data collection effort. Much of what is currently known about system is already documented in recent and upcoming reports, and NARGFM provides an appropriate platform for quantitative tests of the various conceptual models. An advantage to this approach is that the existing model can be used to guide planning for data collection that can be specifically designed to help confirm or eliminate conceptual models where the model analysis resulted in ambiguous results.

By examining the currently available geologic, hydraulic, and geochemical data, the Cooperators have proposed specific conceptual models that will be the initial focus of the task 1 analysis. In addition, the existing NARGFM conceptual model will be included for evaluation. This analysis will include at least the following conceptual models:

1. Most recharge occurs in the uplands around the Big Chino sub-basin and flows primarily through Paleozoic carbonate aquifer across bounding faults into the basin. There, most of the groundwater flows through the basin in the Tertiary basin fill sediments and volcanic rocks. The rest of this groundwater continues to flow through the basin in the underlying Paleozoic carbonate aquifer. In addition, recharge occurs along stream channels during periodic flood events. Some of the groundwater flowing in the basin fill is consumed by evapotranspiration (native, non-native and agricultural plants). In the general vicinity of Paulden, as a consequence of a structural high that is likely fault controlled, groundwater flows from the basin fill into volcanic rocks and into the Paleozoic carbonate aquifer where it mixes with the groundwater that has flowed only through the Paleozoic carbonate aquifer. The combined flow discharges at the UVS. The flow path through the Paleozoic carbonate rocks, at least in the vicinity of Paulden, is likely controlled by fractures, faults, and fissures (such as the regional Big Chino Fault system).
2. Most recharge occurs in the western part of the sub-basin as direct infiltration to carbonate outcrops, or as mountain-front recharge. Most of this isotopically light recharge travels through the confined Paleozoic carbonate aquifer to the UVS, where it may comprise up to 70 percent of the UVS discharge. This percentage estimate is based on the isotopic and chemical similarity of the Paleozoic carbonate aquifer groundwater and that in UVS.
3. Some upper Verde River baseflow is supported by groundwater derived from recharge to Paleozoic carbonate aquifer in the Big Black Mesa and Hell Canyon watersheds on the north side of the Verde River. Movement of this groundwater is controlled largely by faults, fractures and fissures (such as the regional Mesa Butte Fault system and other local faults) in the Paleozoic carbonate aquifer. Where the faults, fractures and fissures have been enlarged by dissolution of the carbonates, springs such as the UVS, discharge groundwater directly to the Verde River both

upstream and downstream of the Paulden streamflow gage. At and upstream from the UVS, groundwater from the Paleozoic carbonate aquifer mixes with groundwater from the Big Chino sub-basin. The percent of groundwater from each source is unknown but the model should be capable of simulating at least a 50/50 mix.

4. The existing conceptual model underlying NARGFM, with the modification that a portion of the runoff from the Basin Characterization Model (BCM) is routed into an expanded streamflow network within the Big Chino sub-basin and in select surrounding areas. As such, the runoff component would be allowed to infiltrate as focused recharge, with decadal variations. This conceptual model is similar to conceptual model 1, except that flow conduits and barriers associated with fault systems are not explicitly simulated. NARGFM includes three model layers. In the study area, the uppermost layer (layer 1) represents saturated parts of upper basin fill in the Big Chino sub-basin and in adjacent areas. This layer also includes the silt and clay layer and basalt flows in the Paulden area. The middle layer (layer 2) represents sand and gravel of deposits of lower basin fill, and the lowermost layer (layer 3) represents carbonate and crystalline rocks. Discharge of groundwater at and near Upper Verde River Springs is controlled by structure and low transmissivity, resulting from lack of alluvium and discontinuous carbonate rocks. In the steady-state model, simulated groundwater discharge above the Paulden gage is 21,700 acre-ft/year.

The NARGFM will serve as the basis for distinguishing between proposed conceptual models. Rather than modifying the entire model, however, a study area pertaining to the Big Chino sub-basin and select adjacent areas will be defined (figure 1), and the rest of the model domain will provide the regional context for the study area. Within the study area, the model will be modified to represent each of the proposed conceptual models. USGS will attempt to calibrate each model by using the available water-level and streamflow datasets with the assistance of parameter estimation software such UCODE or PEST. Parameter estimation will be limited to parameter distributions in the study area, using head and flow observations from the study area. A possible tool for evaluation of alternative conceptual models is the Multiple Model Analysis (MMA) program (Poeter and Hill, 2007). MMA can evaluate results from a wide range of alternative models, provided that the observations, the observation weighting, and system being represented are the same. The goal of this analysis will be to rank the models using statistical measures provided in the MMA program, possibly eliminating some of the less plausible conceptual models on the basis of that ranking. Predictive runs can be made with one or more of the higher-ranking conceptual models, and future data collection will allow re-evaluation and re-ranking of conceptual models.

Owing to the fact that one of the ultimate concerns is how groundwater development in the Big Chino sub-basin at the Big Chino Water Ranch (BCWR) affects downgradient springs and surface water resources, an analyses of select pumping locations will be performed on each of the most plausible conceptual/numerical models to illustrate to the Cooperators the differences in model results, if any, from selecting one conceptual model vs. another. Pumping locations and time frames for analysis of effects will be selected in

consultation with the Cooperators. Outputs will include, but not be limited to, model assumptions, water budgets, drawdown maps and changes in stream base flow.

A critical component of all project tasks will include a close working relation between the Cooperators and USGS. As details regarding conceptual models are formulated and those models are implemented into numerical models, regular communication will be essential to guide USGS staff in representing the Cooperators' concepts appropriately. Similarly, USGS will work with the Cooperators to fully communicate the results obtained.

Task 2. Identify Data Needed to Distinguish Conceptual Models

The purpose of Task 1 is to constrain plausible conceptual models using numerical test models. A possible outcome of that analysis is that multiple conceptual models will be feasible that cannot be distinguished with existing field data. The second project task will be to identify the types and locations of additional data that will be required to discern between multiple plausible conceptual models.

Additional data needs have been identified by the Cooperators and documented in a Big Chino Sub-basin Data Collection and Monitoring Plan. This proposal is written in reference to that plan. Some aspects of proposed data collection are already described, planned, and budgeted in the Data Collection and Monitoring Plan, while others, such as geophysical surveys, will be conducted as part of this proposed work.

Work completed to date has identified specific data gaps and has provided tools that can guide the data collection associated with this effort. It is expected that while some data collection can be defined and initiated immediately (Task 3), other aspects will be subject to modification over time in response to knowledge gained from analysis of collected data, development and calibration of the groundwater flow model, and from research by others. Specifically, elements that will guide the data collection planning include:

- Previously published data and analyses. Among these sources is the NARGFM, SRP model, BCWR model of the upper Big Chino sub-basin and BCWR Wellfield Design Investigation. The construction process of the NARGFM model included the consideration of various conceptual models of flow and highlighted many data deficiencies that limited the ability to constrain framework and conceptual models

- The Cooperators' Data Collection and Monitoring Plan. The Plan includes the installation of new hydrologic data collection points (wells, streamflow stations and weather stations) as well as the continuation and, as appropriate, expansion of existing monitoring networks. Data collected as part of the Cooperators' Plan will be incorporated into the current effort. Conversely, the outcome of data collection planning effort described here will be communicated back to the Cooperators for consideration.

- Observation prediction and parameter prediction statistics applied to the multiple numerical models constructed during Task 1. These models provide an opportunity to better understand the importance of improving knowledge about specific parameters and data within the model domain through an analysis of sensitivity. The test numerical models will be used to guide data collection for the development of the enhanced Big Chino model. Knowledge gained during the development of the regional model will provide insight into the types and locations of additional data that are most needed to improve and constrain conceptual models of the flow system. Software tools such as those developed by Tonkin and others (2007) that calculate Observation-Prediction (OPR) and Parameter Prediction (PPR) statistics will be used to evaluate the sensitivity of the models to new or existing observations. The tools can then be employed to evaluate the relative importance of various kinds and locations of data to improve simulated predictions. The results of this analysis will be communicated to the Cooperators for consideration in honing their monitoring plan.

Task 3. Collect New Data

Aspects of new data collection will be initiated immediately after the joint funding agreement is signed and will focus on remedying known deficiencies and on providing field evidence to support or reject the proposed conceptual flow-system models. As Task 1 results are realized, the specific types and locations of data collection may be adjusted. In the project timeline, new data are collected longer than can be incorporated into the improved numerical model in order to increase the period of record for future utility. The specific data collection categories defined are:

- **Groundwater levels and aquifer storage change**. Definition of groundwater level collection locations and drilling needed for this effort is described in detail in the Cooperators' Data Collection and Monitoring Plan. Aspects are restated here for the purpose of emphasizing the data necessary to meet the stated objectives of the proposal; however, other data collection defined in the Monitoring Plan will also benefit the project.

  Collection of water-level data will serve several purposes. Monitoring of levels through time at targeted locations and depths will provide insights regarding how different aquifers respond to natural variability in recharge as well as to withdrawals. Appropriately selected wells will provide data for calculation of horizontal hydraulic gradients in key areas. Wells designated for long-term monitoring will provide information on trends resulting from human and natural stresses and a subset will serve the "alert" function requested by the Cooperators. Where important, and if possible, water-level data will also be collected from nested piezometers colocated geographically, but separated vertically in different aquifer units. To facilitate this, USGS recommends that the site-selection process for Cooperator-installed wells consider the utility of also monitoring nearby existing wells that will compliment data collected at new wells. Preferably, the nearby existing and new wells will be screened in different vertically adjacent

aquifers and vertical gradients will be defined to help define the flow system and the connectivity between critical aquifers. Designation of some specific well locations will, in many cases, depend on the results of Task 2. Water levels in all wells should be measured by using installed continuously recording pressure transducers and (or) at least semi-annually by field personnel.

USGS will rely on Cooperator-furnished water-level data. This proposal budgets sufficient resources for USGS to inventory selected existing wells and newly installed monitoring wells and to manage QA/QC and archiving of tape-down and transducer-collected water level data in the national USGS National Water Information System database. The USGS will rely on the Cooperators to communicate with well and property owners, install equipment, and collect data. The USGS will, however, will assist with identification and selection of appropriate monitoring wells and locations. Specific subtasks related to well monitoring are:

- Subtask 3a. Survey existing wells (location, access, video, water sampling) in the area of the basin-fill/carbonate aquifer interface north and east of Paulden and near the UVS to determine their suitability as long-term monitoring wells.
- Subtask 3b. Install a deep monitor well in the Paleozoic carbonate aquifer near the southern margin of the upper Big Chino sub-basin (well BMW-2 in BCWR Monitoring Plan).
- Subtask 3c. Depending on the results of Subtask 3a and the OPR/PPR analysis, select existing or install one or more monitor wells to define hydrogeologic units and measure water levels and hydraulic gradients near the UVS.
- Subtask 3d. Install vertically distributed piezometers in the Paulden area to record hydraulic gradients and water-level responses in the Paleozoic carbonate aquifer, alluvium overlying the carbonates, basalt units, and the shallow aquifer units overlying the basalt.

- Subtask 3e. Quantify aquifer storage properties using microgravity observations. Aquifer storage properties are a poorly constrained, but highly important, variable that have a direct effect on the predicted timing of changes in stream base flow due to groundwater pumping. Repeated measurements of changes in gravity at wells and corresponding measurement of water levels provide a means to calculate aquifer storage properties. A subset of wells monitored as part of this effort will also be monitored for microgravity changes. There are currently 6 wells within the study area that are being monitored for water-levels and seasonal groundwater storage (3 times per year). The existing network will be augmented with 15 to 20 additional storage-monitoring stations, many of which will be co-located with observation wells and others that will be in areas where storage change information would be helpful but are lacking observation wells.

- **Perform geophysical surveys.** Geophysical techniques will be employed to gather data regarding the subsurface environment in locations, with a distribution, and at a budget not possible using monitor wells.

  - Subtask 3f. Electrical geophysical methods (ground-based transient electromagnetic (TEM) and controlled source audio-magnetotelluric (CSAMT)) will be used in 3 areas to address specific questions in Big Chino sub-basin. The USGS Arizona Water Science Center will use Center equipment and experienced staff to carry out these surveys. Targets of the electrical surveys will include the aquifer extent and lithology and geologic structures such as horsts and grabens. In particular, the distributions of productive aquifer materials (coarse-grained sediments and limestone), and poor aquifer materials (fine-grained sediments and crystalline rock), will be mapped. Depths of investigation of will range from a few tens of meters to several hundred meters. Data processing will include subsurface electrical models. Additional methods that may be used to refine the electrical survey results, such as 2-dimensional electrical resistivity surveys and seismic reflection, will be considered after evaluation of the initial surveys.

    The 3 areas of interest for electrical geophysical surveys include:

    1. Paleozoic carbonate aquifer that lies to the north of the Verde River above the Paulden gage T18N R2W sec 26 to T18N R1W sec 30, T18N R2W sec 35 to T18N R1W sec 32, T17N R2W sec 2 to T17N R1W sec 5. The Cooperators are planning well drilling in this area. The electrical geophysical surveys for this area will be completed during the first 2 quarters of the project in year 1 so that interpretation will be available to aid well siting.

2. North of Paulden and south of Big Black Mesa including areas within T18N R2W sec 16, 17, 20, 21, 26, 27, 28, 33, 34. The purpose of electrical geophysical surveys in area 2 is to gain structural and lithologic information for the improved groundwater flow model. The surveys of area 2 will be completed during the first 3 quarters of year 2.

3. The region of steep hydraulic gradients near Walnut Creek that appear to hydraulically compartmentalize the upper and lower parts of the alluvial basin including an area within the following region T19N R4W sec 9, 10, 11, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36 and T19N R3W sec 19, 30, 31. The purpose of electrical geophysical surveys in area 3 is to gain structural and lithologic information for the improved groundwater flow model. The surveys of area 3 will be completed during the first 3 quarters of year 2.

The target of surveys north of the Verde River include the thickness and extent of the Paleozoic carbonate aquifer including geologic structures such as the Mesa Butte and Big Chino Fault systems that may limit or transmit groundwater flow. Detailed CSAMT profiles will be needed to map geologic structure in sufficiently useful detail. The specific location of profiles will be determined after evaluating available geologic information, drill logs, other geophysical data, the hydrogeologic framework model of Fry (NAU Master's Thesis, 2006), and access to lands in the region. At least 3 profiles are planned, 2 approximately W-E and 1 N-S. The distribution of CSAMT soundings along profiles may be as small 500 ft or as great as 1 mile between stations along multiple profiles.

The target of surveys north Paulden and south of Big Black Mesa include the thickness and extent of the Paleozoic carbonate, basalt and alluvial aquifers including the Big Chino Fault. Detailed CSAMT or TEM profiles will be use to map geologic structure. The specific location of profiles will be determined after evaluating available geologic information including drill logs, other geophysical data, and access to lands in the region.

The targets of surveys near Walnut Creek include the thickness, extent, and continuity of the alluvial and Paleozoic carbonate aquifers and the extent and thickness of the silt and clay body. Detailed CSAMT or TEM profiles will be use to map aquifer lithology and geologic structure. The specific location of profiles will be determined after evaluating available geologic information including drill logs, other geophysical data, and access to lands in the region.

- **Geochemical data.**

  The Cooperators' Data Collection and Monitoring Plan includes collection of geochemical data including stable isotopes of water and major cations and anions. The USGS believes that these data may prove useful for constraining conceptual models through limited flow-path analysis and will use these data to the greatest degree possible.

Task 4. Construct improved hydrogeologic framework and numerical model

The time-invariant data collected in Task 2 (well logs, geophysical assessments) will be considered in the context of the conceptual underpinnings of NARGFM and other existing work, such as a geologic framework model created by Northern Arizona University researchers for most of the Big Chino sub-basin, the SRP model, and the BCWR numerical model of the upper Big Chino sub-basin, to define a refined hydrogeologic framework model and alternative conceptual models. These various concepts will then be built into numerical models that will be used to test whether each model fits the time-variant data (water levels, streamflow, spring discharge) collected in Task 2 or compiled from other sources and databases.

A new improved model will be constructed from NARGFM, results of the conceptual analysis from Task 1, and new data collected in Task 3. The improved model will be either an inset model that derives boundary conditions from NARGFM or a new version of NARGFM that incorporates the updated conceptual model in the area of interest. In either case, the area of interest will encompass, at a minimum, the Big Chino sub-basin and the Big Black Mesa and Hell Canyon watersheds.

The 1-km spatial discretization of the NARGFM domain is believed to be adequate to address the Cooperators' objectives, but the layering, distribution and magnitude of aquifer properties, use of conduits, and spatial extent will be modified using the conceptual models constructed in Task 3 to create a suite of numerical models that can be used to test and constrain the range of conceptual models into a plausible subset.

Task 5. Assess potential Impacts of Big Chino Groundwater Development

The USGS will use the final numerical model to assess the location and timing of impacts to regional groundwater outflow including natural discharge locations in the Verde River headwaters. The locations examined will include the UVS and other key discharge locations as identified by the USGS and the Cooperators. Data for the analysis of impacts will derive primarily from forward scenario runs performed using the updated numerical model and scenarios provided by the Cooperators. It is anticipated that at a minimum the scenarios will include withdrawals (existing and future) by the following:

- Big Chino Water Ranch (BCWR)
- Agriculture
- Municipal and other public suppliers (existing and anticipated)
- Exempt wells

The details of analysis and presentation of results from the scenario runs will be determined through close communication with the Cooperators throughout the project. Scenario results can readily be expressed as composite effects from many stresses, or as effects from individual stresses. It is likely that the primary scenario analysis will focus on the predicted depletion of key surface-water resources and of evapotranspiration (at fixed locations) resulting from groundwater development for select pumping locations and times. The analysis will also predict water-table surface changes through time and relate those changes to depletion of surface water.

The USGS will work with the Cooperators to understand the implications of the predictions as well as the limitations and uncertainties inherent in the modeling process. The Cooperators have an interest in establishing a well-monitoring network that would allow water managers to set alert levels based on changes in water levels. There are several considerations for use of wells for this purpose. First, effects of pumping must be large enough to be separated from other signals from variability in climate and barometric pressure. Second, it must be understood that there are residual effects after management action (such as reduced pumping) that can only be understood by running the model. The best approach for establishing monitoring wells is to use the model and pre-established management constraints. In addition to use as alert indicators, water level data from the wells should be used as points for refining the calibration of the model in the future.

Task 6. Communication (Deliverables)

Several aspects of this project—for example, that the Cooperators will be responsible for collection of some components of essential data and that Cooperator-conceived conceptual models are to be tested by USGS—require close communication between the Cooperators and USGS. This will be accomplished through informal and formal communications. Informal communications will be via telephone and email and will include exchange of data, clarification of previous work products, discussion of conceptual models, etc.

Informal Cooperator interaction will be welcomed throughout the project. Formal communications will include progress updates and reports, as described below.

- **Project progress updates**

The USGS proposes to hold quarterly meetings in person or via remote-communication technology with the Cooperators to regularly update progress made and, as importantly,

to seek input regarding the Cooperators' intent. Anticipated information exchanged in quarterly meetings includes:

- Status and issues regarding planning of USGS-conducted field data collection
- Feedback from USGS to the Cooperators regarding the planning and implementation of Cooperator-conducted field data collection
- Collected data
- Assumptions made regarding implementation of Cooperator-derived conceptual models into numerical test models
- Details regarding USGS-derived conceptual models to be tested
- Results of the conceptual model testing
- Development of refined framework using field data
- Development of improved numerical model
- Progress of improved numerical model calibration
- Inquiry to Cooperators regarding the model scenarios development
- Initial results and implications of scenario runs
- Results of well alert-level analysis
- Progress on final report publication

When feasible, material to be presented at quarterly meetings should be furnished to the Cooperators at least one week in advance of the meeting.

In addition, a fundamental part of Task 1 will be a numerical-model analysis of the implications of selecting one conceptual model vs. another from the perspective of depletion of Upper Verde River source water. Results will be communicated with the Cooperators by using presentations.

- **MODFLOW model files**

The USGS will provide all model files from the improved numeric model to the Cooperators for review. The model files will, however, be considered preliminary and for the purpose of cooperator review until final publication.

- **Reports publication**

Publication of peer-reviewed and publically released reports documenting methods and results will play an essential role in building confidence in project results for the Cooperators and for the public as a whole. Study results will be formally released in USGS series reports and become publically available upon release; however, through the quarterly meetings described previously, the Cooperators will be engaged in the process throughout and will be aware of findings. The Cooperators will be asked to review model files during the course of the project and will also be asked to review draft report products. In addition to Cooperator reviews, report products will have two independent colleague reviews. Until final USGS approval of reports, results cannot be publically released.

Two USGS series reports will be published as part of this project. The first will summarize the results of Task 1—the conceptual model testing and elimination. The second will discuss the results of the geophysical surveys, data from well drilling and monitoring that are used in the project, and will document the final improved numerical model. A web page for the project will be maintained for the duration of the project. At the discretion of project staff, scientific journal articles may also result from this work. Such articles, although not a requirement of this project, would serve to strengthen the scientific integrity of the work. Cooperators will be given the opportunity to review and comment on articles prior to submission to the scientific journal.

Schedule

The proposed project timeline spans 4 years, which represents a one-year extension relative to earlier discussions regarding this work. The primary reason for the addition of a year is that that adequate time will be needed to:

1 – Complete the Task 2 analysis of highest priority data needs such that the results can inform and influence the type and location of geophysical and hydrologic data collected.

2 – Implement data collection and collect a sufficient period of record to provide useful information that will be built into the final improved numerical model.

The proposed work will be carried out in stages by task. A Gantt chart (Table 1) shows the proposed project timeline by tasks. Tasks are timed such that each completes in an appropriate sequence to provide needed results and interpretations to the next tasks. An exception of the collection of water level and aquifer storage change data. Those tasks are continued through year 4 to increase the period of record; however, the data that will inform the enhanced model development will by necessity of timing end early in project year 3. Data collected in year 4 that will not be included in the improved numerical model are represented as a cross-hatched pattern. The USGS feels the continued collection of data to extend the period of record at least through the fourth project year is of high value.

Table 1. Proposed project timeline by task and project year

	Project Year 1				Project Year 2				Project Year 3				Project Year 4			
Task	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1: Conceptual model testing																
2: Identify needed data																
3 a-d: Assess/manage water level data																
3 e: Aquifer storage change monitoring																
3 f: Geophysical field surveys - area 1																
3 f: Geophysical field surveys - areas 2-3																
3 f: Geophysical data analysis																
4: Improved model development																
5: Assessment of impacts																
6a: Report results of task 1 and 2																
6b: Report results of tasks 3-5																
Report review and publication																

Budget and personnel

The preliminary project budget is presented by task and by fiscal year in Table 2. The proposed project requires a wide variety of skillsets for successful implementation. USGS will pursue a project-management goal to keep key modeling staff dedicated to the project through completion. USGS will assemble a project team that reflects expertise in the hydrologeology of the area, in numerical modeling, and in geophysical field data collection and analysis. Although USGS cannot firmly commit specific staff members to

the project until negotiations are completed, we currently expect to assign three experienced numerical modelers, Jesse Dickinson, Don Pool, and Stan Leake, to work on the project as needed throughout. Proposal budgeting included these individuals plus field support from students, hydrologic technicians, and hydrologists.

It is important to note that some data collection tasks, specifically the geophysics and aquifer storage change monitoring, will be performed by USGS personnel and are specifically budgeted in this proposal. Well drilling, groundwater level data collection, aquifer testing, and certain ephemeral channel flow modeling are critical to the success of this effort but are budgeted and staffed through the Cooperators' Monitoring Plan. Success of the proposed work relies on the successful and timely implementation of those data collection efforts. The proposed budget does include resources for USGS personnel to inventory wells installed by the Cooperators' as well as perform standard USGS QA/QC on Cooperator-collected data. In addition, data used by the USGS in the analysis, regardless of source, will be archived in the USGS National Water Information System database.

USGS will commit federal Cooperative Water Program matching funds to the proposed project. Although data regarding specific funding amounts are not currently available, USGS expects to commit no less than $50,000 and up to $100,000 annually.

Table 2. Preliminary project budget by fiscal year and task for the purpose of predicting the magnitude and timing of groundwater pumping effects on Upper Verde River source waters

	Project year			
Task	Year 1	Year 2	Year 3	Year 4
Task 1: Conceptual modeling	$162,966	--	--	--
Task 2: Identify data needs	$62,265	--	--	--
Task 3 a-d: Management of WL data	$56,688	$14,098	$14,521	$14,957
Task 3e: Aquifer storage	$58,000	$40,000	$40,000	$40,000
Task 3f: Geophysics data collection	$58,382	$107,614	--	--
Task 3f: Geophysics data analysis	$16,507	$27,385	--	--
Task 4: Improved model development	--	--	$124,731	--
Task 5: Implications analysis	--	--	$58,506	$63,237
Task 6: Report - author aspects	$18,779	$76,677	--	$168,318
Report - publication	--	$10,320	--	$13,760
Drilling, testing wells, collecting WL data	†	†	†	†
Total	$433,587	$276,095	$237,759	$300,272

†Well drilling, logging, aquifer testing, and water-level monitoring are assumed to be completed outside this scope of work; the timeliness of the work proposed here depends on completion of well drilling and monitoring.

Selected References

Arizona Department of Water Resources, 2000, Verde River Watershed Study: Arizona Department of Water Resources, Phoenix, Arizona, vp.

Blasch, K.W., Hoffmann, J.P., Graser, L.F., Bryson, J.R., and Flint, A.L., 2006, Hydrogeology of the upper and middle Verde River watersheds, central Arizona: U.S. Geological Survey Scientific Investigations Report 2005–5198, 101 p., 3 plates.

Ewing D.B, Osterberg J.C., Talbot W.R., 1994, Groundwater study of the Big Chino Valley, Technical Report, Section I of III, Perspective, United States Bureau of Reclamation.

Glover, R. E., and Balmer, G. G., 1954, River depletion resulting from pumping a well near a river. EOS Trans. Am. Geophys. Union, 35(3), 468–470.

Hill, M. C., and Tiedeman, C. R., 2007, Effective groundwater model calibration: New Jersey, John Wiley and Sons, 455 p.

Jenkins, C.T., 1968, Computation of rate and volume of stream depletion by wells: U.S. Geological Survey Techniques of Water-Resources Investigations, Ch. D1, Bk 4, 17 p.

Knauth, L.P., and Greenbie, M., 1997, Stable isotope investigation of groundwater-surface-water interactions in the Verde Rivers headwaters area: Arizona State University Department of Geology report in fulfillment of Arizona Water Protection Fund Grant #95-001, administered by Arizona Department of Water Resources, 28 p.

Langenheim, V.E., DeWitt, Ed, and Wirt, Laurie, 2005, Geophysical framework based on analysis of aeromagnetic and gravity data, upper and middle Verde River Watershed, Yavapai County, Arizona: U.S. Geological Survey Scientific Investigations Report 2005—5278, 25 pp. 1 pl.

Ostenaa, D.A., U. Schmischal, C.E. King, Jr., and J.W. Wright, 1993, Groundwater Study of the Big Chino Valley, U.S. Bureau of Reclamation, Denver, CO.

Poeter, Eileen P., and Mary C. Hill, MMA, A computer code for Multi-Model Analysis: U.S. Geological Survey Techniques and Methods 6-E3, 113 p.

Pool, D.R., Blasch, K.W., Callegary, J., and Graser, L., (in review), Groundwater Flow Model of the Redwall-Muav, Coconino, and Alluvial Basin Aquifer Systems of Northern and Central Arizona, U.S. Geological Survey Scientific Investigations Report.

Schwab, K.J., 1995, Maps showing groundwater conditions in the Big Chino sub-basin of the Verde River basin Coconino and Yavapai Counties, Arizona-1992, ADWR Hydrologic Map Series Report No. 28.

Theis, C.V., 1940, The source of water derived from wells: essential factors in controlling the response of an aquifer to development. *Civil Engineer* 10:277-280.

Theis, C.V., 1941, The effect of a well on the flow of a nearby stream: *American Geophysical Union Transactions*, 22, part 3, 734-738.

Tonkin, M.J., Tiedeman, C.R., Ely, M.D., and Hill, M.C., 2007, OPR-PPR, a computer program for assessing data importance to model predictions using linear statistics: Reston Virginia, USGS, Techniques and Methods Report TM-6E2, 115 pages.

Wirt, Laurie, and Hjalmarson, H.W., 2000, Sources of springs supplying base flow to the Verde River headwaters, Yavapai County, Arizona: U.S. Geological Survey Open-File Report 99-0378, 50 p.

Wirt, L, E. DeWitt, and V.E. Langenheim, 2005, Geologic Framework of Aquifer Units and Groundwater Flowpaths, Verde River Headwaters, North-Central Arizona. U.S. Geological Survey Open-File Report 2004-1411.

Exhibit 4

Big Chino Sub-basin Data Collection and Monitoring Plan,
January 25, 2011

BIG CHINO SUB-BASIN DATA COLLECTION AND MONITORING PLAN

YAVAPAI COUNTY, ARIZONA

January 25, 2011

PURPOSE & GOALS

The purpose of the Big Chino Sub-basin Data Collection and Monitoring Plan ("Plan") for the Big Chino sub-basin of the Verde River Groundwater Basin (Figure 1) is to collect additional hydrologic data for development of a numerical groundwater flow model and establish a long-term data collection program. The data are designed to:

1. provide hydrologic data for development of a numerical groundwater flow model of the Big Chino sub-basin and surrounding area,
2. monitor changes in the hydrologic system caused by proposed groundwater pumping and transport by Prescott and Prescott Valley (the Communities) from the Big Chino Water Ranch (BCWR) in the upper Big Chino sub-basin (Figure 2) that may indicate a potential impact upon the base flow of the upper Verde River,
3. monitor changes in the hydrologic system caused by other existing or proposed groundwater pumping in the Big Chino sub-basin that may indicate a potential impact upon the base flow of the upper Verde River, and
4. monitor changes in the hydrologic system caused by climatic variations.

The specific goals of the Plan are to develop a Big Chino sub-basin groundwater data collection and monitoring strategy that includes:

1. Improved understanding of the hydrologic relationship between groundwater and surface water in the upper Verde River area.
2. An early warning system for the Upper Verde Springs (UVS).
3. Collection of data that may be used to distinguish Communities' groundwater pumping impacts due to the Project from the impacts of groundwater pumping of others in the sub-basin, and natural system variability.
4. Ability to relate regional groundwater and surface water observations to future groundwater model calibration & verification
5. Recognition of the need for additional data collection which might include precipitation, surface water flows, groundwater withdrawals, and effects of artificial recharge

The Plan assumes that the Communities' will pump groundwater exclusively from lands on the Big Chino Water Ranch in the upper Big Chino sub-basin.[1]

DATA NEEDS FOR GROUNDWATER FLOW MODEL

Under a separate scope of work, a groundwater flow model of the Big Chino sub-basin and the area surrounding the UVS will be developed. It is recognized that existing hydrologic data within the study are variable, both in quality and quantity. Data are more plentiful for some aspects of the hydrologic system than others. Some data needs have been identified that, if filled, are thought to significantly improve the ability of the groundwater flow model to simulate actual hydrologic conditions. It is further anticipated that as the groundwater flow model is developed and as data are collected and interpreted, new questions may arise so that additional data collection may be required. At this time, the following areas of additional data needs have been identified:

[1] There exists the potential that groundwater pumping for transportation may occur at other locations throughout the Big Chino sub-basin. This plan would be revised if additional pumping locations were to alter this assumption.

- hydrogeologic controls on water movement between the basin-fill and Paleozoic carbonate aquifers with particular emphasis on the area between Wineglass Ranch and the UVS,
- geologic structural controls on groundwater movement in the Paleozoic carbonate aquifer surrounding the UVS,
- aquifer parameters (transmissivity and storage coefficient) of the Paleozoic carbonate aquifer, and
- quantification and distribution of infiltration/runoff relationships.

It is anticipated that the current USGS Northern Arizona Regional Groundwater Flow Model (NARGFM) will be used to help guide some of the data collection activities.

DATA COLLECTION AND MONITORING PLAN COMPONENTS

The Plan is comprised of the following components:

1. City of Prescott Groundwater Monitor Wells for the Big Chino Water Ranch

   Maintain the City of Prescott groundwater monitor wells for the Big Chino Water Ranch as provided in Attachment A. The City of Prescott monitor well plan for the BCWR consists of seven (7) monitor wells, six (6) of which are now in place. Two (2) of the wells were existing, four (4) were installed by the City and one is planned for future installation. Although six (6) monitor wells have been completed (Figure 3.), the City's consultant, Southwest Groundwater Consultants Inc. (SGC), was unable to complete the seventh, Boundary Monitoring Well #2 (BMW-2) due to drilling problems.

BMW-2 is important with respect to the monitoring of the Paleozoic carbonate aquifer and is planned for completion early in the program. The location of this well has been revised from the plan presented in Attachment A. The proposed new location is adjacent BMW-3 in order to facilitate the measurement of heads in the basin-fill and Paleozoic carbonate aquifers at the same geographic location. The new location is shown on Figure 3.

All of the installed BCWR monitor wells are or will be incorporated into the ADWR/USGS monitoring networks.

2. GWSI Wells in the Big Chino Sub-basin

ADWR GWSI index wells in the Big Chino sub-basin are shown on Figure 4. These wells are disproportionately concentrated in the upper portion of the sub-basin. It is proposed to add wells to the GWSI in the Williamson Valley, middle and lower regions of the Big Chino sub-basin, and in the Paleozoic carbonate aquifer north of the upper Verde River. Approximately 10 to 20 wells will be added to the GWSI to achieve a density similar to the existing GWSI in the rest of the Big Chino sub-basin. Potential existing wells to be considered for inclusion in the GWSI are shown on Figure 4.

ADWR GWSI Index wells historically have been selected to provide good spatial distribution or coverage within a groundwater basin and to assess vertical gradients if possible. ADWR GWSI Index wells are selected based on guidelines developed by the USGS Office of Ground Water for the Collection of Basic Records (CBR) Program. Additional details can be found at: http://water.usgs.gov/ogw/CBR/Guidelns.html

Specific criteria for Index well selection can include at a minimum the following:

- Open to a single, known hydrogeologic unit
- Known well construction that allows good water-level measurements
- Located in unconfined aquifers or near-surface confined aquifers that respond to climatic fluctuations
- Minimally affected by pumpage and likely to remain so
- Essentially unaffected by irrigation, canals, and other potential sources of artificial recharge
- Long-term accessibility
- Well has never gone dry (not susceptible to going dry)

Additional desired characteristics:

- Representative of broad area (e.g., a regional aquifer)
- Complete characterization of the site is available
- A long record of water-level measurements exists
- Lithologic and geophysical logs available
- Alternative well identified for each site

Please note that selection criteria may vary for GWSI Index wells depending on area specific monitoring objectives. For example, wells may be selected that are located in confined conditions versus unconfined for specific data needs.

Monitoring of existing wells in Big Chino sub-basin is incorporated into the Big Chino Sub-basin Monitoring Plan, as described below.

a. In 2008 ADWR began semi-annual water level monitoring of 30-34 wells in the upper Big Chino sub-basin. It is unclear if ADWR will continue to monitor these wells on a semi-annual basis. However, it is recommended that water levels in these wells continue to be

measured on a semi-annual basis until or until the data are sufficient to support a less frequent measuring period.

b. On a 4 to 5 year frequency, ADWR has conducted comprehensive water level measurement "sweeps" for many groundwater basins throughout the State. During these sweeps ADWR attempts to obtain water level measurements from as many wells as circumstances and scheduling allows. The last water level sweep for the Big Chino sub-basin occurred in 2009.

   ADWR may not be able to continue its periodic all-inclusive sweep of existing wells in the Big Chino sub-basin to obtain water level measurements. However, if measurement sweeps are conducted, the data will be incorporated into the annual monitoring report as they become available.

3. Geophysical Surveys

The geology of the Big Chino sub-basin is complex. Understanding the relationships between the alluvial sediments (tertiary basin fill), volcanic interflows and intrusive events, and the Paleozoic carbonate rocks is essential to understanding both the movement of the groundwater from the area of the BCWR to the UVS and the potential effects of pumping in the upper Big Chino sub-basin on the base flow of the upper Verde River.

Geophysical surveys have been conducted to assess the general configuration of the Big Chino valley and major structural features (WRA 1990; USBR 1993; USGS 2000). Additional surveys are proposed to focus specifically on three key areas:

- Extent and distribution of coarse-grained and fine-grained aquifer materials in the middle portions of the sub-basin;

- Lithologic and structural conditions in the area between Wineglass Ranch and the UVS;
- Major (Mesa Butte and Big Chino faults) and lessor (fissure and solution zone) structural features in the Paleozoic carbonate rocks north of the UVS.

The primary geophysical tools are anticipated to be electrical methods (TEM and CSAMT). These may be supplemented with other methods such as seismic surveys in selected areas. Electrical geophysical methods (ground-based transient electromagnetic (TEM) and controlled source audio-magnetotelluric (CSAMT)) will be used in the three (3) specified areas to address specific questions in Big Chino sub-basin. The USGS Arizona Water Science Center will use Center equipment and experienced staff to carry out these surveys as part of a related project to construct a groundwater flow model of the Big Chino sub-basin. Targets of the electrical surveys will include the aquifer extent and lithology and geologic structures such as horsts and grabens. In particular, the distributions of productive aquifer materials, coarse-grained sediments and limestone, and poor aquifer materials, fine-grained sediments and crystalline rock, will be mapped. Depths of investigation will range from a few tens of meters to several hundred meters. Data processing will include subsurface electrical models. Additional methods that may be used to refine the electrical survey results, such as 2-dimensional electrical resistivity surveys and seismic reflection, will be considered after evaluation of the initial surveys.

The three (3) areas of interest for electrical geophysical surveys are discussed below:

a. The region of steep hydraulic gradients near Walnut Creek that appear to hydraulically compartmentalize the upper and lower

parts of the alluvial basin including an area within the following region T19N R4W sec 9, 10, 11, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36 and T19N R3W sec 19, 30, 31. The targets of surveys include the thickness, extent, and continuity of the alluvial and Paleozoic aquifers and the extent and thickness of the silt and clay body. Detailed CSAMT or TEM profiles will be use to map aquifer lithology and geologic structure. The specific location of profiles will be determined after evaluating available geologic information including drill logs, other geophysical data, and access to lands in the region.

b. Paleozoic aquifer that lies to the north of the Verde River above the Paulden gage T18N R2W sec 26 to T18N R1W sec 30, T18N R2W sec 35 to T18N R1W sec 32, T17N R2W sec 2 to T17N R1W sec 5. Targets of surveys include the thickness and extent of the Paleozoic aquifer including geologic structures that may limit or transmit groundwater flow. Detailed CSAMT profiles will be needed to map geologic structure in sufficiently useful detail. The specific locations of profiles will be determined after evaluating available geologic information, drill logs, other geophysical data, the hydrogeologic framework model of Fry (NAU Master's Thesis, 2006), and access to lands in the region. At least 3 profiles are proposed, 2 approximately W-E and 1 N-S, but more may be needed. The distribution of CSAMT soundings along profiles may be as small as 500 ft or as great as 1 mile between stations along multiple profiles.

c. North of Paulden and south of Big Black Mesa including areas within T18N R2W sec 16, 17, 20, 21, 26, 27, 28, 33, 34. The target of these surveys include the thickness and extent of the Paleozoic and alluvial aquifers including the Big Chino Fault.

Detailed CSAMT or TEM profiles will be used to map geologic structure. The specific locations of profiles will be determined after evaluating available geologic information including drill logs, other geophysical data, and access to lands in the region.

4. New Groundwater Monitor Wells

Up to 10 new groundwater monitor wells are anticipated as part of this plan. New monitor wells will be constructed in a manner to allow for both water level measurement and collection of water quality samples. The following new monitor wells (Figure 5) are proposed to be added to the network, measured at least semi-annually or continuously, as appropriate. Final well locations will be based upon access, land availability and technical considerations, including the results of the geophysical surveys.

a. Existing wells will be reviewed and evaluated as potential monitor wells based upon ownership, access, construction and condition. It is anticipated that this would be done in conjunction with ADWR's assessment of its index well coverage of the Big Chino sub-basin (Task 2). This task will also benefit from a review of the soon to be published USGS Northern Arizona Regional Groundwater Flow Model (NARGFM), with emphasis on improving future model calibration and results.
b. Unless existing wells will suffice (see Section 2), three to five additional wells will be installed in Sections 13, 24 and 25 of T18N, R2W and Sections 16-33 of T18N, R1W (Figure 5). For initial cost estimation, it is anticipated three (3) wells would be installed to a depth of 300 feet below land surface (ft bls) and two (2) wells would be 700 ft bls.
c. A well will be installed in the E½ of Section 36, T18N, R2W, drilled into Paleozoic carbonate aquifer (Figure 5). The depth of the well is uncertain but the potentiometric surface is expected to be at an elevation higher than 4,300 feet (300 ft bls).

d. There are very few existing wells in the Big Chino sub-basin just above the Verde River headwaters. A well is proposed to be

installed in the SE¼ NE¼ Section 11, T17N, R2W in the saddle between the two knobs in the NE¼ of this section. The well will be drilled into the Paleozoic carbonate aquifer to a depth of approximately 330 ft bls. This would put the bottom of the well 50 feet below the elevation of the Verde River (elevation approximately 4170).

e. It is important to establish the current and future piezometric head in the Paleozoic carbonate aquifer as close to the UVS as possible. A new groundwater monitor well is proposed in Section 12, T17N, R2W as close to the UVS as possible given site and ownership constraints.

f. The playa deposit in the middle of the Big Chino sub-basin potentially has a significant effect on groundwater movement. It is unclear whether existing wells (and their reported water levels) in and near the playa are penetrating a perched aquifer on top of the playa, the regional basin-fill aquifer, or both. A new dual piezometer monitor well screened in the shallow (perched) aquifer and deeper (regional) aquifer is proposed to investigate the presence of a perched aquifer. The well would be located in NW ¼ of Section 26 T18N, R4W and drilled to a total depth of approximately 400 ft bls.

g. A new Paleozoic carbonate aquifer exploration/monitor well is proposed near Wineglass Ranch (NW ¼ of Section 24 or SW ¼ of Section 25, T18N, R3W) to investigate the carbonate hydraulic head and aquifer parameters in the middle portion of the Big Chino sub-basin. The depth of this well would be 900-1,000 ft bls

h. .Continuous water level monitoring equipment will be installed in up to ten (10) new monitor wells (in addition to the six (6) existing wells with continuous recording devices).

i. SRP has installed water level monitoring equipment at the Gipe well, located in the NE¼ of the NE¼ of the NE¼ of Section 17, T18N, R1W, ADWR Registration number 55-511557, in cooperation with Drake Mining LLC. Water level data are being collected in real time and are available to the public. The Gipe well is completed in the Paleozoic carbonate aquifer (Figure 5). The well monitoring equipment is currently being maintained by SRP with hopes that it will be incorporated into the ADWR GWSI network.

j. Chino Valley has proposed a recharge facility to be located in the lower Big Chino sub-basin, NW¼ Section 4, T17N, R2W, at APN 306-40-008D. Any monitor wells associated with that recharge facility will be made part of this Plan.

5. Paleozoic Carbonate Aquifer Testing

Measured transmissivity and storage data for the Paleozoic carbonate aquifer in the Big Chino sub-basin are nonexistent. It is proposed to develop aquifer parameters at three geographically dispersed locations in the sub-basin as noted below.

a. at the new BMW-2 monitor well located adjacent to BMW-3 (see Attachment A),
b. at a new carbonate monitor well to be located in the vicinity of the Wineglass Ranch (Section 4g), and
c. at the new monitor well to be located near the UVS (Section 4d).

Each well will be geophysically logged when drilled. The logging suite will include at least two depths of penetration of resistivity measurement, spontaneous potential, natural gamma, neutron, porosity, gamma gamma density, sonic travel time, and borehole televiewer.

After the wells are completed, long-term pumping tests of at least seven (7) days duration will be conducted on each well. The length of each test will be adjusted in the field so that the length is adequate to test a sufficiently large volume of aquifer so that transmissivity adjacent to the borehole and aquifer transmissivity farther from the borehole can be estimated. Additionally, the tests will aid in understanding whether or not the aquifer at the location of the monitor wells is connected to an extensive network of fractures and/or solution features.

In order to balance cost and the need for aquifer data, wells will be designed to accommodate a pump capable of producing approximately 500 gpm. Well diameter is anticipated to be twelve (12) inches. It is understood that in areas of extensive solution fractures this pumping rate may not be adequate to stress the aquifer: in this event a qualitative assessment of aquifer transmissivity will made.

6. Water Quality Sampling

Groundwater quality monitoring usually has one of two purposes: 1) to detect movement of poor-quality water related to pumping, or 2) to detect presence or introduction of anthropogenic contaminants. Prescott will monitor groundwater quality of the planned BCWR production wells to ensure that all municipal water supply standards are met. However, outside the BCWR there seems to be little need for monitoring groundwater quality to detect changes with time.

There is, however, a need for additional chemical and isotopic data to improve understanding of the hydrogeology in Big Chino sub-basin. For example, data for arsenic (As) concentrations are particularly important given that high As concentrations in drinking water have human-health implications and arsenic concentrations have been shown to vary with

depth near the BCWR, and very high (>100 µg/L) concentrations have been reported in 6-10 wells near the Wineglass Ranch.

There are essentially no water quality or stable isotopic data in the middle Big Chino sub-basin (T18N, R4W), even though this area may be within the main groundwater flow path from the upper to lower Big Chino sub-basin. Such data are also very sparse between Williamson Valley and Paulden. Water quality sampling is discussed below

a. **Existing wells with repeated sampling** - groundwater from three (3) wells has been sampled and analyzed from 2 to 10 different times. Well (B-17-2)4AAA was sampled in 1991 by ADWR, and in 2003 by USGS (Wirt et al, 2005). The two analyses, including trace elements, were nearly identical.

   Well (B-18-3)25CDA was sampled by ADWR ten times from 1990-1998. All constituents were very stable during that period. However, boron concentrations (averaging 135 mg/L) are 2 to 3 times larger than most basin-fill analyses; and silica concentrations (averaging 73 mg/L) are 2.5 to 4 times higher than most basin-fill aquifer analyses. Thus, this well may not be representative of basin-fill aquifer groundwater.

   Well (B-19-4)4CAC) was sampled 7 times by ADWR from 1990 to 1998, and again by USGS in 2001. All analyses were essentially the same, with the exception of the 1993 analysis in which concentrations were about 60 percent higher for most constituents.

   Given the consistency of the analyses for the above wells, the Cooperators do not plan to embark on a repeat sampling (monitoring) program unless analysis of new data or results from

numerical groundwater flow modeling identify a reason for further sampling of these wells.

b. **Stable isotopes** - The ratio of stable isotopes of oxygen and hydrogen ($^{18}O/^{16}O$ and H^2/H^1) relative to a known standard are useful for identifying the source of water, as well as the season and elevation of recharge. Stable isotopes of water are also useful for calculating the proportions of source waters in a mixed water sample. To be useful, a stable isotope monitoring campaign must characterize the "end members", which can be called the pure source waters, the water for which source is of interest, as well as temporal variability in both of those sample types.

In the most general terms, the property of stable isotopes from which their utility derives is that the heavier isotope in water evaporates and condenses at a slower rate than the lighter isotope. This differential rate results in 'fractionation', or a separation of heavy from light isotopes. The result is that water termed isotopically heavy or light represents precipitation that condensed at different temperatures and altitudes. Winter precipitation (and therefore groundwater recharged by winter precipitation) tends to be isotopically light. Similarly, precipitation that forms at high altitudes over mountains tends also to be isotopically light, resulting in the recharge of isotpically light groundwater in mountain blocks and fronts.

The existing data set for stable isotopes is so small that a large sampling effort would be required to obtain a regionally meaningful data set. A total of 32 stable isotope values for the Big Chino sub-basin are reported in the literature (Blasch 2006; Wirt 2005; and Wirt & Hjalmarson 2000) – this includes the 1996 ASU samples. Of

the 32 values, 15 are located between the southern playa deposits and Upper Verde Springs (downstream end of sub-basin); eight (8) are in wells overlying the playa deposits; four (4) are in CV Ranch; three (3) are in Williamson Valley; and two (2) are six (6) to 10 miles NW of the BCWR. Like the water chemistry, there are no stable isotope data from BCWR to Paulden, except in the playa deposit area.

If the sparse data allowed for a generalized conclusion, the lightest groundwater is in Williamson Valley; followed, in order, by carbonates near Paulden; the wells on the playa deposits; the average of wells near the UVS; and the heaviest near the BCWR. Collecting additional stable isotope data from wells in the middle portion the valley may provide some additional insights on the hydrogeology.

The USGS is reportedly analyzing surface-water samples, collected by volunteers, for stable isotopes in drainages extending into the Juniper and Santa Maria Mountains. These isotope analyses may provide end member data required for interpreting mixing of isotopes from the mountains to the UVS.

c. **Wells to be sampled for water chemistry and stable isotopes** - The installation of new wells presents an opportunity to collect water samples that are well characterized with respect to the depth and aquifer from which the water derives. Water chemistry and stable isotope samples will be collected from all new monitor wells.

Water from approximately 10 existing wells will be sampled and analyzed from the central basin area between the BCWR and Paulden where no groundwater chemistry data currently exist. As

the study proceeds other wells may be identified and sampled, as appropriate. Water chemistry analyses will include, at a minimum, common inorganic anions and cations plus trace metals and stable isotopes. The existing wells to be sampled will be chosen after further research into which wells have sufficient information (depths, perforation interval, logs, etc.) to warrant sampling.

7. Base flow water quality sampling

Other than during specific research activities (ASU 1996, Wirt 2005), surface water quality in the Big Chino sub-basin has been sampled only sporadically. Given the importance of understanding the relationship between ground and surface water in the Big Chino sub-basin regular water quality sampling of base flow at selected locations should be implemented, at least until a consistent baseline can be established. Therefore, it is proposed to sample base flow as follows:

1. at least quarterly at the USGS' Williamson Valley gage,
2. The Paulden and the SRP Campbell Ranch gage will be sampled at time of visits during base flow conditions for the first two years. At the same time a water sample of flow from the UVS will also be collected. This sample will be taken on the north side of the Verde River as close to the springs as is physically possible.

At a minimum, samples will be analyzed for common inorganic anions, cations, arsenic and stable isotopes. The USGS is conducting monthly stable isotope sampling at the Paulden gaging station. For this monitoring effort those monthly samples will be bolstered with quarterly sampling and analysis of inorganic anions, cations, and trace metals. A similar sampling regimen, plus stable isotopes will be instituted for the SRP Campbell Ranch gage and possibly upstream.

8. Verde River Low Flow Measurement

SRP will provide low-flow stream flow data on a monthly basis from the Campbell Ranch low flow stream gage. This stream gage is located on the Verde River down-gradient from the UVS (see Figure 2).

9. Verde River Tributary and Verde River Flow Measurement

Stream flow in Partridge Creek and Big Chino Wash are potential sources of recharge to the regional Big Chino sub-basin basin-fill aquifer. Neither of these surface water drainages is currently gaged. Measurement of stream flow in these drainages would aid in the quantification of recharge to the basin-fill aquifer.

Runoff from the Walnut Creek drainage traverses karstic Paleozoic carbonate rocks before entering the valley floor and flowing on the surface of the basin-fill aquifer. Monitoring ephemeral streamflow above and below the carbonate outcrops can assist in defining the distribution and quantity of recharge to the Paleozoic carbonate and basin-fill aquifers.

The following streamflow monitoring is proposed to be incorporated into the Plan:

a. **New streamflow gaging locations** - At least nine (9) new stream flow gages are proposed: one (1) on Partridge Creek, four (4) on Big Chino Wash, two (2) on Walnut Creek, one (1) on Pine Creek and one (1) on Williamson Valley Wash. Given the ephemeral nature of these streams Continuous Slope Area (CSA) gages are proposed. Field verification will be required to assess hydraulic, access and land ownership suitability of the proposed locations. Tentative locations of the proposed gages are shown on Figure 6.

b. **Existing streamflow gaging stations -** Flow data from the USGS Del Rio Springs gage near Chino Valley, (Station number 09502900), the Williamson Valley Wash gage near Paulden, (Station number 09502800), and the Paulden gage, (Station number 09503700) will be included in the annual monitoring report along with data from relevant Yavapai County Flood Control gages shown on Figure 6.

10. Climate Monitoring

The federal government (NOAA/NWS) and the Yavapai County Flood Control District operate weather stations within the study area, as shown on Figure 6. All of these stations measure precipitation; several also collect other climatological data (temperature, humidity, wind speed, etc.). Relevant data, including but not limited to precipitation, from these sites will be compiled and used in estimates of recharge and in assessing the impact of climatic changes on water levels and streamflow.

Blasch (2005) concludes that significant recharge to aquifers in the study area originates as precipitation on the Juniper Mountains and on Big Black Mesa. It is proposed to establish precipitation gages in these areas. There are two (2) existing, but currently inactive, gages in the Juniper Mountains that will be considered for the precipitation network. Two (2) new gages are proposed on Big Black Mesa in recharge source areas identified by Blasch, as shown on Figure 6.

Evapotranspiration can be monitored using a combination of point measurements and Basin Characterization Modeling (BCM). Until recently the USGS operated two (2) climate stations that estimated potential evapotranspiration in Chino Valley and near the Paulden streamflow gaging station. Additionally, basin ET estimates using satellite

data were previously estimated during the Rural Watershed Study. These latter basin ET estimates should be continued. It is proposed to work with the USGS to evaluate the ability of the BCM to provide localized estimates of ET for the numerical model. If the use of satellite data and the BCM prove inadequate, additional vegetative water use analyses to estimate ET may be proposed.

11. Natural Recharge

Discriminating between the impacts of climate fluctuations and pumping withdrawals on changes in Verde River base flow is a more complicated step than monitoring changes in the aquifer attributed to withdrawals alone. This is primarily attributed to the various recharge mechanisms occurring within the sub-basin, time scale of recharge and attenuation of groundwater signals, and correlation between water withdrawals and precipitation. Precipitation monitoring is a necessary first step for the general understanding of water entering the sub-basin and was discussed in the previous section. Recharge rates are necessary to estimate the amount of water that is entering the groundwater system and deterministic models are necessary to determine the flow through the groundwater system. Multiple strategies will be employed to provide this information including:

a. Direct monitoring of channel recharge. Streamflow gages will be installed within the main channel and major tributaries to estimate infiltration (seepage) during runoff events (see Section 8).
b. Integration of recharge data into the existing BCM and existing and planned groundwater models (see Section 9).

12. Groundwater Storage

The response of the groundwater system in the Big Chino sub-basin to variations in groundwater withdrawals and natural recharge is poorly known. Monitoring of water-levels in wells in the two (2) primary aquifers will help in understanding hydraulic response. However, the relation of storage change to water-level change, aquifer-storage coefficient, is also poorly understood. Additional periodic monitoring of groundwater storage using gravity methods at several sites throughout the basin will help determine both aquifer storage coefficient and the spatial distribution of variations in recharge. The USGS currently operates several microgravity stations in the study area where data are collected quarterly. It is proposed to establish up to 20 additional microgravity stations. Many of the stations will be co-located at monitor wells where variations in water-level and gravity will be used to estimate storage coefficient. Some of the stations will also be located in expected recharge areas where wells are unavailable.

13. Groundwater Pumpage

Prescott will install flow meters on BCWR production wells. For the non-BCWR irrigation wells, an annual survey of crop type will be made along with annual estimates of irrigated acreage using current aerial photographs or satellite imagery. These data will be used to compute groundwater pumping rates for unmetered irrigation wells. Non-BCWR municipal pumping will be provided by ADWR. Estimates of domestic well pumping will be based upon the number of domestic wells in the sub-basin as annually updated by ADWR.

14. Big Chino Sub-basin Monitoring Plan Annual Report

An annual monitoring report summarizing the data generated will be prepared and made available.

PROPOSED IMPLEMENTATION SCHEDULE

The proposed schedule follows a phased approach with the specific points of implementation to be determined by the monitoring and/or modeling committees. In general, the schedule is as outlined below:

Year 1: Install 5 of 9 stream gages, add the GWSI wells and install precipitation stations

Year 2: Install 5 of 9 shallow monitoring wells

Year 3: Install remaining 4 stream gages, remaining 4 shallow wells, begin geophysical and aquifer storage monitoring and begin modeling

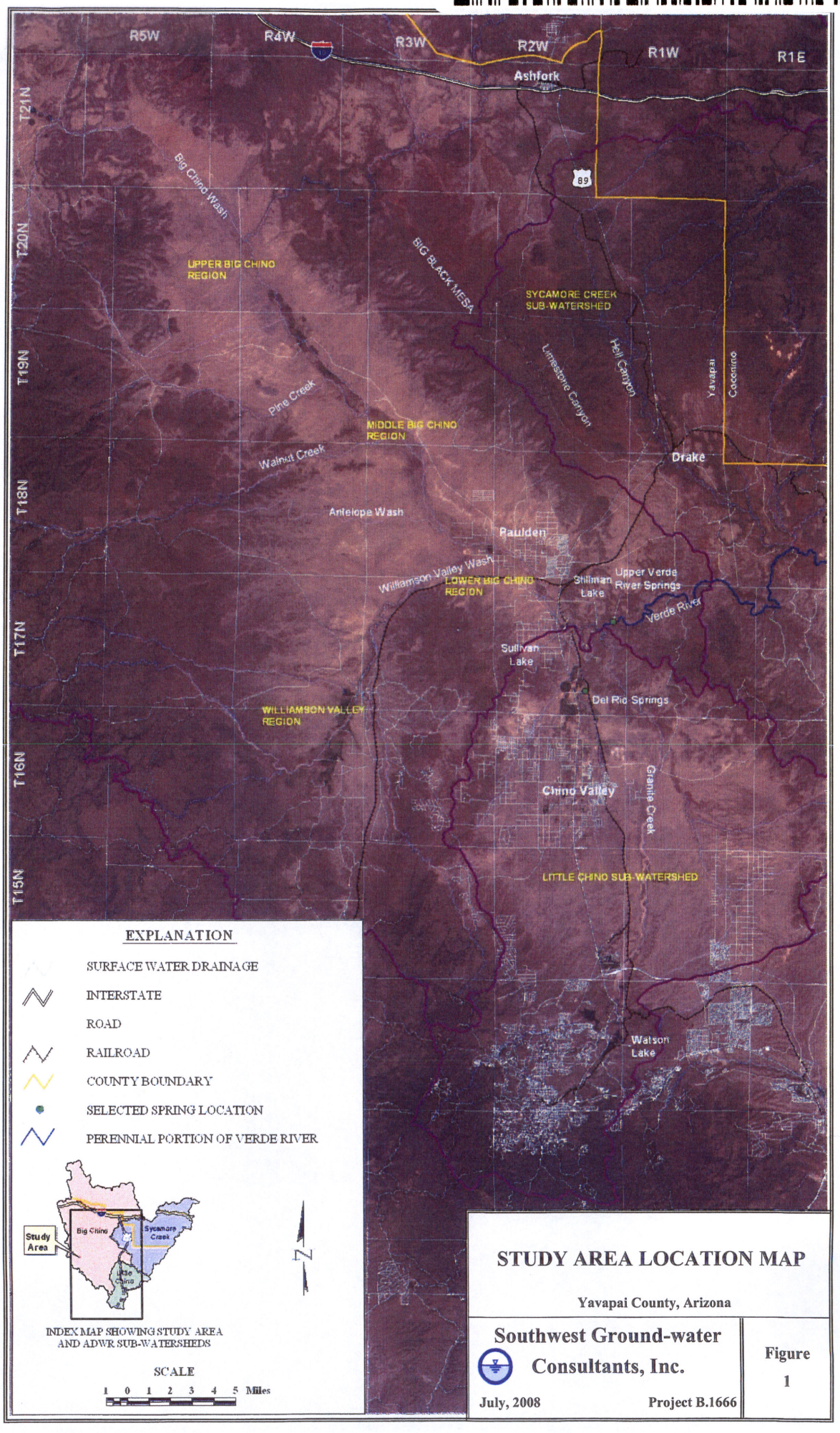
Year 4: Install 2 deep wells, complete geophysical monitoring

Year 5: Continue aquifer storage monitoring, model development and anylysis

Year 6: Complete Modeling Report

LIST OF FIGURES AND ATTACHMENTS

FIGURES



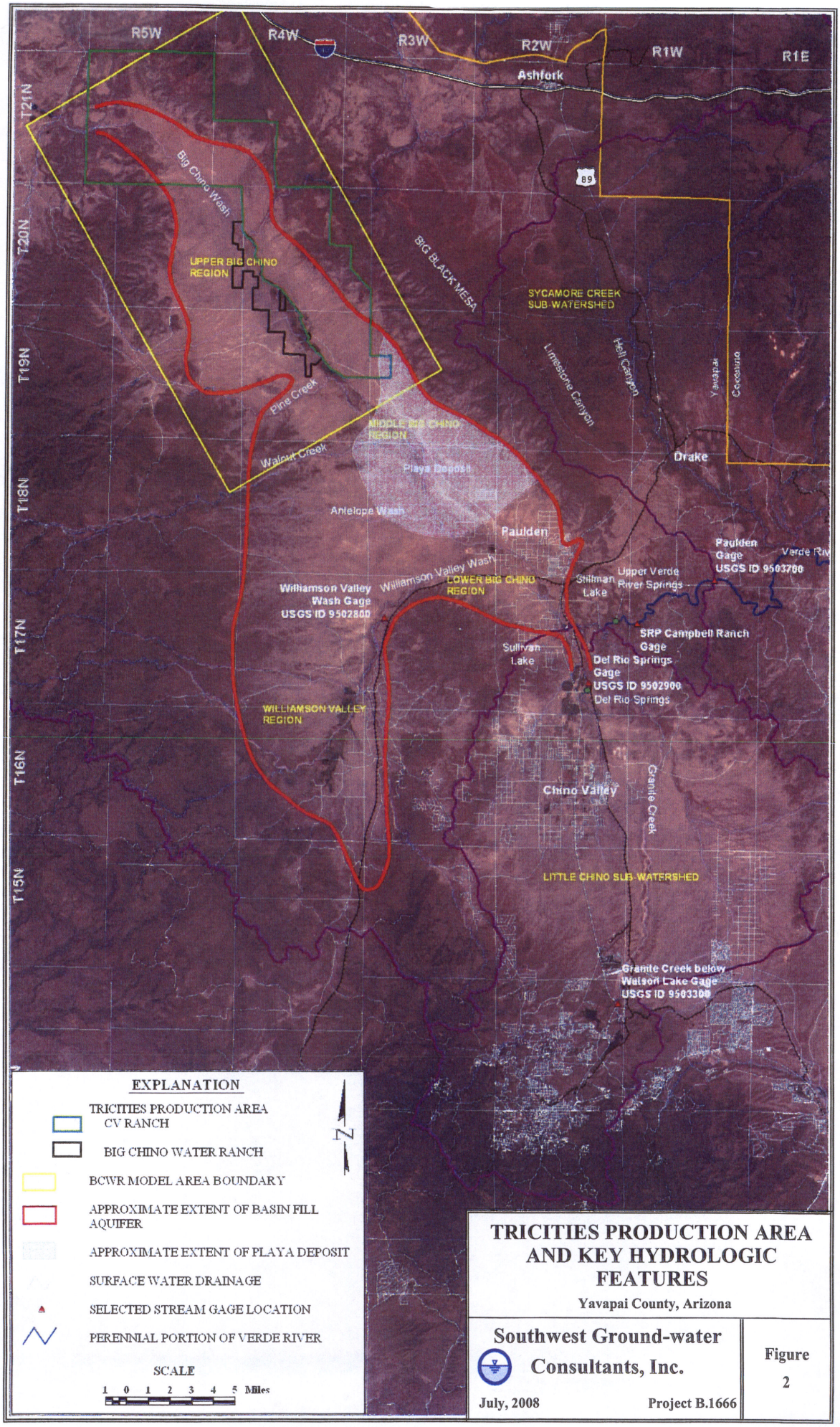
STUDY AREA LOCATION MAP

Yavapai County, Arizona

Southwest Ground-water Consultants, Inc.

July, 2008 Project B.1666

Figure 1



TRICITIES PRODUCTION AREA AND KEY HYDROLOGIC FEATURES

Yavapai County, Arizona

Southwest Ground-water Consultants, Inc.

July, 2008 Project B.1666

Figure 2

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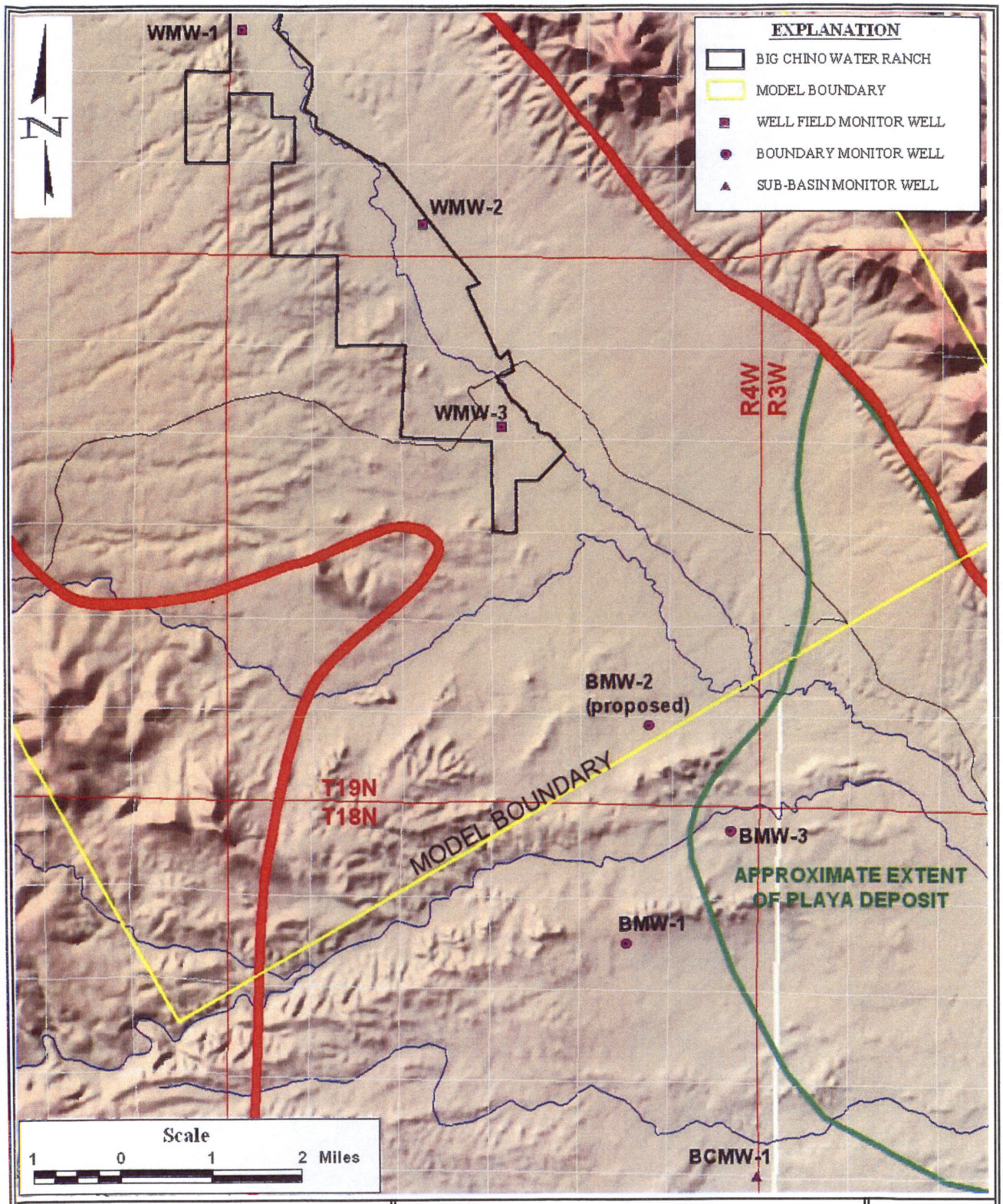
$51.50 Page: 81 of 102 2012-0058080



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BCWR MONITOR WELL LOCATION MAP

Big Chino Water Ranch, Yavapai County, Arizona

Figure 3

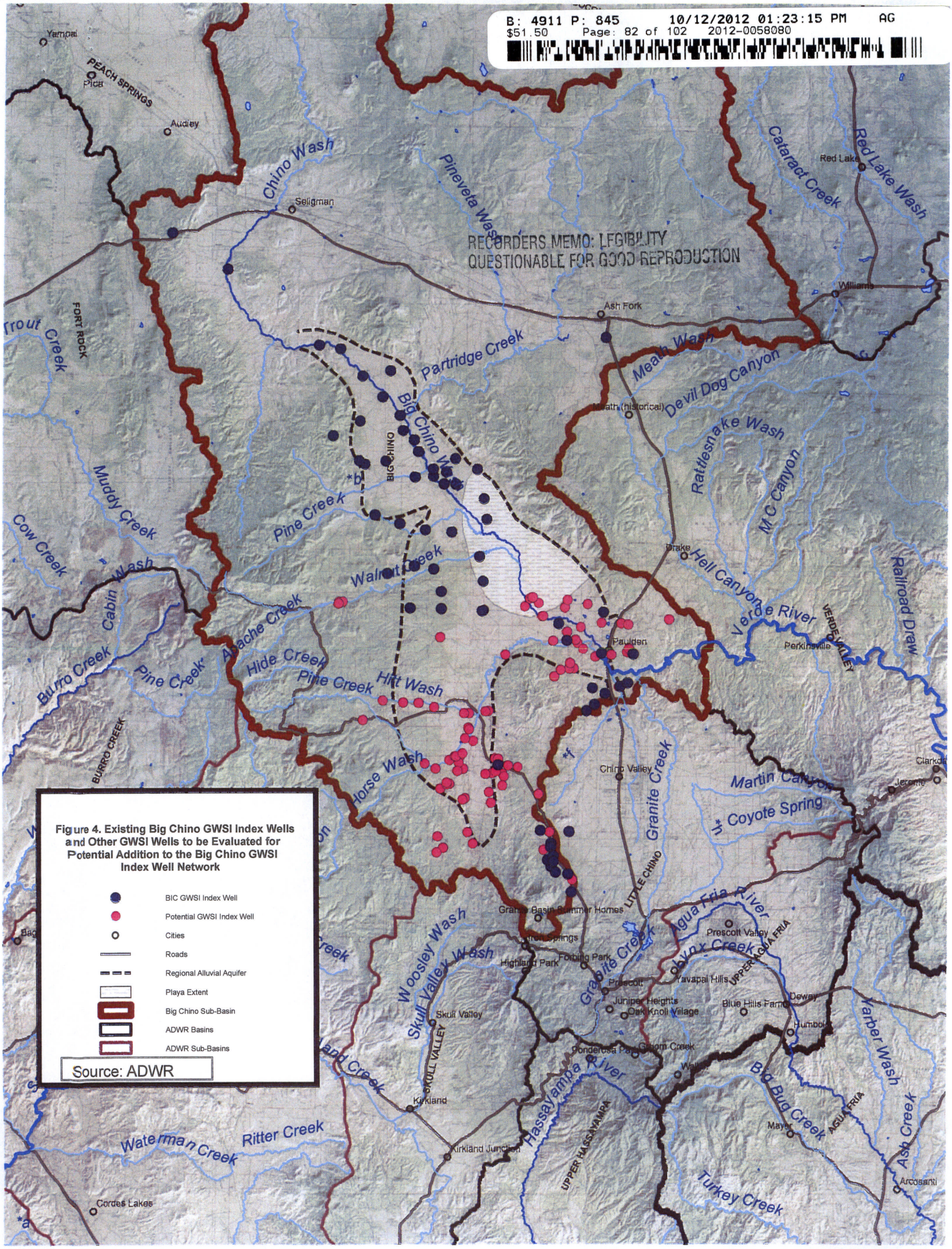
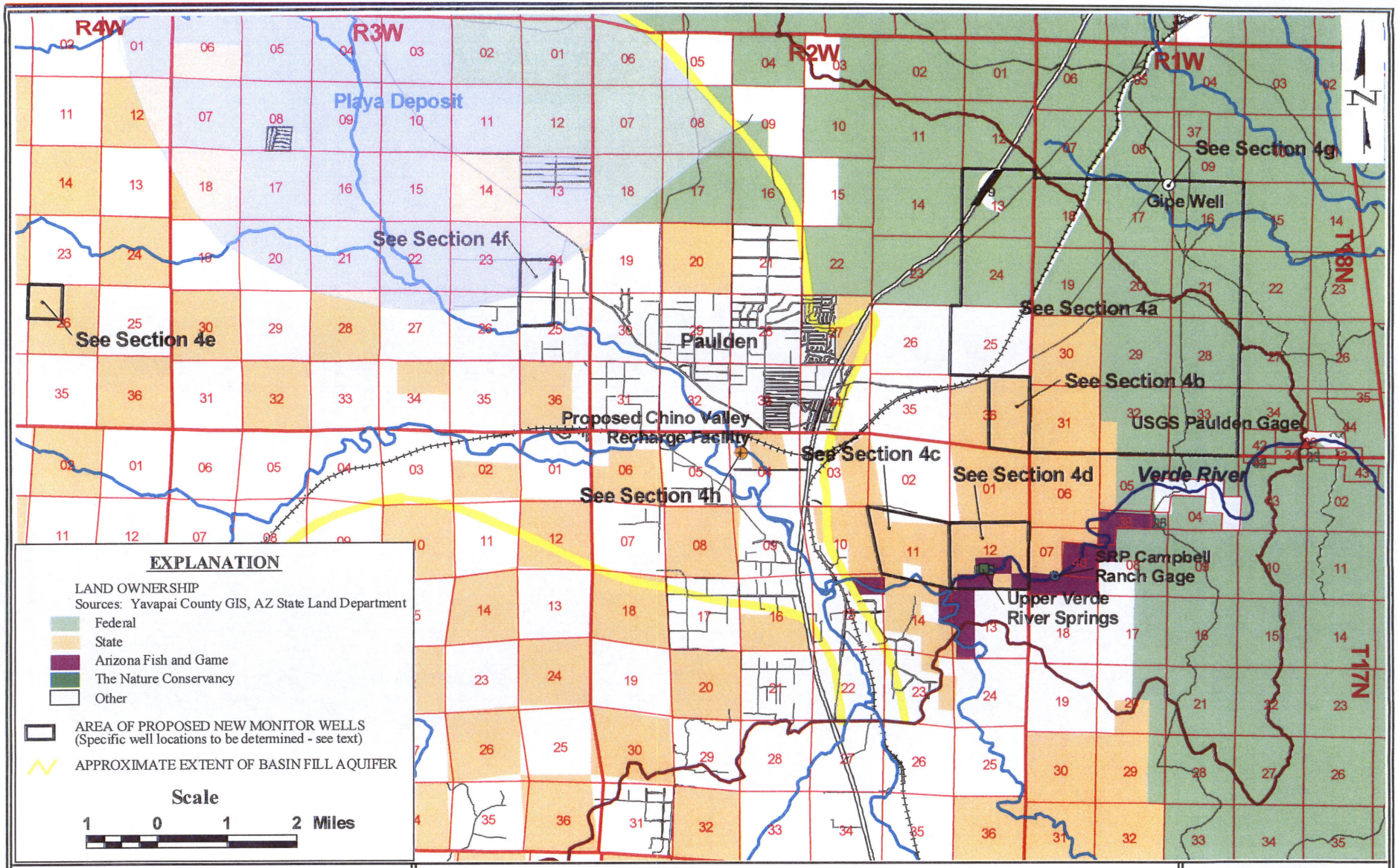


Figure 4. Existing Big Chino GWSI Index Wells and Other GWSI Wells to be Evaluated for Potential Addition to the Big Chino GWSI Index Well Network

- BIC GWSI Index Well
- Potential GWSI Index Well
- Cities
- Roads
- Regional Alluvial Aquifer
- Playa Extent
- Big Chino Sub-Basin
- ADWR Basins
- ADWR Sub-Basins

Source: ADWR



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April, 2010 Project B.1796

PROPOSED NEW WELL AREAS

Yavapai County, Arizona

Figure 5

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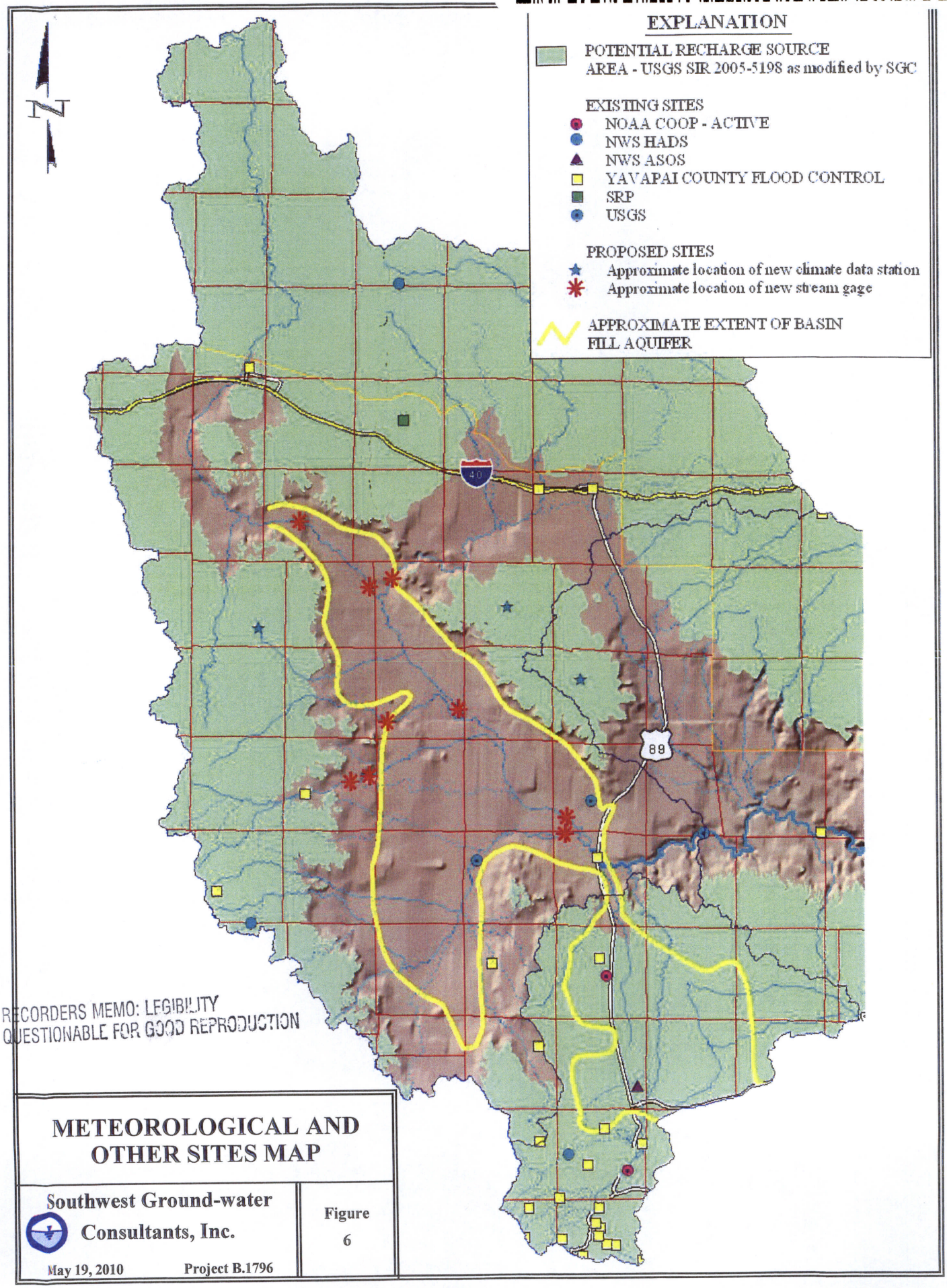


METEOROLOGICAL AND OTHER SITES MAP

Southwest Ground-water Consultants, Inc.

Figure 6

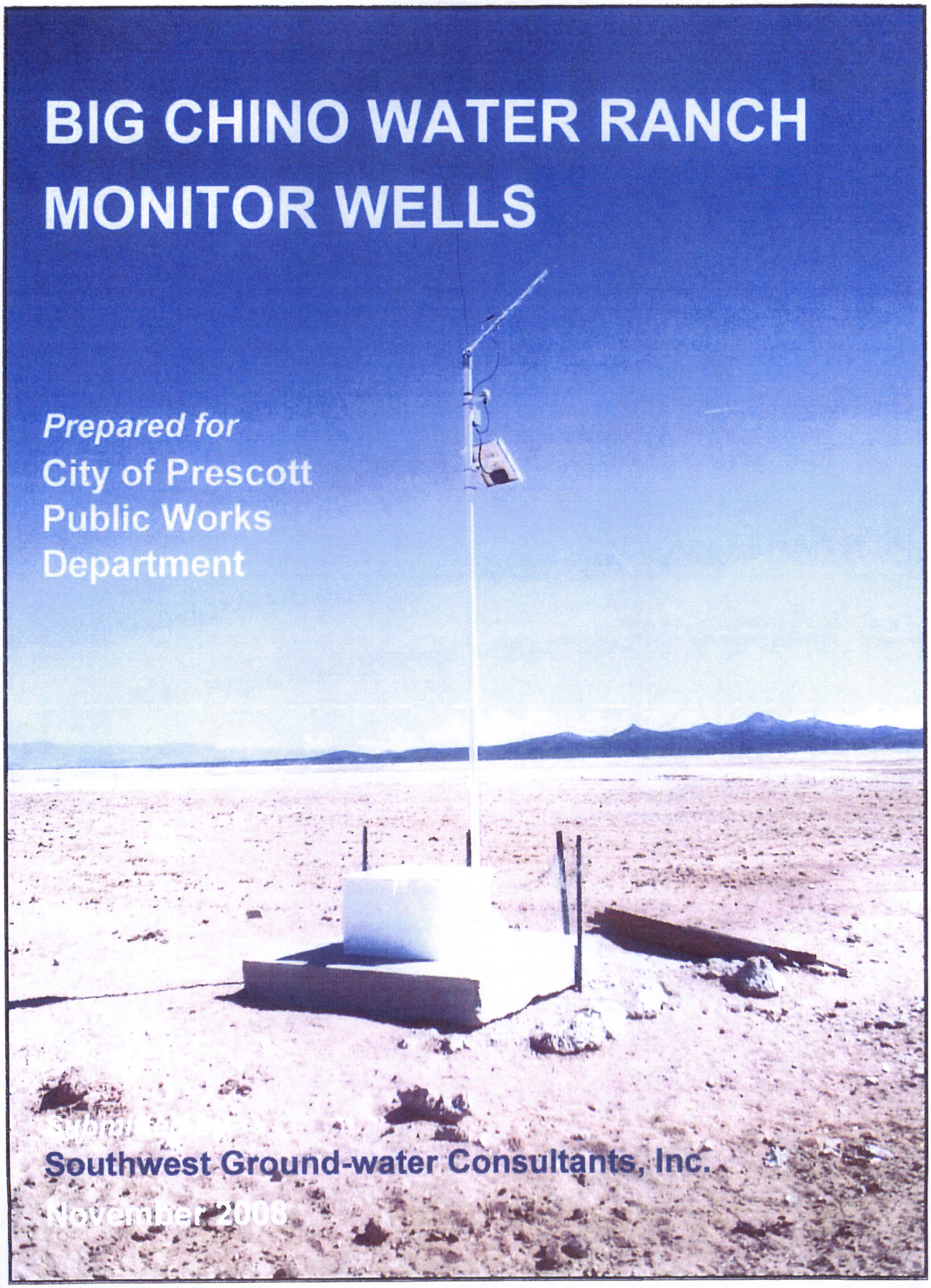
May 19, 2010 Project B.1796

Attachment A

City of Prescott Groundwater Monitor Wells for the Big Chino Water Ranch

November 2008

BIG CHINO WATER RANCH MONITOR WELLS



Prepared for
City of Prescott
Public Works
Department

Submitted by:
Southwest Ground-water Consultants, Inc.
November 2008

REPORT
BIG CHINO WATER RANCH (BCWR)
MONITOR WELLS

Prepared for

City of Prescott
Public Works Department

Expires: 12/31/2[illegible]

Submitted by

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November 2008

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Date Signed 11/14/12
ARIZONA, U.S.A.
Expires: 12/31/2013

LIST OF TABLES

LIST OF FIGURES

Expires: 12/31/

1.0 EXECUTIVE SUMMARY

The Big Chino Water Ranch (BCWR) ground-water level monitoring program consists of seven (7) monitor wells six (6) of which are in place. Two (2) of the monitor wells are existing irrigation wells, three (3) new monitor wells have been installed under this program and one is planned for future installation. All of the monitor wells are or will be incorporated into the Arizona Department of Water Resources (ADWR) and/or U. S. Geological Survey (USGS) monitoring networks.

BCWR monitor well location and construction data are summarized on Table 1. Location of the wells is shown on Figure 1. Well construction diagrams, except for existing well WMW-1 for which construction data are not available, are presented on Figures 2 through 7. Lithologic logs and geophysical logs of monitor wells installed by the City are presented in Appendix I. The ADWR Well Drillers Report for existing well WMW-1 is given in Appendix II.

2.0 INTRODUCTION

2.1 BACKGROUND

The City of Prescott is committed to monitoring potential changes to the ground-water conditions in the area of the BCWR due to the City's development of the ground-water resources beneath the BCWR. In 2004 the City initiated a process of stakeholder involvement in identifying possible impacts on ground and surface water resources on and outside of the Big Chino Water Ranch property. As part of this process, a Peer Review Group was established to specifically assist in the development a ground-water monitoring program. Based on this process, a proposed ground-water monitoring program was presented in "Ground-water Monitoring Plan, Big Chino Water Ranch", dated December 7, 2005.

In 2004 the City commissioned the development of the BCWR numerical ground-water flow model of the Upper Big Chino sub-subbasin, including the area of the proposed BCWR well field. The City's ground-water monitoring program is designed to monitor changes in ground-water levels over time and to support re-calibration of the BCWR ground-water flow model, as needed.

2.2 HYDROGEOLOGY

The BCWR is located in the Upper Big Chino sub-subbasin of the Big Chino Subbasin in north-central Arizona near the boundary of the Transition Zone and the Colorado Plateau Physiographic provinces. The Big Chino Subbasin is an elongated asymmetrical graben bounded on the east-northeast by the Big Chino fault. Maximum depth of the graben is approximately 2,500 ft and occurs adjacent to the fault in the middle of the basin. The Big Chino Valley is mantled by erosional remnants of Quaternary and Tertiary gravels. Beneath the gravels is an

alluvial sequence of clays, clayey silts, sands and conglomerates of thicknesses ranging from less than 10 feet around the edges of the valley to greater than 2,000 ft in the center. An extensive playa deposit composed of fine-grained silts and clay-like sediments is located in the middle of the basin. Either within or beneath (or both) the alluvium is a volcanic rock (basalt and latite) interval of variable thickness (<30 to 200 ft) and extent. Between 300 and 400 ft of Paleozoic carbonates (dolomite and limestone) underlie the basin-fill alluvium/volcanic sequence over much of the subbasin. On the upthrown side of a fault bounding the Upper Big Chino sub-basin on the west, the carbonates appears to have been removed by erosion.

2.3 PURPOSE

The purpose of the BCWR ground-water monitoring program is to measure ground-water conditions prior to the start of the City of Prescott's ground-water withdrawals on the Big Chino Water Ranch property and to assess changes in conditions over time. The ground-water system in the Big Chino Valley is complex and the impacts due to pumpage on the BCWR will vary considerably both in time and space. Specifically the BCWR monitoring program is designed to:

1. **Measure water level change in the area of the BCWR well field.** This relates to ensuring that the well field will operate in an efficient manner. This will also assist in re-calibration of the BCWR ground-water flow model, if needed, based on future measured water levels.
2. **Measure water level change downgradient from the BCWR.** Impacts on water users outside of the Upper Big Chino sub-subbasin will occur only if water levels and gradients at the southern end of the Upper Big Chino sub-subbasin (which corresponds to the BCWR numerical model southern boundary) are reduced. Data on water level change over time in this area will also assist in re-calibration of the BCWR ground-water flow model, if needed.

The BCWR monitoring program was initiated in December 2005. Location, permitting and construction of the monitor wells occurred between December 2005 and May 2007.

3.0 MONITOR WELLS

The Big Chino Water Ranch (BCWR) ground-water level monitoring program consists of seven (7) monitor wells six (6) of which are in place. Two (2) of the wells are existing, three (3) have been installed under this program and one is planned for future installation. All of the installed wells are or will be incorporated into the Arizona Department of Water Resources (ADWR) and/or U. S. Geological Survey (USGS) monitoring networks.

The monitoring program is divided into three main groups of wells based on their general purpose and location: wells in the well field, wells on the southern border of the ground-water model area and wells outside the upper Big Chino sub-subbasin. Monitor well designations reflect their purpose/location, as follows:

Purpose/Location	Designation	Well Number
Well field	Well field Monitor Well (WMW)	WMW-1, WMW-2, WMW-3
Southern Model Boundary	Boundary Monitor Well (BMW)	BMW-1, BMW-2, BMW-3
Big Chino Sub-Basin	Big Chino Monitor Well (BCMW)	BCMW-1

Drill Tech, Inc. of Chino Valley, Arizona was contracted by the City to drill and construct the monitor wells. WMW-2 was completed using the Versa-Drill V-2000NG drill rig and the direct air rotary drilling method. WMW-3 and BCMW-1 were completed using a Schramm T685WS Rotodrill rig and the direct air rotary drilling method. BMW-3 was started with the Schramm drill rig and completed with a Portadrill TLS drill rig. BMW-3 was completed using the direct air rotary drilling method. However, a failed attempt was made to drill the well deeper using direct mud rotary.

Each of the installed and proposed monitor wells are described below. Key monitor well information is summarized on Table 1. Locations of all BCWR monitor wells are shown on Figure 1.

3.1 BCWR WELL FIELD MONITOR WELLS (WMW)

Three (3) monitor well locations on the BCWR were identified based on the following criteria.

- spatial distribution over the ranch
- water level change in the major producing units (upper alluvium and basalt)
- non-pumping wells

Most of the wells on the BCWR are irrigation pumping wells. For this reason, two (2) of the three (3) well field monitor wells are new wells, as discussed below. New monitor wells also have the advantage of being designed and constructed to monitor water levels in target aquifer units.

3.1.1 Well Field Monitor Well (WMW) - 1

Registration Number – 55-624116
Location – B(20-4)19CBA
Aquifer Unit Monitored: Upper Alluvium and Basalt

WMW-1 utilizes an existing BCWR non-pumping irrigation well, Pump Number 7. This well was drilled in 1959 to a reported total depth of 635 feet below land surface. The reported depth to ground water when drilled was 43 feet below ground surface (bgs). The measured the depth to water on July 10, 2008 was 72.04 feet bgs (NWISWeb 2008). The reported yield of this well is 1,400 gallons per minute (gpm), however the well is no longer equipped and this yield could not be confirmed. There are no data on the perforated interval in this well. According to the driller's log, aquifer materials penetrated in this well include approximately 605 feet of alluvium (predominated by gravels) and approximately 30 feet of volcanic materials (basalt?). The well is

cased with 16" diameter steel casing. The ADWR Drillers Report is given in Appendix II.

WMW-1 is located near the northern edge of the BCWR and is approximately 2.3 miles northwest of Well Pump Number 8, a sometimes active irrigation well. This well is currently equipped with a continuous water level recording device and is on the USGS real-time network via a satellite transmitter.

3.1.2 Well Field Monitor Well (WMW) – 2

Registration Number: – 55-210660
Location – B(20-4)33CBD
Aquifer Unit Monitored: Upper Alluvium

WMW-2 is located in the central portion of the BCWR, approximately 200 feet north of Pump Number 3, an inactive irrigation well. An as-built diagram is provided on Figure 2. Total casing depth is 419 ft bgs. The well is slotted from 99-159 and 319-399 ft bgs. WMW-2 monitors water levels in the upper alluvium. Depth to water in WMW-2 on January 24, 2008 was 43.22 ft bgs.

WMW-2 will be included in the ADWR well network. Water level will be measured semi-annually.

3.1.3 Well Field Monitor Well (WMW) – 3

Registration Number: 55-210659
Location – B(19-4)9DAA
Aquifer Unit Monitored: Basalt

WMW-3 is located near the southern end of the BCWR, approximately 1,000 feet southeast from Pump Number 12, an active irrigation well. An as-built diagram for WMW-3 is presented on Figure 3. Total casing depth is 655 ft bgs with a slotted interval of 615-655 ft bgs. WMW-3

monitors the water level in the upper 60 ft of the basalt. Depth to water in WMW-3 on January 24, 2008 was 21.59 ft bgs.

WMW-3 will be included in the ADWR network. Water level will be measured semi-annually.

3.2 BOUNDARY MONITOR WELLS (BMW)

The boundary between the Upper Big Chino and the Middle Big Chino sub-subbasins is approximately coincident with the southern general head boundary (GHB) of the BCWR ground-water model. Changes in flow across this boundary could potentially have an impact on uses in the Middle and Lower Big Chino sub-basins and, ultimately, on flow in the Verde River Springs. Three (3) boundary monitor wells were proposed to monitor changes in water levels downgradient from the BCWR well field. Two (2) of the wells have been installed. The deep carbonate well (BMW-2) was not be completed, as discussed below.

3.2.1 Boundary Monitor Well (BMW) - 1

ADWR Registration No. 55-200027
Location: B(18-4)11ACA
Aquifer Unit Monitored: Upper Alluvium

BMW-1 will monitor water levels in the upper alluvium unit. BMW-1, previously named BH-1 was one of the exploration borings drilled as part of the earlier CV/CF Ranch hydrology investigation. At the request of the landowner the exploration boring was converted to a livestock well. Permission was subsequently obtained from the owner to use it a monitoring well.

BMW-1 penetrates the upper alluvium to a depth of 490 ft bgs. Clay is encountered from land

surface to 300 ft bgs. From 300 ft bgs to 420 ft bgs the material is clayey sand. A well graded sand with some clay was penetrated between 421 ft bgs to 490 ft bgs. Granite was encountered from 491 to 507 ft bgs, where the hole was terminated.

Four (4) inch diameter PVC casing is installed from land surface to 490 ft bgs. The casing is slotted from 290 to 490 ft bgs. The annulus is sealed with cement grout from 0-20 ft bgs. Depth to water was measured at 315.60 ft bgs on March 13, 2007. An as-built diagram is provided on Figure 4. BMW-1 will monitored semi-annually.

3.2.2 Boundary Monitor Well (BMW) - 2

ADWR Registration No.: Not yet drilled
Location: B(19-4)35AAB
Aquifer Unit Monitored: Carbonates

Installation of proposed BMW-2 was attempted at the current location of BMW-3, but could not be completed to the target depth. Borehole stability problems prevented the drilling contractor from completing the well as planned. This well is proposed for future installation. Estimated depth to the top of the carbonates is approximately 1,600 ft bgs. The carbonates are estimated to be approximately 400 feet thick, giving a total well depth of about 2,000 ft bgs. The proposed well design is presented on Figure 5.

On completion it is proposed to install a transducer and data recorder on BMW-2.

3.2.3 Boundary Monitor Well (BMW) - 3

ADWR Registration No.: 55-905773

Location: B(18-4)01ACA

Aquifer Unit Monitored: Playa/Playa Fringe/Alluvium

An as-built diagram of BMW-3 is presented on Figure 6. As noted above, it was originally intended to construct BMW-2 at this location; however, the drilling contractor was unable to complete BMW-2 as designed. To salvage as much invested value as possible it was decided to complete the well as BMW-3.

Total casing depth is 1,000 ft bgs. BMW-3 is cased with LACES and is slotted from 499 to 999 ft bgs. The well monitors the water level in the playa fringe unit. Depth to water in BMW-3 on June 15, 2008 was 155 ft bgs.

BMW-3 is included in the ADWR network and has a continuous water level recorder.

3.3 WELLS OUTSIDE THE UPPER BIG CHINO SUB-SUBBASIN

There are areas within the Big Chino subbasin that lack good water level and aquifer data. One such area is downgradient from the BCWR model southern boundary where ground-water flow from the upper Big Chino sub-subbasin meets ground-water flow from the Williamson Valley sub-subbasin. Water level contours suggest relatively high transmissivity in this area; however, water level and aquifer data are limited. During the stakeholder process the Salt River Project proposed a monitoring well in this area (e-mail from Kornrumph dated January 5, 2005). The location of this well (BCMW-1) is shown on Figure 1.

3.3.1 Big Chino Monitor Well (BCMW) - 1

ADWR Registration No.: 55-211839

Location: B(18-4)25AAA

Aquifer Unit Monitored: Alluvium

A borehole was drilled to total depth of 737 ft bgs. Alluvium was penetrated from land surface to 695 ft bgs where the borehole encountered granite to the total well depth of 737 ft bgs. An as-built diagram for BCMW-1 is presented on Figure 7. Total casing depth is 680 ft bgs. BCMW-1 is slotted from 300 to 620 ft bgs. The well monitors the water level in the alluvium. Depth to water on June 15, 2008 was 261.2 ft bgs.

BCMW-1 is equipped with a continuous water level recording device that is maintained by ADWR.

Table 1, Summary of Monitor Well Data

Monitoring Area	Well ID	DWR No.	Status*	Cadastral Location	Total Depth (ft-bgs)	Casing Depth (ft-bgs)	Screen Interval (ft-bgs)	Monitored Units	Monitoring Frequency
Wellfield	WMW-1	55-624116	Existing	B(20-4)19CBA	635	605	NR	Alluvium/Basalt	Continuous
	WMW-2	55-210660	New	B(20-4)33CBD	420	419	99-159, 319-399	Upper Alluvium	Semi-Annual
	WMW-3	55-210659	New	B(19-4)19CCC	670	655	615-655	Basalt	Semi-Annual
Model Boundary	BMW-1	55-200027	Existing	B(18-4)11BDA	507	489	289-489	Alluvium	Semi-Annual
	BMW-2		Proposed	B(19-4)35AAB	2,000	2,000	1,600-2,000	Carbonates	Proposed continuous
	BMW-3	55-905773	New	B(18-4)01ACA	1,410	1,000	499-999	Playa Fringe/Alluvium	Continuous
Middle Big Chino	BCMW-1	55-211839	New	B(18-4)25AAA	690	680	300-680	Alluvium	Continuous

NR - Not Reported

* New, installed under this program

Exhibit 5

Previous Monitoring Costs through 2010 and Estimated Future Monitoring Costs (Eight Year Period); and Estimated Modeling Costs beginning in Year 3 following Agreement Execution

Exhibit 5

Previous Monitoring Costs through 2010 and Estimated Future Monitoring Costs (Eight Year Period)

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
Name	Previous Monitoring Costs Through 2010[1]	5 Stream Gages	5 Shallow Wells	4 Stream Gages, 4 Shallow Wells	2 Deep Wells	O&M	O&M	O&M	O&M	
Prescott[2]	$270,500	$4,296	$239,097	$256,359	$483,913	$114,649	$114,649	$114,706	$114,706	$1,442,374
Prescott Valley[3]	$229,500	$3,644	$202,857	$217,502	$410,566	$97,271	$97,271	$97,320	$97,320	$1,223,752
Salt River Project[4]	$148,450	$351,550	$220,646	$236,931	$447,240	$105,960	$105,960	$105,854	$105,854	$1,679,994
Total	**$648,450**	**$359,490**	**$662,600**	**$710,793**	**$1,341,720**	**$317,880**	**$317,880**	**$317,880**	**$317,880**	**$4,346,123**

Estimated Modeling Costs beginning in Year 3 following Agreement Execution

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Name				Conceptual planning, data needs identification, aquifer storage and geophysics work	Water Level data, aquifer storage, geophysics, interim report	Water Level data, aquifer storage, model dvelopment and analysis	Water Level data, aquifer storage, implications analysis, final report	
Prescott[2]				$156,380	$99,578	$85,751	$108,298	$450,007
Prescott Valley[3]				$132,677	$84,485	$72,754	$91,883	$381,799
Salt River Project[4]				$144,529	$92,031	$79,253	$100,091	$415,903
Total				**$433,587**	**$276,094**	**$237,758**	**$300,272**	**$1,247,711**

(1) Incorporates a catch-up provision to share previous monitoring costs incurred by the parties
(2) Cost Share Calculated as 54.1% of 2/3 of total costs
(3) Cost Share Calculated as 45.9% of 2/3 of total costs
(4) Cost Share Calculated as 1/3 of total costs