Final dated June 26, 2009

Borrego Valley Water Resources Investigation

By
Borrego Water District

Submitted in Partnership with the Department of the Interior's Bureau of Reclamation
Basin Study Program

Borrego Valley Basin, California Basin Study Proposal

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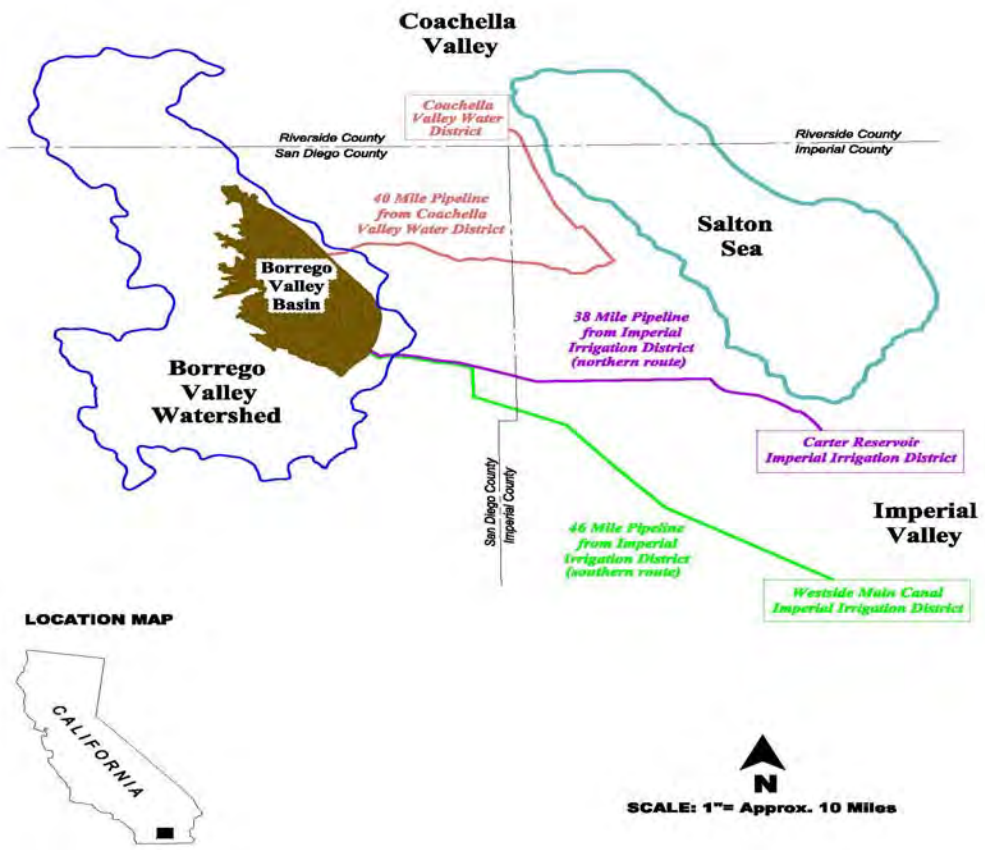
Acronym / Abbreviation List:

AAWARE	Agricultural Alliance for Water and Resource Education
AFY	Acre Feet per Year
Basin	Borrego Valley Basin
District	Borrego Water District
County	County of San Diego
CalFed	CALFED-Bay-Delta Program
CVP	Central Valley Project
DWR	California Department of Water Resources
IWRMP	Integrated Water Resources Management Plan
MHI	Median Household Income
MOU	Memorandum of Understanding
RCD	Resource Conservation District
Reclamation	Bureau of Reclamation
RWMG	Regional Water Management Group
SCAO	Southern California Area Office
SDSU	San Diego State University
SWP	State Water Project
USGS	United States Geological Survey

A. Project Information

1. Title: Borrego Valley Water Resources Investigation

2. Location: Borrego Valley is located in the northeastern portion of San Diego County, California, approximately 85 miles northeast of the city of San Diego, about 25 miles due west of the Salton Sea and about 30 miles southwest of the Palm Springs area (Figure 1). This area of San Diego County is within the Colorado Desert geomorphic province of California and lies along the margin of the desert region to the east.



Borrego Water District
Water For America Initiative
BORREGO VALLEY BASIN LOCATION MAP
Figure 1

3. Study Cost: The total study cost is projected at $ 1.5 million. The non-federal cost-share contribution will be at less 50% of the total project cost and be derived from a combination of cash and in-kind services.

Federal Share	$ 750,000
Non-Federal Share:	400,000
Non-Federal In kind:	350,000
Total	$ 1,500,000

4. Cost Sharing Partner: The District is the primary cost-share partner. Stakeholder outreach has occurred with the County, AAWARE, and several other entities including local golf courses. These partners represent local stakeholders with a potential financial stake in water resources use and development in the Basin.

Organization	**Primary Contact**	**Contact Information**
Borrego Water District	Richard Williamson	General Manager PO Box 1870 806 Palm Canyon Drive Borrego Springs, CA 92004 Ofc: 760.767.5806 Fax: 760.767.5994 rich@borregowd.org
Agricultural Alliance for Water and Resource Education	Steven Smiley	c/o Seley Ranches PO Box 70 Borrego Springs, CA 92004 Ofc. 760.399.6213 jojobarefugee@gmail.com
Borrego Springs Golf Course Association LLC	Robert Moore	Borrego Springs Golf Course Association PO Box 808 Borrego Springs, CA 92004 Ofc. 760.519.8125
County of San Diego	Jim Bennett	County of San Diego Department of Planning and Land Use 5201 Ruffin Rd., Suite B San Diego, CA 92123 Ofc: 858.694.3820

5. Reclamation Regional Contact:

Primary Contact	Contact Information
Bill Steele	SCAO Area Manager 27708 Jefferson Avenue, Suite 202 Temecula, CA 92590 Ofc: 951.695.5310 Fax: 951.695.5319 wsteele@usbr.gov
Jack Simes	SCAO Planning Officer 27708 Jefferson Avenue, Suite 202 Temecula, CA 92590 Ofc: 951.695.5310 Fax: 951.695.5319 jsimes@usbr.gov

6. Supporting Letters: The following stakeholders have provided letters of support for the proposed study:

- AAWARE
- Borrego Springs Fire Protection District
- Borrego Springs Golf Course Association, LLC
- Borrego Village Association
- California Assemblyman Joel Anderson
- California State Senator Dennis Hollingsworth
- County of San Diego Supervisor Ron Horn
- U.S. Congressman Duncan Hunter

B. Study Abstract

Nature of problem: All developed water uses in the Basin are extracted from a single aquifer. Around 1945, groundwater extractions began to exceed the basin's natural recharge. The resulting overdraft has steadily increased and is now estimated at about 12,000 AFY. Aquifer depletion is estimated to occur in the next 50-100 years. However, the overdraft becomes even more critical if current use continues under current climate change models indicating a 10-20% reduction in local rainfall and contributory runoff. Unless the overdraft is mitigated, the local economy will be severely disrupted.

The year round population of the area is about 3,300 residents many of whom are considered 'economically disadvantaged'. During the winter months, the population served by the District increases to approximately 10,000 residents. Tourism annually brings 1 million visitors to the areas attractions including wildflower blooms, annual Grapefruit festival and Anza-Borrego Desert state park's 15+ natural springs. The Grapefruit festival celebrates the largest agricultural product from the valley.

Agriculture production in the Basin has expanded since the 1968 study from approximately 2,000 acres to over 4,000 acres today. Agriculture accounts for the majority of pumped groundwater (70%) followed by recreational and landscape uses (20%), and then domestic use (10%). The current consumption rates are not sustainable.

To mitigate and reduce the overdraft, the District and County cooperated to develop a 2:1 mitigation for new water service. New water requests must demonstrate that for every gallon or acre foot of new water needed two gallons or acre feet of groundwater extraction are eliminated. The District has adopted this ratio. While agricultural land fallowing and increased conservation at the four golf courses can offer some reduction in the overdraft, only importation will eliminate the overdraft and begin to restore the aquifer. However, the Basin area is not connected to any surface conveyance systems that could deliver imported water.

Scope: Reclamation completed a reconnaissance investigation of the Basin in 1968 as part of the Inland Basins Project. Since 1968, agricultural, residential and commercial land use has changed significantly and the imbalance between water extraction and recharge has increased.

Approach: The proposed investigation will upgrade the 1968 reconnaissance investigation to an appraisal level analysis. The study will consist of three primary tasks that include several subtasks. The first task will focus on updating the 1968 report, fill in missing data gaps, and then begin to evaluate the potential additional impacts from operational changes in basin management, change in local water supplies due to climate change, reevaluate imported water supply alternatives, and identify other potential supply alternatives that have taken place since 1968.

Second, the study will develop a set of project alternatives that may include: ocean desalting and water transfers, desalting of Salton Sea inflow, capture and treatment of agriculture return flows, purchase and fallowing of other agricultural lands with access to Colorado River water, a nonstructural alternative, and/or the development of a groundwater bank for storage of wet year flows or for storage of excess delivery flows. All potential project alternatives would require the construction of a conveyance pipeline. This investigation will also examine the various pipeline route alternatives.

The third task would address that the Basin was poorly defined at the time of the 1968 report. The USGS and the DWR are working with the District on a multi-year study to develop an updated numeric model and to inventory all wells. The project would use this study data to analyze imported water requirements, assess potential for aquifer recharge, and develop alternative scenario modeling for groundwater management.

Study Results: The proposed Basin Study will analyze the water supply and demand imbalances throughout the study area through 2060, assess options for resolving the imbalances, and develop recommendations for future consideration. The study will provide the local community and the County with sufficient information for formulating an effective water supply and import system to assure the continued viability of the Borrego Springs area.

The study is proposed to be conducted over a period of 18 months beginning in October 2009 and is estimated to cost approximately $1.5 million, with a cost share of at least 50 percent by the non-Federal Cost Share Partner through both cash and in-kind services.

C. Proposal Text

1. Extent and Consequences of Existing Imbalance in Water Supply and Demand

Current Water Use

Historically, the Borrego Valley has been primarily an agricultural community. Although agricultural irrigation remains the single most intensive use of groundwater, the valley has gradually changed since 1960 to an accumulation of farms, retirement communities, residential homes, and golf resorts.

Agricultural Water Use: Agricultural development rapidly expanded in Borrego Valley after 1945, and is today still the most intensive use of groundwater in the valley. Primary crops grown in the valley have included row crops, table grapes, citrus orchards, and a variety of other agriculture such as date orchards, tree farms and ornamental nurseries, flowers, alfalfa, and potatoes. This water demand is generated by approximately 4,000 acres of agriculture, some of it, such as the potato fields, only uses water periodically. Today, citrus has become the primary agricultural product grown in Borrego Valley occupying approximately 2245 acres.

Extractions of groundwater are metered for only a small part of the production in the valley. Consequently, agricultural groundwater use for the entire valley must be estimated by taking the acreages of each crop type, multiplied by a standard water delivery amount for that crop type. Estimated current annual water use is about 14,000 to 15,000 acre feet. Net water use, after deducting irrigation return flows, is about 10,000 AFY.

Municipal Water Use: Municipal use has been a relatively small but growing component of the total groundwater use in Borrego Valley. Urban water use is generated by the existing commercial development and approximately 2,500 residences all of which are metered. Net water use is estimated at about 2,000 AFY.

Recreational Water Use: Recreation has become the second most intensive use of groundwater in Borrego Valley. The primary use of water for recreational activities in Borrego Valley is irrigation of several golf courses. Annual groundwater production for all golf courses is estimated at approximately 4,400 acre-feet with net water use about 4,000 acre feet. Water deliveries to the golf courses are estimated from water meter sales, acreages and applied water factors and reports to the County.

Landscape Water Use: Several areas, including street medians and parks are landscaped. These metered areas use about 800 acre-feet per year.

Current Total Extracted Groundwater: It is estimated that the total amount of extracted groundwater or applied water use in the Borrego Valley is about 22,000 to 23,000 AFY. Net

water use is estimated at about 16,500 AFY. Thus, about 70 percent of the extracted groundwater from the aquifer was used for agricultural irrigation, 22 percent for recreational purposes (golf course and landscape irrigation), and 8 percent for municipal supply.

Basin Supply

Precipitation over the surrounding watershed generates surface water runoff, primarily from the mountains that flank the basin to the north and west of Borrego Valley. Runoff from the surrounding mountains enters the valley along several creeks and intermittent streams and infiltrates into the ground at the head of alluvial fans or along the streambeds as they run out into the valley. The water supplies recharging the Borrego Valley were estimated by the USGS (1987) at about 4,800 AFY.

Imbalance in water Supply and Demand

As shown in the preceding sections, the current net water use of approximately 16,500 AFY exceeds the long-term estimated average recharge to the groundwater basin by about 12,000 AFY.

Future Water Use

The issue of continued overdraft and declining groundwater levels has been the subject of much concern and debate locally and at the County's land use department. Consequently, policies are now in place that attempt to mitigate the expanded groundwater usage.

<u>County of San Diego Groundwater Mitigation Policy</u>: A regulatory arm of the County recently addressed this issue head-on by instituting a policy to curtail the expansion of the overdraft. The County's Department Planning and Land Use established a policy on all new developments requiring water in the Borrego Valley.

In essence, projects are required to offset any new use of groundwater. For example, a project could mitigate its projected water use by fallowing agricultural land or removing golf course land out of use. Thus, the County is requiring a 1:1 off-setting water mitigation for projects that have not been platted.

Previously platted developments are exempt from the County mitigation requirement. There are about 3,725 dwelling units that do not have to meet the County requirement. These units, assuming 0.95 AFY per dwelling unit, will require about 3,540 AFY.

<u>District Groundwater Mitigation Policy</u>: The District recently adopted a Groundwater Mitigation Policy requiring either the fallowing of irrigated land or the payment of a mitigation fee in lieu of fallowing for all new water uses, regardless of their platting status. The District Policy requires a 2:1 mitigation, but will accept the County's 1:1 mitigation as meeting one-half of the District requirement. The District mitigation fee, based on a 2:1 requirement, is $3,250 per single family residence. Funds derived from this mitigation fee can be used to purchase water restricting

easements on agricultural lands (fallowing) and to obtain a new water supply for importation to the Valley.

The 3,500 AFY of potential new demand posed by the currently entitled lots does that are not subject to the County mitigation policy requiring fallowing, are subject to the full District mitigation at policy at 2:1. This demand could add to the water extractions from the aquifer unless the mitigation fees are used for agricultural land fallowing or for importing water.

A study contained in the District IWRMP shows that the net water use reduction from fallowing all agriculture lands would fall short of offsetting the potential new municipal water demands by about 3,000 AFY. Thus, the current net water use would increase by about 3,000 AFY. This increase is due to the 3,500 AFY of new demands that are not subject to the County offset and the unavailability of agricultural lands for new demand mitigation.

This analysis, however, assumes a complete fallowing of all agricultural lands in the area, which is probably not attainable due to lifestyle and economic choices expected to be made by the some of the existing farmers. The potential in increased extractions is therefore greater than the 3,000 AFY.

How soon will there be consequences?

The District has proceeded on a step by step basis to address the aquifer overdraft since the 1968 Reclamation study. The USGS (USGS, 1984) developed a mathematical model to try and define the basin in the mid 1980's. This research was continued by SDSU graduate students. The model was updated and run with more current data. The District has since purchased the SDSU numeric model, its input data, and has contracted with USGS to update the numeric model with data collection occurring in 2008 and 2009. The District has also been actively working to define the aquifer basin with DWR. Four groundwater monitoring wells have been professionally logged and completed. The DWR is contracted to inventory all wells in the basin and define the resource quantity and quality. An early estimate from the current USGS research is that the 50-100 year 'life expectancy' for the aquifer is much closer to 50 years or earlier if all variables remain at today's rates.

Four issues add a degree of uncertainty regarding aquifer 'life expectancy'. First, agricultural use has expanded from 1968 to the present. This trend is expected to continue and agricultural use accounts for 70% of the aquifer production. Second, the County has approved many developments in the past that have not been constructed to date and are not subject to the new water mitigation regulations. The County also continues to anticipate development growth, primarily residential, over the next 20 years. Residential use accounts for 10% of the aquifer production. Any increase in agricultural or residential use will increase the aquifer depletion rate. Third, climate change modeling anticipates a 10-20% decline in rainfall. If this directly correlates to the USGS' recharge estimate of 4,800 AFY, then the basin will lose 480-960 AFY in recharge. This will further exacerbate the overdraft issue. Finally, there is concern that lowered water levels in the main aquifer could cause an 'upwelling' of poor quality water that is believed present in the lower aquifer. This would reduce the 'useful' life of the aquifer or required advanced treatment and disposal. Disposal is not an option unless a conveyance is

constructed. The work with Reclamation, USGS and DWR is expected to provide a more refined estimate of the aquifer life.

Consequences if Water Supply Imbalance is not Addressed

As indicated earlier, the only viable solution to the overdraft is the importation of water from outside of Borrego Valley. Several investigations have projected the life of the aquifer under varying scenarios, but it is clear that without an imported water supply, the area will eventually experience a severe water shortage which would impact greatly the local economy. Thus, it should be recognized that the area provides substantial benefits to the economy of the county and the employment of farm workers and other service industries. A few of the economic benefits are mentioned in the following[1]:

Population:

Hispanic	957 (about 34% of the total)
Non Hispanic	1,892
Total	**2,849**

MHI (1999 dollars): $36,638 (California MHI: $37,994)
Employment: 1463

Assessed Valuations (June 30, 2006): $ 470,000,000
Approximate Annual Tax Revenue at 1%: $ 4,700,000

[1]Source: SANDAG. Economics and Finance, 2000 Census data, www.sandag.org

Since the local water resources are being exceeded by nearly 500% and if the groundwater basin were to be 'emptied', then the local economy would be reduced to about 20% of today's values. The estimated value of agricultural products produced in the Borrego area for 2007 was $18,000,000. Thus, an 80% reduction in the water supply for agriculture would eliminate about $14,400,000 in annual revenue from the market. This would create a severe hardship on the residents and a substantial reduction in the assessed value of the land and structures of the area. Also, if climate change as projected by the DWR modeling reduced the local precipitation, then the negative consequences would be even greater.

2. The extent to which Federal Involvement is needed due to the nature and complexity of the issues involved

Reclamation delivers up to 4.4 million acre feet of water from the Colorado River to southern California. Reclamation water deliveries are also connected to southern California through the Cal-Fed Bay Delta Program and the interconnected CVP and SWP systems, the latter of which can deliver up to 2,583,300 acre feet of water in normal years at full allocation to Southern California. The only long-term viable solution to reduce depletion and/or restore the Basin aquifer is through imported water from either the Colorado River or the State Water Project.

Because Reclamation is involved with the delivery and transport of some or all of Southern California's imported water supply through the Colorado River Aqueduct, Reclamation is in a unique position to assist District in project development, analysis and identification of a potential solution(s). No other local, state or federal agency has the technical expertise, background in local and regional water issues, and demonstrated ability to identify and implement project solutions with a wide range of stakeholders comparable to Reclamation's.

3. Existence and quality of data and models available

There are several models and data sets that will be useful in the conduct of this study. The models will be discussed first and then the data sets.

Groundwater Basin Models:

Finite Element Model: A USGS groundwater flow model was developed in 1988. The existing USGS model is a three-dimensional finite-element ground-water flow model of three aquifers calibrated at steady-state (1945) and transient (1946-79) conditions. This is a verified model of the Borrego Valley Groundwater Basin. The model has recently been updated with hydrologic and pumping data for the period 1980 to 2000. These data were derived from two Master's Theses completed in 2002. The initial operational run comparison with historic data show good correlation. This model can be utilized in the Basin Study process without the concern of the USGS lengthy 'review' process.

MODFLOW Model: The finite-element model developed by the USGS (1988) is currently being converted by them to MODFLOW-2005. The finite-difference code has many new features, including subsidence and the extraction process, which could be used to enhance this simulation after the initial conversion. Like the finite-element model, the model will consist of a steady-state stress period and seventeen two-year transient stress periods. Initially, the volumes and distribution of recharge and net ground-water extractions will be updated to 2008. In addition, the hydraulic properties (hydraulic conductivity, specific storage, and specific yield) and geometry for the aquifers will analyzed and compared to those developed in the 1988 model and in the Netto-Henderson model (described below). Because the USGS review process will not be completed prior to the completion of our study, only the preliminary model work and data calibration will be available during this proposed study.

Netto Henderson Groundwater Model: This model was completed as a requirement in the Master's Thesis program at SDSU in 2002. This MODFLOW based model, and its extensive input data, was purchased by District. The District has chosen, however, to contract with the USGS for the development of an independent model. Much of the input data from the SDSU model will be utilized in the development of the USGS model.

Climate Models: A recent report (July, 2008) prepared by DWR, entitled Water & Border Area Climate Change, summarized the impacts of climate change along the Colorado River. The impacts of climate change in our Basin Study area are shown in that report. A 10-20% decrease in annual runoff is predicted for the period 2041-2060, with over 90% of the models in agreement. It is our intent to utilize these models in our Basin Study.

Data Sets: This Basin Study has access to existing data collected by DWR, USGS, Reclamation, and several graduate students. All of this data has been through a peer review process and is available for use (see sources below). DWR and USGS are currently working with the District on two different basin research projects. This data will be made available to the study. In addition, the District has decades worth of well log data and water quality reporting. As part of this study, this latter data and any data collected through this study will be checked and peer reviewed.

Data Sources:

Borrego Water District, *Groundwater Management Plan*, September 2002.
-------, *Water Use Survey, 2008*. Rolwing, J.R.
-------, *Integrated Water Resources Management Plan, March, 2009*.

California Department of Water Resources, *Borrego Valley Water Management Plan*, 1984.
-------, Southern District, *Groundwater Basin Assessment*, 2002.
-------, *California's Groundwater, Update 2003*, Bulletin 118, October 2003.
-------. *Water & border area climate change, an introduction*, July, 2008.

Henderson, T.W., *Hydrogeology and Numerical Modeling of the Borrego Valley Aquifer System*, Master's Thesis, San Diego State University, Fall 2001.

Moyle, Jr., W.R., *Water Resources of Borrego Valley and Vicinity, California, Phase 1—Definition of Geologic and Hydrologic Characteristics of Basin*. U.S. Geological Surrey Open-File Report 82-855, 1982.
-------, *Water Resources of Borrego Valley and Vicinity, California, Phase 2—Development of Ground-Water Model*. U.S. Geological Survey Open-File Report 87-4199.

Netto, Steven, *Water Resources of the Borrego Valley, San Diego County, California*. Master's Thesis, San Diego State University, 2002.

San Diego County Department of Land Use and Planning, Presentation on *Borrego Valley Water Levels, DPLU CEQA Policy, and Existing and Potential Residential Development,* Bennett, J. December 2007.

U.S. Bureau of Reclamation, *Inland Basin Projects, Borrego Valley, California*, Reconnaissance Investigations, June 1968.

4. Nexus between the Basin Study and a Reclamation project or activity

Key elements of the Basin Study involve data analysis and aquifer modeling to develop more effective water solutions, reduce overdraft, and appraise imported water alternatives to restore the aquifer and/or use the estimated 500,000 acre feet of storage space to bank local and imported waters. Through the imported water alternatives and potential banking, the proposed

Basin Study is linked with Reclamation projects and programs in the Lower Colorado and Mid-Pacific Regions.

The Secretary of the United States Department of the Interior, acting through Reclamation, is the Watermaster for the Lower Colorado River. Reclamation owns and operates the major water storage, hydroelectric production and water delivery facilities on the lower Colorado River, manages the water resources consistent with the Law of the River, and deliveries 4.4 million acre feet of water to southern California. In addition to the Colorado River system, Reclamation is involved as a partner with the State of California (i.e. SWP) over the operation of the CalFed/Bay Delta system in northern California through which approximately 2,538,300 acre feet of water is moved conveyed to southern California. As such, southern California has been identified as an area of solution for the CalFed/Bay Delta system.

5. Stakeholders interest in and support for the Basin Study

The main stakeholders in the district include a mutual benefit organization that represents the major water consumers in the Valley, the growers. The second largest water using group is the golf courses. Both of these groups and others including the local chamber of commerce have previously signed an MOU supporting the acquisition of data and funding for evaluating the local groundwater resource.

Letters of support for this effort are being requested from all of the stakeholders listed below. However, due to the limited time to obtain governing board approval, we may not have all letters by the submittal date. Those available are attached.

The Borrego Valley area has recently formed a Regional Water Management Group (RWMG) and committee structure. This is in response to the State of California's Prop 84 requirements for receiving grant funding. The formulation of the RWMG will allow for a long-term working relationship that can lead to a successful solution to the areas water resource management.

It is our intent, should we be chosen to proceed with the Basin Study, to utilize the RWMG organization and process to develop understanding and support for the recommendations that will be developed from the Basin Study. Therefore, a brief description of the composition of the RWMG, including each stakeholder's role in the RWMG process and regional water management responsibilities should be helpful in understanding our commitment towards a successful program.

The RWMG is composed of four working subcommittees and a Policy and Steering Committee. Additionally, while not a formal committee, the sole local newspaper, the Borrego Sun, serves as an additional outreach component of the RWMG. Finally, Project & Programs Specific committees manage projects and programs. Stakeholders involved in the committees are described as follows:

Members of the Policy/Steering Committee:

The Borrego Water District: The District was established in 1962 as a California water district. The District is the sole domestic water supplier in the area and also provides sewer, flood control and gnat abatement for areas in the unincorporated community of Borrego Springs. Additionally, the District adopted a groundwater management plan under Assembly Bill 3030 in 2002 and obtained the authority of a groundwater replenishment district. This designation allows the District to do planning for groundwater management and provides the authority, among others, to (a) buy and sell water, (b) exchange water (c) distribute water in exchange for ceasing or reducing groundwater extraction (d) recharge the basin and (e) build necessary works to achieve groundwater replenishment. This also provides the authority to levy a replenishment assessment, but only if replenishment water is available.

The County of San Diego: This County is charged with providing flood protection throughout the unincorporated areas of the county. The County has many authorities, including flood management for the Borrego Valley area and has regulatory control over land uses.

The Resource Conservation District of Greater San Diego County: The RCD is an independent, non-enterprise (local government) special district organized under Division 9 of the California Public Resources Code. It is authorized and directed to promote and provide conservation education, to conduct research, and to advise and assist other public agencies and private individuals in the areas of land-use planning, soil and water conservation, wildlife habitat enhancement and restoration, control of exotic plant species, and watershed restoration.

Stakeholders and Subcommittees:

The following stakeholders are included in the RWMG.

Golf Course Association of Borrego Valley: This nonprofit organization to provide representation for the 5 golf courses in the area.

Save Our Aquifer Coalition: The Save Our Aquifer Coalition, a California public interest association, was formed in the early 2000s to draw public attention to and lobby for correction of the aquifer overdraft situation in the Borrego Valley.

The Sponsor Group: The Borrego Springs Sponsor Group is a County sanctioned entity that provides local input to the county planning process. They are an advisory panel that makes recommendations to the County.

Agricultural Alliance for Water and Resource Education (AAWARE): This California nonprofit mutual benefit corporation was formed in 2003 by the majority of growers in the Borrego Valley. The non-profits purpose is “to provide educational information concerning agricultural use of water resources and to protect against the reduction of that use without just compensation.”

Anza-Borrego Desert State Park: Anza-Borrego Desert State Park is the largest state park in California. It completely surrounds the Borrego Springs Community.

Non-Local Technical Resources: The DWR and the USGS have been working with the District as technical resources. DWR has been conducting an assessment of the basin's groundwater resources since 2002. And in 2008, DWR and the District entered into an agreement to perform a comprehensive basin well inventory and water quality assessment. The USGS also entered into agreement with District to develop a numeric model of the groundwater basin. That three year effort includes establishing a high precision GPS survey of key wells in the Valley.

D. Study Outline and Schedule

Task 1.0: Assess existing data

- 1.1 Identify data sources and collect information needed for performing the planning, designs and environmental analyses.
- 1.2 Evaluate and document existing data and its value to the basin study program.
- 1.3 Identify data gaps and prepare a strategy to collect the necessary data for the basin study.

Deliverables: Report chapter that includes summary of currently available data, data gaps identification analysis, discussion of the strategy to be used to collect the data necessary to fill the data gaps, and a bibliography identifying all available reports from prior basin investigation.

Task 2.0: Assess existing models

- 2.1 Review existing models that have been used in the Borrego basin and adjacent areas of southern California and the State of California
- 2.2 Evaluate the value of each model to the basin study effort
- 2.3 Select those models needed to analyze future water supply and water demand needs for the basin.
- 2.4 Review the availability of existing climate change models and determine which one(s) are applicable to our study analysis.

Deliverables: Report chapter that includes summary discussion of the model reviews performed and the relative value of each model to the basin study effort.

Task 3.0: Review the 1968 reconnaissance investigation

- 3.1 Review the findings of the report and compare them to the current situation.
- 3.2 Identify data gaps that exist from 1968 to 2009.
- 3.3 Evaluate the potential impacts from operational changes since 1968 in:
  - 3.3.1 Basin management
  - 3.3.2 Changes in local water supplies due to climate change
  - 3.3.3 Re-evaluate opportunities for water augmentation from imported water supply alternatives
  - 3.3.4 Identification of other potential water supply alternatives (water conservation, fallowing of agriculture, etc.)

Deliverables: Report chapter that includes summary discussion of the 1968 report prepared by Reclamation and the potential additional impacts from operational changes in basin management, changes in water supply availability due to climate change, a re-evaluation of the availability of

imported water supply alternatives and the potential use of non-structural alternatives to bring the future water supply and water demands into balance.

Task 4.0: Develop and evaluate range of alternatives

4.1 No Action
4.2 Imported water alternatives (max 4)
4.3 Non-structural alternative

Deliverables: Report chapter that includes an analysis of the various water supply alternatives available in the basin study area or nearby areas that could be implemented to bring the current water supply and water demands imbalance into balance. This analysis will include consideration of various future water supply sources and their ability to be brought to the basin study area for use. The team will also provide report documentation on the evaluation of the various alternatives and their ability to bring the future water supply sources and water demands into balance.

Task 5.0: Define and update the Borrego Valley ground water basin:

5.1 USGS and DWR will update the numeric ground water model and inventory all wells.
5.2 Use data gain from this basin study to analyze the impact of imported water on the ground water basin.
5.3 Develop alternative scenario modeling runs for the development of future ground water management plans.

Deliverables: Report chapter that involves quantifying the baseline ground water levels in order to analyze the water supply and water demand relationships existing in the current ground water management situation and run scenarios to see what it will take to bring the aquifer into balance.

Task 6.0: Findings and Recommendations:

6.1 The basin study team will prepare a series of findings based on the analyses performed for meeting and bringing into balance future water supplies and water demands.
6.2 The basin study team will prepare a series of recommendations for the local community and the county with sufficient information for formulating future courses of action to address the water supply and water demand imbalances existing now and in the future for the basin.

Deliverables: Final study report that includes all chapter reports from Tasks 1 through 5. The study team will develop a set of findings and recommendations from the analyses performed for this basin study and prepare a study report documenting all of the results from the technical tasks.

Task 7.0: Identification and coordination of Stakeholder Outreach and Involvement:

7.1 Initiate coordination with interested stakeholders
7.2 Initiate coordination with other Federal, State, and local agencies
7.3 Conduct as needed meetings with stakeholders and the general public with the purpose being to provide up-to-date information and status on the basin study effort

Deliverables: Narrative discussion of the problems and needs identified by basin study stakeholders, identification of cooperating agencies, and implementation of any requested MOU's.

Task 8.0: Study Management:

8.1 Study Management Team established
8.2 Identification of the Project manager
8.3 Development of the Plan of Study
8.4 Development of a Memorandum of Agreement between Reclamation and the study partner(s).
8.5 Coordination of study activities
8.6 Management of the project costs and results.
8.7 Preparation of all project deliverables.

Deliverables: Detailed Plan of Study, Study partners MOA, budget, schedule and progress reports as determined by the study partners.

Task	Role / Responsibility	Estimated Cost	Deliverable Date (from time of award)
Task 1	Reclamation / District		
subtask 1.1		$50,000	3 months
subtask 1.2			3 months
subtask 1.3			6 months
Task 2	District		
subtask 2.1		$100,000	6 months
subtask 2.2			6 months
subtask 2.3			8 months
subtask 2.4			8 months
Task 3	Reclamation		
subtask 3.1		$75,000	3 months
subtask 3.2			6 months
subtask 3.3			8 months
Task 4	Reclamation		
subtask 4.1		$650,000	9-15 months
subtask 4.2			9-15 months
subtask 4.3			9-15 months
Task 5	District		
subtask 5.1		$300,000	15 months
subtask 5.2			15 months
subtask 5.3			15 months
Task 6	Reclamation / District		
subtask 6.1		$100,000	18 months
subtask 6.2			18 months
Task 7	Reclamation / District		
subtask 7.1		$75,000	1 month
subtask 7.2			1 month
subtask 7.3			length of study
Task 8	Reclamation / District		
subtask 8.1		$150,000	1 month
subtask 8.2			1 month
subtask 8.3			2 months
subtask 8.4			2 months
subtask 8.5			length of study
subtask 8.6			length of study
subtask 8.7			length of study
	TOTAL	**$1,500,000**	