Attachment 4: Project Description

The following attachment provides a complete, detailed description of the proposed project consistent with the *LGA Guidelines & PSP* (DWR, May 2012).

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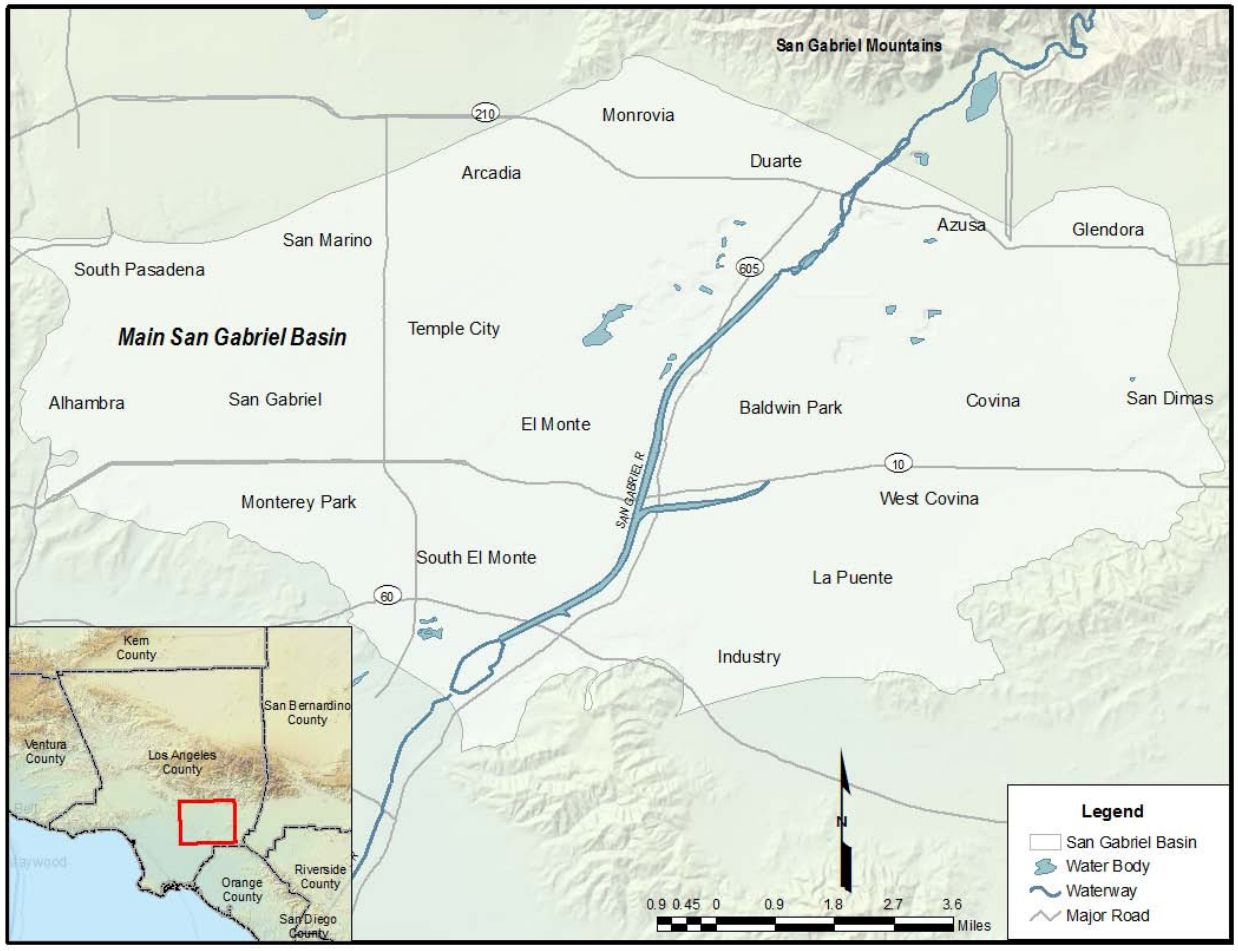
1. Description of Main San Gabriel Basin

1.1. A Critically Important Water Supply

The Main San Gabriel Basin (Basin), located in San Gabriel Valley (Valley) of Eastern Los Angeles County, covers over 167 square miles and serves as the primary source of water supply to more than 1.4 million residents in 19 cities and communities; approximately 31% of the residents are considered low income or disadvantaged (income less than 80% of the Statewide Median Household Income).

Figure 1: Map of Cities that Rely on the Main San Gabriel Basin



Over 80 percent of the Valley's water supply is drawn from the Basin and thus, good management and protection of the Basin is imperative to the livelihood of the Valley's residents and their economy.

1.2 Hydrogeology Creates Management Opportunities and Challenges

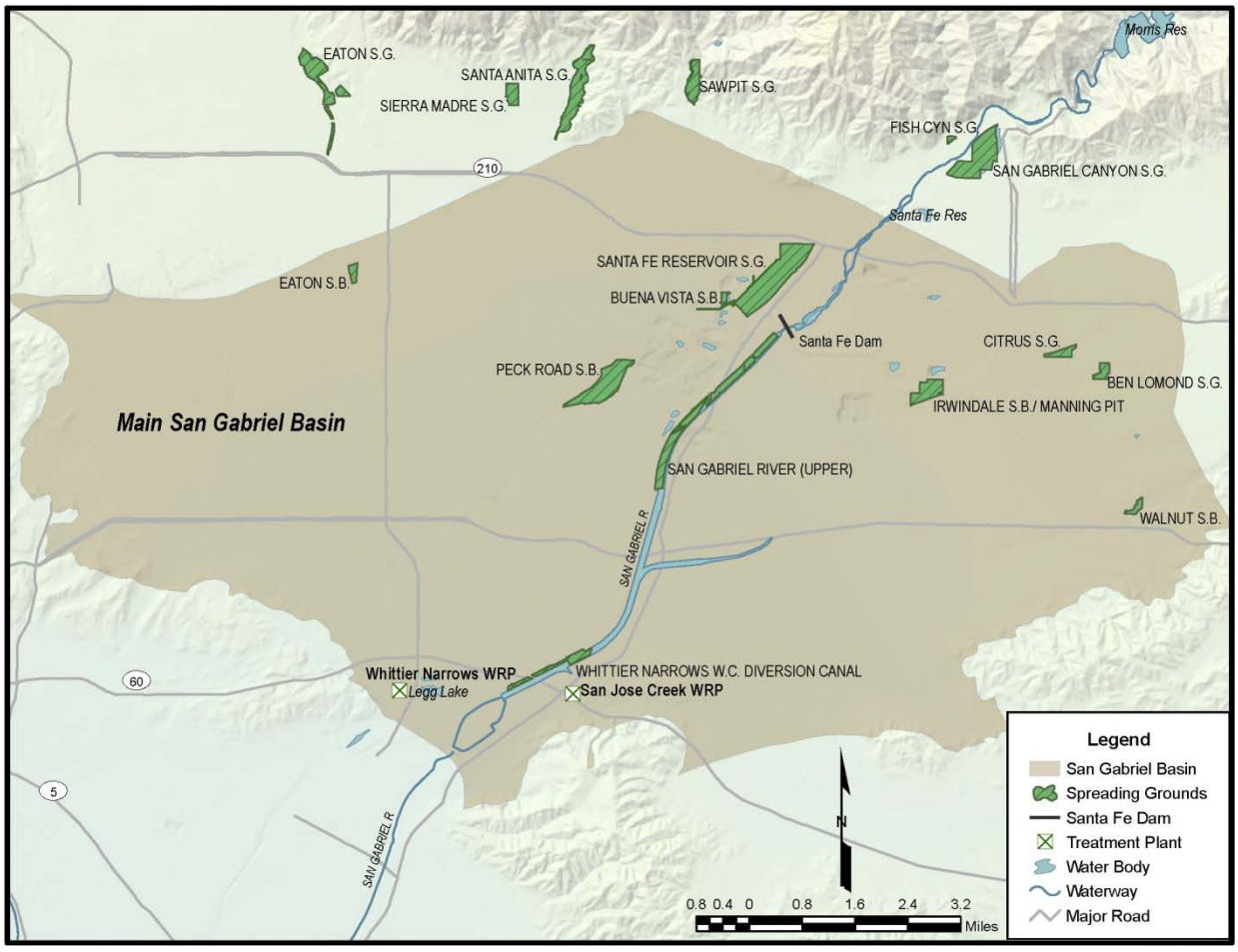
The Basin is mostly unconfined and highly permeable which is well suited for surface spreading or injection of replenishment water but is also problematic for managing contamination. More coarse-grained sands and gravels are found in the northern portion of the Basin and along the San Gabriel River, while relatively more fine-grained alluvial layers alternate with coarse-grained units

in the southern portion of the Basin. These laterally continuous fine-grained units create semi-confined to confined conditions in the south, which limit opportunities for surface spreading.

On a regional scale, groundwater flows from the northern and eastern perimeters of the Basin to the south and southwest toward the basin outlet to the Central Basin at Whittier Narrows. In the western portion of the Basin, groundwater generally flows westward toward a major cone of depression caused by groundwater pumping in the southwestern quadrant of the Basin.

There are currently 17 spreading basins, covering more than 1,100 acres, operated by Los Angeles County Department of Public Works (LACDPW) or other agencies that are capable of capturing stormwater runoff from adjacent canyons or imported water. The off-stream facility with the highest recharge capacity is the Santa Fe Spreading Grounds (SFSG). Historically, the SFSG has received both local runoff and imported water.

Figure 2: Spreading Grounds Used to Replenish the Main San Gabriel Basin



The total volume of water recharged in the Basin varies from year to year, based on precipitation, conserved stormwater, and the availability of imported water, but has averaged about 153,000 AFY over the 10 year period between fiscal year (FY) 1999-00 and 2008-09. On average, local runoff accounted for 73 percent of the recharge water, while imported water accounted for 27 percent (LACDPW, 2010).

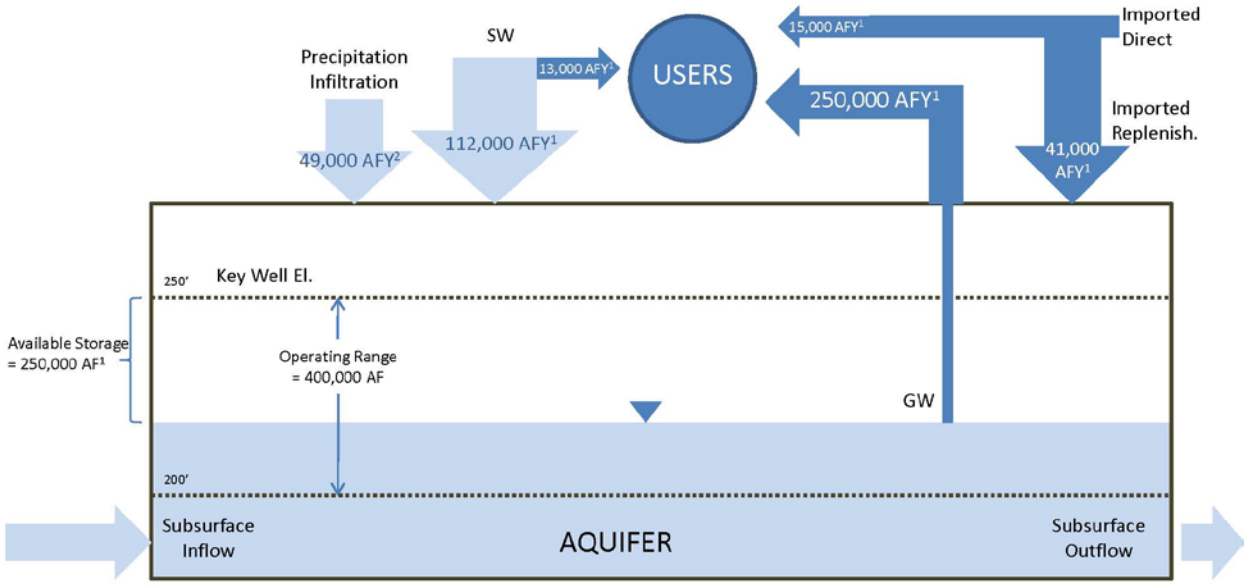
The usable storage capacity in the operating range is approximately 400,000 AF (Superior Court of State of California for the County of Los Angeles, 1989). Between FY 1999-00 and 2008-09, the operating safe yield averaged 250,000 AFY, and the available storage capacity for recharge averaged 250,000 AFY (MSGBW, 2010).

1.3 Pumping Expected to Continue and to Increase

Groundwater production from the Basin is typically greater than the safe yield, resulting in a replenishment obligation and providing the need for increased recharge. From 1999-00 to 2008-09, groundwater accounted for an average of 86 percent of the potable water supply in communities overlying the Basin, with imported water and surface water diversions making up the remainder. Groundwater production from the Basin has averaged about 250,000 AFY over the last ten years (FY 1999-00 to 2008-09) (MSGBW, 2010); and production has exceeded the safe yield by an average of approximately 41,000 AFY. Under the Main San Gabriel Basin Judgment (described further in Section 1.4), when groundwater pumping exceeds the operating safe yield, pumpers are assessed a replenishment fee by the Watermaster to fulfill replenishment requirements for the basin.

A schematic diagram of the MSG Basin water balance is shown in **Figure 3**.

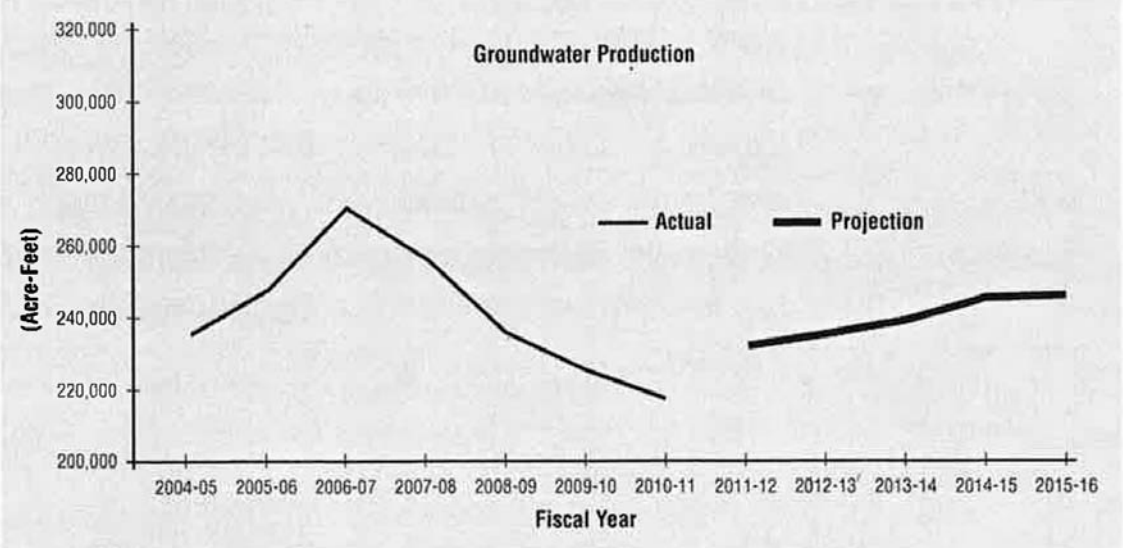
Figure 3: Main San Gabriel Basin Water Balance



Notes:
1. Average values, 1999-2009, LACDPW data and reports and Watermaster reports
2. Average values, 1978-2003, GeoMatrix, Comprehensive Groundwater Model Report, July 2005

Future pumping is expected to increase by 10-20% over the next five years as illustrated in **Figure 4**, thus making good management of the groundwater basin imperative. In addition to meeting the demands of residents, the Basin is also being studied for potential use for regional aquifer storage and recovery projects, with potential yields of up to 100,000 AFY.

Figure 4: Projected and Historical Water Production



Source: Draft Five-Year Water Quality and Supply Plan 2011-12 to 2015-16 (MSGB Watermaster, November 2011)

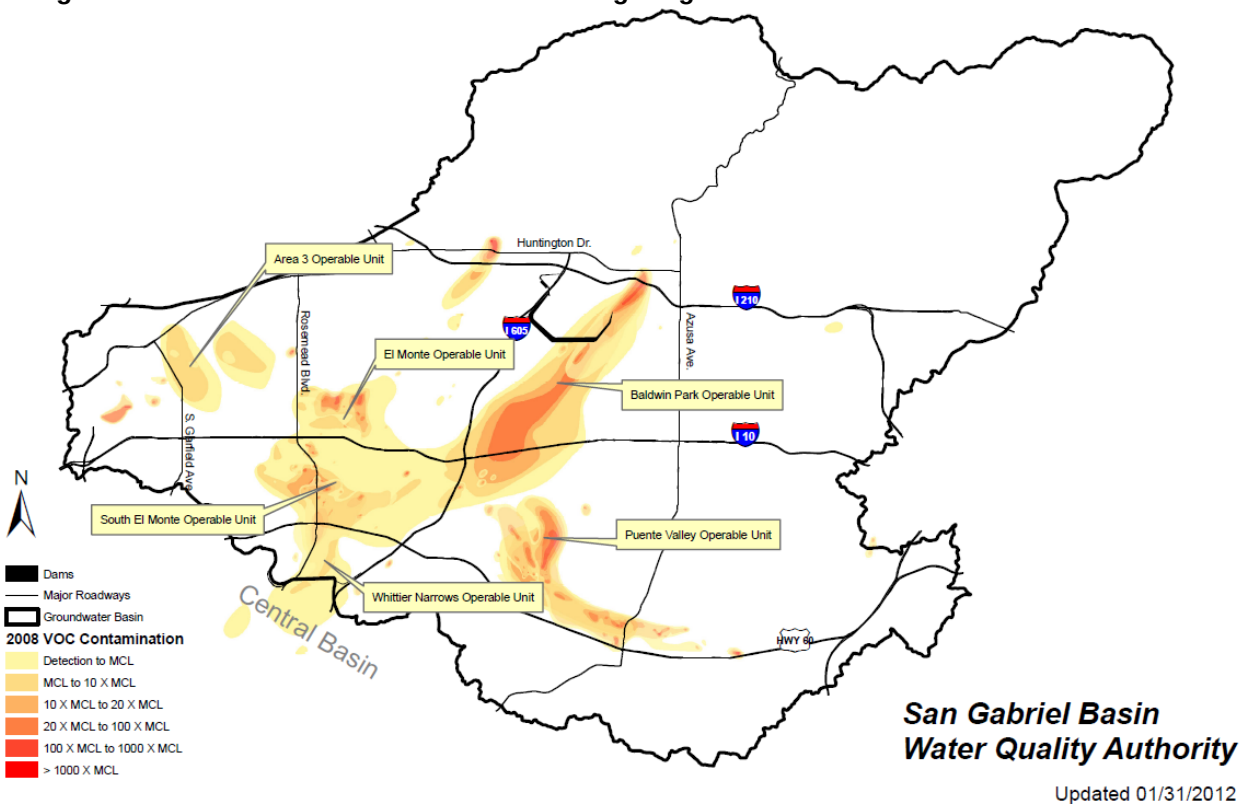
1.4 Major Contamination Increases Management Challenges and Costs

While natural groundwater quality in the Basin is good, groundwater quality has been impacted by anthropogenic releases of contaminants, resulting in large contamination plumes and multiple areas of contamination. The result is that the Main San Gabriel Basin is considered one of the largest Superfund sites regulated by the U.S. Environmental Protection Agency (USEPA). These areas require remediation. Groundwater contaminated with volatile organic compounds (VOCs), nitrate, perchlorate, NDMA, and 1,2,3-trichloropropane has been identified in the Basin. In response, the USEPA has defined several operable units (OU) or areas of contamination in the Basin.

Figure 5 shows how VOC contamination covers a large percentage of the groundwater basin area. In addition, the type and movement of contaminants is complex. **Figure 6** illustrates the different plumes within the largest OU, the Baldwin Park Operable Unit (BPOU), and their proximity to major replenishment facilities.

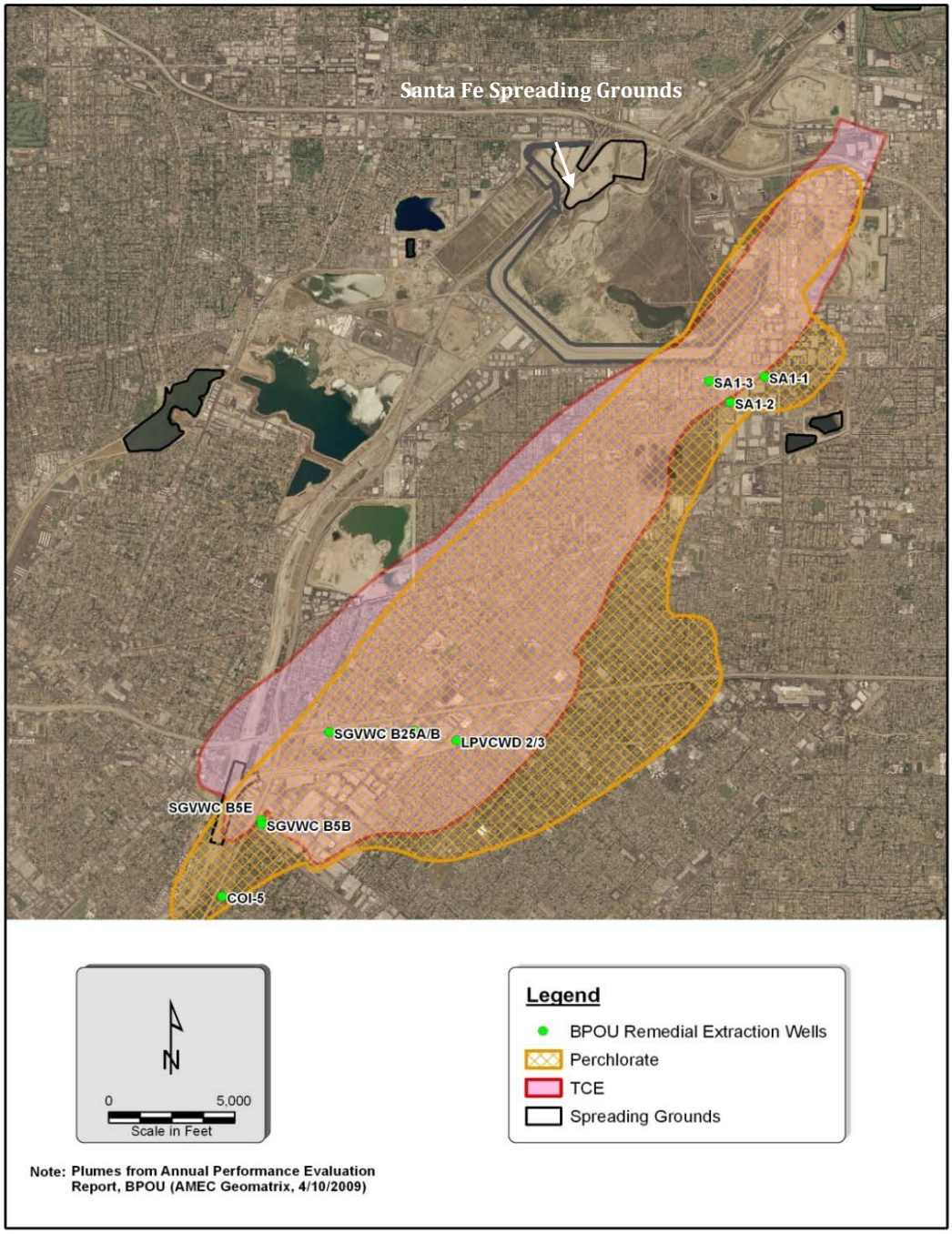
Containment and clean up of contamination in the Basin has and continues to prove extremely challenging as contaminant plumes migrate and merge. In addition, new contaminants (such as perchlorate and Chromium-6) have become regulated.

Figure 5: VOC Contamination Plumes Covering Large Portions of the Main San Gabriel Basin



Source: San Gabriel Basin Groundwater Quality Management and Remediation Plan "§406 Plan"; March 2012, San Gabriel Basin Water Quality Authority

Figure 6: Baldwin Park Operating Unit Illustrates Complexity of Contaminant Plumes

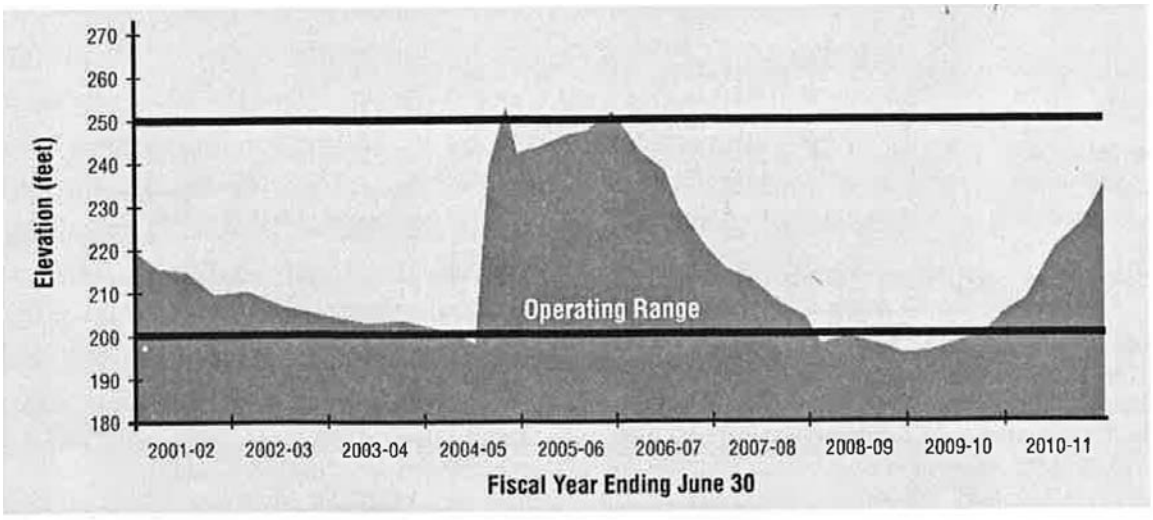


To date, approximately $47 million has been spent to contain and clean up contamination in the Basin. The San Gabriel Water Quality Authority estimates the nearly $700 million more is needed to achieve the cleanup goals established by the USEPA (WQA, 2012).

1.5 Increasing Complexity of Replenishment Supplies

Historically, the Basin groundwater levels have been consistently maintained through replenishment with a combination of local runoff and lower-cost imported water provided by the Metropolitan Water District. However, over the past six years the availability of both of these supplies has been more erratic than ever experienced before, resulting in a dramatic drop in groundwater levels followed by an over-supply of replenishment water. Such swings are predicted to become more typical for the Basin as climate change increases the volatility of wet and dry conditions. With these changed conditions, new analytical tools are needed to understand the impacts these swings will have on groundwater levels and groundwater quality and to manage re-operation of the replenishment system to keep the costs of replenishing the Basin affordable.

Figure 7: Groundwater Levels in the Main San Gabriel Basin Are Becoming Increasingly Erratic (2001 to 2011)



Source: Draft Five-Year Water Quality and Supply Plan 2011-12 to 2015-16 (MSGB Watermaster, November 2011)

To better understand and address the issue of erratic replenishment supplies, a number of studies have recently been launched. These include:

- **Los Angeles County DPW Stormwater Conservation Study:** DPW, in cooperation with the US Bureau of Reclamation, is embarking on this study to examine the impacts that local climate change will have on the County's existing runoff capture and recharge program for the Main San Gabriel Basin. Of concern is the ability of the current system to handle projected increases in the severity of both storm and drought events.
- **Los Angeles County DPW Sediment Management Plan:** DPW is also embarking on a plan to remove more than 50 million cubic yards of sediment from its runoff capture facilities. How much sediment is removed and the process by which it is removed (i.e., sluicing downstream versus truck hauling) will affect groundwater replenishment in the Basin.
- **USGVMWD Recycled Water Action Plan:** The USGVMWD is pursuing a plan to reuse between 10,000 and 25,000 AFY of recycled water to replenish the Basin. Key issues

associated with this plan include blending recycled water with natural runoff to meet Department of Public Health requirements as well as potential recharge capacity and groundwater mounding constraints in recharge areas.

- **USGVMWD Integrated Resources Plan (IRP):** The USGVMWD is completing the development of an IRP that has identified the need to develop recharge supplies from a combination of supplies including uncaptured stormwater, recycled water, and available imported water. The timing, volume and location for replenishment using these supplies, however, still need refinement.
- **MWD Groundwater Replenishment Study for the MSGB:** MWD recently completed a feasibility study that examined the potential to recharge and recover up to 100,000 afy of recycled water into the Basin. The study concluded that such a large scale project could be feasible. The next steps in the project would be to begin to further study specific project opportunities where recharge and recovery capacity could be achieved without disrupting other basin operations, including contaminant clean up.
- **US Army Corps of Engineers (USACE) Sante Fe Dam Conservation Pool Feasibility Study**: The USACE has been exploring creating a conservation pool behind Santa Fe Dam to yield up to 3,000 afy of potential new supply for replenishment of the Basin downstream. How that addition runoff is released and recharged will need to be evaluated in the context of current conditions and operations.

Despite the initiation of a number of studies, one common source of data and information and one common modeling tool is missing, leaving each entity to compile and re-compile data for their own analyses and then develop their own single-purpose models to meet the needs of their individual analysis. This need for a single source of qualified data and for a calibrated modeling tool is the basis for the project proposed in this application.

2. Current Basin Management Plan

2.1 Main San Gabriel Judgment

The Main San Gabriel Basin currently operates under an adjudication judgment. The Main San Gabriel Basin Judgment (Judgment) was entered in 1968 (Case #924128, Upper San Gabriel Valley Municipal Water District, Plaintiff, vs. City of Alhambra, et al., Defendants), but was amended on August 14, 1970 to include the additional issue of surface water diversion rights. On January 4, 1973, after extensive negotiations, a stipulated judgment in this case was entered. The judgment establishes adjudicated rights for 190 original parties to the legal action.

The Main San Gabriel Basin Watermaster was formed in 1973 by the California Superior Court of Los Angeles County to administer the basin's adjudicated water rights and to provide a basin-wide governing body for management of water resources. There have been subsequent amendments since 1973 to extend and clarify the Watermaster's role. The Judgment documents serve as a functionally equivalent document to the MSG Basin Groundwater Management Plan (GWMP).

The Watermaster's primary responsibilities include the following:

- Manage and control the withdrawal and replenishment of water supplies in the Basin
- Determine annually the Operating Safe Yield (i.e., the amount of groundwater that can safely be extracted) for the succeeding fiscal year, and notify the pumpers of their shares thereof
- Acquire and spread replacement water as needed
- Coordinate local involvement in efforts to preserve and restore the quality of groundwater in the Basin
- Assist and encourage regulatory agencies to enforce water quality regulations affecting the Basin
- Collect production, water quality, and other relevant data from producers
- Prepare an annual report of Watermaster activities, including financial activities, and summary reports of pumping and diversion
- Improved Basin management and facilitate potential modifications to judgment amendment to allow taking more water when available

The Watermaster operates under a formal set of rules and regulations that dictate the procedures by which Watermaster-controlled actions are to be carried out. Under these rules, water producers must obtain approval for the following:

- Constructing or modifying a well
- Constructing a groundwater treatment plant
- Increasing groundwater extraction
- Spreading water in the basin
- Spreading and storing supplemental water under a cyclic storage agreement

In order to fund the operation, the Watermaster is authorized to levy and collect assessments from the producers based upon their amounts of production during the preceding fiscal year. These assessments are applied primarily to the purchase of replacement water and to administrative costs (Main San Gabriel Basin Watermaster, 2010c).

In June 2012, the Judgment was amended to give the Watermaster increased flexibility to optimize groundwater supplies, ensure reliability, provide regional water storage opportunities, and minimize the San Gabriel Valley's vulnerability to drought and imported water shortages. With this amendment, new opportunities have been created for improved management of the Basin:

- Export and storage of supplemental water
- Public policy education
- Replacement purchase flexibility
- Spread of import water above 250 feet amsl
- Water resource development assessment and supplemental assessments
- Replacement water-purchase planning in conjunction with Responsible Agencies.

2.2 Collaboration with other Public Entities

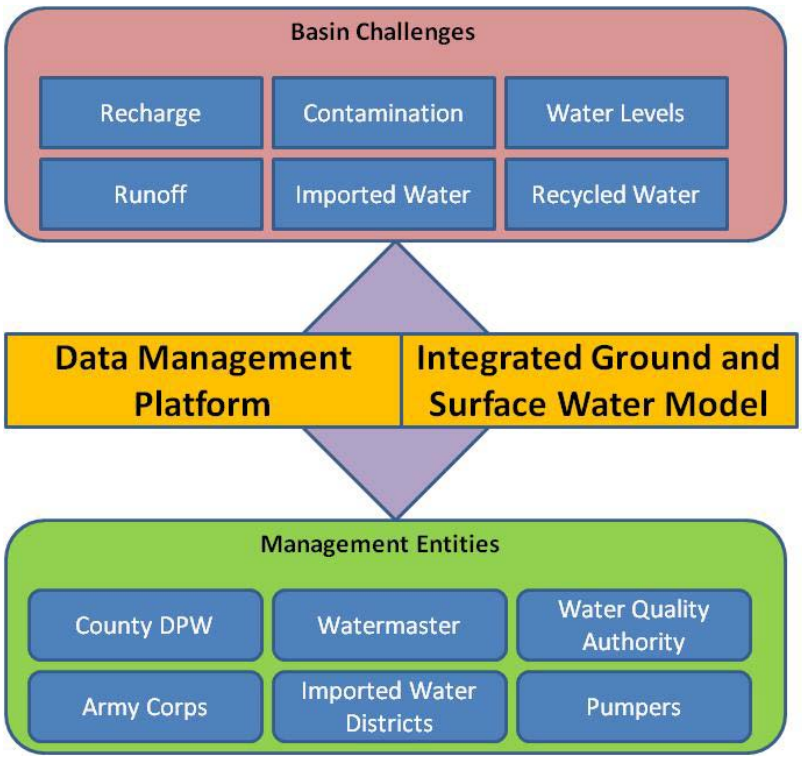
While the Watermaster handles many management responsibilities, it is highly dependent on the support of a number of other entities that provide important Basin management functions. These include:

- **Los Angeles County Department of Public Works:** LACDPW spreads imported water from MWD and SGVMWD in the San Gabriel Valley on behalf of the SGVMWD, USGVMWD and the Three Valleys Municipal Water District and refines operations of basins to improve recharge. LACDPW is in charge of sediment management throughout the San Gabriel Watershed. LACDPW has also partnered with USBR for the stormwater conservation project.
- **San Gabriel Water Quality Authority:** The WQA was established by the State Legislature (SB1679) on February 11, 1993 to develop, finance and implement groundwater treatment programs in the Main San Gabriel Basin. The WQA mission is to coordinate, plan, and implement groundwater quality management programs to efficiently remediate groundwater contamination and assist in preventing future contamination. WQA is in charge for future negotiation for ongoing clean up.
- **Upper San Gabriel Valley Municipal Water District:** The Upper District is managed on a day-to-day basis by a professional management team, appointed by the Board of Directors, which possesses expertise in operations, engineering, finance, legal affairs, government and community relations and water conservation. The Upper District is also engaged in a water-quality monitoring program involving chemical and physical constituents in the local domestic water supplies. The Upper District is in charge of implementing projects to increase local water recharge to reduce imported water reliance. Local water recharge includes stormwater, recycled water and low impact development.
- **U.S. Army Corps of Engineers:** The USACE is responsible for the safe operation of the Santa Fe Dam which protects downstream communities from flooding. To this end, they are also responsible for ensuring that changes to the conservation pool behind Santa Fe Dam will continue to provide the designed level of flood projection.
- **Pumpers:** Pumpers in the Basin range in size from small single wells to large municipal pumping operations. Collectively the pumpers are responsible for maintaining the safe operation of the groundwater basin through their governing role with the Watermaster.

3. Tools Needed to Improve Collaboration and Analysis

As described above in Sections 1 and 2 and illustrated below in **Figure 8**, the Main San Gabriel Basin is facing exceedingly complicated challenges, requiring a more refined understanding of the Basin as well as mechanisms to improve the coordination between the multiple entities that share management responsibilities for the Basin.

Figure 8: Shared Data Management and Modeling Tools Will Improve Coordination to Address the Basin's Challenges



Problem Statement

Currently, the collection of data among the various stakeholders in the Basin is not consolidated in one place. For example, the Watermaster compiles groundwater elevation and quality information from selected wells in the Basin while the San Gabriel Water Quality Authority compiles information on contamination and pumping from the clean-up projects it implements. Separately, the Los Angeles County Department of Public Works collects and maintains data on flows into its spreading facilities but does not correlate this information necessarily to groundwater levels.

Meanwhile, each entity has developed separate planning and analytical tools designed to service their own responsibilities. For example, Public Works has a runoff model of its system that it uses to plan future improvements to its surface facilities (without taking dynamics of surface water-groundwater interaction into account). Meanwhile, the Watermaster maintains a 2-dimensional

groundwater model to track groundwater contour levels (that does not take contaminant transport into account). However, the groundwater model does not incorporate surface water-groundwater interaction and/or effects of changes in surface runoff and corresponding recharge.

Thus, under these circumstances, cooperative planning and analysis can be challenging and time consuming, requiring multiple requests for data that may not be provided in either the format needed or with the appropriate quality assured.

Project Goals and Objectives

With this backdrop, the goals of the proposed project are to:

- Improve coordination and collaboration among Basin stakeholders to increase Basin yields, improve operating efficiency, and help control the costs of groundwater replenishment
- Develop and maintain a complete single database of groundwater basin information and an efficient mechanism for sharing groundwater basin data with stakeholders
- Provide a tool that more accurately models the dynamics of the groundwater basin including surface flows and the movement of contaminants.

Specific project objectives are to:

- Develop a data management system that makes groundwater elevation and quality as well as surface water and streamflow information accessible to authorized users in a user-friendly and graphical platform.
- Develop a 3-dimensional basin-wide model that will be useful for surface and subsurface flows in an integrated manner, including modeling surface water-groundwater interactions as well as solute transport.
- Promote and support the involvement of key stakeholders in the development of these tools to maximize their usefulness to all parties.

This proposed project is directly relevant to many of the Basin management responsibilities mandated for the Watermaster and documented in the Basin's GWMP (see Attachment 3). These are outlined in **Table 1** below.

Table 1: Relevance of Proposed Project to Basin Management Objectives

Watermaster Basin Management Responsibilities	Relevance of Proposed Project
Manage and control the withdrawal and replenishment of water supplies in the basin	Will allow more accurate predictions of replenishment needed to meet withdrawal requirements. Will assist with more accurately identifying and implementing replenishment projects.
Determine annually the Operating Safe Yield (i.e., the amount of groundwater that can safely be extracted) for the succeeding fiscal year, and	Will provide a more accurate estimate of the Operating Safe Yield.

notify the pumpers of their shares thereof	
Acquire and spread replacement water as needed	Will allow for better management of replenishment operations which will reduce costs for acquiring additional water from either imported or recycled water sources.
Coordinate local involvement in efforts to preserve and restore the quality of groundwater in the basin	Will create a system that directly links multiple parties using common tools and access to a more complete range of data Will assist with more accurately identifying and implementing groundwater clean-up projects.
Assist and encourage regulatory agencies to enforce water quality regulations affecting the basin	Will improve both the quality and efficiency of communication with USEPA on clean-up activities by consolidating information into a single system with a helpful user interface, modeling and reporting system.
Collect production, water quality, and other relevant data from producers	Will create a system that will simplify the collection and management of data from pumpers.

To accomplish this, the proposed project consists of two major elements: Development of a basin-wide Data Management Platform and development of an Integrated Groundwater Surface Water Model. Both of these systems will be developed in collaboration with key stakeholders in the Basin and will be maintained going forward by the Watermaster. Each of these proposed systems and the processes for developing them are described below in further detail.

Data Management System

As mentioned above, data is collected by multiple parties but is not readily accessible by those outside the agency responsible for collecting the data. In addition, the existing data has historically been collected in different formats, including hard copy logs, to spreadsheets, to newer database programs.

Currently, the Watermaster and the Water Quality Authority are collaborating to digitize their information and create a consolidated database of information on the Basin's groundwater levels and water quality. The effort, however, is limited to the data that those entities collect. In addition, the consolidated database will not have an interface through which other organizations can readily access the data. Furthermore, plans have not yet been developed for how this new consolidated database will be maintained and coordinated between the different entities.

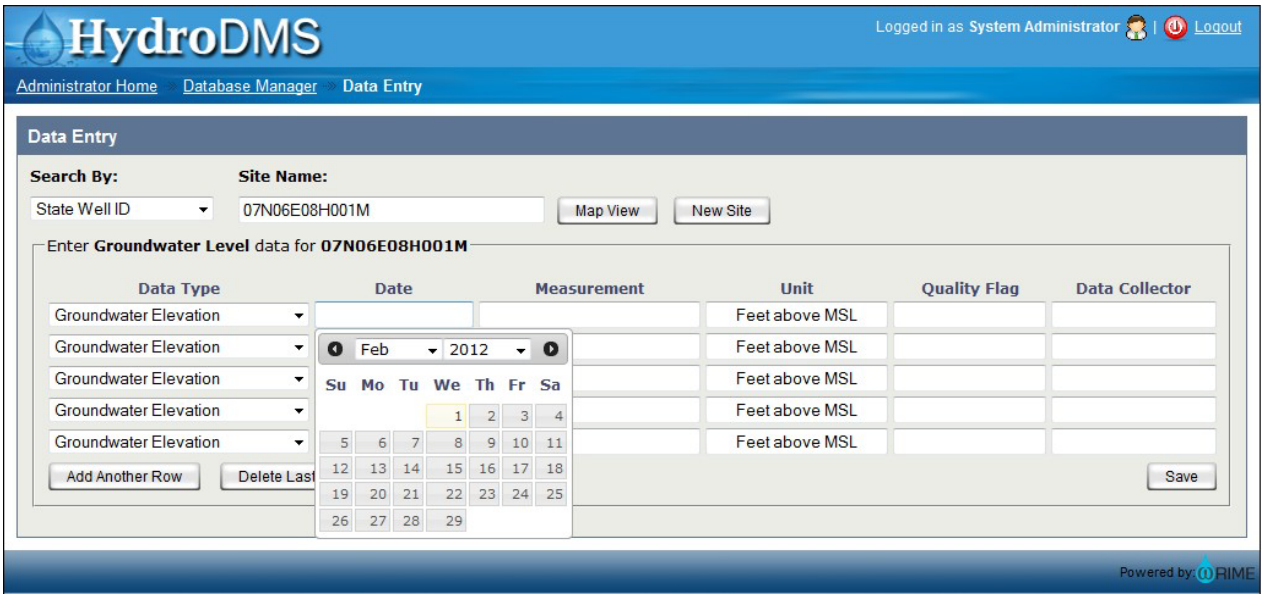
As such, the first portion of this project is a data management system that will build upon this initial effort to create a web-based platform. Such a system will allow the Watermaster, the Water Quality Authority, and other responsible agencies to accomplish a number of valuable activities, including:

- standardize the compilation and reporting of data;

- share information and/or link to multiple databases;
- allow download of information to models and other analytical tools;
- facilitate reporting to DWR's CASGEM program;
- facilitate compliance with the Watermaster's and the Water Quality Authority's annual reporting requirements;
- generate common reports on water quality and groundwater levels that can be used to communicate with stakeholders, regulators, and the community.

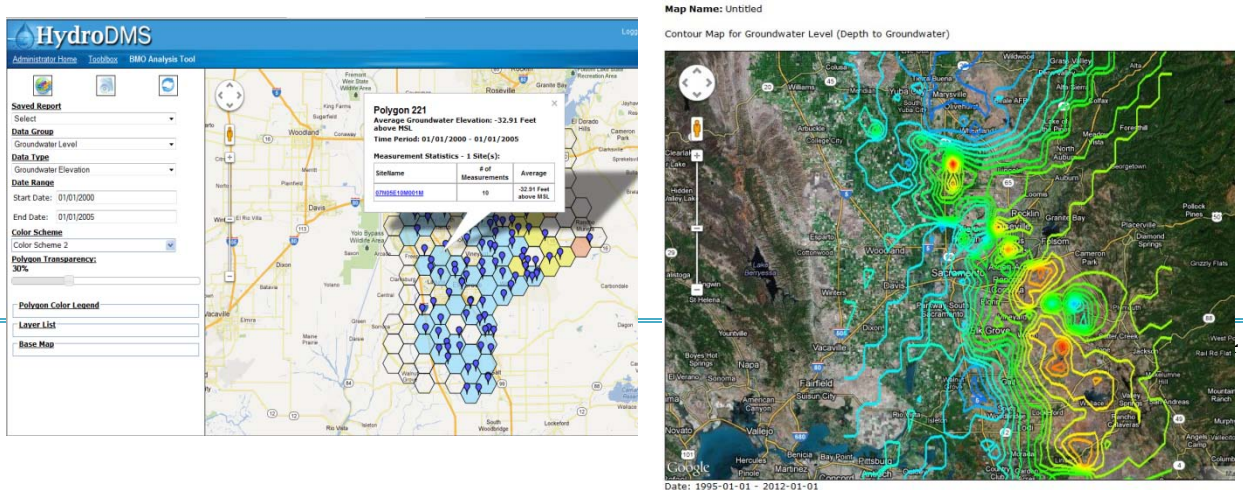
As illustrated by the example in **Figure 9** below, the system will have features that are easy to understand by multiple users.

Figure 9: Example of a Proposed Data Management System that will Standardize how Data is Saved and Made Available



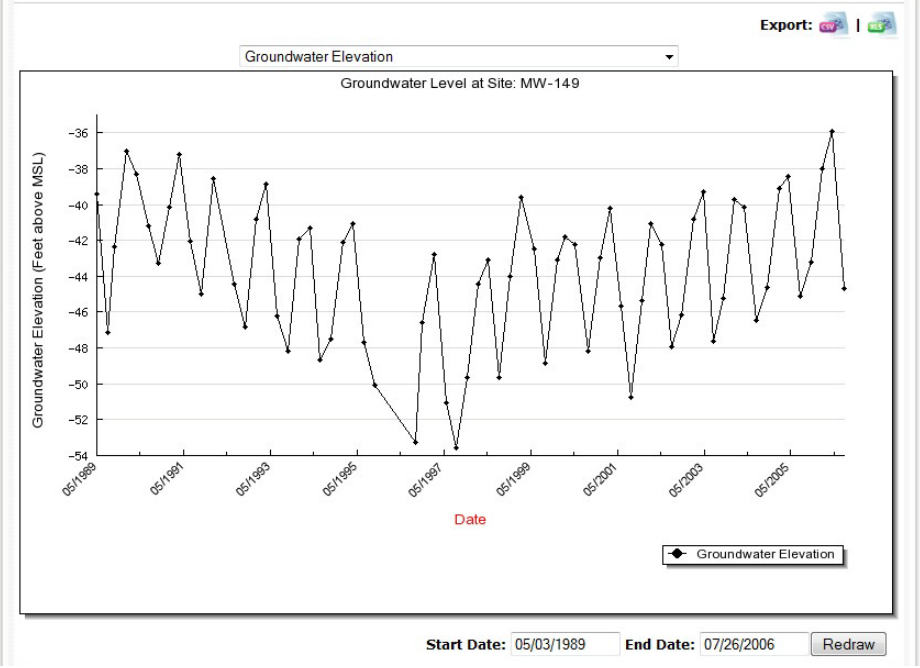
In addition, the system will include tools that will illustrate data geographically to help in communicating the spatial relationships of the data (as illustrated by the example in **Figure 10**).

Figure 10: Example of a Proposed System that will Improve Data Understanding by Presenting Information Geographically



Lastly, the system will feature tools (see example in **Figure 11**) that will allow the presentation of data over time and other variables to facilitate understanding of the changes in Basin parameters.

Figure 11: Example Graphic of Time Series Data that Allows as Many Parameters as Possible to be Readily Accessible



Data management systems such as these for groundwater basins have proven useful in many areas of the State, including Chino Basin in Southern California and Central Sacramento County in Northern California. The stakeholders from the Basin will contact those who have developed these systems to incorporate their lessons learned and to solicit qualified contractors to help develop the system and provide training to the stakeholders/users of the system.

Develop Integrated Groundwater and Surface Water Model

Similar to data management, there is a substantial need to improve the modeling tools that are available for analyzing and predicting with greater accuracy the dynamics of the Basin. The predictions have significant implications. For example, estimating replenishment needs with a lower degree of accuracy could result in improperly timing deliveries of water which in turn, could result in the need to purchase additional supplies. Similarly, not accurately predicting the movement of contaminant plumes could lead to less favorable settlements with those responsible for the contamination. Together, the costs could add up into the tens of millions of dollars.

Because of the general unconfined nature of the Basin, the proposed project includes a task to develop an Integrated Groundwater and Surface water Model (IGSM). IGSM and its sister model,

the Integrated Water Flow Model maintained by DWR (IWFM), are fully integrated 3-D surface water and groundwater models that have been successfully applied to numerous basins throughout California. The IGSM is capable of simulating various hydrologic conditions that occur in the Main San Gabriel Basin including:

- Stream flow
- Stream-aquifer interaction
- Rainfall/runoff
- Surface process based on land use type
    - Urban
    - Agricultural
    - Native
- Urban and agricultural water use
- Water supply
    - Groundwater pumping
    - Surface water deliveries
- Soil moisture accounting
    - Precipitation
    - Runoff
    - Infiltration
    - Deep percolation
- Unsaturated zone flow
- Reservoir operation
- Water quality

Both the IGSM and the IWFM have similar features for flow modeling. However, the IGSM provides a platform for future particle tracking and mass transport modeling. As such, the choice of specific code will be made in consulting with DWR and stakeholders based on future potential modeling needs. The current Work Plan and Budget assumes model development based on the IGSM platform. Based on our experience and discussions with DWR modeling staff, we expect that a potential change in platform to IWFM would not impact the budget and/or schedule.

IGSM is a model that has been used for simulation of various projects throughout the Central Valley and other basins in California. The projects and hydrological conditions that IGSM has been used for, and are expected to be used for in the Basin, include the following:

- Groundwater recharge and recovery projects including ASR and water banking
- Indirect Potable Reuse (IPR) project permitting
- Integrated Regional Water Management (IRWM) support
- Climate change impacts on water resources conditions
- Stream-aquifer interactions
- Environmental and natural habitat protection
- Local reservoir operation and surface water deliveries
- Well protection programs
- Municipal water supply support
- Land subsidence
- Salt and nutrient management

IGSM has a GIS based graphical user interface (GUI) that will be used to setup the model input data files, run the model and view model results. The GUI is capable of generating the following:

- Contour maps of spatial values such as groundwater heads
- Hydrographs and charts of time series data
- Bar charts of components of various budget output files
- Tables of monthly, annual, and average budget files
    - Groundwater budget
    - Water use budget
    - Stream budget
    - Soil budget

Figures 12 - 14 below illustrate examples of the graphical and modeling capabilities of the IGSM.

Figure 12: Example of Calibration Well Average GWL Display

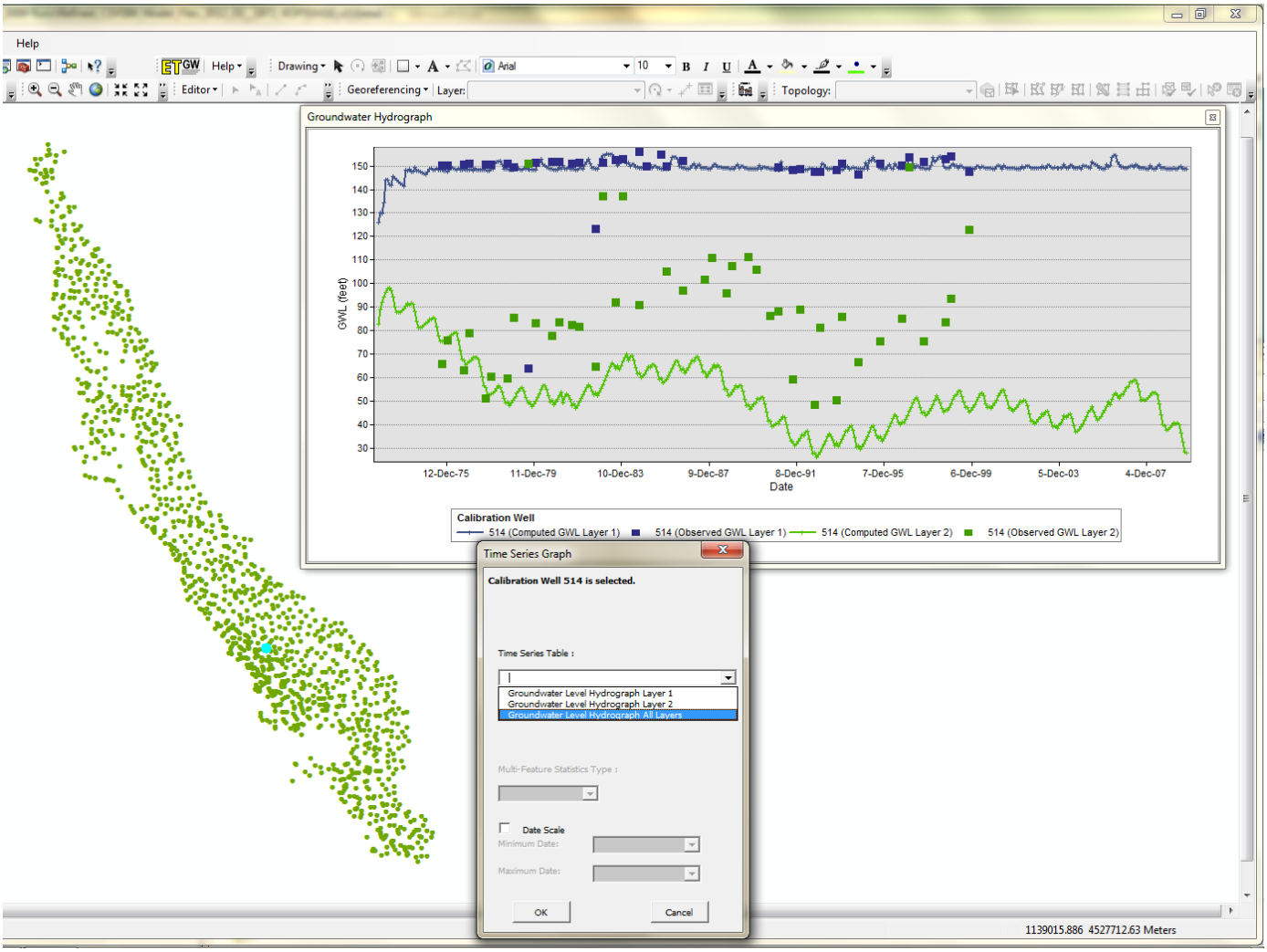


Figure 13: Example of Streamflow Hydrograph Display

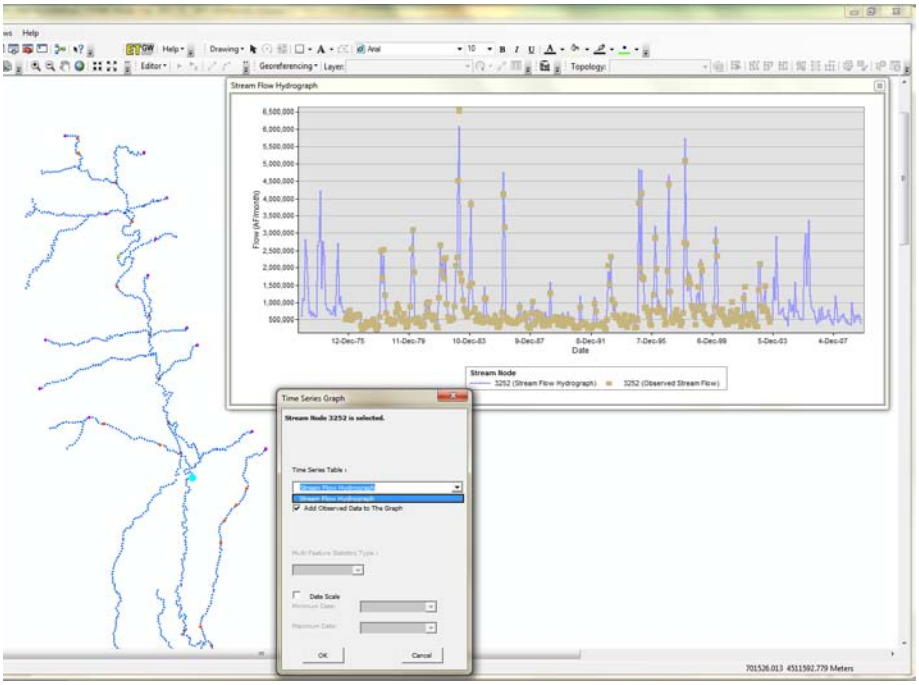
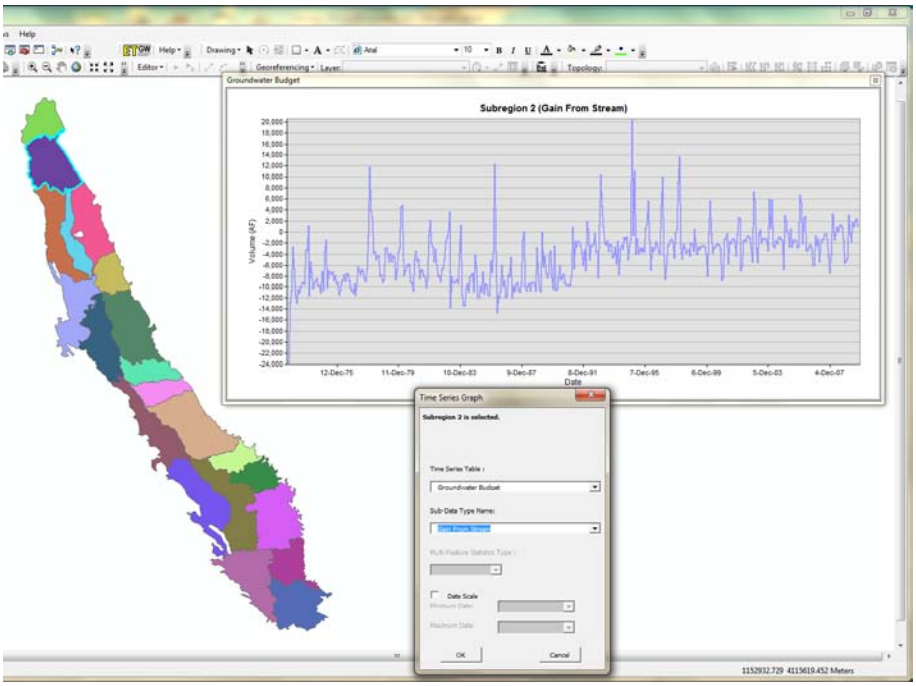


Figure 14: Example of Basin Sub-Division for Better Definition of Local Conditions



Engage Stakeholders in the Process

The Main San Gabriel Basin Data Management Platform and Integrated Groundwater Surface Water Model will be coordinated with stakeholder outreach efforts, which will be partially conducted under another contract. The objectives will be to exchange information, provide feedback, and discuss public outreach needs, strategies and approaches.

Outreach events and meetings that will be conducted as a part of this project include a training session, coordination meetings with the Watermaster and Upper District, public Board meetings, and technical work group meetings with the modeling team. Detailed information on stakeholder outreach may be found in Attachment 5, Work Plan.

Prepare Plans for Ongoing Management

Coordination with data providers and others will be performed during the course of technical studies. Management of the overall technical studies process will be performed to ensure that project requirements are met. Regular progress reports will be prepared on tasks, budgets, and schedules.

Once the DMS and IGSM are developed, populated, and calibrated, both will be maintained by the Watermaster. New and updated information for the data management system will be provided by the various Basin stakeholders. The Watermaster will manage access to the DMS and IGSM and will lead training efforts and additional stakeholder outreach as necessary.

Continued Funding of DMS and IGSM After Grant Funds are Expended

All expenses will be handled by the Watermaster for continued support of the DMS and IGSM. At the conclusion of the grant-funded project, the DMS and IGSM will be developed, populated, and calibrated. At that time, if technical staff and other capabilities are available with the Watermaster, detailed training will be provided to ensure that staff have the knowledge to perform data entry and QA/QC processes for the DMS. For the IGSM, detailed training to ensure that staff can manage code, data, and operation of the model will be provided. Follow up technical support will be provided by the DMS and model developers as well.

Hosting of the DMS can be done on the Watermaster server, in which case, technical support can be provided by the DMS and model developers. The data base can also be hosted off-site, in which case technical support can also be provided by the DMS and model developers.

References

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