

# **Cuyama Valley Groundwater Basin Groundwater Sustainability Plan Data Management System Draft**

**Prepared by:**



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## Chapter 6 Data Management System

This chapter includes the Data Management System Section that satisfies § 352.6 of the Sustainable Groundwater Management Act Regulations. This section contains three main subsections:

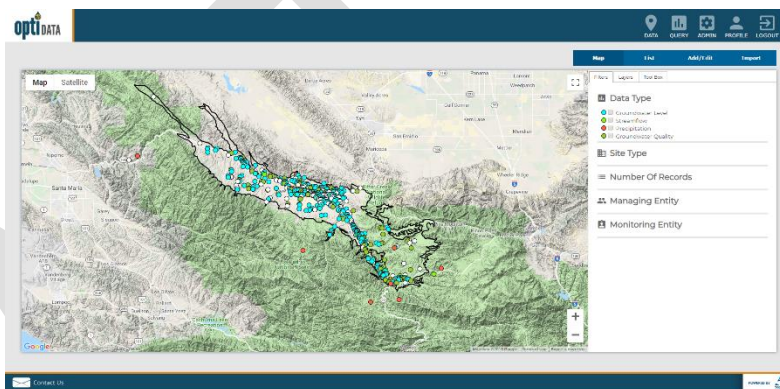
- Overview of the Cuyama Basin Data Management System
- Functionality of the Data Management System
- Data Included in the Data Management System

### 6.1 Overview of the Cuyama Basin Data Management System

The Cuyama Basin Data Management System (DMS) is implemented using the Opti platform. The DMS serves as a data sharing portal to enable utilization of the same data and tools for visualization and analysis to support sustainable groundwater management and transparent reporting of data and results.

The DMS is web-based and publicly accessible using common web browsers including Google Chrome, Firefox, and Microsoft Edge. It is a flexible and open software platform that utilizes familiar Google maps and charting tools for analysis and visualization. The site may be accessed here:

<http://opti.woodardcurran.com/cuyama>



### 6.2 Functionality of the Data Management System

The DMS is a modular system that includes numerous tools to support GSP development and ongoing implementation, including:

- User and Data Access Permissions
- Data Entry and Validation
- Visualization and Analysis
- Query and Reporting

The DMS can be configured for additional tools and functionality as the needs of the GSA change over time. The following sections briefly describe the currently configured tools. For more detailed instructions on the usage of the DMS, please refer to the Opti User Guide.

#### 6.2.1 User and Data Access Permissions

User access permissions are controlled through several user types that have different roles in the DMS as summarized in Table 6-1 below. These user types are broken into three high-level categories:

- System Administrator users manage information at a system-wide level, with access to all user accounts and entity information. System Administrators can set and modify user access permissions when an entity is unable to do so.

- Managing Entity (Administrator, Power User, User) users are responsible for managing their entity's site/monitoring data and can independently control access to this data. Entity users can view and edit their entity's data and view (not edit) shared or published data of other entities. Note: *The Cuyama Basin GSA is currently configured as the Managing Entity for all datasets.*
- Public users may view data that is published but may not edit any information. These users may access the DMS using the Guest Login feature on the login screen.

In addition to user permissions, data access is also controlled through three options:

- Private data is monitoring data that is only available for viewing and editing, depending on user type, by the entity that is managing the data in the DMS.
- Shared data is monitoring data that is available for viewing by all users in the DMS (excludes Public Users).
- Public data is monitoring data that is available publicly and can be viewed by all user types in the DMS and may be published to other sites or DMSs as needed.

Modules/Submodules	System Administrators	Entity			Public
		Admin	Power User	User	
Data: Map	●	●	●	●	○
Data: List	●	●	●	●	○
Data: Add/Edit	●	●	●		
Data: Import	●	●	●		
Query	●	●	●	●	○
Admin	●				
Profile	●	●	○	○	○

● Indicates access to all functionality, ○ Indicates access to partial functionality (see explanations in following sections)

**Table 6-1: Data Management System User Types**

### 6.2.2 Data Entry and Validation

To encourage agency and user participation in the DMS, data entry and import tools are easy-to-use, accessible over the web, and help maintain data quality and standardization. The DMS allows Administrator and Power Users to enter data either manually via easy-to-use interfaces, or through an import tool utilizing Excel templates, ensuring data may be entered into the DMS as soon as possible after collection. The data is validated using a number of quality control checks prior to inclusion in the DMS.

#### Data Collection Sites

Site information is input for groundwater wells, stream gages, and precipitation meters manually either through the Data Entry tool or when prompted in the Import tool. In the Data Entry tool, new sites may be added by clicking on New Site. Existing sites may be updated using the Edit Site tool. During data import, the sites associated with imported data are checked against the existing site list in the DMS. If the site is not in the existing site list, the user is prompted to enter the information via the New Site tool before the data import can proceed.

The information that is collected for sites is shown in Table 6-2.

Basic Info	Well Info	Construction Info
Site Type Local Site Name Local Site ID Latitude/Longitude Description County Managing Entity Monitoring Entity Type of Monitoring Type of Measurement Monitoring Frequency	State Well ID USGS Code CASGEM ID Ground Surface Elevation (ft) Reference Point Elevation (ft) Reference Point Location Reference Point Description Well Use Well Status Well Type Aquifers Monitored Groundwater Basin Name/Code Groundwater Elevation Start/End Date Groundwater Quality Start/End Date Comments	Total Well Depth Borehole Depth Casing Perforations Casing Diameter Casing Modifications Well Capacity Well Completion Report Number Comments

**Table 6-2: Data Collection Site Information**

### Monitoring Data Entry

Monitoring data including but not limited to groundwater elevation, groundwater quality, streamflow, and precipitation, may be input either manually through the Data Entry tool or using templates in the Import tool. The Data Entry tool allows users to select a site and add data for the site using a web-based tool. The following information is collected:

- Data Type (e.g. groundwater elevation, groundwater quality, streamflow, or precipitation)
- Parameter for selected Data Type, units populate based on selection
- Date of Measurement
- Measurement Value
- Quality Flag
- Data Collector
- Supplemental Information based on Data Type (e.g. Reference Point Elevation, Ground Surface Elevation, etc.)

Data import templates include the same data entry fields and are available for download from the DMS. The Excel-based templates contain drop down options and field validation similar to the data entry interface.

### Data Validation

Quality control helps ensure the integrity of the data added to the DMS. The entities that maintain the monitoring data that were loaded into the DMS may have performed previous validation of that data; no effort was made to check or correct that previous validation and it was assumed that all data provided was valid. While it is nearly impossible to determine complete accuracy of the data added to the DMS since

the DMS cannot detect incorrect measurements due to human error or mechanical failure, it is possible to verify that the data input into the DMS meets some data quality standards. This helps promote user confidence in the data stored and published for visualization and analysis.

Upon saving the data in the data entry interface or importing the data using the Excel templates, the following data validation checks are performed by the DMS:

- **Duplicate measurements:** The database checks for duplicate entries based on the unique combination of site, data type, date, and measurement value.
- **Inaccurate measurements:** The database compares data measurements against historical data for the site and flags entries that are outside the historical minimum and maximum values.
- **Incorrect data entry:** Data field entries are checked for correct data type, e.g., number fields do not include text, date fields contain dates, etc.

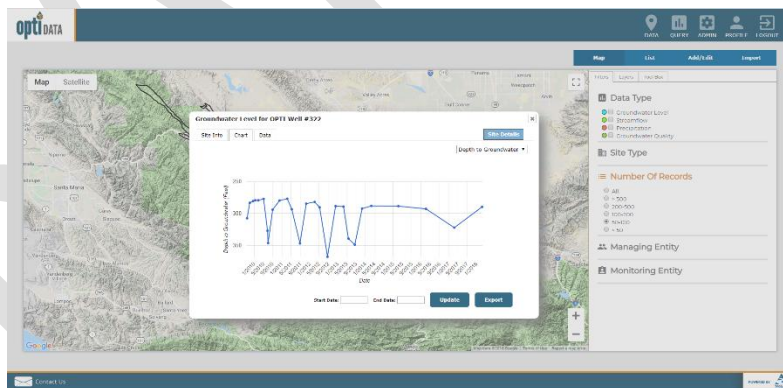
Users are alerted to any validation issues and may either update the data entries or accept the values and continue with the entry/import. Users may access partially completed import validation through the import logs that are saved for each data import. This allows a second person to also access the imported data and review prior to inclusion in the DMS.

### 6.2.3 Visualization and Analysis

Transparent visualization and analysis tools enable utilization of the same data and methodologies, allowing stakeholders and neighboring GSAs to use the same data and methods for tracking and analysis. In the Cuyama DMS, data visualization and analysis are performed in both Map and List views.

#### Map View

The Map view displays all sites (groundwater wells, stream gages, precipitation meters, etc.) in a map-based interface. The sites are color coded based on associated data type and may be filtered by different criteria such as number of records or monitoring entity. Users may click on a site to view the site detail information and associated data. The monitoring data is displayed in both chart and table formats. In these views, the user may select to view different parameters for the data type. The chart and table may be updated to display selected date ranges, and the data may be exported to Excel.



#### List View

The List view displays all sites (groundwater wells, stream gages, precipitation meters, etc.) in a tabular interface. The sites are listed according to site names and associated entities. The list can be sorted and filtered by different criteria such as number of records or monitoring entity. Similar to the Map view, users may click on a site to view the site detail information and associated data. The monitoring data is displayed in both chart and table formats. In these views, the user may select to view different parameters for the data type. The chart and table may be updated to display selected date ranges, and the data may be exported to Excel.

## **Analysis Tools**

The Toolbox is available in the Map view and offers Administrative and Entity users access to the Well Tiering tool to support monitoring plan development. The flexibility of the DMS platform allows for future analysis tools, including contouring, total water budget visualization, and management area tracking.

### **6.2.4 Query and Reporting**

The DMS has the ability to format and export data and analysis at different levels of aggregation, and in different formats, to support local decision making and for submission to various statewide and local programs (i.e., SGMA, CASGEM, GAMA, etc.).

#### **Ad-hoc Query**

The data in the DMS can be queried and reported using the Query Tool. The Query Tool includes the ability to build ad-hoc queries using simple options. The data can be queried by:

- Monitoring or Managing Entity
- Site Name
- Data Type

Once the type of option is selected, the specific criteria may be selected, e.g., groundwater elevation greater than 100 ft. Additionally, users may include time periods as part of the query. The query options can build upon each other to create reports that meet specific needs. Queries may be saved and will display in the saved query drop-down for future use.

The query results are displayed in a map format and a list format. In both the map and list views, the user may click on a well to view the associated data. The resulting data of the query may be exported to Excel.

#### **Standard Reports**

The DMS can be configured to support wide-ranging reporting needs through the Reports Tool. Standard report formats may be generated based on a predetermined format and may be created at the click of a button. These report formats may be configured to match state agency requirements for submittals, including annual reporting of monitoring data that must be submitted electronically on forms provided by the Department of Water Resources.

## **6.3 Data Included in the Data Management System**

Many monitoring programs exist at both the local and state/federal levels. A cross-sectional analysis was conducted within the basin to document and assess the availability of data within the basin, as well as statewide or federal databases that provide data relevant to Basin.

The DMS can be configured to include a wide variety of data types and associated parameters. Based on the analysis of existing datasets within the basin and the GSP needs, the following data types were identified and are currently included in the DMS:

- Groundwater Elevation (2 parameters)
- Groundwater Quality (17 parameters)
- Streamflow (1 parameter)
- Precipitation (1 parameter)
- Subsidence (1 parameter)

The data was collected from a variety of sources, as shown in Table 6-3 below. Each dataset was reviewed for overall quality and consistency prior to consolidation and inclusion in the database. In many cases, there were discrepancies between the ground surface elevation (GSE) of the well from different sources. In these cases, the ground surface elevation of the well was updated using the USGS digital elevation model (DEM).

The groundwater wells shown in the DMS are those that are included data sets provided by the monitoring data sources shown below for groundwater elevation and quality. These do not include all wells currently used for production and may include wells historically used for monitoring that do not currently exist. Care was taken to minimize duplicative wells in the DMS. As datasets were consolidated, sites were evaluated based on different criteria (e.g., naming conventions, location, etc.) to determine if the well was included in a different dataset. Datasets for the wells were then associated with the same well, where necessary.

After the data was consolidated and reviewed for consistency, it was loaded into the DMS. Using the DMS data viewing capabilities, the data was reviewed for completeness and consistency to ensure the imports were successful.



Data Source	Datasets Collected	Date Collected	Activities Performed
US Geological Survey (USGS)	<ul style="list-style-type: none"> <li>Groundwater Elevation</li> <li>Streamflow</li> <li>Precipitation</li> </ul>	5/4/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> <li>Recalculated GSE based on DEM on select wells</li> </ul>
Department of Water Resources (DWR) CASGEM/Water Data Library (WDL)	<ul style="list-style-type: none"> <li>Groundwater Elevation</li> </ul>	4/18/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> <li>Recalculated GSE based on DEM on select wells</li> </ul>
San Luis Obispo County	<ul style="list-style-type: none"> <li>Groundwater Elevation</li> <li>Groundwater Quality</li> </ul>	4/2/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> <li>Recalculated GSE based on DEM on select wells</li> </ul>
Santa Barbara County Water Agency	<ul style="list-style-type: none"> <li>Groundwater Elevation</li> <li>Precipitation</li> </ul>	3/27/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> <li>Recalculated GSE based on DEM on select wells</li> </ul>
Ventura County	<ul style="list-style-type: none"> <li>Groundwater Elevation</li> <li>Groundwater Quality</li> <li>Precipitation</li> </ul>	3/8/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> <li>Recalculated GSE based on DEM on select wells</li> </ul>
DWR Natural Resources Agency	<ul style="list-style-type: none"> <li>Groundwater Quality</li> </ul>	6/14/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> </ul>
GeoTracker	<ul style="list-style-type: none"> <li>Groundwater Quality</li> </ul>	6/5/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> </ul>
California Environmental Data Exchange Network (CEDEN)	<ul style="list-style-type: none"> <li>Groundwater Quality</li> </ul>	8/29/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> </ul>
National Water Quality Monitoring Council	<ul style="list-style-type: none"> <li>Groundwater Quality</li> </ul>	6/1/2018	<ul style="list-style-type: none"> <li>Removed duplicate records</li> </ul>
UNAVCO	<ul style="list-style-type: none"> <li>Ground Surface Elevation</li> </ul>	3/12/2018	<ul style="list-style-type: none"> <li>None</li> </ul>
Local Data	<ul style="list-style-type: none"> <li>Groundwater Elevation</li> <li>Groundwater Quality</li> <li>Other</li> </ul>	Various	<ul style="list-style-type: none"> <li>Removed duplicate records</li> <li>Recalculated GSE based on DEM on select wells</li> </ul>

**Table 6-3: Sources of Data Included in the Data Management System**