OWENS VALLEY GROUNDWATER BASIN

Sampling and Analysis Plan (SAP)

Submitted to

OWENS VALLEY GROUNDWATER AUTHORITY

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Certification

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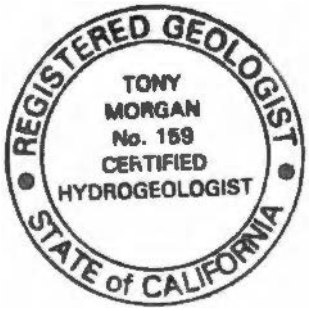

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List of Acronyms and Abbreviations

°C	degree(s) Celsius
ASTM	American Society of Testing and Materials
bgs	below ground surface
BMO	Basin Management Objective
BMP	Best Management Practices
DTW	depth-to-water
HCM	Hydrogeologic Conceptual Model
CASGEM	California Statewide Groundwater Elevation Monitoring
CDL	California Driver License
CCR	California Code of Regulations
CFR	Code of Federal Regulations
COC	chain of custody
DBS&A	Daniel B. Stephens & Associates, Inc.
DDW	SWRCB Division of Drinking Water
DO	dissolved oxygen
DQA	data quality assessment
DQO	data quality objective
DWR	California Department of Water Resources
EDD	electronic data deliverable
ELAP	California Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
GSP	Groundwater Sustainability Plan
HASP	health and safety plan
ICWD	Inyo County Water District
L	liter(s)
LADWP	Los Angeles Department of Water and Power
LCS	laboratory control sample
MD	matrix duplicate
MCL	maximum contaminant level
MDL	method detection limit
mL	milliliter(s)
MQO	measurement quality objective
MS	matrix spike

MSD	matrix spike duplicate
NAD	North American datum
NAVD	North American vertical datum
ORP	oxidation/reduction potential
OSHA	Occupational Safety and Health Administration
oz	ounce(s)
PARCC	precision, accuracy, representativeness, completeness, and comparability
PPE	personal protective equipment
QA	quality assurance
QC	quality control
PQL	practical quantitation limit
psi	pounds per square inch
RASA	regional aquifer-system analysis
RL	reporting limit
RP	reference point
RPD	relative percent difference
SAP	sampling and analysis plan
SOP	standard operating procedure
SVOC	semivolatile organic compound
SUM	summation
SWN	DWR state well number
SWRCB	California State Water Resources Control Board
TCLP	toxicity characteristic leaching procedure
TD	total depth
TDS	total dissolved solids
TFR	total filterable residue
TMDL	Total Maximum Daily Load
TVGMD	Tri-Valley Groundwater Management DistrictUSGS U.S. Geological Survey
VOC	volatile organic compound
WLE	water level elevation

1. Sampling and Analysis Plan Description and Management

Daniel B. Stephens & Associates, Inc. (DBS&A) has prepared this *Sampling and Analysis Plan (SAP)* for the Owens Valley Groundwater Authority (OVGA) and is under contract to prepare their Sustainable Groundwater Management Act (SGMA) of 2014 Groundwater Sustainability Plan (GSP or Plan). This SAP is intended to be included as an Appendix in the final GSP for the Owens Valley Groundwater Basin ((DWR basin ID: 6-12) and the Fish Slough subbasin (DWR basin ID: 6-12.02) (Figure 1-1)

1.1 Introduction, Problem Definition and Background

This section describes the purpose of the SAP and provides background information.

1.1.1 Purpose of the SAP

The purpose of this Sampling and Analysis Plan (SAP) is to establish SGMA compliant monitoring protocols and standard methods for water quality and groundwater level data collection in the Owens Valley Groundwater Basin. Water quality field sampling in the basins includes both groundwater and surface water. This SAP details:

- Water sample collection procedures;
- Analytical methods to be used;
- Groundwater level measurement protocol in water wells; and
- Data Quality Assurance (QA) and Quality Control (QC) procedures.

This SAP is not intended to impose specific schedules or monitoring wells and/or sampling locations on Inyo County Water Department (ICWD), City of Bishop, Mono County, or other entities. The SAP is intended to formalize field techniques and procedures that OVGA or other entities may already have in place for their respective existing long-standing monitoring programs. A brief summary of these monitoring networks are presented later in this SAP.

1.1.2 Background

DBS&A has developed this SGMA-focused Sampling and Analysis Plan (SAP) as a companion document to the Monitoring Plan and Data Gaps Analysis Technical Memorandum (Tech Memo) deliverable. The Tech Memo will provide recommendations on filling data gaps (temporal and

spatial). SGMA requires aquifer-specific evaluation (DWR, 2016b) which will be a challenge in these basins (and in many basins across the State) as many existing monitoring points utilize privately owned agricultural wells or municipal wells potentially screened across multiple water-bearing units.

The Tech Memo is anticipated to include, but is not necessarily limited to, descriptions of the following:

- Available groundwater level and water quality data;
- Groundwater level and water quality monitoring networks;
- A trends analysis of groundwater level and groundwater quality constituents; and
- Recommendations on how refinement and expansion of the existing monitoring programs might minimize or eliminate data gaps, especially in critical areas.

1.1.3 Technical or Regulatory Guidelines and Guidance

DBS&A has developed this SAP in accordance with California Department of Water Resources' (DWR) SGMA inspired Best Management Practices (BMP). This SAP has been prepared in accordance with DWR's BMP #1 - M*onitoring Protocols, Standards, and Sites* (DWR, 2016a). Technical guidance documents considered in preparation of this SAP include, but are not limited to, the following documents:

- Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 (EPA, 2006)
- Requirements for Quality Assurance Project Plans, EPA QA/R-5 (U.S. EPA, 2001)
- National Field Manual for the Collection of Water-Quality Data (USGS, individual Chapters published as separate documents)
- Groundwater technical procedures of the U.S. Geological Survey: U.S. Geological Survey Techniques and Methods 1–A1 (USGS, 2011)

Much of the content contained in DWR's BMP #1 was directly applicable to the development of this SAP and BMP content has been liberally reproduced in this SAP. Links to complete documents, available online and cited in this SAP, are included in the References Section, where available.

This SAP has been prepared to satisfy criteria contained in 23 CCR § 352.2, § 352.4 and § 352.6. Monitoring protocols are to be reviewed and modified, as necessary, at least every five years as part of the periodic GSP evaluation (5-year updates).

1.1.4 SGMA Sustainability Indicators

Six sustainability indicators have been identified in the SGMA legislation that are effects caused by groundwater conditions occurring throughout a basin that, when significant and unreasonable, become undesirable results. The basin's GSP will establish sustainable management criteria that will provide metrics for evaluating undesirable results relative to the sustainability indicators. Data must be sufficient to limit uncertainty when used to assess the sustainability indicators. The essence of the six indicators are listed below:

- Groundwater Levels;
- Groundwater Storage;
- Seawater Intrusion;
- Water Quality;
- Land Subsidence; and
- Interconnected Surface Water

"GSP Regulations allow GSAs to use groundwater elevation as a proxy metric for any (or potentially all) of the sustainability indicators when setting minimum thresholds and measurable objectives, provided the GSP demonstrates that there is a significant correlation between groundwater levels and the other metrics" (DWR, 2017).

It is anticipated that groundwater levels will be used as a proxy for assessing other sustainability indicators in the basin in establishing basin-specific sustainable management criteria so it was determined that groundwater level measurement protocols should be included as a component of this SAP.

1.1.5 U.S. EPA Data Quality Objective Process

Data collected in accordance with this SAP will be of a standardized level of quality that provides decision makers with a sufficient level of confidence in the accuracy of the data on which they rely to inform their policy decisions. This SAP describes procedures to assure that the basin-specific Data Quality Objectives (DQOs) are met, and that the quality of data are known and documented.

The following excerpt from DWR's BMP #1 recommends:
"Establishing data collection protocols that are based on best available scientific methods is essential. Protocols that can be applied consistently across all basins will likely yield comparable data. Consistency of data collection methods reduces uncertainty in the comparison of data and facilitates more accurate communication within basins as well as between basins.

Basic minimum technical standards of accuracy lead to quality data that will better support implementation of GSPs....

It is suggested that each GSP incorporate the Data Quality Objective (DQO) process following the U.S. EPA Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA, 2006). Although strict adherence to this method is not required, it does provide a robust approach to consider and assures that data is collected with a specific purpose in mind, and efforts for monitoring are as efficient as possible to achieve the objectives of the GSP and compliance with the GSP Regulations" (DWR, 2016a).

DQOs are qualitative and quantitative statements developed through the seven-step DQO process (U.S. EPA, 2006). The DQOs clarify the study objectives, define the most appropriate data to collect and the conditions under which to collect the data, and specify acceptance criteria that will be used to evaluate whether the quantity and quality of data collected are sufficient to support decision making. The DQOs are used to develop a scientific and resource-effective design for data collection. Basins-specific DQOs are presented in Section 1.3.1 of this SAP.

1.1.6 QA/QC objectives

The overall QA/QC objectives are as follows:

- Obtain data of known quality to support goals set forth in the Owens Valley Groundwater Basin GSP
- Document all aspects of the quality program, including performance of the work and flexibility for changes to mitigate issues if they are discovered in the future
- Attain QC requirements for field measurements and analyses specified in this SAP

This SAP has been prepared with consideration of the EPA document, *Requirements for Quality Assurance Project Plans, EPA QA/R-5* (U.S. EPA, 2001). Table 1-1 provides a link between the

EPA's guidance and this SAP, and identifies the sections of this SAP that address the elements of QA/R-5.

EPA QA/R-5 QAPP Element	OVGA SAP
A1 Title and Approval Sheet	Title and Approval Sheet
A2 Table of Contents	Table of Contents
A3 Distribution List	Distribution List
A4 Project/Task Organization	1.0 SAP Description and Management
A5 Problem Definition/Background	1.1 Introduction, Problem Definition and Background
A6 Project/Task Description	1.2 SAP Description
A7 Quality Objectives and Criteria	1.3 Quality Objectives and Criteria
A8 Special Training/Certification	1.4 SOPs, Special Training and Certification
A9 Documents and Records	2.1 WQ Field Activity Documentation and Record Keeping 3.1 WL Field Documentation and Record Keeping
B1 Sampling Process Design	
B2 Sampling Methods	2.2 Sampling Methods and Field Activities
B3 Sample Handling and Custody	2.3 Sample Handling, Custody and Laboratory Coordination
B4 Analytical Methods	2.5 Analytical Methods
B5 Quality Control	2.6 WQ Assurance and Quality Control 3.5 WL Quality Assurance and Quality Control
B6 Instrument/Equipment Testing, Inspection, and Maintenance	2.7 WQ Instrument and Equipment Testing, Inspection, and Maintenance Requirements 3.3 WL Equipment Testing, Inspection, and Maintenance Requirements
B7 Instrument/Equipment Calibration and Frequency	2.8 Instrument Calibration and Frequency
B8 Inspection/Acceptance of Supplies and Consumables	4.0 Requirements for Inspection and Acceptance of Supplies and Consumables
B9 Non-Direct Measurements	5.0 Non-Direct Measurements)
D2 Validation and Verification Methods	7.2 Verification Methods
B10 Data Management	6.0 Data Management
C1 Assessment and Response Actions	7.1 Assessment and Response Actions
C2 Reports to Management	7.2 Reports to Management
D1 Data Review, Verification, and Validation	8.1 Data Review and Reduction Requirements
D3 Reconciliation with User Requirements	9.0 Reconciliation with Data Quality Objectives

Table 1-1. Summary of SAP cross-over with EPA QA/R-5 Requirements.

1.1.7 Geographic Description of the Basin

The geographic area covered by the SAP is shown in Figure 1-1. The basin is primarily an alluvial groundwater basin located along the Owens River in Inyo County and extends northward of the Inyo-Mono County boundary into Mono County.

The communities of Bishop, Independence, Big Pine, Lone Pine, as well as smaller communities such as Benton, Chalfant, Olancha, Keeler, and Cartago are located within the basin, but the predominant land use is agricultural or undeveloped/range land.

1.1.8 Physical Setting of the Basin

Owens Valley is located on the eastern side of the Sierra Nevada Mountains in California on the western edge the Basin and Range Province (Figure 1-2). The surrounding watershed is approximately 3,287 mi^2, extending from Long Valley and Benton Valley in the north to Haiwee Reservoir in the south. The Owens Valley groundwater basin is comprised of Owens Valley (6-012.01) and Fish Slough subbasins (6-012.02), which are about 1,032 mi^2 and 5 mi^2, respectively. Locally, the northern arm of the Owens Valley subbasin that contains Chalfant, Hammil, and Benton Valleys is referred to as “Tri-Valley.” For the purposes of this plan, this area is included when referring to the Owens Valley groundwater basin unless stated otherwise.

Elevations in the watershed range from 14,505 ft above mean sea level (amsl) at the summit of Mt. Whitney to 3,529 ft amsl in the Owens Dry Lake portion of the watershed. Topography can be broadly classified into three categories: mountain uplands, volcanic tablelands, and valley fill. The margins of the watershed are primarily composed of the steep, mountainous uplands. The western boundary is formed by the Sierra Nevada Mountains and the eastern boundary is formed by the White and Inyo Mountains, resulting in an elongated U-shaped watershed. The volcanic tablelands located to the north of Bishop are not nearly as prominent as the mountainous uplands but form a local topographic high. Valley fill makes up nearly a third of the total watershed area, formed by deposition from the Owens River, tributaries draining the surrounding mountains, and paleolakes.

The Owens River enters the northern portion of the groundwater basin near Bishop and then meanders southward through the valley towards Owens (dry) Lake (Figure 1-3). Numerous tributaries drain the Sierra Nevada and enter the western portion of the groundwater basin. A

relatively high drainage density and large volume of annual runoff has caused the alluvial fans formed by these streams to coalesce and form a broad apron that extends eastward towards the center of the valley (Danskin, 1998). In contrast, there is relatively little runoff coming into the basin from the Inyo and White Mountains and alluvial fans on the east side of the valley are not nearly as prominent and more isolated compared those on the west. The Owens River generally flows on the east side of the valley as a result of this asymmetrical fan configuration.

The Owens Valley is a closed basin due to the Coso Range at the southern end of the watershed preventing groundwater and surface-water outflow since the end of the Pleistocene. Surface-water and groundwater flow east and then turn south toward to the , the natural terminus of the watershed. Prior to construction of the Los Angeles Aqueduct in the early 20th century inflows to the valley generally exceeded evapotranspiration rates and formed Owens Lake, which covered more than 100 mi^2 and had depths greater than 20 ft (Danskin, 1998). Diversion of surface-water for irrigation within the valley and exported south via the Los Angeles Aqueduct significantly altered the water budget and desiccated the lake by 1926 (Saint-Amand et al., 1986). With the exception of very wet years, Owens (dry) Lake is a playa and was one of the largest sources of dust pollution in the United States due to the combination of high winds and easily erodible sediments (Gill, 1996).

1.1.9 Historical and Current Groundwater Management in the Basin

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Monitoring Plan and Data Gaps Analysis Technical Memorandum***

Prior to SGMA, groundwater management for the Inyo County portion of Owens Valley was performed pursuant to the Long Term Water Agreement (LTWA). The overall goal of the LTWA is “to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County” [City of Los Angeles v. County of Inyo, 1991]. Implementation methods for these goals are described in the “Green Book,” a technical appendix to the LTWA [County of Inyo and City of Los Angeles, 1990]. All lands owned by the City of Los Angeles in Inyo County are governed by the LTWA, and these lands are considered adjudicated and exempt for the purposes of SGMA.

In general, the primary goal of LTWA groundwater management for the LA-owned portion of the Owens Valley in Inyo County is to manage groundwater pumping to protect and sustain phreatophytic vegetation that depends on shallow groundwater as a primary water source. The primary goal is accomplished by a combination of monitoring, modeling, and forecasting of vegetation and hydrologic conditions on an annual basis. If pumping reduces, or is projected to reduce, soil moisture below a threshold that would cause irreversible damage to vegetation then pumping is decreased or stopped completely until water levels and soil water recover. Annual pumping plans provided by LADWP are prepared and analyzed using recent monitoring data and modeling. Since the vast majority of groundwater is pumped by the LADWP, the LTWA applies to most groundwater extraction in the Inyo County portion of Owens Valley.

In the Mono County portion of the Owens Valley, groundwater management is the responsibility of the Tri-Valley Groundwater Management District (TVGMD). According to the most recent General Plan Update [County of Mono, 2015], the TVGMD was formed in response to concern over possible exportation of groundwater from the area and implements an area-wide well-monitoring program. However, it is not clear that a comprehensive pumping or water level monitoring program exists as no groundwater data has been provided to the OVGA by the TVGMD to date. Furthermore, the TVGMD website appears to function primarily to host public announcements of monthly meetings, and does not contain groundwater management plans, or reporting and monitoring requirements. As noted by Langridge and others [2016], the TVGMD is a functioning public agency which holds periodic public meetings, but with no permanent staff and no employees on payroll (limited staff are provided by Mono County). The scope of the district's activities appear to be limited and primarily focused on preventing groundwater export from the area.

1.1.9.1 Summary of Existing Monitoring Networks

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Monitoring Plan and Data Gaps Analysis Technical Memorandum***

Multiple entities have established monitoring networks in the Owens Valley groundwater basin. The largest and most frequently measured monitoring well network is maintained by the LADWP and Inyo County Water Department. The U. S. Geological Survey (USGS) has historically conducted studies in the basin, but does not routinely monitor groundwater levels or water quality.

Several studies have included targeted data collection programs and have contributed to the available datasets in the basin.

Adequacy of the existing monitoring well network for evaluating groundwater level and quality spatially is discussed in the ***Monitoring Plan and Data Gaps Analysis Technical Memorandum***. This includes consideration of the number and distribution of wells screened discretely within in a single aquifer zone in the groundwater basin.

1.1.9.2 Groundwater Quality

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Monitoring Plan and Data Gaps Analysis Technical Memorandum***

Due to the generally high quality of water in the Owens Valley, no formal network has been established to measure and monitor groundwater quality in the basin. Monitoring is typically done on a well-specific basis according to the California Regulations Related to Drinking Water, or a site-specific basis according to the California State Water Resources Control Board in response to localized groundwater contamination (e.g., leaking underground storage tank). As a result, most groundwater quality observations are clustered around population centers in the basin. Further detail is contained in the ***Monitoring Plan and Data Gaps Analysis Technical Memorandum.***

1.1.9.3 Surface Water Quality

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Monitoring Plan and Data Gaps Analysis Technical Memorandum***

Surface-water runoff entering the Owens Valley is primarily sourced from Sierra Nevada snowmelt and is generally considered to be excellent in quality. As a result, limited surface-water quality data has been collected in the basin, typically consisting of a single sample for a given location. As it is impossible to determine water quality trends from a single data point, and the OVGA does not have any legal

jurisdiction over surface-water, these data were not assimilated into the Owens Valley database. This may change if more surface-water quality data become available in the future.

1.1.9.4 Groundwater Level

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Monitoring Plan and Data Gaps Analysis Technical Memorandum***

More than 535,000 water level measurements have been recorded in the Owens Valley at 1,314 wells between July 1924 and May 2020. Measurements are collected as a depth to water from a reference point, typically the top of the well casing. This value is then converted into a groundwater elevation using the elevation of the reference point. If the ground surface elevation is also known, a depth to water below ground surface (bgs) can be also be calculated. Groundwater level data assembled in the Owens Valley database were collected by multiple entities, and as such have varying degrees of data quality. Due to the sheer number of water level observations a complete review of quality of each datum prior to development of the GSP was not possible. Priority was given to checking data quality for representative monitoring points for which sustainable management criteria are based. It is anticipated that data quality issues will be addressed as they are discovered in the future.

The California Statewide Groundwater Elevation Monitoring (CASGEM) Program is a collaboration between local monitoring parties and DWR to collect statewide groundwater elevation measurements from wells in each basin throughout the State. Much of the water level data in the CASGEM database for Owen Valley basin was reported by ICWD, Mono County, TVGMD and LADWP.

1.1.10 Principal Decision Makers

The SAP principal decision maker is the OVGA Board of Directors. These decision makers will use data collected in accordance with this SAP in their basin management decision making process. Information regarding the Board composition, representation, formation and legal authority of the OVGA is included in other sections of the GSP.

1.2 SAP Description

This section describes the SAP data collection objectives and measurements for the basin.

This SAP addresses collection of water quality and groundwater level data indicative of the sustainability of human and environmental beneficial uses of groundwater in the basin. Additional analyses considerations may be necessary to address ecological receptors.

1.2.1 Basin Hydrogeologic Conceptual Model

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Hydrogeologic Conceptual Model Technical Memorandum***

The Owens Valley groundwater basin is large and complex hydrogeologic system consisting of an alluvial and fluvial aquifer interbedded with clays and volcanic flows. Confined to semi-confined conditions are generally found along the axis of the valley, with unconfined conditions present along the margin of the valley. Faults intersect the groundwater basin and act as both conduits for and barriers to groundwater flow depending on the location and orientation. Groundwater is primarily sourced from runoff that infiltrates into the alluvial fans along the margin of the valley as streams flow across them. Groundwater flow is generally from the margins towards the axis of the valley, and from the north towards the south. Naturally elevated solute concentrations are present either due to leaching of volcanic deposits or evaporative concentration in the Owens Lake area. Groundwater and surface-water in the basin are highly managed by the LADWP, with the majority of extracted groundwater exported out of the basin to the south for use in Los Angeles. Groundwater is used for a variety of purposes within the basin including agricultural, municipal, domestic, ecological, industrial, and recreational uses.

Further details on the hydrogeologic conceptual model for this basin are contained in the ***Hydrogeologic Conceptual Model Technical Memorandum*** included as an appendix to the GSP.

1.2.1.1 Analytes of Concern

Historically water quality data analytes (chemicals) of concern in the basin have generally included, but are not necessarily limited to, the following analytes:

- Arsenic;
- Nitrate;
- Total Dissolved Solids (TDS);
- Chloride; and
- Sodium

*The discussion in this section comes from the **Owens Valley Groundwater Sustainability Plan – Monitoring Plan and Data Gaps Analysis Technical Memorandum***

Both arsenic and nitrate have legally enforceable maximum contaminant levels (MCLs) of 10 micrograms per liter (µg/L) and 10 milligrams per liter as nitrogen (mg/L as N), respectively. Secondary, non-enforceable standards for TDS and chloride have been set at 500 mg/L and 250 mg/L, respectively. Sodium was included in the analysis because it is part of the conditional use permit issued by Inyo County for the Crystal Geyser Roxane water bottling plant expansion in the Owens Lake management area, although no state or federal standard has been set for it.

Further details on the analytes of concern for this basin are contained in the ***Monitoring Plan and Data Gaps Analysis Technical Memorandum*** included as an appendix to the GSP.

1.2.1.2 Historically Established Potential Sources of Groundwater Contamination

The landfills in basin have historically been identified as potential source of groundwater contamination. Each of these landfills have ongoing monitoring programs that are summarized below:

Bishop-Sunland Landfill

The Bishop-Sunland Landfill currently operates under an Evaluation Monitoring Program, indicating there has been a known release from the waste unit to groundwater. There is no significant off-site contamination at the landfill, however, contaminants have been detected in both upgradient and downgradient monitoring wells at levels generally ranging from below the laboratory Practical Quantitation Limit (PQL) to 5 µg/L. These contaminants include tetrachloroethene (PCE) and dichlorodifluoromethane (CFC-12) in downgradient wells MW-2 and MW-6, and 1,1-dichloroethane (1,1-DCA), trichloroethene (TCE), trichlorofluoromethane (CFC-11), PCE and CFC-12 in upgradient wells MW-1, MW-5. Off-site, dual-nested monitoring wells MW-8 and MW-9 are generally non-detect for all contaminants. A Corrective Action Plan has been

implemented at the landfill, which includes the extraction of landfill gases from multiple sources on-site to help improve the groundwater quality.

Independence Landfill

The Independence Landfill currently operates under a Detection Monitoring Program, indicating there is no known release from the waste unit to groundwater. There is no significant off-site contamination at the landfill, however, CFC-11 and PCE have been detected intermittently in downgradient monitoring wells MW-2 and MW-3 at trace-to-low levels ranging from below the PQL to 1 µg/L. Inorganic monitoring parameters chloride, nitrate, sulfate, and TDS generally increase in concentration in all monitoring wells during drought years. Drought conditions can be further exacerbated by nearby groundwater pumping operations by the LADWP, which can run the landfill monitoring wells dry.

Lone Pine Landfill

The Lone Pine Landfill currently operates under an Evaluation Monitoring Program, indicating there has been a known release from the waste unit to groundwater. There is no significant off-site contamination at the landfill, however, 1,1-DCA, CFC-11 and PCE have been detected in downgradient monitoring wells MW-2 and MW-3 at trace-to-low levels ranging from below the PQL to 1 µg/L. There is no corrective action currently required at the Lone Pine Landfill.

Benton Landfill

The Benton Landfill currently operates under a Detection Monitoring Program, indicating there is no known release from the waste unit to groundwater. There is no significant off-site contamination at the landfill, and the groundwater monitoring wells are generally non-detect for volatile organic compounds.

Chalfant Landfill

The Chalfant Landfill currently operates under a Detection Monitoring Program, indicating there is no known release from the waste unit to groundwater. There is no significant off-site contamination at the landfill, however, CFC-11 and PCE have been detected in downgradient monitoring well MW-4 at levels generally ranging from below the PQL to 2 µg/L.

1.2.1.3 Groundwater Flow Paths and Potential Migration Pathways

Groundwater flow in the Owens Valley basin generally moves north-to-south through the alluvium. Groundwater recharge from tributary channels originating in the adjacent basin-bounding mountain ranges may locally impart an east-west groundwater flow path towards the more central portions of the basin where the flow paths evolve to the more general north-to-south orientation.

Site-specific flow paths in the basin and groundwater gradients are often influenced by localized and/or transient pumping depressions induced by well fields and individual wells pumped at high extraction rates.

The following are offered as general groundwater migration pathways of contaminates and are not specific to the Owens Valley basin. Groundwater contaminants may migrate by advection and dispersion, volatilize to soil gas, and ultimately disperse into the atmosphere, or may become adsorbed to aquifer soldis. Groundwater flow may redistribute contaminants within the shallow groundwater environment or transfer them to deeper aquifers.

1.2.1.4 Human Receptors

The predominant land use in the basin is for agricultural purposes or undeveloped rangeland/open space. Other land uses such as residential and commercial/industrial are generally limited to areas near cities, towns, or occasionally isolated commercial or industrial facilities. Potable groundwater produced for human use and consumption is monitored and regulated by the SWRCB Division of Drinking Water (large water systems) and the Inyo County Environmental Health Services (small water systems), and Mono County Environmental Health (small water systems).

1.2.2 Objectives

The primary objectives of this SAP are as follows:

- Describe water sample collection procedures;
- Analytical methods to be used;
- Groundwater level measurement protocol in water wells; and
- Data Quality Assurance (QA) and Quality Control (QC) procedures.

1.2.3 Tasks

SAP tasks include the following:

- Data collection planning and support;
- Management;
- Field acquisition of data; and
- Data review and validation.

Field activities should be conducted in accordance with this SAP to ensure proper sample management, including accurate chain of custody procedures for sample tracking, protective sample packaging techniques, and proper sample preservation techniques, as well as compliance with any applicable site-specific health and safety plans (HASP) (not included as part of this SAP).

1.3 Quality Objectives and Criteria

The following subsections present the DQOs and measurement quality objectives (MQOs) for the basin.

1.3.1 Data Quality Objectives

The seven steps of the DQO process for this SAP are presented in Table 1-2. Key to systematic planning is determining whether the problem to be solved requires a quantitative or qualitative answer (U.S. EPA, 2006).

Step 1: State the Problem
• Multiple entities collect water quality and water level data in the basin and basic minimum technical standards of accuracy are needed to ensure quality data are collected that will better support GSP implementation and OVGA policy decisions. Data must be sufficient to limit uncertainty when used to assess the sustainability indicators.
Step 2: Identify the Goal(s)
• Establish data collection protocols that are based on best available scientific methods. Protocols that can be applied consistently across the basin will likely yield comparable data. Consistency of data collection methods reduces uncertainty in the comparison of data and facilitates more accurate communication within as well as between basins.
Step 3: Identify the Inputs
• Groundwater Quality Sampling of Water Wells (dedicated monitor wells will be sampled where available) • Surface Water Quality Sampling • Groundwater Level Measuring in Water Wells (dedicated monitor wells will be sampled where available)
Step 4: Define the Boundaries of the Study
• The horizontal study boundaries are defined as the boundaries of the basin. • The vertical boundaries are defined as the base of groundwater below ground surface that is of a quality and quantity that it can be beneficially used. • There is no foreseeable temporal boundary as up-to-date water quality and water level data will continue to be necessary through GSP implementation and into the future to ensure sustainability in the basin is maintained once achieved.
Step 5: Develop an Analytical Approach
• Groundwater quality samples will be compared to the OVGA approved sustainable management criteria protective of water quality in the basin. • Groundwater levels will be compared to the OVGA approved sustainable management criteria protective of groundwater levels in the basin and any sustainability indicators in which water level is established as a viable proxy in the basins' GSP.
Step 6: Specify Performance or Acceptance Criteria
• Quality assurance samples will be collected during the sampling to evaluate sampling techniques and consistency. • Analytical results will be evaluated within their own tolerance limits and compared to appropriate screening levels. • Water quality samples will be analyzed using EPA methods that have been selected based on the reporting limits (RLs). RLs should be at a resolution that are sensitive enough to meet basins' DQOs.
Step 7: Develop a Plan for Obtaining Data
• It is not the purpose of this SAP to establish specific monitoring points but to equip the field data collecting entities active in the basins to collect data that is of a quality that will support sustainability monitoring in the basin. • The protocols established in this SAP will allow for consistently of data collection across the basin and will reduce uncertainty in data comparisons.

Table 1-2. Data Quality Objectives.

1.3.2 Measurement Quality Objectives

Analytical results of water quality samples should be evaluated in accordance with precision, accuracy, representativeness, completeness, and comparability (PARCC) and sensitivity parameters to document the quality of the data and to ensure that the data are of sufficient quality to meet the SAP objectives. Of these PARCC parameters, precision and accuracy should be evaluated quantitatively by collecting the QC samples listed in Table 1-3. The following subsections describe each of the PARCC parameters and how they will be assessed within this SAP.

Data Quality Indicator	QC Check Sample	Acceptance Criteria
Precision (RPD)	MS/MSD Field duplicates	35% RPD 50% RPD
Accuracy (Percent recovery)	MS and MSD Blanks [a]	50 to 150% recovery Less than MDL
Representativeness	The sampling methods and the analytical methods described in this SAP are designed to provide data that are representative of site conditions.	
Completeness	The objective for data completeness is 90%.	
Comparability	The use of standard published sampling and analytical methods, and the use of QC samples, will ensure data of known quality. These data can be compared to any other data of known quality.	
Sensitivity	Not applicable	RLs and laboratory RLs sensitive to basins' DQOs.

[a] May include method blanks, reagent blanks, instrument blanks, calibration blanks, and other blanks collected in the field (such as field blanks)

QC = Quality control
RPD = Relative percent difference
MDL = Method detection limit
MS = Matrix spike
MSD = Matrix spike duplicate

Table 1-3. Data Quality Indicators for Water Quality Sample Laboratory Analysis.

1.3.2.1 Precision

Precision is the degree of mutual agreement between individual measurements of the same chemical property under similar conditions. Usually, combined field and laboratory precision is evaluated by collecting and analyzing field duplicates and then calculating the variance between the samples, typically as a relative percent difference (RPD).

RPD is calculated as follows:

$$RPD = \frac{|A - B|}{(A + B)/2} \times 100\%$$

where A = First duplicate concentration
B = Second duplicate concentration

Field sampling precision can be evaluated by analyzing field duplicate samples. It is recommended that for every 10 samples collected, 1 blind duplicate sample should be collected. However, this may not be necessary for inorganic analytes with low risk of contamination during sampling and are analyzed by straight forward standardized laboratory methods.

Laboratory analytical precision is evaluated by analyzing laboratory duplicates or matrix spike (MS) and matrix spike duplicate (MSD) samples. For this SAP, MS/MSD samples should be generated for all analytes. The results of the analysis of each MS/MSD pair should be used to calculate the RPD as a measure of laboratory precision.

1.3.2.2 Accuracy

A program of sample spiking should be conducted to evaluate laboratory accuracy. This program includes analysis of the MS and MSD samples, laboratory control samples (LCSs) or blank spikes, surrogate standards, and method blanks. MS and MSD samples should be prepared and analyzed at a frequency of 5 percent. LCSs or blank spikes are also analyzed at a frequency of 5 percent. Surrogate standards, where available, are added to every sample analyzed for organic constituents. The results of the spiked samples are used to calculate the percent recovery for evaluating accuracy.

$$\text{Percent Recovery} = \frac{S - C}{T} \times 100\%$$

where S = Measured spike sample concentration
C = Sample concentration
T = True or actual concentration of the spike

1.3.2.3 Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent the characteristics of a population, variations in a parameter at a sampling point, or an environmental condition that they are intended to represent. For this SAP, representative data are anticipated to be obtained through careful selection of sampling locations and analytical parameters. Representative data will be obtained through proper collection and handling of samples to avoid interference and minimize contamination.

Representativeness of data can be ensured through the consistent application of established field and laboratory procedures. Field blanks (if appropriate) and laboratory blank samples should be evaluated for the presence of contaminants to aid in evaluating the representativeness of sample results. Data determined by comparison with existing data to be non-representative should be used only if accompanied by appropriate qualifiers and limits of uncertainty. However, this may not be necessary for inorganic analytes with low risk of contamination during sampling and are analyzed by straight forward standardized laboratory methods.

1.3.2.4 Completeness

Completeness is a measure of the percentage of basin-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with QC procedures outlined in this SAP, and when none of the QC criteria that affect data usability are exceeded.

When all data validation is completed, the percent completeness value should be calculated by dividing the number of usable sample results by the total number of sample results planned for this investigation.

Completeness should also be evaluated as part of the data quality assessment (DQA) process (U.S. EPA, 2000). This evaluation will help determine whether any limitations are associated with the decisions to be made based on the data collected.

1.3.2.5 Comparability

Comparability expresses the confidence with which one dataset can be compared with another. Comparability of data can be achieved by consistently following standard field and laboratory procedures and by using standard measurement units in reporting analytical data.

1.3.2.6 Detection and Quantitation Limits

The method detection limit (MDL) is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The MDL for each analyte should be listed as the detection limit in the laboratory's electronic data deliverable (EDD). The practical quantitation limit (PQL) represents the lowest concentration of an analyte that can be accurately and reproducibly quantified in a sample matrix by a specific method. Reporting limits (RL or RDL) may vary from lab-to-lab and are the lowest detection of an analyte from a sample after any sample dilution adjustments have been accounted for. Analyte concentrations below the RL are reported as not detectable. Sometimes laboratory results can be obtained for analytes below the PQL but these results should be reported as estimated values if concentrations are less than MDLs. For potable water samples, the U.S. EPA and many states have established water regulations for Maximum Contamination Levels (MCL) for primary and secondary contaminates. In California, state drinking water MCLs are often lower than the national regulations.

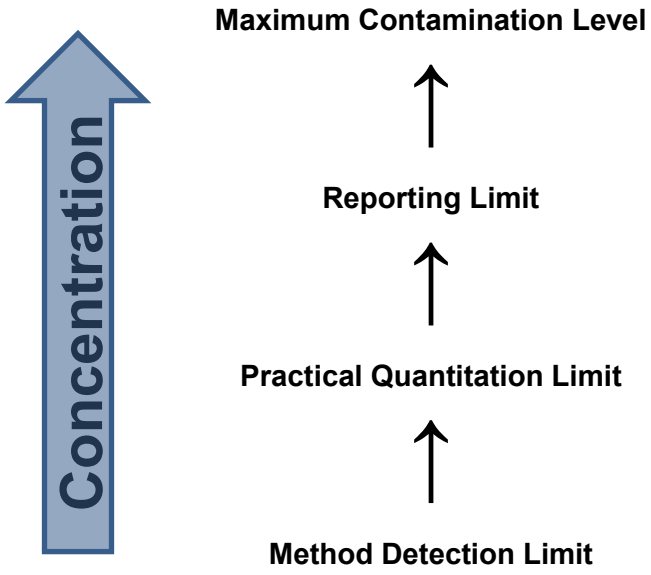

Figure 1-4. Laboratory water quality analysis detection and quantitation limits diagram.

1.4 SAP Personnel Organization

Personnel involved in SAP implementation are listed in Table 1-4, and shown as an organization chart in Figure 1-5.

Individual	Role in SAP	Organizational Affiliation	Contact Information
	Data Clearing House	ICWD	
	QA Officer	ICWD	
OVGA Executive Manager	SAP Manager	OVGA Executive Manager	
Board of Directors	Policy/Decision Maker	OVGA	
	Regulatory Agency	DWR	

Table 1-4. SAP Implementation Personnel

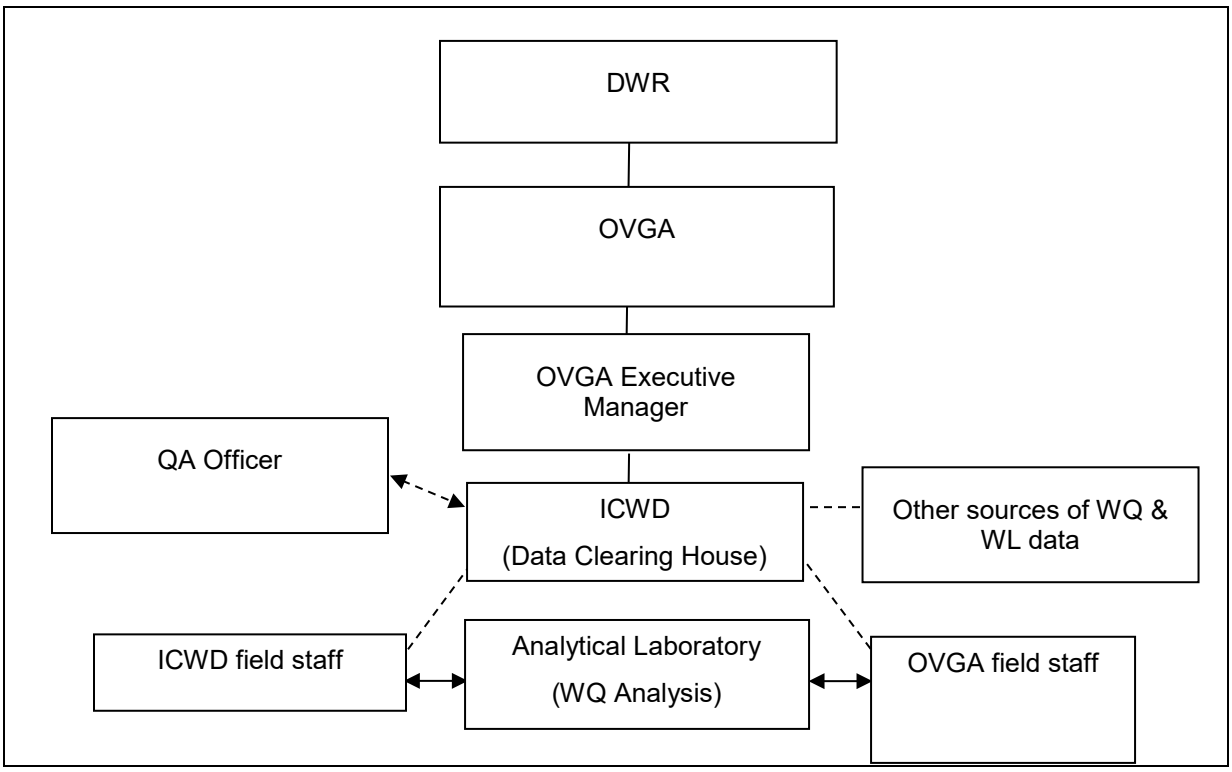

Figure 1-5: Organizational Chart

1.5 Standard Operating Procedures, Special Training and Certification

This section outlines potential Standard Operating Procedure development, field staff training, and certification requirements that may be necessary to complete the activities described in this SAP.

1.5.1 Standard Operating Procedures

It is recommended that individual monitoring entities develop and maintain Standard Operating Procedures for all field program activities. Table 1-5 lists recommended SOPs that should be developed (or updated as necessary) and implemented, if not currently in place, by monitoring entities in accordance with DWR's BMP #1 - *Monitoring Protocols, Standards, and Sites* (DWR, 2016a) and guidance from USGS reference documents cited in this SAP.

SOP Title
General Requirements
Equipment
Field Notes
Decontamination of Field Equipment
Water Sampling
Preparation for Water Sampling
Measurement of Field Parameters
Collection of Groundwater Samples
Collection of Surface Water Samples
Sample Preservation
Sample Filtration
Quality Assurance/Quality Control (QA/QC) Samples
Water Sampling
Measurement of Water Levels in Wells
Pressure Transducer & Data Logger: Deployment, Download, Maintenance and Troubleshooting
Quality Assurance/Quality Control (QA/QC) Water Levels

Table 1-5. List of potential Standard Operating Procedures

1.5.2 Equipment Operator Certifications and Licenses

Individual monitoring network managers and supervisors are responsible for ensuring that all field personnel are properly trained and certified in the activities they perform. Field sampling sometimes requires the use of specialized equipment that may require certification and training to safely operate.

1.5.3 Health and Safety Training

A basin-specific health and safety plan (HASP) is not included as part of this SAP. Agencies (e.g., Inyo, Mono County,) should have in place HASPs and ongoing field staff training programs that are specific to the field conditions and safety hazards encountered in field data collection activities.

It is not anticipated that field personnel working in the basin will necessitate access to sites that contain hazardous materials but personnel should be aware that OSHA training requirements are defined in 29 Code of Federal Regulations (CFR) 1910.120(e). However, if necessary, these requirements include (1) 40 hours of formal off-site instruction, (2) a minimum of 3 days of actual on-site field experience under the supervision of a trained and experienced field supervisor, and (3) 8 hours of annual refresher training. Field personnel who directly supervise employees engaged in hazardous waste operations also receive at least 8 additional hours of specialized supervisor training.

Copies of the field team's health and safety training records, including course completion certifications for the specialized supervisor training and the initial and refresher health and safety training, should be maintained and kept with site-specific files.

1.6 Monitoring Site Access Agreements

A signed access agreement should be procured prior to accessing all sites. The signed agreement should be on file and should be on hand in the field.

General agreement components should include, but are not necessarily limited to, the following:

- Monitoring site name (and any known alias), location and address;

- Property owner's name;
- Property contact information including property representative primary point of contact;
- Names of field staff, agency affiliations and contractors (if any) accessing the site as part of the monitoring program;
- Date and expiration (if any) of agreement;
- Prior notification requirements of intent to access property;
- Days of the week and time(s) of day property access is permitted; and
- Terms of agreement (e.g., liability considerations, data sharing considerations).

2. Water Quality Data Generation and Acquisition

A primary objective of this SAP is to describe groundwater and surface water sample collection procedures that will produce reliable basin-specific water quality data that can be used to evaluate sustainability in the basin with respect to the sustainability indicators set forth in the SGMA legislation. This section details activities associated with data collection, including field methods to be implemented, analytical requirements of the SAP, and steps that should be undertaken to ensure the adequacy of the data collection activities.

The following excerpt is from DWR's BMP 1 (DWR, 2016a):
Groundwater quality sampling protocols should ensure that:

- *Groundwater quality data are taken from the correct location*
- *Groundwater quality data are accurate and reproducible*
- *Groundwater quality data represent conditions that inform appropriate basin management and are consistent with the DQOs*
- *All salient information is recorded to normalize, if necessary, and compare data*
- *Data are handled in a way that ensures data integrity*

2.1 Water Quality Field Activity Documentation and Record Keeping

This Section discusses the requirements for documenting field activities and general record keeping. This documentation is imperative in preparing laboratory data packages (Section 2.3). Field personnel should follow the guidelines outlined in DWR's BMP #1 - *Monitoring Protocols, Standards, and Sites* (DWR, 2016a).

Field personnel should use monitoring network specifically prepared forms ("run sheets") or permanently bound field logbooks with sequentially numbered pages to record and document field activities. All paper field documentation should be scanned and archived by the monitoring entity.

General field-site documentation information should be on file with the monitoring agency that includes any access agreements (see Section 1.6) and associated property information. All field forms and logbooks should include and record at a minimum, the following information:

- Monitoring site name;

- Monitoring schedule event/list (e.g., fall water quality sampling run);Date and time (24-hour format) onsite;
- Name and affiliation of all on-site personnel including contractors or visitors;
- Weather conditions during the field activity;
- Summary of activities performed and significant events;
- Notes of conversations with coordinating officials;
- References to other field logbooks or forms that contain specific information;
- Discussions of problems encountered and their resolution;
- Discussions of deviations from the monitoring entity's field sampling plan or other governing documents; and
- Description of all photographs taken.

2.2 Sampling Methods and Field Activities

This Section describes the procedures for sample collection, including sampling methods and equipment, sample preservation requirements, and decontamination procedures. All samples collected should be analyzed by a laboratory certified under the Environmental Laboratory Accreditation Program (ELAP) (DWR, 2016a).

The USGS publishes the *National Field Manual for the Collection of Water Quality Data* (NFM). The NFM is comprised of standalone Chapters which are periodically updated by the USGS. DWR recommends that the NFM be used to guide the collection of reliable data (DWR, 2016a).

2.2.1 Groundwater Well Sampling Methodology

Groundwater samples should be collected from wells in the basin in accordance with the monitoring entities' SOPs that should adhere to the standard methods detailed in the USGS NFM. "*The specific sample collection procedure should reflect the type of analysis to be performed and DQOs"* (DWR, 2016a).

Before purging and sampling, groundwater level elevation should be measured in the well as described in the protocols in Section 3 of this SAP. The total depth (TD) of the well, depth-to-water (DTW) level measurement, and casing internal radius (in consistent units of feet) are needed to calculate the casing volume (V).

Casing volume in gallons is calculated as follows:

$$V = \pi r^2 h \quad (7.48)$$

where V = casing volume (in gallons)
r = casing radius (feet)
h = TD – DTW (feet)

Each well, not equipped with low-flow or passive sampling equipment, should be purged of a minimum of three casing volumes (3 x V) prior to sampling to ensure that a representative groundwater sample is obtained. When purging by use of a pump or airlifting, a discharge rate should be estimated (if a flow meter is unavailable) so that field staff can estimate the time required to complete the purging process before sample collection. In the case of sampling with bailers, the volume of water extracted before sampling should be estimated.

"Professional judgment should be used to determine the proper configuration of the sampling equipment with respect to well construction such that a representative ambient groundwater sample is collected" (DWR, 2016a). If a well is purged dry, it should be documented and sampled when the well has recovered to within 90% of the original level prior to sampling. "*Professional judgment should be exercised as to whether the sample will meet the DQOs and adjusted as necessary" (DWR, 2016a).*

Means of extracting groundwater from a well for sampling include, but may not be limited to, the following industry standard methods:

- **Dedicated pump** - It is recommended that "samples should be collected at or near the wellhead. Samples should not be collected from storage tanks, at the end of long pipe runs, or after any water treatment" (DWR, 2016a).
- **Temporary pump** - See Section 2.2.3 for decontamination considerations between monitoring sites.
- **Bailer** - Dedicated or disposable polyethylene bailers are recommended. Bottom-emptying devices are recommended to transfer groundwater samples from bailers to unpreserved containers, to minimize volatilization and ensure sample integrity.

- **Airlifting** - Method not recommended when collecting samples for determination of analytes that are volatile or otherwise are affected by exposure to oxygen (USGS, 2018).
- **Low-Flow Sampling Equipment** - Requires additional special protocols. "In addition to the protocols listed above, sampling using low-flow sample equipment should adopt the following protocols derived from EPA's Low-flow (minimal drawdown) ground-water sampling procedures (Puls and Barcelona, 1996). These protocols apply to low-flow sampling equipment that generally pumps between 0.1 and 0.5 liters per minute. These protocols are not intended for bailers" (DWR, 2016a).
- **Passive Sampling Equipment** - Requires additional special protocols. "In addition to the protocols listed above, passive diffusion samplers should follow protocols set forth in *USGS Fact Sheet 088-00*" (DWR, 2016a).

If a pressure transducer and data logger is installed in a dedicated monitoring well, it should be removed before bailing, airlifting or installing any temporary sampling equipment (e.g., Grundfos Red-Flo2). See Section 3.3.3 for additional pressure transducer and data logger considerations.

The following minimum field parameters should be collected at the time of sampling:

- Specific Conductivity or Electrical Conductivity (EC);
- pH - "Measurements of pH should only be measured in the field, lab pH analysis are typically unachievable due to short hold times" (DWR, 2016a); and
- Temperature.

Additional field parameters "*may also be useful for meeting DQOs of GSP and assessing purge conditions. All field instruments should be calibrated daily and evaluated for drift throughout the day"* (DWR, 2106a). See Section 2.7.2 for Field Equipment and Instruments considerations. Additional field parameters may include, but are not limited to, the following:

- Dissolved Oxygen (DO) (in situ measurements preferable);
- Oxidation/Reduction Potential (ORP); and
- Turbidity.

Field parameters should be collected before, during and immediately after purging and should stabilize prior to sampling. "*Samples should be collected under laminar flow conditions. This may require reducing pumping rates prior to sample collection"* (DWR, 2016a). The water samples

collected for dissolved metals should be mechanically filtered using a 0.45-micron filter, if necessary, to remove suspended particulates prior to the samples being placed in the appropriate containers for laboratory analyses.

"All samples requiring preservation must be preserved as soon as practically possible, ideally at the time of sample collection. Ensure that samples are appropriately filtered as recommended for the specific analyte. Entrained solids can be dissolved by preservative leading to inconsistent results of dissolve analytes. Specifically, samples to be analyzed for metals should be field-filtered prior to preservation; do not collect an unfiltered sample in a preserved container" (DWR, 2016a).

Monitoring entities in the basin should have specific analytical programs adapted for their respective monitoring networks. Laboratory analytical methods are described in Section 2.5 of this SAP. Groundwater samples should be accompanied by full chain of custody documentation at all times (see Section 2.3.4).

2.2.2 Surface Water Sampling Methodology

Surface water samples should be collected from locations in the basin in accordance with the monitoring entities' SOPs that should adhere to the standard methods detailed in the USGS NFM. "*The specific sample collection procedure should reflect the type of analysis to be performed and DQOs"* (DWR, 2016a).

Similar methodologies should be used in sampling surface water as have been described above for sampling groundwater. Samples should be collected from flowing streams (not stagnate ponded water). Samples can be collected directly from the water source and so pumps and the purging process described above, is not necessary for collecting surface water samples.

Section 2.7.2 describes Field Equipment and Instruments considerations. The following minimum field parameters should be collected at the time of sampling:

- Specific Conductivity or Electrical Conductivity (EC);
- pH - "Measurements of pH should only be measured in the field, lab pH analysis are typically unachievable due to short hold times" (DWR, 2016a); and
- Temperature.

Additional field parameters may include, but are not limited to, the following:

- Dissolved Oxygen (DO) (in situ measurements preferable);
- Oxidation/Reduction Potential (ORP); and
- Turbidity.

If field conditions require filtering (e.g., such as with turbid surface water), the water samples should be mechanically filtered using a 0.45-micron filter to remove suspended particulates prior to the samples being placed in the appropriate containers for laboratory analyses. Field filtered samples shall be noted on the accompanying chain of custody and with reported results.

"All samples requiring preservation must be preserved as soon as practically possible, ideally at the time of sample collection. Ensure that samples are appropriately filtered as recommended for the specific analyte. Entrained solids can be dissolved by preservative leading to inconsistent results of dissolve analytes. Specifically, samples to be analyzed for metals should be field-filtered prior to preservation; do not collect an unfiltered sample in a preserved container" (DWR, 2016a).

Monitoring entities in the basin should have specific analytical programs adapted for their respective monitoring networks. Laboratory analytical methods are described in Section 2.5 of this SAP. Surface water samples should be accompanied by full chain of custody documentation at all times (see Section 2.3.4).

2.2.3 Equipment Decontamination

Sampling decontamination between monitoring sites may be required, especially if a sampling site is known to contain transferable contaminants. If a site is known to be contaminated, dedicated or disposable sampling equipment should be used. Disposable gloves should be properly discarded between sampling sites.

The following excerpt is from DWR's BMP #1 (DWR, 2016a):
The sampler should clean the sampling port and/or sampling equipment and the sampling port and/or sampling equipment must be free of any contaminants. The sampler must decontaminate sampling equipment between sampling locations or wells to avoid cross-contamination between samples or wells.

Basin-specific examples include, but are not limited to, the following:

- Bailers used to sample shallow monitoring wells down-gradient from septic systems should not be used to sample any wells in the basin.
- Sampling pumps and the associated hardware (e.g., tubing) used in monitoring wells or other wells (e.g., abandoned production wells) should be matched to the analytes of concern for a particular well.

2.3 Sample Handling, Custody and Laboratory Coordination

Each sample collected by the field staff should be traceable from the point of collection through analysis and final disposition to ensure sample integrity. Sample integrity helps to ensure the legal defensibility of the analytical data and subsequent conclusions.

The following bullets are general guidance and standardized protocols recommended by DWR in BMP #1 (DWR, 2016a):

- *Prior to sampling, the sampler must contact the laboratory to schedule laboratory time, obtain appropriate sample containers, and clarify any sample holding times or sample preservation requirements.*
- *Each well used for groundwater quality monitoring must have a unique identifier. This identifier must appear on the well housing or the well casing to avoid confusion.*
- *Sample containers should be labeled prior to sample collection. The sample label must include: sample ID (often well ID), sample date and time, sample personnel, sample location, preservative used, and analytes and analytical method.*
- *Samples should be chilled and maintained at 4 °C to prevent degradation of the sample. The laboratory's Quality Assurance Management Plan should detail appropriate chilling and shipping requirements.*
- *Samples must be shipped under chain of custody documentation to the appropriate laboratory promptly to avoid violating holding time restrictions.*
- *Instruct the laboratory to use reporting limits that are equal to or less than the applicable DQOs or regional water quality objectives/screening levels."*

2.3.1 Site and Sample Identification

Each sampling location (groundwater and surface water) should be identified as clearly as possible (e.g., Well #1 is not an acceptable site identifier). *"Each well used for groundwater quality*

monitoring must have a unique identifier. This identifier must appear on the well housing or the well casing to avoid confusion" (DWR 2016a). All monitoring entities operating within the basin should use the same unique identifier scheme but where not practical (e.g., for historical network or other reasons), cross-over tables should be developed to identify monitoring sites within the basin. Blind duplicates should be clearly documented, with the actual well location listed in the logbook.

California Code of Regulations (23 CCR § 352.4) requires that the CASGEM Well Identification Number be used, if available, for identifying site locations. In addition, DWR identifies wells by State Well Number (SWN). SWNs are in an alphanumeric form (e.g., 04N18W20P01S) based on the public land grid (Township, Range and Section) which indicates geographic location of the well. In the SWN naming scheme, Sections are further subdivided into 1/16ths in which individual wells are numbered sequentially. The final letter in a SWN is the baseline and meridian of the public land grid in which the well lies. The following recommends naming conventions appropriate for different kinds of samples:

- **Groundwater samples.** CASGEM Well Identification Number and DWR State Well Numbers (SWN) are recommended for identifying well sampling sites in the basin.
- **Surface water samples.** A modified SWN format is recommended for identifying surface water sampling sites in the basin in the form: Township, Range and Section followed by "SW" and ending with individual sites within the section numbered sequentially (e.g., 04N17W29SW1)
- **Trip blanks, field blanks, and equipment blanks.** Samples should be designated TB, FB, and EB respectively.

2.3.2 Sample Labeling

A sample label should be affixed to each sample container. The label should be completed with the following information written in indelible ink:

- Sample location and identification number;
- Date and time of sample collection;
- Sample collector's initials;
- Preservation required; and
- Analysis required.

2.3.3 Sample Documentation

Documentation during sampling is essential to ensure proper sample identification. Field staff should adhere to the following general guidelines for maintaining field documentation:

- Documentation will be completed in permanent black or dark blue ink.
- All entries will be legible.
- Errors will be corrected by crossing out with a single line and then dating and initialing the lineout.
- Any serialized documents will be maintained by the monitoring entity and referenced in the site logbook.
- Unused portions of pages will be crossed out, and each page will be signed and dated.

The monitoring entity's supervisor is responsible for ensuring that sampling activities are properly documented.

2.3.4 Chain of Custody

Standard sample custody procedures should be used to maintain and document sample integrity during collection, transportation, storage, and analysis. A sample should be considered to be in custody if one of the following statements applies:

- It is in a person's physical possession or view.
- It is in a secure area with restricted access.
- It is placed in a container and secured with an official seal such that the sample cannot be reached without breaking the seal.

Chain of custody procedures provide an accurate written record that traces the possession of individual samples from the time of collection in the field to the time of acceptance at the laboratory. The chain of custody record should be used to document all samples collected and the analysis requested. Information that the field personnel should record on the chain of custody record includes the following:

- Sample location and identification number;
- Name and signature of sampler;
- Destination of samples (laboratory name);
- Date and time of collection;

- Analysis requested;
- Signatures of individuals involved in custody transfer, including the date and time of transfer;
- Airbill number (if applicable); and
- Monitoring entity supervisor's contact and phone number.

Unused lines on the chain of custody record should be crossed out. Field personnel should sign chain of custody records that are initiated in the field, and the airbill number should be recorded. The record should be placed in a waterproof plastic bag and taped to the inside of the shipping container used to transport the samples. Signed airbills serve as evidence of custody transfer between field personnel and the courier, and between the courier and the laboratory. Copies of the chain of custody record and the airbill should be retained and filed by field personnel before the containers are shipped.

2.3.5 Sample Shipment

The following procedures should be implemented if samples collected in accordance to this SAP are shipped:

- The shipping box should be filled with bubble wrap, sample bottles, and packing material. Sufficient packing material should be used to prevent sample containers from breaking during shipment.
- The chain of custody records should be placed inside a plastic bag. The bag should be sealed and taped to the inside of the cooler lid. The airbill, if required, should be filled out before the samples are handed over to the carrier. The laboratory should be notified if the sampler suspects that the sample contains any substance that would require laboratory personnel to take safety precautions.
- The shipping box should be closed and taped shut with strapping tape around both ends.
- Signed and dated custody seals should be placed on the front and side of each shipping box. Wide clear tape should be placed over the seals to prevent accidental breakage.
- The chain of custody record should be transported within the taped sealed shipping box. When the shipping box is received at the analytical laboratory, laboratory personnel should open the shipping box and sign the chain of custody record to document transfer of samples.

2.4 Sampling Containers and Holding Times

Confer with the ELAP certified analytical lab that will be receiving the samples for required containers for required sample volume, container type, preservation technique, and holding time for each analysis that is to be conducted on the groundwater samples collected. Required containers, preservation techniques, and holding times for field QC samples, such as field duplicates and MS/MSD samples (Section 2.6), should be the same as for field samples.

2.5 Analytical Methods

The source of analytical services to be provided will be determined by the individual entities conducting monitoring in the basin and should support the basin-specific DQOs presented in this SAP. EPA-approved methods for laboratory analyses of the samples should be used. Many of the general mineral, general physical and metals constituents (analytes or chemicals) listed in Table 1-6 are commonly sampled for in the basin by various entities. EPA-approved standard analytical methods are associated with each constituent listed in the table. As mentioned above, operators of potable water systems are required to sample for a variety of additional constituents including organic compounds.

Constituent	Analytical Method
General Mineral	
Aggressive Index	SM 4500HB
Bicarbonate as HCO3	EPA 2320B
Boron	EPA 200.7
Calcium	EPA 200.7
Carbonate as CO3	EPA 2320B
Chloride	EPA 300.0
Copper	EPA 200.7
Fluoride	EPA 300.0
Hydroxide as OH	EPA 2320B
Iron	EPA 200.7
Langlier Index (20°C)	SM 4500HB
Magnesium	EPA 200.7
Manganese	EPA 200.7
MBAS Screen (Foaming Agents)	SM 5540C
Nitrate + Nitrite as N	EPA 300.0
Nitrate as NO3	EPA 300.0
Nitrate Nitrogen	EPA 300.0
Nitrite as N	EPA 300.0
pH (Field)	-
Potassium	EPA 200.7
Sodium	EPA 200.7
Sodium Absorption Ratio (SAR)	EPA 200.7
Specific Conductivity	EPA 2510B
Sulfate	EPA 300.0
Total Alkalinity (as CACO3)	EPA 2320B
Total Anions	EPA 200.7
Total Cations	EPA 200.7
Total Dissolved Solids_SUM	EPA 200.7
Total Dissolved Solids_TFR	EPA 2540C
Total Hardness as CaCO3	EPA 200.7
Zinc	EPA 200.7
General Physical	
Color	SM 2120B
Odor	SM 2150B
Temperature (Field)	-
Turbidity	SM 2130B
Microbiology	
Total Coliform P/A	SM 9223B
Total Coliform (Enumeration)	SM 9223B

Constituent	Analytical Method
Inorganic Chemicals (IOC) - Metals	
Aluminum	EPA 200.8
Antimony	EPA 200.8
Arsenic	EPA 200.8
Barium	EPA 200.8
Beryllium	EPA 200.8
Cadmium	EPA 200.8
Chromium	EPA 200.8
Lead	EPA 200.8
Mercury	EPA 245.1
Nickel	EPA 200.8
Selenium	EPA 200.8
Silver	EPA 200.8
Thallium	EPA 200.8
Vanadium	EPA 200.8
1,2,3 - Trichloropropane	SRL 524M-TCP
Carbamates	EPA 531.1
Chlorinated Pesticides	EPA 505
Chromium VI	EPA 218.6
Diquat	EPA 549.2
EDB & DBCP	EPA 504.1
Endothall	EPA 548.1
Glyphosate	EPA 547
Gross Alpha	EPA 900.0
Haloacetic Acids	EPA 552.2
Herbicides	EPA 515.3
Nitrogen Phosphorus Pesticides	EPA 507
Radium-228	EPA Ra-05
Perchlorate	EPA 314.0
Total Alpha Emitting Radium-226	EPA 903.0
Total Cyanide (CN)	SM 4500-CN C,E
Trihalomethanes	EPA 551.1
Uranium	EPA 908.0
VOC's Full List	EPA 524.2
Asbestos	EPA 100.2
Dioxin (AQ/Solid) - 2,3,7,8, TCDD Only	EPA 1613
Organic Compounds in Drinking Water	EPA 525.2

Table 1-6. Laboratory Analytical Methods.

If an analytical system fails, the laboratory QA officer should be notified, and corrective action should be taken. In general, laboratory corrective actions should include stopping the analysis,

examining instrument performance and sample preparation information, and determining the need to reprepare and/or reanalyze the samples.

TDS can be reported by either Total Filterable Residue (TFR) or by Summation (SUM), which is calculated by summing the mass of the major anions and cations in a water sample. TDS by Summation commonly yields a slightly higher value than the TDS by Total Filterable Residue. The wet chemistry evaporative method (TFR) is now the standard laboratory analysis for TDS and is recommended method for water sample analysis in the basin.

2.6 Water Quality Assurance and Quality Control

Various field and laboratory QC samples and measurements should be used to verify that analytical data meet the QA objectives. It is recommended that field QC samples and measurements be collected to assess the influence of sampling activities and measurements on data quality. Similarly, laboratory QC samples should be used to assess how the laboratory's analytical program influences data quality. This section describes the QC samples that are recommended to be analyzed during the site sampling activities. Table 1-3 shows the acceptance criteria for each type of QC sample. Table 1-7 specifies the recommended frequency of QC samples to be collected at the site.

Field Quality Control Sample	Frequency for Soil Matrix
Field duplicate	1 per 10 samples, rounded up
Equipment rinsate blank	1 per sampling event (run)
Matrix spike/matrix spike duplicate [a] (organics only)	1 per 20 samples
Matrix spike/matrix duplicate [b] (inorganics only)	1 per 20 samples
Trip blank	1 with each cooler containing aqueous samples for VOC analysis
Temperature blank	1 per cooler

[a] Matrix spike, matrix spike duplicate, and matrix duplicate analyses are technically not field quality control samples; however, they generally require that the field personnel collect additional volume of sample, and are therefore included on this table for easy reference.

Table 1-7. Frequency of Field Quality Control Samples.

All laboratories that perform analytical work under this SAP should adhere to a QA program that is used to monitor and control all laboratory QC activities. Each laboratory must have a written QA manual that describes the QA program in detail. The laboratory QA manager is responsible for ensuring that all laboratory internal QC checks are conducted in accordance with EPA methods and protocols, the laboratory's QA manual, and the requirements of this SAP.

Many of the laboratory QC procedures and requirements are described in EPA-approved analytical methods, laboratory method SOPs, and method guidance documents.

2.6.1 Field Quality Control Samples

Field QC samples should be collected and analyzed to assess the quality of data that are generated by sampling activities. These samples include laboratory QC samples collected in the field, field duplicates, equipment rinsates, MS/MSDs, and trip blanks. A temperature blank should be included. QC samples collected in the field for fixed laboratory analysis are presented in Table 1-7.

Field duplicates are independent samples that are collected as close as possible, in space and time, to the original investigative sample. Field duplicates can measure the influence of sampling and field procedures on the precision of an environmental measurement. They can also provide information on the heterogeneity of a sampling location. Field duplicates should be collected as listed in Table 1-7.

Equipment rinsate blanks are collected when non-dedicated or non-disposable sampling equipment is used to collect samples and put the samples into containers. One equipment blank should be collected per sampling event (run).

MS/MSDs are laboratory QC samples that are associated with analytical methods for organics. MSs are typically associated with analytical methods for inorganics. In the laboratory, MS/MSDs and MSs are split and spiked with known amounts of analytes. Analytical results for MS/MSDs and MSs and laboratory duplicate samples are used to measure the precision and accuracy of the laboratory's organic and inorganic analytical programs, respectively. Each of these QC samples should be collected and analyzed at a frequency of 1 for every 20 investigative samples or 1 method blank per batch if the batches consist of fewer than 20 samples.

Temperature blanks are containers of deionized or distilled water that are placed in each cooler shipped to the laboratory. Their purpose is to provide a container to test the temperature of the samples in the respective cooler.

2.6.2 Laboratory Quality Control Samples

EPA methods specify the preparation and analysis of QC samples. These samples may include, but are not limited to, the following types: (1) LCSs, (2) method blanks, (3) MS and MSD samples, (4) matrix duplicate (MD) samples, (5) surrogate spikes, and (6) standard reference materials or independent check standards. The following subsections discuss the QC checks that should be implemented.

2.6.2.1 Laboratory Control Samples

LCSs are thoroughly characterized, laboratory-generated samples that are used to monitor the laboratory's day-to-day performance of analytical methods. The results of LCS analyses are compared to well-defined laboratory control limits to determine whether the laboratory system is

in control for the particular method. If the system is not in control, corrective action should be implemented. Appropriate laboratory corrective actions include (1) stopping the analysis, (2) examining instrument performance or sample preparation and analysis information, and (3) determining whether samples should be reprepared or reanalyzed.

2.6.2.2 Method Blanks

Method blanks, which are also known as preparation blanks, are analyzed to assess the level of background interference or contamination in the analytical system and the level that may lead to elevated concentration levels or false positive data. Method blanks should be required for all laboratory analyses and should be prepared and analyzed at a frequency of 1 method blank for every 20 samples, or 1 method blank per batch if the batch consists of fewer than 20 samples.

A method blank consists of reagents that are specific to the analytical method and are carried through every aspect of the analytical procedure, including sample preparation, cleanup, and analysis. The results of the method blank analysis should be evaluated in conjunction with other QC information to determine the acceptability of the data generated for that batch of samples. Ideally, the concentration of a target analyte in the method blank should be below the reporting limit for that analyte. For some common laboratory contaminants, a higher concentration may be allowed.

If the method blank for any analysis is beyond control limits, the source of contamination should be investigated, and appropriate corrective action should be taken and documented. This investigation includes an evaluation of the data to determine the extent of the contamination and its effect on sampling results. If a method blank is within control limits but analysis indicates a concentration of analytes that is above the reporting limit, an investigation should be conducted to determine whether any corrective action could eliminate an ongoing source of target analytes.

For organic and inorganic analyses, the concentration of target analytes in the method blank must be below the reporting limit for that analyte for the blank to be considered acceptable. An exception may be made for common laboratory contaminants (such as methylene chloride, acetone, 2-butanone, and phthalate esters) that may be present in the blank at up to five times the reporting limit. These compounds are frequently detected at low levels in method blanks from materials that are used to collect, prepare, and analyze samples for organic parameters.

2.6.2.3 Matrix Spikes and Matrix Spike Duplicates

MSs and MSDs are aliquots of an environmental sample to which known concentrations of target analytes and compounds have been added. The MS is used to evaluate the effect of the sample matrix on the accuracy of the analysis. If there are many target analytes, they should be divided into two to three spike standard solutions. Each spike standard solution should be used alternately. The MS, in addition to an unspiked aliquot, should be taken through the entire analytical procedure, and the recovery of the analytes should be calculated. Results should be expressed in terms of percent recoveries and RPD. The percent recoveries of the target analytes and compounds are calculated and used to determine the effects of the matrix on the precision and accuracy of the method. The RPD between the MS and MSD results is used to evaluate method precision.

The MS/MSD is divided into three separate aliquots, two of which are spiked with known concentrations of target analytes. The two spiked aliquots, in addition to an unspiked sample aliquot, are analyzed separately, and the results are compared to determine the effects of the matrix on the precision and accuracy of the analysis. Results should be expressed as RPD and percent recovery and compared to control limits that have been established for each analyte. If results fall outside control limits, corrective action should be performed.

2.6.2.4 Laboratory (Matrix) Duplicates

MDs, which are also called laboratory duplicates, are prepared and analyzed for inorganic analyses to assess method precision. Two aliquots of sample material are taken from the sample and processed simultaneously without adding spiking compounds. The MD and the original sample aliquot are taken through the entire analytical procedure, and the RPD of the duplicate result is calculated. Results are expressed as RPD and are compared to control limits that have been established for each analyte.

2.6.2.5 Surrogate Spikes

Surrogates are organic compounds that are similar to the analytes of interest in chemical properties but are not normally found in environmental samples. Surrogates are added to field and QC samples before the samples are extracted to assess the efficacy of the extraction procedure and to assess the bias that is introduced by the sample matrix. Results are reported

in terms of percent recovery. Individual analytical methods may require sample reanalysis based on surrogate criteria.

The laboratory should use surrogate recoveries mainly to assess matrix effects on sample analysis. Obvious problems with sample preparation and analysis (such as evaporation to dryness or a leaking septum) that can lead to poor surrogate spike recoveries must be eliminated before low surrogate recoveries can be attributed to matrix effects.

2.6.3 Common Data Quality Indicators

This section describes how QA objectives for precision, accuracy, completeness, and sensitivity are measured, calculated, and reported.

2.6.3.1 Precision

Precision of many analyses is assessed by comparing analytical results of MS and MSD sample pairs for organic analyses, field duplicate samples, laboratory duplicate samples, MDs, and field replicate measurements. If precision is calculated from two measurements, it is normally measured as RPD. If precision is calculated from three or more replicates, it is measured as relative standard deviation.

2.6.3.2 Accuracy

The accuracy of many analytical methods is assessed by using the results of MS and MSD samples for organic analyses, MS samples for inorganic analyses, surrogate spike samples, LCSs, standard reference materials, independent check standards, and measurements of instrument responses against zero and span gases.

For measurements in which spikes are used, percent recovery should be calculated.

2.6.3.3 Completeness

Completeness is a measure of the percentage of basin-specific data that are valid. Valid data are obtained when samples are collected and analyzed in accordance with QC procedures outlined in this SAP, and when none of the QC criteria that affect data usability are exceeded.

When all data validation is completed, the percent completeness value should be calculated by dividing the number of usable results by the total number of sample results planned for this investigation.

Completeness should also be evaluated as part of the DQA process (U.S. EPA, 2000). This evaluation will help determine whether any limitations are associated with the decisions to be made based on the data collected.

2.6.3.4 Sensitivity

The achievement of MDLs depends on instrument sensitivity and matrix effects. Therefore, it is important to monitor the instrument sensitivity to ensure data quality and to ensure that analyses meet sensitivity requirements with respect to SAP QA objectives (Section 1.3.2).

2.7 Water Quality Instrument and Equipment Testing, Inspection, and Maintenance Requirements

This section outlines testing, inspection, and maintenance procedures for field equipment and instruments and for laboratory instruments.

2.7.1 General Requirements

Testing, inspection, and maintenance methods and frequency should be based on the following:

- The type of instrument;
- The instrument's stability characteristics;
- The required accuracy, sensitivity, and precision of the instrument;
- The instrument's intended use, considering basin-specific DQOs;
- Manufacturer's recommendations; and
- Other conditions that affect measurement or operational control.

For most instruments, preventive maintenance is performed in accordance with procedures and schedules recommended in (1) the instrument manufacturer's literature or operating manual or (2) SOPs associated with particular applications of the instrument.

In some cases, testing, inspection, and maintenance procedures and schedules will differ from the manufacturer's specifications or SOPs. This can occur when a field instrument is used to

make critical measurements or when the analytical methods that are associated with a laboratory instrument require more frequent testing, inspection, and maintenance.

2.7.2 Field Equipment and Instruments

After the field equipment and instruments arrive in the field, they should be inspected for damage and the beginning and end of each day of use. Damaged equipment and instruments should be replaced or repaired immediately, if practicable. Battery-operated equipment (e.g., EC/pH meter) should be checked to ensure full operating capacity; if needed, batteries should be recharged or replaced.

Following use, field equipment should be properly decontaminated. Any equipment problems should be reported so that problems are not overlooked and any necessary equipment repairs are performed before the next use of the equipment.

2.7.3 Laboratory Instruments

All laboratories that analyze samples collected in accordance with this SAP must have a preventive maintenance program that addresses (1) testing, inspection, and maintenance procedures and (2) the maintenance schedule for each measurement system and required support activity. This program is usually documented by an SOP for each analytical instrument that is to be used. The program will typically be laboratory specific; however, it should follow requirements outlined in EPA-approved guidelines. Some of the basic requirements and components of such a program are as follows:

- As a part of its QA/QC program, each laboratory will conduct a routine preventive maintenance program to minimize instrument failure and other system malfunction.
- An internal group of qualified personnel will maintain and repair instruments, equipment, tools, and gauges. Alternatively, manufacturers' representatives may provide scheduled instrument maintenance and emergency repair under a repair and maintenance contract.
- The laboratory will perform instrument maintenance on a regularly scheduled basis. The scheduled service of critical items should minimize the downtime of the measurement system. The laboratory will prepare a list of critical spare parts for each instrument. The laboratory will request the spare parts from the manufacturer and will store the parts.

- Testing, inspection, and maintenance procedures described in laboratory SOPs will be performed in accordance with manufacturer's specifications and the requirements of the specific analytical methods that are used.
- All maintenance and service should be documented in service logbooks (or the site-specific logbook) to provide a history of maintenance records. A separate service logbook should be kept for each instrument. All maintenance records will be traceable to the specific instrument, equipment, tool, or gauge.
- The laboratory will maintain and file records that are produced as a result of tests, inspections, or maintenance of laboratory instruments. If necessary, these records will be available for review by internal and external laboratory system audits.

2.8 Instrument Calibration and Frequency

All laboratory equipment that is used to analyze samples collected in accordance with this SAP should be calibrated on the basis of written SOPs that are maintained by the laboratory. Calibration records (including the dates and times of calibration and the names of the personnel performing the calibration) should be filed at the location at which the analytical work was performed and maintained by the laboratory personnel who performed QC activities. The laboratory QA manager is responsible for ensuring that all laboratory instruments are calibrated in accordance with the requirements of this SAP

Subcontracted laboratories may conduct laboratory work if the primary laboratory is not ELAP certified to perform requested analysis or cannot meet requested turnaround times. Subcontracted laboratories are subject to the same requirements as the primary sample receiving laboratory.

The laboratories should follow the method specific calibration procedures and requirements for laboratory measurements. Calibration procedures and requirements should also be provided, as appropriate, for laboratory support equipment, such as balances, mercury thermometers, pH meters, and other equipment that is used to take chemical and physical measurements.

3. Groundwater Level Data Generation and Acquisition Protocol

An objective of this SAP is to describe groundwater data collection procedures that will produce reliable basin-specific water level data that can be used to evaluate sustainability in the basin with respect to the SGMA legislation sustainability indicators. This section details activities associated with measuring water levels in wells, including field methods to be implemented and steps that should be undertaken to ensure the adequacy of the data collection activities.

DWR's BMP #1 (DWR, 2016a) includes the following considerations for developing groundwater level protocols:

- Groundwater level data are taken from the correct location, well ID, and screen interval depth
- Groundwater level data are accurate and reproducible
- Groundwater level data represent conditions that inform appropriate basin management DQOs
- All salient information is recorded to correct, if necessary, and compare data
- Data are handled in a way that ensures data integrity

3.1 Groundwater Level Field Documentation and Record Keeping

This Section discusses the requirements for documenting water level measurement activities. Field personnel should follow the documentation guidelines outlined in DWR's BMP #1 - *Monitoring Protocols, Standards, and Sites* (DWR, 2016a).

Field personnel should use monitoring network specifically prepared forms ("run sheets") or permanently bound field logbooks with sequentially numbered pages to record and document field activities. Example water level data collection forms are included in *Groundwater technical procedures of the U.S. Geological Survey: U.S. Geological Survey Techniques and Methods 1–A1* (USGS, 2011). All paper field documentation should be scanned and archived by the monitoring entity.

General field-site documentation information should be on file with the monitoring agency that includes any access agreements (see Section 1.6) and associated property information. All field forms and logbooks should include and record at a minimum, the following information:

- Well identifier - CASGEM Well Identification Number and CA DWR SWN are recommended (see Section 2.3.1 for a description of DWR's well identification convention);
- Monitoring schedule event/list (e.g., fall water level run);
- Date and time (24-hour format) of measurement; and
- Comments/ Notes field
    - Discussions of problems encountered and their resolution
    - Discussions of deviations from the monitoring entity's water level measuring SOP or other governing documents
    - Factors that may influence the depth to water readings (see Section 3.4.1).

Documentation of water level measurements is essential to ensure data integrity. Field staff should adhere to the following general guidelines for maintaining field documentation:

- Documentation will be completed in permanent black or dark blue ink.
- All entries will be legible.
- Errors will be corrected by crossing out with a single line and then dating and initialing the lineout.
- Any serialized documents will be maintained by the monitoring entity and referenced in the site logbook.
- Unused portions of pages will be crossed out, and each page will be signed and dated.

The monitoring entity's supervisor is responsible for ensuring that water level measurement activities are properly documented. The following subsections offer common "no measurement" obtained explanations and data qualifiers. It is important that monitoring entities maintain standardized lists of data qualifiers and all field staff understand the intended meaning (i.e., field conditions) of each qualifier so that they are applied in a standardized and consistent manner.

3.1.1 No Measurement Documentation

The following are common explanations for why a water level measurement was not obtained by field staff while accessing a well-site listed on a monitoring network schedule. Each of the bulleted explanations shown below can be assigned a unique number in a list maintained by a monitoring entity that allows field staff to quickly and efficiently document the field conditions that prohibited

a water level measurement from being obtained. A list of commonly used qualifiers is included below. Documentation may include, but is not limited to, the following explanations:

- Measurement Discontinued;
- Pumping;
- Pump house locked;
- Tape hung up;
- Can't get tape in casing;
- Unable to locate well;
- Well has been destroyed;
- Special/Other (requires explanation in comments field);
- Casing leaking or wet;
- Temporarily inaccessible;
- Well dry; and
- Unmeasured flowing well.

If a water level is not obtained, the minimum site visit information, outlined above, should still be collected. Documenting well-site conditions can help inform future data collection efforts in the basin. For example, if a well is pumping multiple site visits in a row, it may warrant contacting the well owner or operator to schedule a time to measure the well when it will be off.

3.1.2 Water Level Measurement Qualifiers

The following are common water level measurement qualifiers that that can be assigned a unique number in a list maintained by a monitoring entity that allows field staff to quickly and efficiently document ancillary information associated with a water level measurement. Commonly used by qualifiers are included below.

- Caved or deepened;
- Pumping;
- Nearby pump operating;
- Casing leaking or wet;
- Pumped recently;
- Air or pressure gauge measurement;

- Special/Other (requires explanation in comments field);
- Recharge operation at or nearby well;
- Oil in Casing;
- Acoustic sounder;
- Measured flowing well; and
- Does not match transducer record.

3.2 Scheduling of Groundwater Level Monitoring Events

Groundwater levels in California basins are often at their highest annual levels during the spring of each year following winter precipitation. They are often at their lowest in the fall preceding the start of the winter rainy season with much of the annual precipitation falling from November through February in the basin. Temporal coordination of groundwater level collection activities across the State is important for comparison of water level measurements collected by different monitoring entities. DWR's BMP #2 specifies that *"Groundwater levels will be collected during the middle of October and March for comparative reporting purposes"* (DWR, 2016b)

The following excerpt is from DWR's BMP 1:
"Groundwater elevation data will form the basis of basin-wide water-table and piezometric maps, and should approximate conditions at a discrete period in time. Therefore, all groundwater levels in a basin should be collected within as short a time as possible, preferably within a 1 to 2 week period" (DWR, 2016a).

Likely water levels will be collected by Inyo County, Bishop, CSD's, and Mono County, as part of their established monitoring networks in the basin during other times of the year for various purposes, but as tight (small) a monitoring event window as reasonably possible should be scheduled around October and March of each year. These recommended spring-high water level measurement runs centering around April 1 and fall-low runs around October 1 are to conform to DWR's timing preference (mentioned above) for producing comparative state-wide record sets. Public water supply systems (e.g., City of Bishop) often have other sampling or measurement requirements (e.g., weekly water level measurements, quarterly or annual water quality sampling and analysis) as requirement of permits to serve potable water supplies.

3.3 Groundwater Level Equipment Testing, Inspection, and Maintenance Requirements

This section outlines testing, inspection, and maintenance procedures for field equipment and water level measurement devices.

3.3.1 General Requirements

Testing, inspection, and maintenance methods and frequency should be based on the following:

- The type of water level measurement device;
- The instrument's stability characteristics;
- The required accuracy, sensitivity, and precision of the equipment;
- The equipment's intended use, considering basin-specific DQOs;
- Manufacturer's recommendations; and
- Other conditions that affect measurement or operational control.

For most equipment, preventive maintenance is performed in accordance with procedures and schedules recommended in (1) the manufacturer's literature or operating manual or (2) SOPs associated with particular applications of the measurement device.

3.3.2 Manual Water Level Measurement Equipment

After field equipment and measurement devices are transported to the field, they should be inspected for damage at the beginning and end of each day of use. Damaged equipment should be replaced or repaired immediately, if practicable. Battery-operated equipment (e.g., electric sounder) should be checked to ensure full operating capacity; if needed, batteries should be replaced.

Following use, field equipment should be properly decontaminated. Any equipment problems should be reported so that problems are not overlooked and any necessary equipment repairs are performed before the next use of the equipment. Common water level measurement devices are listed below:

- Steel Surveyor's Measuring Tape;
- Electric Sounder (single wire and dual wire);

- Acoustic Sounder; and
- Permanently Installed Air Line.

For air line measurements, gauge reading is recorded after pressurizing with a pneumatic pump or compressed air tank. The depth of the bottom of the submerged tubing in the well open to the atmosphere must be known to calculate the water level in the well from the measured pressure.

3.3.3 Recording Water Level Devices - Pressure Transducer and Data Loggers

Pressure transducer and data logger monitoring networks are becoming commonplace in many groundwater basins. These devices can be used for recording water level measurements in wells on user defined or event based schedules.

The electronics components of the device are sealed in a housing that is installed below the water level surface in the well. They measure pressure (commonly in psi) above the sensor. For every 1 psi of pressure recorded by the gauge, there are 2.31 feet of potentiometric head above the sensor. A simple linear correction (coefficient) can be applied to adjust output readings to depth-to-water in the well or water level elevation referenced to mean sea level (given a RP elevation has been surveyed for the site). The devices can be downloaded during well-site visits or can be connected to telemetry systems to transmit data remotely.

The following excerpt is from DWR's BMP #1 (DWR, 2016a) and provides guidance on the use of pressure transducers and data loggers as a component of the monitoring plan for a basin:
When installing pressure transducers, care must be exercised to ensure that the data recorded by the transducers is confirmed with hand measurements.

The following general protocols must be followed when installing a pressure transducer in a monitoring well:

- *The sampler must use an electronic sounder or chalked steel tape and follow the protocols listed above to measure the groundwater level and calculate the groundwater elevation in the monitoring well to properly program and reference the installation. It is recommended that transducers record measured groundwater level to conserve data capacity; groundwater elevations can be calculated at a later time after downloading.*
- *The sampler must note the well identifier, the associated transducer serial number, transducer range, transducer accuracy, and cable serial number.*

- *Transducers must be able to record groundwater levels with an accuracy of at least 0.1 foot. Professional judgment should be exercised to ensure that the data being collected is meeting the DQO and that the instrument is capable. Consideration of the battery life, data storage capacity, range of groundwater level fluctuations, and natural pressure drift of the transducers should be included in the evaluation.*
- *The sampler must note whether the pressure transducer uses a vented or non-vented cable for barometric compensation. Vented cables are preferred, but non-vented units provide accurate data if properly corrected for natural barometric pressure changes. This requires the consistent logging of barometric pressures to coincide with measurement intervals.*
- *Follow manufacturer specifications for installation, calibration, data logging intervals, battery life, correction procedure (if non-vented cables used), and anticipated life expectancy to assure that DQOs are being met for the GSP.*
- *Secure the cable to the well head with a well dock or another reliable method. Mark the cable at the elevation of the reference point with tape or an indelible marker. This will allow estimates of future cable slippage.*
- *The transducer data should periodically be checked against hand measured groundwater levels to monitor electronic drift or cable movement. This should happen during routine site visits, at least annually or as necessary to maintain data integrity.*
- *The data should be downloaded as necessary to ensure no data is lost and entered into the basin's DMS following the QA/QC program established for the GSP. Data collected with non-vented data logger cables should be corrected for atmospheric barometric pressure changes, as appropriate. After the sampler is confident that the transducer data have been safely downloaded and stored, the data should be deleted from the data logger to ensure that adequate data logger memory remains.*

3.4 Groundwater Level Measurements and Related Field Activities

Water level measurements from wells in the basin should be performed in accordance with the monitoring entities' SOPs that should adhere to the standard methods detailed in *Groundwater technical procedures of the U.S. Geological Survey: U.S. Geological Survey Techniques and Methods 1–A1* (USGS, 2011). *"Well construction, anticipated groundwater level, groundwater*

level measuring equipment, field conditions, and well operations should be considered prior collection of the groundwater level measurement" (DWR, 2016a).

3.4.1 Well-Site Conditions Assessment and Pre/Post-Measurement Activities

Upon arriving at a well-site, a basic site conditions assessment should be conducted. If the well being monitored is not a dedicated monitor well and is equipped with a pump, check to see if the pump is in operation or for other indicators that the pump was in operation recently (e.g., warm motor, wet adjacent irrigated fields or water around the well not associated with rain events). Do not measure the water level in the well if it is pumping unless instructed to do so by the monitoring entity's supervisor. Document *"factors that may influence the depth to water readings such as weather, nearby irrigation, flooding, potential for tidal influence [not applicable for the Owens Valley Groundwater Basin], or well condition*" (DWR, 2016a). Document any site conditions findings that do not result in a water level measurement according to Section 3.1.1, and qualify water level measurements, as appropriate, with qualifiers listed in Section 3.1.2.

The sampler should remove the appropriate cap, lid, or plug that covers the monitoring access point listening for pressure release. If a release is observed, the measurement should follow a period of time to allow the water level to equilibrate" (DWR, 2016a). *"If agricultural or municipal wells are used for monitoring, the wells must be screened across a single water-bearing unit, and care must be taken to ensure that pumping drawdown has sufficiently recovered before collecting data from a well"* (DWR, 2016b). After measuring the well, *"The sampler should replace any well caps or plugs, and lock any well buildings or covers"* (DWR, 2016a).

3.4.2 Reference Points and Surveying

If not previously measured and recorded for the site, or the former measurement is no longer valid (e.g., the surface casing was sheared off as the result of being run over by a truck), the reference point (RP) height in feet (above or below ground surface) should be measured. "*Depth to groundwater must be measured relative to an established Reference Point (RP) on the well casing. The RP is usually identified with a permanent marker, paint spot, or a notch in the lip of the well casing. By convention in open casing monitoring wells, the RP reference point is located on the north side of the well casing. If no mark is apparent, the person performing the measurement should measure the depth to groundwater from the north side of the top of the well casing"* (DWR, 2016a).

Ground elevation and top of casing elevation reference points should be measured to North American Vertical Datum 1988 (NAVD88) within 0.5 foot accuracy (23 CCR § 352.4) and a higher level of accuracy of 0.1 foot or less is preferred.

The locations of the monitoring wells on the land surface should be surveyed to North American Datum 1983 (NAD83) to an accuracy of 0.1 foot. DWR's standard horizontal projected coordinate system is California Teale Albers, NAD83. Feature class (location) data uploaded through the SGMA portal is required to be converted to this projected coordinate system for consistency across data sets. The OVGA's online database (www.owens.gladata.com) uses NAD 1983.

"*Survey grade global navigation satellite system (GNSS) global positioning system (GPS) equipment can achieve similar vertical accuracy when corrected. Guidance for use of GPS can be found at USGS http://water.usgs.gov/osw/gps/. Hand-held GPS units likely will not produce reliable vertical elevation measurement accurate enough for the casing elevation consistent with the DQOs and regulatory requirements"* (DWR, 2016a).

"Geographic locations shall be reported in GPS coordinates by latitude and longitude in decimal degree to five decimal places, to a minimum accuracy of 30 feet, relative to NAD83, or another national standard that is convertible to NAD83" (23 CCR § 352.4).

3.4.3 Measuring Groundwater Levels in Water Wells

Depth to groundwater should be measured to a minimum accuracy of 0.1 feet (23 CCR § 352.4) with a desired accuracy of 0.01 feet relative to the RP. "*Measure depth to water in the well using procedures appropriate for the measuring device. Equipment must be operated and maintained in accordance with manufacturer's instructions"* (DWR, 2016a). Measurements must be in consistent units. Recommended units are feet, partitioned into tenths of feet, and hundredths of feet. The use of feet and inches is not recommended. "*Air lines and acoustic sounders may not provide the required accuracy of 0.1 foot"* (DWR, 2016a).

Groundwater elevation is calculated as follows:

$$\mathrm{WLE} = \mathrm{RP} - D\mathrm{TW}$$

Where:

WLE = Groundwater Level Elevation

RP = Reference Point Elevation

DTW = Depth to Water

"For measuring wells that are under pressure, allow a period of time for the groundwater levels to stabilize. In these cases, multiple measurements should be collected to ensure the well has reached equilibrium such that no significant changes in water level are observed. Every effort should be made to ensure that a representative stable depth to groundwater is recorded. If a well does not stabilize, the quality of the value should be appropriately qualified as a questionable measurement" (DWR, 2016a).

3.4.3.1 Flowing Wells

A special condition associated with confined aquifer systems (see Section 1.1.8) are naturally flowing wells (artesian) wells where the potentiometric head in the well rises above the land surface. If a monitored well is found to be flowing (i.e., naturally without the aid of a pump) after removal of the well cap, the condition should be documented. If appropriate and safe, the well should be measured. *"Site specific procedures should be developed to collect accurate information and be protective of safety conditions associated with a pressurized well. In many cases, an extension pipe may be adequate to stabilize head in the well. Record the dimension of the extension and document measurements and configuration"* (DWR, 2016a).

Two methods of measuring flowing wells are summarized below:

- Use of tubing or an extension pipe (appropriate for low artesian pressures). Water level under pressure from the flowing well rises in the tube/pipe to a height that is measured above the top of the well casing with respect to the established RP.
- Use of a pressure gauge (commonly applied where high artesian pressures make use of tubing/extension pipes impractical). For every 1 psi of pressure recorded by the gauge, there are 2.31 feet of potentiometric head above the gauge.

3.4.3.2 Periodically Dry Wells

If a well is dry, then document the total depth of the well (TD). If water level is measured near the TD of the well, professional judgment must be used to decide if the measurement is actually representative of the aquifer zone the well is completed in. Many wells have a sump (blank casing with a bottom cap) at the bottom of the well. Ten to 20-foot sumps are common in irrigation and

production wells. Water level measurements that approach the TD of a well should be considered suspect unless the construction of the well is known and it has been determined that the water is not evaporation (condensation) water in the bottom of the well with the actual water level of the aquifer some distance below the bottom of the well.

3.4.4 Equipment Decontamination

"The water level meter should be decontaminated after measuring each well" (DWR, 2016a). Equipment decontamination is especially important if a monitoring well-site is known to contain transferable contaminants. If a site is known to be contaminated, dedicated equipment or thorough decontamination after each use may be necessary. Disposable gloves should be properly discarded between sampling sites.

3.5 Groundwater Level Quality Assurance and Quality Control

ICWD and Mono County have QA and QC measures in place to maintain the quality of the data collected by their individual monitoring networks. DWR recommends that *"All data should be entered into the GSA data management system (DMS) as soon as possible. Care should be taken to avoid data entry mistakes and the entries should be checked by a second person for compliance with the DQOs"* (DWR, 2016a).

As mentioned above, OVGA acts as the clearinghouse for water level data collected in the basin. This arrangement provides an additional QA/QC check for water level data collected in the basin by standardizing reference points and the use of data qualifiers associated with water level measurements. If any collected data are found to be suspect, OVGA can contact the originating source of the data (entity that collected the water level measurements) and resolves any apparent issues before upload to the State's database.

4. Requirements for Inspection and Acceptance of Supplies and Consumables

Individual monitoring network managers and supervisors are responsible for identifying the types and quantities of supplies and consumables that are needed for collecting the samples and groundwater level measurements described in this SAP. When supplies are received, field personnel should inspect the condition of all supplies before the supplies are accepted for use. If the supplies do not meet the monitoring entities acceptance criteria (e.g., non-expired field meter calibration standards), the supplies should be rejected.

5. Non-Direct Measurements

For this SAP, it is anticipated that Iinyo County, Bishop, or CSD's or their consultants will acquire data from non-direct measurements such as databases, spreadsheets, and literature files. In addition, these entities may acquire well owner verbally reported data (e.g., verbal water level measurement). Professional judgment and comparison to direct-measurements will be necessary in assessing the usefulness of non-direct measurements in GSP preparation.

6. Data Management

"Each Agency shall develop and maintain a data management system that is capable of storing and reporting information relevant to the development or implementation of the Plan and monitoring of the basin" (23 CCR § 352.6).

6.1 Water Quality Data

When appropriate, the data should be obtained from the analytical service provider in the form of an EDD, in addition to the required hard copy analytical data package. Formal verification of data should be conducted before associated results are presented or are used in subsequent activities.

Data tracking is essential to ensure timely, cost-effective, and high-quality results. Data tracking begins with sample chain of custody. When the analytical service provider receives custody of the samples, the provider should send a sample acknowledgment to the supervisor of the monitoring network entity. The sample acknowledgment confirm sample receipt, condition, and required analyses. The chain of custody forms should contain all pertinent information about each sample and can track the data at each phase of the process.

Data should be imported into the monitoring entities electronic database and shared with the OVGA clearing house for the agency's use annually at a minimum.

6.2 Water Level Data

Data should be imported into the monitoring entities electronic database and shared with the OVGA clearing house on a minimum frequency of once a year. Water level elevation data appropriately and all data qualifiers (Section 3.1.2) and associated water level measurements should be entered into the database along with any no measurement explanations (Section 3.1.1) documented in the field collection effort should be entered into the database along with the measured water levels.

7. Assessment, Response Actions, and Reports to Management

7.1 Assessment and Response Actions

The SAP QA Officer should conduct a readiness review immediately prior to major data collection tasks in the basin. The QA Officer should report findings to the OVGA Executive Manager, who should take corrective action (if necessary) before the data collection task begins. The OVGA Executive Manager and QA Officer should thoroughly debrief field staff a short time after beginning their respective implementation tasks if any emerging/unanticipated problems are reported and take corrective action, if necessary.

7.2 Reporting to Management

An annual report, after submittal of the basins' GSP, is required as a component of the SGMA legislation. The annual reports are intended to document monitoring and water use data to the DWR to gauge performance of the groundwater basin relative to the sustainability goal(s) identified in the basins' GSP. A component of the annual report could include SAP performance in meeting the sustainability monitoring requirements in the basin. Any limitations in the way the data can be reliably used should be described.

The OVGA Executive Manager could present an annual oral report to the OVGA Board of Directors during a regular monthly board meeting. The oral report should include:

- Readiness review findings (described above);
- Status of SAP related activities in the basin; and
- Identify whether any major QA problems were encountered (and if so, how they were handled).

8. Data Evaluation and Usability

This section describes the procedures that are planned to review and verify field and laboratory data, as well as procedures for verifying that the data are sufficient to meet DQOs and MQOs for the basin.

8.1 Data Review and Reduction Requirements

Data reduction (i.e., processing) and review are essential functions for preparing data that can be used effectively to support basin-specific policy decisions and DQOs. Data review includes all procedures that field or laboratory personnel conduct to ensure that measurement results are correct and acceptable in accordance with the QA objectives that are stated in this SAP. Field and laboratory measurement data reduction and review procedures and requirements are specified in previously discussed field and laboratory methods, and guidance documents.

Field personnel should record, in a field logbook and/or on the appropriate field form, all raw data from chemical and physical field measurements. Field staff should have the primary responsibility for (1) verifying that field measurements were made correctly, (2) confirming that sample collection and handling procedures specified in this basin-specific SAP were followed, and (3) ensuring that all field data reduction and review procedures requirements are followed. Field staff are also responsible for assessing preliminary data quality and for advising the data user of any potential QA/QC problems with field data. If field data are used in required basin reporting, data reduction methods should be fully documented.

The laboratory should complete data reduction for chemical and physical laboratory measurements and should complete an in-house review of all laboratory analytical results. The laboratory QA manager is responsible for ensuring that all laboratory data reduction and review procedures follow State and Federal requirements. The OVGA SAP QA manger is responsible for ensuring that these laboratory procedures are consistent with the requirements that are stated in this SAP. The laboratory QA manager should also be responsible for assessing data quality and for advising the OVGA SAP QA manager of possible QA/QC problems with laboratory data.

8.2 Verification Methods

All data that are used to support decision making must be adequate for their intended purposes. This section outlines the basic data verification procedures that should be followed for all field and laboratory measurements.

The usability of a dataset is determined by comparing the data with a predetermined set of QC limits. Inyo County, Bishop, and CSD's data reviewers should conduct a systematic review of the data for compliance with established QC limits (such as sensitivity, precision, and accuracy) on the basis of spike, duplicate, and blank sampling results that are provided by the laboratory. Data reviewers should evaluate laboratory data for compliance with the following information:

- Method- and basin-specific analytical service requests;
- Holding times;
- Initial and continuing calibration acceptance criteria;
- Field, trip, and method blank acceptance criteria;
- Surrogate recovery;
- Field duplicates and MS and MSD acceptance criteria;
- MD precision;
- LCS accuracy;
- Other laboratory QC criteria specified by the method or on the basin-specific analytical service request form;
- Compound identification and quantitation; and
- Overall assessment of data, in accordance with basin-specific objectives.

The most current EPA guidelines should be followed for completing data verification for all applicable test methods (U.S. EPA, 2002).

9. Reconciliation with Data Quality Objectives

After data have been collected, reviewed, and validated, the data should undergo a final evaluation to determine whether the DQOs specified in this SAP have been met. EPA's DQA process should be followed to verify that the type, quality, and quantity of data that are collected are appropriate for their intended use (U.S. EPA, 2000).

The DQA process involves (1) verifying that the data have met the assumptions under which the data collection design and DQOs were developed, (2) taking appropriate corrective action if the assumptions have not been met, and (3) evaluating the extent to which the data support the decision that must be made so that scientifically valid and meaningful conclusions can be drawn from the data. To the extent possible, DQA methods and procedures should be followed that have been outlined by the U.S. EPA (2000).

To the extent possible, DQA process should be followed to verify that the type, quality, and quantity of data collected are appropriate for their intended use (U.S. EPA, 2000). This assessment should include the following:

- A review of the sampling design and sampling methods to verify that these were implemented as planned and are adequate to support basins' objectives.
- A review of basin-specific data quality indicators for PARCC and quantitation limits to determine whether acceptance criteria have been met.
- A review of basin-specific DQOs to determine whether they have been achieved by the data collected.
- An evaluation of any limitations associated with the decisions to be made based on the data collected. For example, if data completeness is only 90 percent compared to a basin-specific completeness objective of 95 percent, the data may still be usable to support a decision, but at a lower level of confidence.

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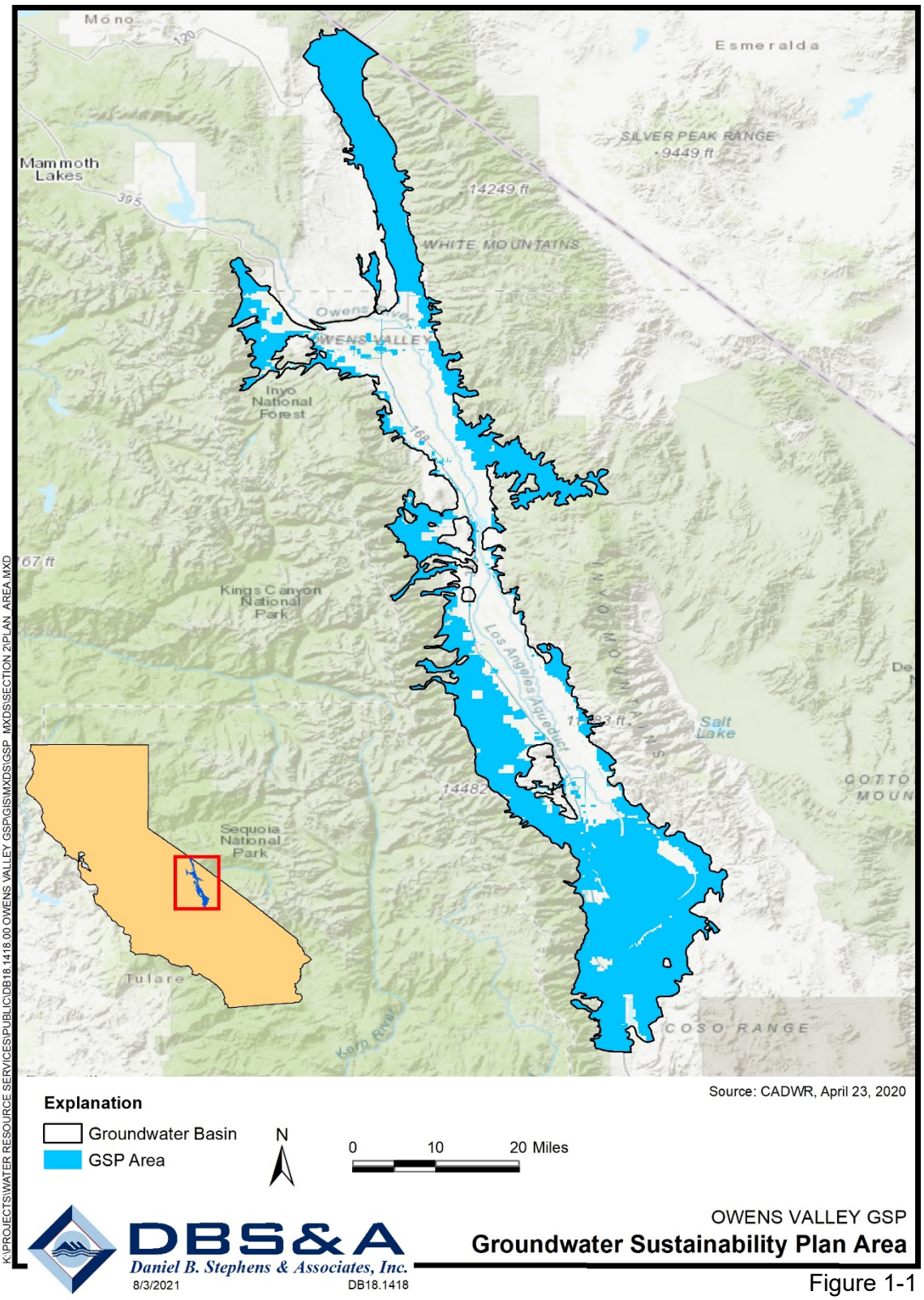
Figures


Mono
Esmeralda
Mammoth Lakes
SILVER PEAK RANGE
9449 ft
14249 ft
WHITE MOUNTAINS
Owens River
OWENS VALLEY
Inyo National Forest
Kings Canyon National Park
Los Angeles Aqueduct
Salt Lake
Sequoia National Park
Tulare
Kern River
COSO RANGE
Explanation
Groundwater Basin
GSP Area
N
0
10
20 Miles
Source: CADWR, April 23, 2020
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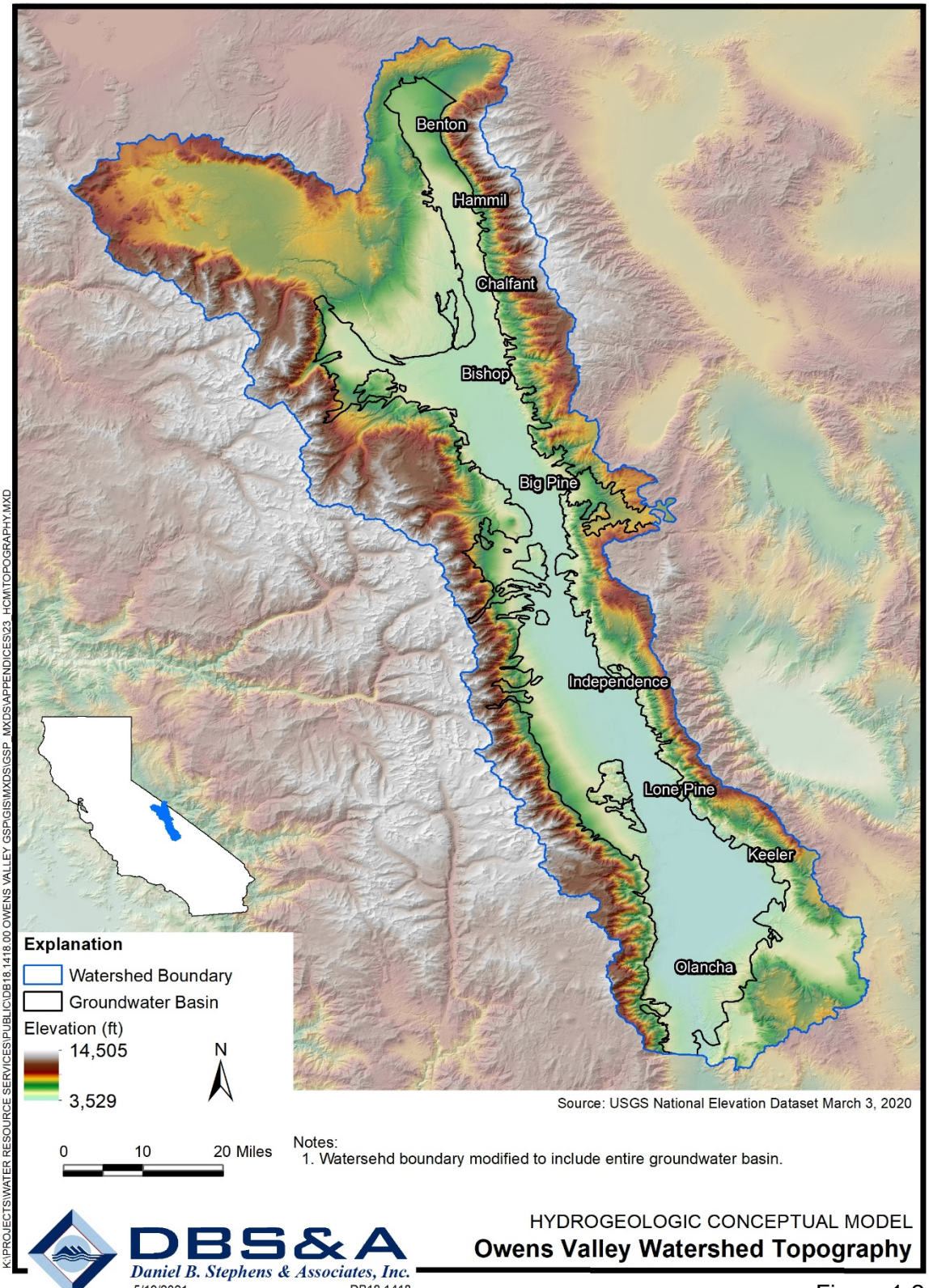
OWENS VALLEY GSP
Groundwater Sustainability Plan Area

Figure 1-1


Benton
Hammil
Chalfant
Bishop
Big Pine
Independence
Lone Pine
Keeler
Olancha
Explanation
Watershed Boundary
Groundwater Basin
Elevation (ft)
14,505
3,529
N
0
10
20 Miles
Source: USGS National Elevation Dataset March 3, 2020
Notes:
1. Watersehd boundary modified to include entire groundwater basin.
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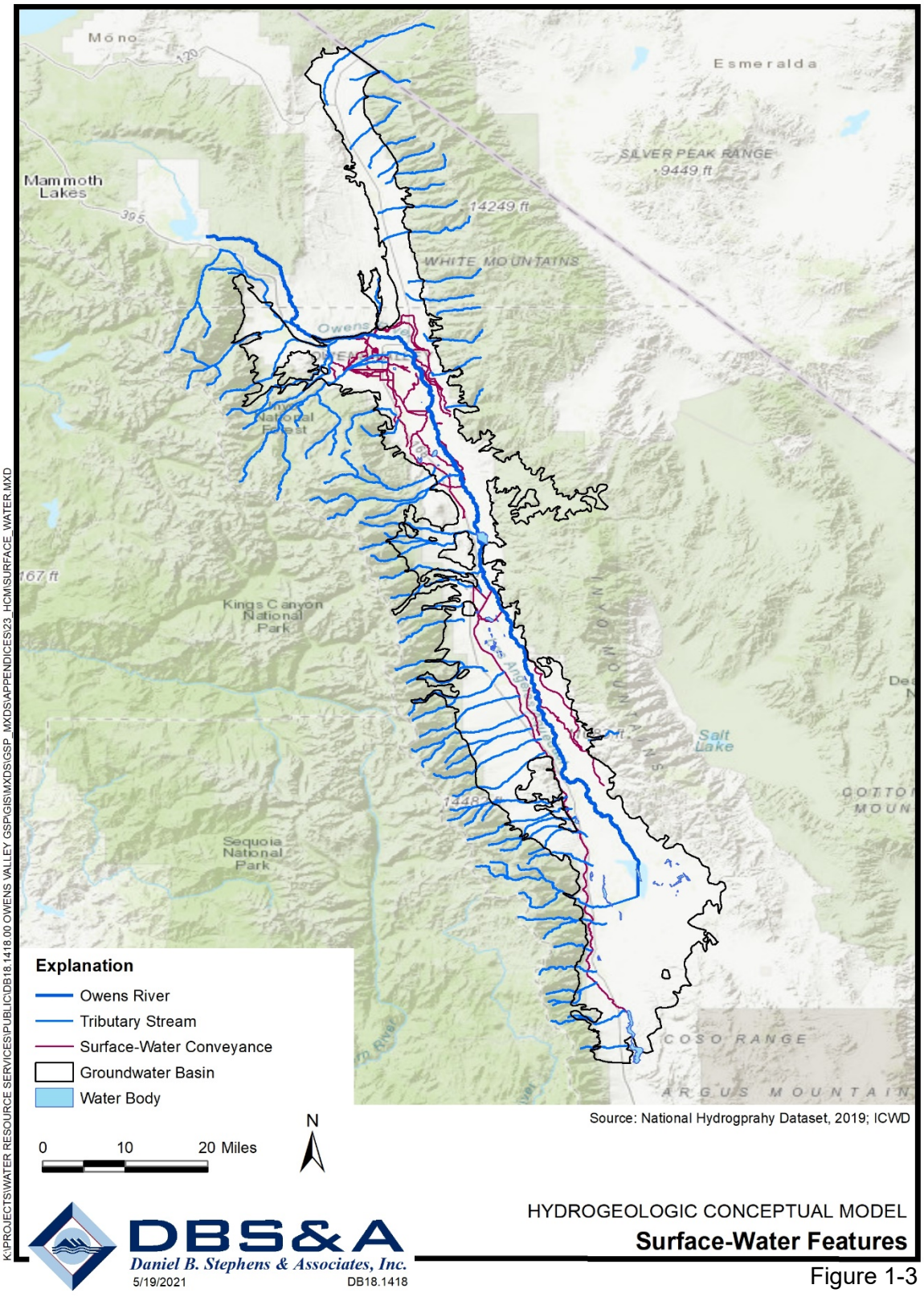
HYDROGEOLOGIC CONCEPTUAL MODEL
Owens Valley Watershed Topography

Figure 1-2


Mono
Esmeralda
SILVER PEAK RANGE
9449 ft
Mammoth Lakes
14249 ft
WHITE MOUNTAINS
Inyo National Forest
Kings Canyon National Park
Sequoia National Park
Salt Lake
COSO RANGE
ARGUS MOUNTAIN
Explanation
Owens River
Tributary Stream
Surface-Water Conveyance
Groundwater Basin
Water Body
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Source: National Hydrogprahy Dataset, 2019; ICWD
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5/19/2021
DB18.1418
HYDROGEOLOGIC CONCEPTUAL MODEL
Surface-Water Features

Figure 1-3

Appendix A. Analytical Laboratory Information

To be supplied by the OVGA at a future date

Owens Valley Basin

Communication and Engagement Plan

Updated: October 8, 2020

NOTE: In order to ensure an adaptive, responsive approach to stakeholder outreach and engagement, it is intended that the components of this plan be developed in collaboration with the Owens Valley Groundwater Basin stakeholders, beginning with the Owens Valley Groundwater Authority board members, staff and consultants. This process has already begun, and this version incorporates the results of that collaboration to date. The plan will be updated as the collaborative process continues.

At the date of this publication, the Owens Valley Groundwater Basin was categorized as a low priority basin by the California Department of Water Resources.

Prepared by
California State University Sacramento

Contents

Owens Valley Groundwater Basin Stakeholder Communication and Engagement Plan

Purpose

The purpose of this Communication and Engagement Plan is to assist the Owens Valley Groundwater Authority (OVGA) in its efforts to develop general and strategic communications to engage stakeholders in groundwater management activities.

Background

California's Sustainable Groundwater Management Act (SGMA) of 2014 requires broad and diverse stakeholder involvement in Groundwater Sustainability Agency (GSA) activities and the development and implementation of Groundwater Sustainability Plans (GSP) for 127 groundwater basins around the state that are listed at high or medium priority. While the Owens Valley Groundwater Basin has recently been characterized by the California Department of Water Resources (DWR) as a low priority basin (as of December 2019)[1], it has elected to move forward with development of a GSP. The OVGA was created to comply with the SGMA requirement that local agencies sustainably manage groundwater in the Owens Valley Groundwater Basin (OVGB).

The intent of SGMA is to ensure successful, sustainable management of groundwater resources at the local level. Success will require cooperation by all stakeholders, and cooperation is far more likely if stakeholders have consistent messaging of valid information and are provided with opportunities to help shape the path forward.

To that end, the intention of the Communications and Engagement Plan (Plan) is to make transparent to stakeholders their opportunities to contribute to the development of a GSP that can effectively address groundwater management within the Owens Valley Groundwater Basin. At the same time, the intention of the Plan is to provide community leaders and the OVGA with a roadmap to follow to ensure stakeholders have meaningful input into OVGA decision-making, including GSP development, through a process widely seen as fair and respectful to interested parties.

[1] At the date of this publication, the Owens Valley Groundwater Basin was categorized as a low priority basin by the California Department of Water Resources.

Basin Overview

The OVGB is a large basin – 1,030 square miles - with a number of jurisdictional, legal, and water management considerations specific to the basin. The Basin includes the Owens, Round, Chalfant, Hammil, and Benton Valleys as well as Fish Slough. Owens Valley is currently identified as a low priority Basin by DWR, and not in a critically overdrafted condition. However, in 2014 the Basin was considered a medium priority basin, but an approved basin boundary modification in 2016 triggered a reassessment of basin priority. In 2018 DWR proposed the basin be classified as high priority due largely to out-of-basin groundwater exports. The OVGA ~~objected to~~ commented on that draft DWR designation and in May 2019, the DWR released phase II of its prioritization proposing to designate the basin low priority. That designation was finalized in December 2019. It is possible that DWR could reassess the Basin priority again at a future date.

Basin Governance and Decision-Making

The GSA for the Basin was formally established as the Owens Valley Groundwater Authority in May 2018. The OVGA is a joint exercise of powers agency composed of Inyo County, Mono County, City of Bishop, Indian Creek-Westridge Community Service District (CSD), and Big Pine CSD. Each of these members has water supply, water management, or land use responsibilities, and is thus eligible to individually form a GSA. The document forming the Owens Valley Groundwater Authority allows for tribes, federal agencies, the Los Angeles Department of Water and Power, PUC regulated private water companies, and other interested parties to have a voting role in GSA decision making. The OVGA has two Interested Party seats for the Lone Pine Paiute Shoshone Tribe and the Owens Valley Committee.

The OVGA is administered by a governing board consisting of one primary appointment and one alternate from each member agency. All OVGA Board of Director meetings are public, noticed, held and conducted in accordance with the Ralph M. Brown Act open and public meeting law. The Board may occasionally establish ~~ad hoc~~ committees for the purpose of making recommendations to the Board on the various activities of the Authority.

OVGA decisions will be informed through staff direction, development of recommendations from ~~ad hoc~~ committees, and input from technical consultants. Furthermore, the OVGA and their staff representatives will engage with Basin stakeholders through the strategies outlined in this plan to help inform the OVGA's decisions.

Communication and Engagement Plan Goals

The intention of the Communication and Engagement Plan is as follows:

- To provide the OVGA, community leaders, and other beneficial users a roadmap to follow to ensure consistent messaging of SGMA requirements and related Basin information and data.
- To provide a roadmap to the OVGA and community leaders to follow to ensure

stakeholders have meaningful input into OVGA decision-making, including GSP development.

- To ensure the roadmap demonstrates a process that is widely seen by stakeholders as fair and respectful to the range of interested parties.
- To make transparent to stakeholders their opportunities to contribute to the development of a GSP that can effectively address groundwater management within the Basin.

The Plan seeks to accomplish the following goals:

1. Educate stakeholders about:
    a. SGMA and its requirements.
    b. Potential changes to current groundwater management under SGMA.
    c. OVGA member agencies within the Owens Valley Groundwater Basin.
    d. How stakeholders are represented in the OVGA.
2. Communicate important deadlines and dates pertinent to GSP development.
3. Articulate strategies and channels for gaining ongoing stakeholder input and feedback to inform GSP design and development.
4. Coordinate outreach and engagement activities between OVGA member agencies, and between Basin management areas, to ensure efficiencies and to support stakeholders in GSP development.
5. Encourage stakeholder engagement by advertising dedicated SGMA outreach channels, including meeting and workshop dates and content, as opportunities for stakeholders to provide input in the OVGA decision-making process and GSP planning process.
6. Gain early and continuing feedback to inform GSP design and development.

Opportunities for Engagement

Opportunities for stakeholder input will be provided throughout the GSP development process, by way of public participation at OVGA Board of Directors meetings, hosted public workshops, direct outreach to constituent groups, and other mechanisms as outlined in this document. Timely notification of opportunities for interested parties to participate in the development and implementation of the GSP should be given via the channels and strategies described within.

Major Audiences

A Basin stakeholder is a "beneficial user" as described by SGMA. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population. Beneficial users, therefore, are any stakeholder who has an interest in groundwater use and management in the Basin community. Their interest may be GSA activities, GSP development and implementation, and/or water access and management in general.

To assist in determining who the specific SGMA stakeholders and beneficial users are, the California Department of Water Resources (DWR) has issued a Stakeholder Engagement Chart (Table 1) for GSP Development in their 2017 *GSP Stakeholder Communication and Engagement Guidance Document*. This table was modified to fit the circumstances and stakeholders of the Owens Valley Groundwater Basin, and will continue to be updated during the planning process. Furthermore, Management Area Outreach Leads may maintain more exhaustive lists respective to their management area, for targeted stakeholder outreach efforts.

Table 1: Stakeholder Engagement Chart for GSP Development. This table will continue to be updated during the GSP planning process. Note: The groups and communities referenced are those identified during initial assessment. OVGA shall maintain current and more exhaustive lists of stakeholders fitting into these groups.

Category of Interest	Examples of Stakeholder Groups	Engagement Purpose
Land Use or Water Management Authority	• Municipalities (City, County planning departments) - City of Bishop - Mono County - Inyo County - Los Angeles Department of Water and Power • Water Management Authorities - Tri Valley Groundwater Management District • Regional Agencies - California Fish & Wildlife Service - Great Basin Air Pollution Control District - State Lands Commission - United States Forest Service • Community Service Districts - Indian Creek Westridge - Big Pine - Keeler - Lone Pine - Sierra Highlands - Sierra North	Consult and/or involve to ensure land use policies are supporting the GSP

	- Starlite - Wheeler Crest	
Private Users	• Business Interests & Private Pumpers - Cattlemen's Association - Crystal Geysers Roxane LLC - Rio Tinto Minerals - Southern California Edison - Zack Ranch • School Systems - Bernasconi Education Center - Bishop Unified School District - Eastern Sierra College Center - Eastern Sierra Unified School District - Lone Pine Unified School District - Round Valley School District • Domestic Users	Inform and/or involve to avoid negative impact to these users
Urban/ Agriculture Users	• Public Water Systems - Aberdeen Water System - Benton Community Center - Benton Station - Bird Industrial Complex LLC - Bishop Country Club - Boulder Creek Trailer Park - CDCR Owens Valley Conservation Camp - Chalfant Community Center - Comfort Inn - Eastern Sierra Regional Airport - Glenwood Mobile Home Park - Highland Mobile Home Park - Horseshoe Meadow Campground - Inyo County Parks and Recreation - Keoughs Hot Springs - Meadowlake Apartments - Mountain View Trailer Court - Park West - Pine Creek Village - Rolling Green - SCE Bishop Creek Plant 4 - Sunland Village Mobile Home Park - Van Loon Water Association • Mutual Water Companies - Brookside Estates - Cartago - Chalfant Valley West - Meadowcreek - Mountain View Estates	Collaborate to ensure sustainable management of groundwater

	- North Lone Pine - Owens Valley - Park West - Ranch Road Estates - Rawson Creek - Rocking K Ranch Estates - R and V - Sierra Grande Estates - Valley Vista - Van Loon - White Mountain - Wilson Circle • Resource Conservation Districts - Inyo Mono RCD • Farm Bureau - Inyo-Mono County	
Environmental and Ecosystem	• Federal and State Agencies - Bureau of Land Management - California Department of Fish and Wildlife - California Department of Water Resources - California State Lands Commission - Great Basin Unified Air Pollution Control District - Inyo County Agricultural Commissioner's Office - Los Angeles Department of Water and Power - Mono County Agricultural Commissioner's Office - National Park Service - NPS Manzanar National Historical Site - Owens Valley Radio Observatory - United States Forest Service - White Mountain Research Center • Environmental Groups - California Native Plant Society, Bristlecone Chapter - Eastern Sierra Audubon - Eastern Sierra Land Trust - Friends of the Inyo - Owens Valley Committee - RCRC - Sierra Club • Land Trusts - Eastern Sierra Land Trust • Special Interest Groups - Cattleman's Association - Sierra Nevada Alliance	Inform, involve and/or collaborate to sustain a vital ecosystem and ensure basin sustainability.
Tribes & Tribal Organizations	• Tribes - Benton Paiute Tribe - Big Pine Tribe	Inform, involve, and/or consult with tribal government

	- Bishop Paiute Tribe - Fort Independence Paiute Tribe - Kutzadika'a Tribe - Lone Pine Paiute Shoshone Tribe - Timbisha Shoshone Tribe - Cabazon Band of the Mission Indians • Tribal Organizations • Owens Valley Indian Water Commission	
Industrial Users	• Commercial and Industrial Self-supplier • Local Trade Association or Group	Inform and/or involve to avoid negative impact to these users
Economic Development	• Chambers of Commerce • Business Groups/Associations • Elected Officials (Board of Supervisors, City Council) • State Assembly Members • State Senators • Civic Clubs - Altrusa of the Eastern Sierra - Big Pine Civic Club - Bishop Lions Club - Independence Civic Club - Rotary Club of Bishop	Inform and/or involve to support a stable economy
Integrated Water Management	• Regional water management groups (IRWM regions) - Inyo Mono IRWMP • Recycled Water Coalition	Inform, involve, and collaborate to improve regional sustainability
General Public	• Citizens Groups • Community Leaders • Recreational Users	Inform to improve public awareness of sustainable groundwater management
Human Right to Water	• Disadvantaged Communities • Environmental Justice Groups • Latino Communities* • Remote private pumpers • Small Community Water Systems* **stakeholders referenced in other categories above*	Inform and/or involve to provide a safe and secure groundwater supplies to all communities reliant on groundwater

Key Messages

As the OVGA is reaching out to stakeholders to inform and engage them in groundwater management issues and items, it is critical to share clear and consistent key messages to avoid confusion and misunderstanding. Key messages are as follows:

1. The OVGA is committed to proactively and sustainably managing groundwater in the Basin through locally tailored management of groundwater resources to protect and sustain the environment, local residents and communities, agriculture, and the economy.
2. The OVGA is committed to proactive and transparent outreach and engagement with stakeholders and Basin community members throughout GSP planning and SGMA implementation.
3. Local control of groundwater should be preserved to the maximum extent practicable, and State intervention to implement SGMA should be avoided.
4. Sustainable groundwater conditions in the Basin are critical to support, preserve, and enhance the economic viability, social well-being, environmental health, and culture of all Beneficial Users and Uses including tribal, domestic, municipal, agricultural, environmental, and industrial users.
5. The OVGA is committed to conducting sustainable groundwater practices that fairly consider the needs of and protect the groundwater resources for all Beneficial Users in the Basin.
6. To support SGMA objectives and Basin-wide water needs, the OVGA will pursue an integrated water management approach for the Basin. An integrated water management approach will honor the social, cultural, natural, and economic diversity of the Basin.
7. While the Basin is currently categorized as low priority, Basin water managers recognize the value in being proactive about groundwater management. Issues resulting from groundwater extraction may become apparent in the future, potentially resulting in another recategorization of the Basin by DWR. Foresight and planning can prevent high costs and major water cut backs in the future.
8. The OVGA recognizes its duty to Basin residents, and future generations to ensure that financial resources are used effectively and responsibly to promote sustainable groundwater conditions. The OVGA is committed to carefully and prudently use funds to fully comply with SGMA and to avoid expanding beyond the scope of SGMA in a manner that might create undue costs to Beneficial Users.
9. The OVGA is committed to designing sustainability indicators that avoid significant and unreasonable impacts to groundwater dependent ecosystems (GDEs).
10. The OVGA is authorized to regulate certain portions of the Basin but ~~and~~ cannot regulate ~~LADWP~~ activities covered under the Inyo County/LADWP Long Term Water Agreement or determine surface water rights due to express limitations set forth ~~as specified~~ in SGMA. The OVGA is committed to responsible water management and ~~will~~

seeks to coordinate with LADWP and prepare a GSP compatible with the ~~Inyo/Los Angeles~~ Long Term Water Agreement.

Recommended Communication Strategies and Mechanisms

OVGA representatives and staff will engage with Basin stakeholders, and will be responsible to track the needs of their local communities. The OVGA will consider stakeholder input gathered from outreach efforts as they move through GSP development and SGMA implementation processes. Four sets of strategies are important to consider when planning outreach and engagement activities, included in the following categories:

- **SGMA-required** strategies that GSAs must legally undertake during different phases of GSA formation, GSP development and implementation. [See Appendix VI for complete description.]
- **Essential strategies** centrally communicated at the Basin and OVGA management area level that are proven to successfully engage stakeholders.
- **Localized strategies** coordinated among member agencies working in OVGA management areas through existing, trusted channels.
- **Secondary strategies** that will enhance engagement efforts locally, at the beneficial user level, and on an as-needed basis.

Essential Communication Strategies

The following strategies are meant to ensure successful engagement of Basin stakeholders during the GSP development and implementation process. The OVGA shall incorporate these strategies to ensure that "interested parties" (as defined under SGMA) and other Owens Valley Groundwater Basin stakeholder interests are considered in the development of the GSP and implementation of SGMA.

1. **Integrate and Expand on Existing SGMA Communication and Outreach Efforts:**
    a. The OVGA Board Meetings and are open to the public. Other outreach activities already conducted to date include a stakeholder assessment in the summer of 2016, meetings held in 2017 with potential GSA members (facilitated by DWR), public informational meetings and a mandatory public process for the proposed basin boundary adjustment in 2018-19, and regularly scheduled public meetings of the OVGA Board since the Board's formal establishment in May 2018.

2. **Develop and Maintain a List of Interested Parties:**
    a. A list of stakeholders and beneficial users is to be developed and updated throughout the GSP planning, implementation and enforcement processes (see Table 1 above).
    b. This list should be reviewed for updates every three to six months.

3. **Maintain a Centralized Website and Social Media Accounts:**
   While individual OVGA member agencies may seek to maintain separate websites, a centralized location for activities that are basin-wide or related to GSP development will demonstrate coordination and provide consistency in messaging.
   a. Allocate staff and resources to maintain a stand-alone website with information about SGMA and GSP planning efforts and other relevant information.
      i. As of April 2020, an RFP for a web developer is awaiting approval by the OVGA Board.
   b. Provide easily accessible list of upcoming planning activities, meetings and opportunities for public involvement.
   c. Provide a place where stakeholders can add their name to the interested parties list.
   d. Include Resources and materials:
      i. Links to external sites (DWR and State Water Resources Control Board)
      ii. Links to individual OVGA member agency websites, relevant blogs, etc.
      iii. Frequently Asked Questions (FAQ) and/or white papers
      iv. OVGA documents (MOUs, bylaws, etc.)
      v. GSP documents (draft GSP documents, notices and meeting calendars for GSP workshops)
      vi. Maintain an online database making pertinent groundwater information available to public, stakeholders, and OVGA members (https://owens.gladata.com/default.aspx#).
   e. Establish corresponding social media accounts, such as FaceBook, Twitter, and Instagram profiles.
      i. Social media accounts should be used for information dissemination purposes primarily, and limit or exclude the ability for general public to engage in "sideline conversations" about SGMA, etc. The social media will have the same information as presented on the website. The social media accounts will not have more information than the website.

4. **Provide Regular Public Notices and Updates. Ensure Brown Act Compliance:**
   a. Provide consistent messaging and outreach regarding SGMA information and GSP updates as they relate to Owens Valley Groundwater Basin. Topics to be noticed include and are not limited to:
      i. GSP development and planning updates
         1. GSP workshops
         2. GSP work plan and timeline
      ii. GSP implementation and enforcement updates (if/when applicable)
      iii. General OVGA updates, including without limitation:
         1. OVGA Board meetings
         2. Public workshops and/or stakeholder roundtables
         3. OVGA annual reports (if applicable)
         4. Other SGMA-related updates

iv. As the work evolves, new items could be added to the list of update topics that stakeholders are provided, to help highlight their importance (for example, an event like an annual forum, or an ongoing activity like groundwater monitoring).

b. Schedule notices to be sent on a regular schedule, for example, bi-monthly, monthly or as needed.
c. Meetings subject to the Brown Act, such as OVGA Board meetings, must provide public notice and post an agenda at least 72 hours in advance of each regularly scheduled meeting (emergency meetings require 24-hour advance notice). The OVGA typically posts meeting agendas before the required deadlines.
d. Develop content appropriate to the audience and their interests, ensuring information is articulated in a way that is easily understood.
e. Notices to community members with less SGMA or technical experience should be easily understood, with streamlined, relatable and repetitive information.
f. Updates and messages should be condensed to one page when possible, providing a succinct summary of the issues discussed, and including links for further or additional information.
g. As applicable, specific items should have an estimated timeline and a designated point of contact, including the person's position, email and telephone.
h. Updates and information are needed in both English and Spanish.
i. Designate responsible staff and appropriate resources for ongoing interagency coordination regarding joint messaging, consistent outreach and communication with stakeholders.
j. Determine appropriate dissemination channels.
    i. Utilize Constant Contact or similar email marketing platform for management of interested party stakeholder lists.
    ii. Utilize member agency listservs delivered via standard email and/or U.S. Mail.

5. Provide Notices and Updates in Print Publications:

a. Notices can take the form of public notices, op-ed articles, letters to the editor, advertisements or paid or earned media.
    i. Send information and/or media releases to regional and local media outlets and contacts.
        1. Trusted radio stations in the region, including stations broadcasting in languages other than English.
        2. Organization and community newsletters and periodicals.
        3. Identify trusted bi-lingual and/or Spanish speaking media outlets.
    ii. Provide follow-up or wrap-up articles written by staff when appropriate.
    iii. Notices and information may also be provided via:
        1. Mailers:
            a. Send to PO boxes in Mono County
            b. As bill inserts via utility districts
            c. As an insert in the Saturday Inyo Register

2. Print publications, including but not limited to:
    a. Inyo County Register
    b. The Sierra Reader
    c. The Sheet
    d. Sunday Paper
    e. CSD Consumer Confidence Report
3. Posted flyers at:
    a. Libraries
    b. Feed supply stores
    c. Grocery stores

iv. Include notices for:
1. Public workshops
2. Specific stakeholder meetings (targeted or special topic meetings)
3. OVGA Board meetings
4. Other standing meetings of particular interest related to SGMA
5. GSP development and planning updates
6. GSP implementation and enforcement updates (if/when applicable)
7. General OVGA and SGMA-related updates

v. Schedule
1. Advertisements (if applicable): allow 21 to 30 days advance (with content approved)
    a. Identify advertisement space
    b. Develop content
2. Letters to Editor: allow up to two weeks for preparation of letter and posting. Letters to the Editor can be published easily without advertisement space.
3. Posting: minimum of one week in advance of meetings for placement of final advertisement.

vi. Dissemination

6. Institute Regular Stakeholder Outreach and Engagement Opportunities:

a. Stakeholder engagement opportunities include but are not limited to:
    i. OVGA Board meetings
    ii. Mono County Regional Planning Advisory Committee
    iii. County Board of Supervisors meetings
    iv. GSP Technical Workshops
    v. Public Workshops and Roundtables
    vi. Owens Lake Groundwater Working Group
b. Public workshop or roundtable content includes but is not limited to:
    i. Updates on OVGA activities
    ii. Updates on GSP development and planning activities

iii. Opportunities for interested parties to participate in the development and implementation of the GSP (i.e., technical workshops on specific GSP components)
iv. Notice of OVGA intent to adopt or amend a GSP
v. Updates on groundwater management activities in the Basin
vi. Notice to impose fees

c. Logistics Considerations
i. Schedule in evenings and/or near community areas as feasible.
ii. Provide translation and facilitation services in English and Spanish
iii. Public comments will be made part of the record for consideration by the OVGA.

7. Strategically Engage Local, Special SGMA Identified Groups

a. Identify Management Area Outreach Leads for each management area defined in the GSP to coordinate and direct localized public outreach and engagement efforts for their areas.
b. Develop a targeted communication strategy to engage difficult to reach communities and community members that may be impacted by SGMA. This may include activities such as:
i. Door-to-door engagement
ii. Speaking at pre-existing community meetings
iii. Coordination with existing advisory groups or non-profit organizations as part of roundtable discussions.
c. Groups include:
i. Disadvantaged Communities (DACs)
ii. Underrepresented communities
iii. Latino communities
iv. Remote private pumpers
d. Recommendation: GSP Management Area Outreach Leads to manage targeted audience outreach activities, and coordinate activities among outreach team.

8. Develop and Update Basin Outreach and Engagement Resources Table

a. Assess and define coordinating OVGA member agencies' outreach tools and resources available for Basin-wide outreach and engagement activities.

9. Develop Consistent, Coordinated Messages and Talking Points

a. Define the key messages needed to effectively convey SGMA-related information to various audiences and ensure consistency in a coordinated outreach effort to all stakeholders.
i. For each GSP topic being discussed, develop a set of talking points that can be used by OVGA members when speaking to specific stakeholder groups or audiences. Talking points and messaging may be customized to specific stakeholder groups as appropriate.

ii. Develop tools, such as a Q&A document and a SGMA 101 document, that contain easy to understand information as well as likely questions and responses you anticipate from stakeholder groups.
iii. Identify and communicate opportunities for public engagement and/or public comment during meetings on GSP development.
iv. Provide clear messaging that the OVGA retains legal responsibility for final OVGA and GSP related decisions.

Localized Outreach and Engagement Strategies

While consistent messaging is to be coherently coordinated at the Basin level, localized outreach should be coordinated among member agencies working in management areas through existing, trusted channels.

1. **Utilize Local Agencies with Standing Meetings:** The most effective way to inform and engage many stakeholders and beneficial users regarding SGMA requirements and soliciting feedback is through trusted local agencies and community organizations with standing meetings and communication channels.
    a. Support local agencies and community organizations in disseminating information and engaging stakeholders in the following ways:
        i. During standing board and/or community meetings
        ii. Through monthly information pieces in newsletters or included in bills
        iii. Disseminating information in both English and Spanish
    b. Local trusted agencies and community organizations include but are not limited to [refer to Table 1 for specific groups]:
        i. Civic Groups
        ii. Mutual water companies
        iii. DAC community meetings and leaders
        iv. Growers associations and industry organizations
        v. Resource conservation groups
        vi. Local and regional environmental justice groups
        vii. Inyo-Mono County Farm Bureaus
    c. Leverage local, trusted resources for community meetings, such as schools, churches, and community centers.
        i. Organize public meetings around explicit topics to specific stakeholders, including:
            1. As needed or requested, SGMA 101 meeting to inform stakeholders of important changes in groundwater management and how it may impact them.
            2. Meetings that explain components of the GSP, so that stakeholders can later provide meaningful input in the GSP development process.
            3. Meetings that detail when and how opportunities to provide input to the OVGA decision making and GSP development processes will occur.

4. Public meetings regarding fee structures to help people understand how to interpret the impacts on them (if/when applicable).

d. Logistics Considerations:
    i. Make information and meetings accessible to various stakeholder groups.
    ii. Provide information in easy to understand and streamlined terms.
    iii. Provide information and facilitation in both English and Spanish.
    iv. Hold meetings during hours that do not impede with regular work schedules (i.e., nights and weekends).

2. **Utilize Existing Local Agency Resources**
    a. Effectively inform and engage diverse beneficial users in SGMA through trusted local agencies and community organizations with existing communication channels such as newsletters, websites and social media.
    b. Disseminate consistent, coordinated messages and talking points through existing local newsletters, websites and social media.
    c. Customize messages to audiences, providing easy to understand updates.
    d. Provide information in both English and Spanish (most websites and social media allow users to set preferred translation).

3. **Build on Strategies to Engage Local, Special SGMA Identified Groups**
    a. To build on the Basin-wide outreach referenced above, it is recommended that each OVGA Management Area Outreach Lead develop additional locally-targeted communication strategies to engage difficult-to-reach communities and community members that will be impacted by SGMA. Groups include Disadvantaged Communities (DACs), underrepresented communities, Latino communities, and remote private pumpers.
    b. Some groups may need to be engaged through channels that do not require internet access, via door-to-door outreach and other opportunities for face-to face engagement.
    c. OGVA member agencies may offer “office hours” or posted open times where interested members of the public can come in to casually discuss SGMA on their own schedule.

Secondary, Conditional Communication Strategies

The following strategies and activities are options for increased stakeholder engagement, or to address particularly difficult discussions (due to, for example, political factors or limited stakeholder knowledge of content). These are for consideration on an as-needed basis to generate more or specialized stakeholder engagement and participation.

1. Develop and update Frequently Asked Questions (FAQ) page on website
2. Create an inexpensive informational brochure
3. Develop a strategic media plan
4. Actively cultivate relationships and updates with state and local elected officials

5. Participate in related planning efforts in the local area and region
6. Create an annual electronic newsletter (annual report)
7. Engage stakeholders through personal outreach of members of the OVGA
8. Participate in local events with an informational booth, such as:
    - ChooChoo Swamp Meet (Bishop)
    - The Lone Pine Film Festival
    - The City Park
    - Earth Day Events

Recommended Milestones for Engaging Stakeholders

To employ the Stakeholder Communication and Engagement Plan effectively, the GSA will need to develop a schedule for outreach and engagement activities. The below table (Table 2) identifies milestones required by SGMA, as well as centralized and localized engagement strategies. This schedule shall be updated into a task-oriented work plan and timeline as communication and engagement tasks are allocated.

Table 2: Summary of Engagement Opportunities and Milestones

Timeframe	Milestone or Stage	Required Community Engagement Under SGMA	Essential & Localized Communication Strategies
Between Notice of GSP Planning and June 30, 2021	During GSP Development	Public Workshops and other opportunities providing stakeholder avenues to participate in GSP development	*Essential* • Public workshops on GSP development (e.g. basin conditions, sustainable management criteria, etc.) • Develop and maintain centralized website and social media accounts • Email notices of public meetings • Newspaper notices of public workshops *Localized* • Make time in standing meetings for updates and information on GSP development • Develop newsletter updates • Disseminate updates via website and social media
Between Notice of GSP Planning and December, 2021	During GSP development	Active involvement of diverse social, cultural, and economic elements of the population within the Basin	*Essential* • Provide regular email notices and updates • Update website regularly • Convene bimonthly meetings of OVGA and technical consultants • Identify and communicate opportunities for public engagement and/or public comment during meetings on GSP development • Develop consistent, coordinated messages and talking points to effectively convey SGMA-related information to various audiences • Develop content appropriate to the audience and their interests, ensuring information can be easily understood • Update area legislative bodies at strategic milestones (and any other groups upon request) *Localized* • Utilize local channels and meetings to identify and communicate opportunities for public engagement and/or

Timeframe	Milestone or Stage	Required Community Engagement Under SGMA	Essential & Localized Communication Strategies
			public comment during meetings on GSP development • Leverage and support local agencies and community organizations in disseminating information and engaging stakeholders, including through existing community meetings, newsletters, websites, and social media • Organize public meetings around concrete impacts to specific stakeholders • Develop additional, locally-targeted communication strategies to engage difficult-to- reach communities and community members
GSP adoption no later than December, 2021	Prior to GSP adoption or amendment	• Provide notice to cities and counties within area encompassed by the proposed plan or amendment • Consider comments provided by the cities and counties • Accommodate requests for consultation received from the cities and counties within 30 days	SEE ABOVE
GSP adoption no later than December, 2021	Prior to GSP adoption or amendment	• No sooner than 90 days following public notice, hold public hearing/ Public Workshop	SEE ABOVE
Prior to GSA imposing fee or increasing fee	If GSA intends to impose or increase a fee	• Provide public with access to the data serving as the basis for the proposed fee, the time and place of explanatory public meeting, and general explanation of topic to be discussed. • Post on project website and mail to any interested party who submits written request for mailed notice of	SEE ABOVE

Timeframe	Milestone or Stage	Required Community Engagement Under SGMA	Essential & Localized Communication Strategies
		meetings on new or increased fees. • No sooner than 10 days following public notice, hold a public meeting.	

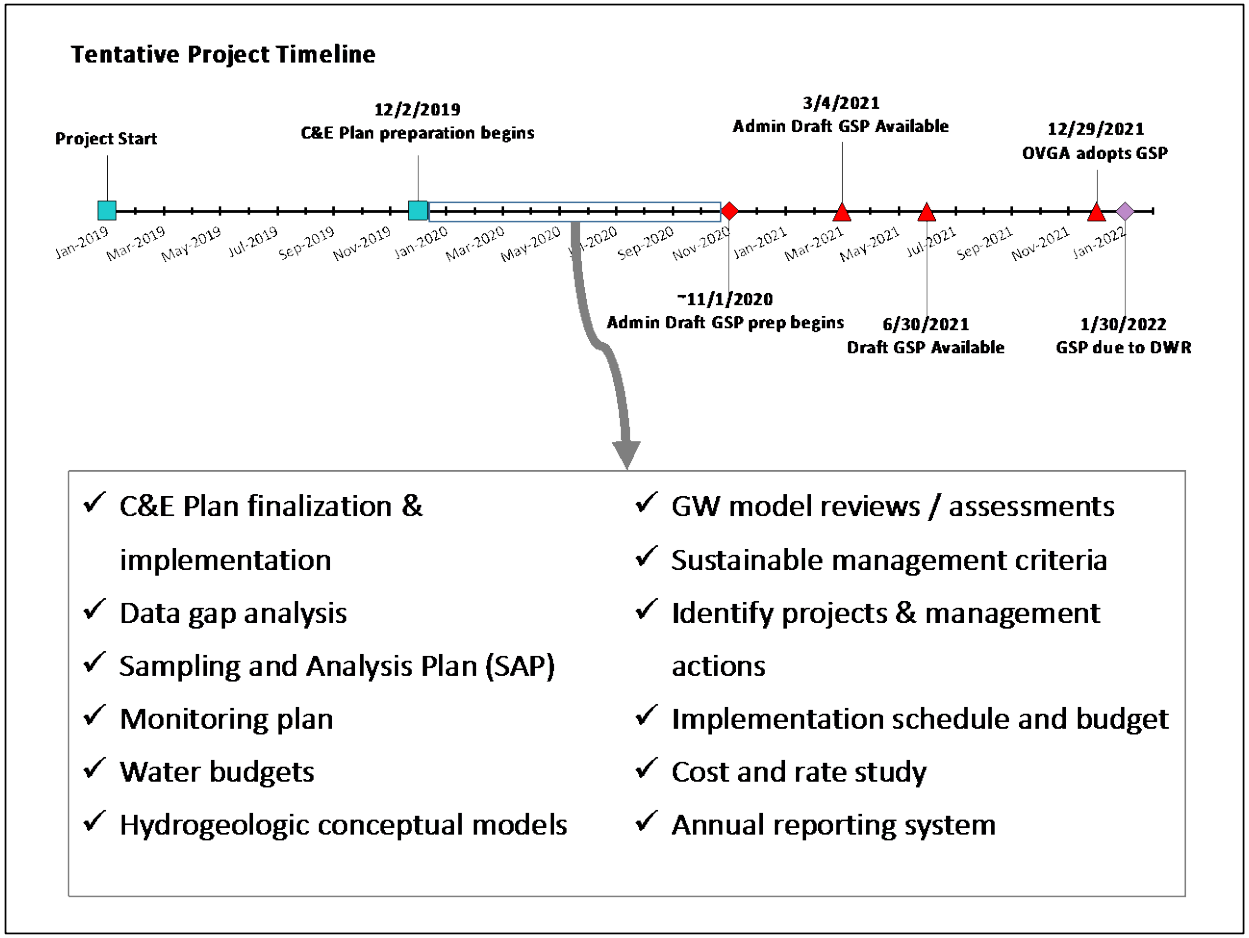
Evaluation and Assessment

Any communication strategy should include opportunities to check in at various points during implementation to ensure that it is meeting the communication and engagement goals and complying with SGMA law. These check-ins can include:

- ✓ What worked well?
- ✓ What didn't work as planned?
- ✓ Meeting recaps with next steps
- ✓ Listing lessons learned … and developing mid-course corrections
- ✓ (As relevant) communications budget analysis

Appendix I: Project Timeline for GSP Development

Figure 1. Approximate project timeline for GSP development.



Appendix II: GSP Outreach and Engagement Process Overview and Example Public Workshop Planning Process

Figure 2. GSP Outreach and Engagement Process Overview

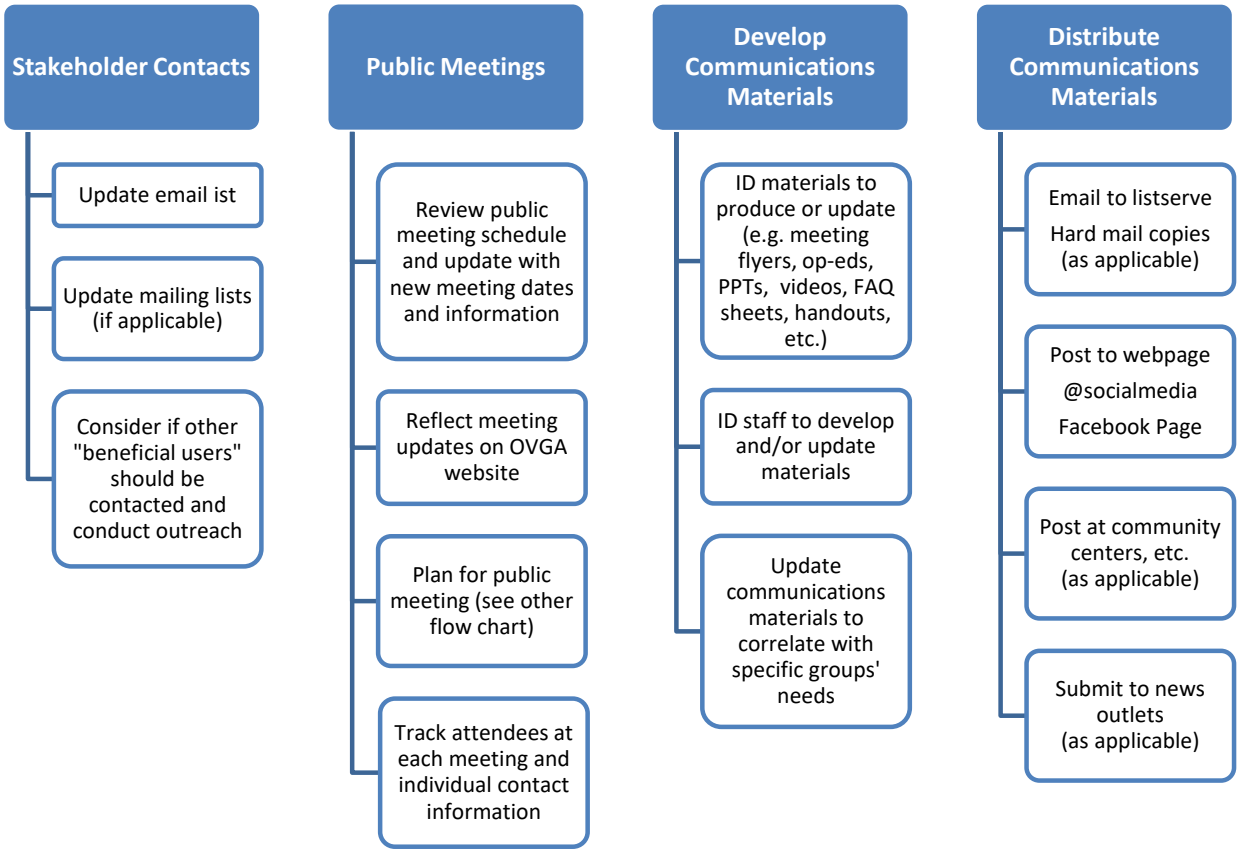
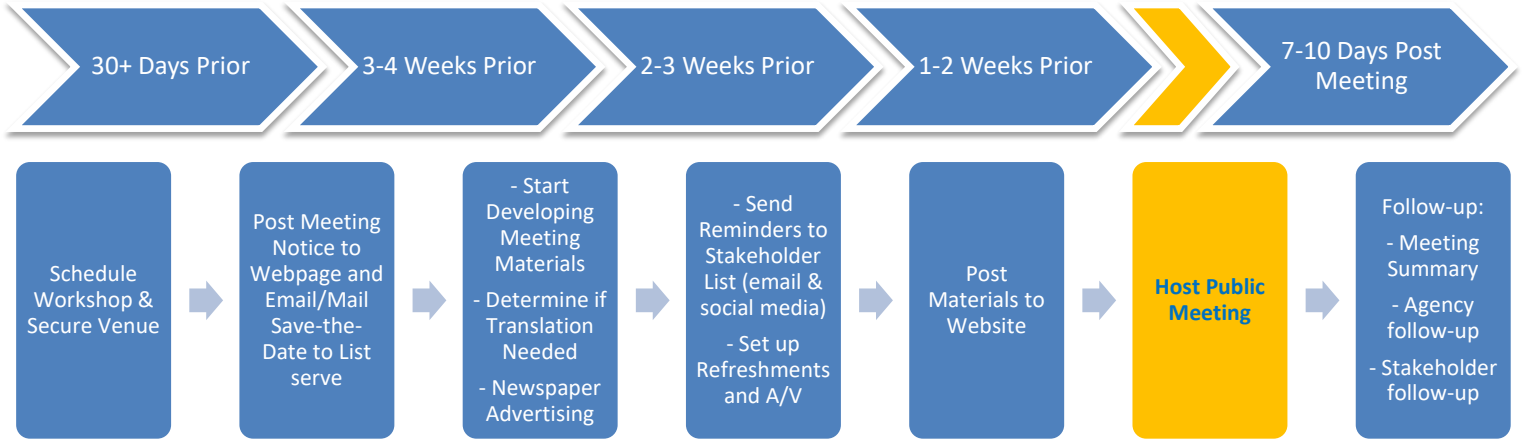


Figure 3. Example Public Workshop Planning Process



Appendix III: Recommendations for Public Workshop Planning

Workshop Logistics Planning Example

A. **Schedule Workshop:** with 21-30 days advanced notice; all parties agree on a suitable date and time for workshop(s). Consider timing of workshops based on target audiences. Alternatively consider hosting identical workshops one in the morning and one in the evening to target multiple audiences.
B. **Venue:** select the venue with at least 30 days in advance, giving time to complete contracts (if not free). Utilize Member agency locations throughout Subbasin. Some location resources include: *Table to be completed.*

Mgmt. Area	Venue	Location	Capacity	Point of Contact

C. **Refreshments** (optional)**:** 7-14 days prior to the meeting, determine what food will be necessary. Depending on the length of the meeting and timing (i.e. a six-hour workshop from 10am-4pm would require lunch, evening meetings should include snacks or dinner) determine if simple refreshments, lunch, or dinner are required. Consider arranging for delivery or pick-up prior to the meeting.
D. **Materials:** develop materials 7-14 days prior to the meeting. Determine if translation services are required.
E. **Translators:** may include Spanish speakers. Translation may include translation of materials and/or in-person translation. If the meeting will require in-person translators, identify these persons 30 days in advance.

Workshop Outreach Strategies Example

A. **Newspaper advertising:** with 14-21 days advance notice and clear messaging approved by GSA.
B. **Stakeholder Interested Parties list dissemination:** GSA and member agencies send information to customers via standard outreach protocols (posting in buildings, Board meetings, websites, newsletters, customer flyers, etc.)
C. **E-mail notice** to existing interested parties list.
    1. Also promote to specific stakeholder groups. See list of Beneficial Users / Interested Parties (Table 1)
D. **Social media:** Utilize existing or created Facebook or Twitter accounts.
E. **GSA website:** Post materials and update homepage with call to action.

Workshop Follow-up Example

A. **Meeting Summary:** within 7-10 business days, develop a meeting summary highlighting action items, presentation content, stakeholder questions, and any discussion held. Include list of attendees for documentation.

B. **Agency Follow-up:** within 7 business days, contact agency staff to debrief on workshop. Identify pros and cons of the meeting, lessons learned, and any improvements to make. Discuss roles, responsibilities, and deadlines for action items. Identify and obtain GSA approval on key messages for stakeholder follow-up.

C. **Stakeholder Follow-up:** at the meeting or within 7 days, distribute a workshop evaluation for feedback on communication practices, content, and improvements to make. Create a summary of the evaluation responses.

Workshop	Timeframe	Possible Topics + Notes
Community Workshop #1	*Summer 2020* August or September	▪ Virtual Meeting ▪ Topics to discuss: - Why this matters NO, brief intro - How to stay involved and provide input end of each workshop - Review GSP Components, Milestones, Action Plan - Basin Setting, Models, Water Budget NO
Community Workshop #2	*Winter 2020* November or December	▪ Virtual or Hybrid Meeting ▪ GSP components compiled. Before or near start of development of Administrative Draft ▪ Topics to discuss: - SMC, Undesirable Results, Baseline and projected water budgets - review of other technical topics as needed
Community Workshop #3	*Spring 2021* March or April	▪ Virtual or Hybrid Meeting ▪ Topics to discuss: - Projects and Management Actions - Review of other technical topics as needed
Community Workshop #4	*Summer 2021* June	▪ Virtual or Hybrid Meeting ▪ Coincide with release of Draft GSP ▪ Topics to discuss: - Overview of GSP by chapter - Process to review + comment on GSP - Review of technical topics as needed

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Community Workshop #5	*Winter 2021* December	▪ Virtual or Hybrid Meeting ▪ Coincide with completion of review period ▪ Topics to discuss: - Revisions made to GSP in response to review period

Appendix IV: Tribal Engagement

The OVGA recognizes the value and importance of directly engaging with tribes in GSP planning and SGMA implementation. Every tribal nation will have its own preferred level and method of engagement. The OVGA shall communicate directly with each tribe to collaboratively develop a communication and engagement plan that suits their needs. The OVGA will operate following these **key outreach principles**:

- Engage early and often
- Consider tribal beneficial uses in decision-making; identify and seek to protect tribal cultural resources
- Share relevant documentation with tribal officials
- Conduct meetings at times convenient for tribal participation with ample notifications
- Request relevant process input/data/information from tribes
- Designate a tribal liaison(s) where appropriate
- Share resources for tribal involvement as is feasible

Tribes and tribal organizations within the Owens Valley Groundwater Basin are:

- Benton Paiute Tribe
- Big Pine Tribe
- Bishop Paiute Tribe
- Fort Independence Paiute Tribe
- Kutzadika'a Tribe
- Lone Pine Paiute Shoshone Tribe
- Timbisha Shoshone Tribe
- Owens Valley Indian Water Commission

Relevant DWR Information

- **SGMA Section 10720.3.** …any federally recognized Indian Tribe, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a groundwater sustainability plan or groundwater management plan under this part through a joint powers authority or other agreement with local agencies in the basin. A participating Tribe shall be eligible to participate fully in planning, financing, and management under this part, including eligibility for grants and technical assistance, if any exercise of regulatory authority, enforcement, or imposition and collection of fees is pursuant to the Tribe's independent authority and not pursuant to authority granted to a groundwater sustainability agency under this part.

- **Draft Discussion Paper Tribal Participation with Groundwater Sustainability Agencies** http://www.water.ca.gov/groundwater/sgm/pdfs/SGMA_Tribal_GSAs.pdf

- **Must a local agency exclude federal and tribal lands from its service area when forming a GSA?** No, federal lands and tribal lands need not be excluded from a local agency's GSA area if a local agency has jurisdiction in those areas; however, those areas are not subject to SGMA. But, a local agency in its GSA formation notice shall explain how it will consider the interests of the federal government and California Native American tribes when forming a GSA and developing a GSP. DWR strongly recommends that local agencies communicate with federal and tribal representatives prior to deciding to become a GSA. As stated in Water Code §10720.3, the federal government or any federally recognized Indian tribe, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a GSP or groundwater management plan through a JPA or other agreement with local agencies in the basin. Water Code References: §10720.3, §10723.2, §10723.8

Tribal Outreach Resources

The follow are links to agency tribal outreach resources and considerations, each of which captures important principles and resources for tribal outreach. A short summary of key outreach principles can be found below.

- Draft Discussion Paper Tribal Participation with Groundwater Sustainability Agencies
- CalEPA Tribal Consultation Policy Memo (August 2015)
- DWR Tribal Engagement Policy (May 2016)
- CA Natural Resources Agency Tribal Consultation Policy (November 2012)
- SWRCB Proposed Tribal Beneficial Uses
- Butte County Associate of Governments: Policy For Government-To-Government Consultation With Federally Recognized Native American Tribal Governments *(a model from the transportation sector)*
- CA Court Tribal Outreach and Engagement Strategies
- Traditional Ecological Knowledge resources
- Water Education Foundation Tribal Water Issues

Appendix V: Disadvantaged Community (DAC) Engagement

The OVGA plans to implement outreach strategies and translatable lessons learned from DAC involvement in the 2008-2011 Inyo-Mono Integrated Regional Water Management Program. Pertinent excerpts from the published report, *Disadvantaged Communities and the Inyo-Mono IRWM Program: A study of the engagement of disadvantaged communities in Integrated Regional Water Management*, are below for quick reference. The complete report is available online at: https://inyo-monowater.org/wp-content/uploads/2014/10/IM_DAC_whitePaper_20140930_FINALcopy4Submittal.pdf

Lessons Learned from 2008-2011 IRWM DAC Outreach

- Understand who the target audience is (e.g., with whom you will be meeting) to understand where and when to meet (such as during the day vs. evening meetings)
- Target outreach materials and approach appropriately (e.g., is a Powerpoint presentation appropriate for the audience, or perhaps paper copies of simple handouts and maps along with a verbal description of the Program and time for questions?)
- DAC (and other) audiences are often interested in what other stakeholders are involved in the IRWM Program, what funding opportunities are available, technical trainings, and engineering assistance
- One-on-one meetings with individual communities and stakeholders may be more appropriate than trying to meet with several entities in one location
- It is important to be able to travel to the target community as there may not be time or funds for them to travel to outreach meetings
- Though there may be commonalities across regions, each community/DAC/tribe/water system/stakeholder has unique and individualized water-related concerns
- Several meetings may be required to engage new communities and involve them in the IRWM process. IRWM is a complex concept to explain to new stakeholders, and it is important to follow up from meetings to answer questions and provide additional information.
- It is important to recognize that outreach to and engagement of Native American tribes should not be "lumped in" with outreach to DACs. IRWM groups need to use outreach and communication techniques appropriate for tribes. These might include in-person communications, reaching out to tribal council members, and regular follow-up communications.
- Disadvantage can mean more than low income. There are other socioeconomic and cultural factors to consider when characterizing DACs and working to make resources available. The current simple definition affects what communities are engaged as DACs and to whom resources and funding are targeted.

This report also discusses outreach tools, stating that the **project webpage** was the most effective tool for information sharing. A **mobile-device version** of the website was also developed as many DAC members do not have home computers but can access the internet through cellular data.

With regard to printed materials, they found a **one-page, tri-fold brochure** offering IRWMP-specific information in a very brief format, directing reader to the website for more information, to be most useful to stakeholders.

Appendix VI: SGMA-Required Outreach and Engagement Strategies

SGMA strongly encourages broad stakeholder engagement in development and implementation of GSPs. According to SGMA:

- "The groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan." [CA Water Code Sec. 10727.8(a)]
- "The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater." [CA Water Code Sec. 10723.2]

GSAs are given broad discretion in the methods and processes utilized to meet engagement requirements. SGMA explicitly authorizes GSAs to form Public Advisory Committees if they choose, but does not require them to do so. The decision to form an advisory committee is left to the individual GSA based on need and effectiveness of these processes within their communities. However, SGMA does have several GSA-specific requirements regarding public notice, public hearings, and public meetings. Requirements include:

1. **Local agencies seeking to become a GSA**[2] must issue public notice and hold a public hearing before doing so. The public notice must be consistent with Section 6066 of the Government Code. The hearing must take place in a county overlying the groundwater basin of interest. [CA Water Code Section 10723 (b)]

   Within 30 days of electing to be (or forming) a GSA, the GSA must inform the State of this development and its intent to manage groundwater sustainably. In doing so, the GSA must:

   a. Include a list of parties who wish to receive "plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents"; and
   b. Explain how the interested parties' perspectives will be considered, both during the development and operation of the GSA and during development and implementation of the GSP. This information must also be sent to the legislative bodies of any city and county in the area covered by the plan.

   Illuminating the term "interested parties," SGMA requires that GSAs consider the interests of "all beneficial uses and users of groundwater," along with entities expected to share responsibilities for implementing GSPs. As a starting point, SGMA specifies a number of types of "interested parties." The GSA must maintain its list of interested parties on an ongoing basis. Anyone who wishes to be put on this list can

[2] This item (1) has already been complied with for the Owens Valley Groundwater Basin.

do so upon making this request in writing. [CA Water Code Section 10730. (b) (2); 10723.2; 10723.4; and 10723.8. (a)]

2. **GSAs planning to develop a GSP**[3] must provide notice of their intent to do so to the public and the state before proceeding. The notice must describe opportunities for interested parties to participate in the development and implementation of the GSP. This written notice must be provided to the legislative bodies of any city or county located within the basin to be managed by the GSP. [CA Water Code Section 10727.8. (a)]
3. **A GSA seeking to adopt or amend a GSP** must provide notice to cities and counties within the area encompassed by the proposed plan or amendment, and consider comments provided by the cities and counties. Cities and counties receiving the notice may request consultation with the GSA, in which case the GSA must accommodate that request within 30 days. The GSA also must hold a public hearing prior to adopting or amending a GSP. There must be at least 90 days between the notice issued to cities and counties and the public hearing. [CA Water Code Section 10728.4]
4. **If a GSA intends to impose or increase a fee**, it must first hold at least one public meeting, at which attendees may make oral or written comments. This public notice must include:
    a. Information about the time and place of the meeting and a general explanation of the topic to be discussed.
    b. Public notice must be posted on the GSA's website and mailed to any interested party who submits a written request for mailed notice of meetings on new or increased fees. (The GSA must establish and maintain a list of interested parties, and the list is subject to renewal by April 1 of each year.)
    c. The public notice must also be consistent with Section 6066 of the Government Code.
    d. In addition, the GSA must share with the public the data upon which the proposed fee is based, and this must be done at least ten days before the public meeting takes place. [CA Water Code Section 10730.(b)(1),(2), and (3)]

[3] This item (2) has already been complied with for the Owens Valley Groundwater Basin.

Appendix VII: Published Educational Materials

DWR has developed various educational materials about SGMA and GSA/GSP development. In addition to DWR materials, academic institutions and foundations have published useful reports about SGMA implementation. While not comprehensive, Table 3 lists some essential SGMA educational and reference materials.

Table 3. Educational and Reference Documents for SGMA Implementation

Educational/Reference Document Titles	Publishing Entity	Date
Groundwater Sustainability Agency Frequently Asked Questions http://www.water.ca.gov/groundwater/sgm/pdfs/DWR_GSA_FAQ_2016-01-07.pdf	DWR	January 2016
Groundwater Sustainability Plan (GSP) Emergency Regulations Guide http://www.water.ca.gov/groundwater/sgm/pdfs/GSP_Final_Regs_Guidebook.pdf	DWR	July 2016
Collaborating for Success: Stakeholder Engagement for Sustainable Groundwater Management Act Implementation http://waterfoundation.net/wp-content/uploads/2015/07/SGMA_Stakeholder_Engagement_White_Paper.pdf	Community Water Center Clean Water Fund Union of Concerned Scientists	July 2015
The 2014 Sustainable Groundwater Management Act: A Handbook to Understanding and Implementing the Law http://www.watereducation.org/sites/main/files/file-attachments/groundwatermgthandbook_oct2015.pdf	Water Education Foundation	October 2015
SGMA Engagement With Tribal Governments https://www.water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/GD_Tribal_Final_2017-06-28.pdf	DWR	June 2017

Appendix VIII: Virtual Engagement Opportunities

Due to ongoing COVID-19 considerations and the need to modify and/or adapt stakeholder outreach and engagement efforts to COVID-19 realities and uncertainties, the OVGA may choose to implement Virtual Community Meetings over the next six to 18 months. A hybrid approach of virtual + in-person meetings may also be preferable.

This document describes some options and considerations for virtual stakeholder engagement.

OVERVIEW

- Emphasis on virtual engagement for Summer and Fall, 2020
- Shorter meetings, hosted more frequently (60-120 min webinars)
- Offered at different times of the day to allow for maximum participation
- In-person or hybrid virtual + in person meetings possible for winter 2020/21

VIRTUAL PUBLIC WORKSHOPS

- Timing: Summer, Fall and Winter (to correspond with GSP milestones)
- Format: Online Zoom Meetings (or alternative webinar platform)
- Duration: 60 - 120 minute webinars

- Engagement Options:
    - Presentations and information sharing out to participants
    - Stakeholder interaction via call in (computer audio or telephone), chat box, submission of written comments in advance
    - Opportunities for technical/topic-specific "breakout room" discussions (using Zoom's breakout room feature)
    - Ability to provide real-time Spanish interpretation
    - Ability to record meetings and archive on OVGA website

- Other Considerations:
    - Keep webinars short, 60 to 120 minutes, for maximum attention and retention of information
    - Consider hosting the same webinar twice, at two time slots (morning and evening) to allow for participants to select the time that most works for their schedule
    - Announce meeting 2-4 weeks in advance. Share materials 1-2 weeks in advance
    - Simultaneous live-stream meeting on Facebook Live
    - Real-time engagement with polling feature or surveys
    - Provide for informal "open house" Q&A session before and after official meeting for public to discuss with hydrogeologist, OVGA Board Member, others
    - With consideration of current CoVid safety restrictions, potential to offer in-person participation via satellite office locations.

- Possible Topics to Cover:
    - Basin Setting
    - Water Budget
    - Sustainable Management Criteria
        - Sustainability Indicators
        - Undesirable results
        - Minimum thresholds & measurable objectives
    - Baseline Pumping Allocations
    - Management Actions and Projects
    - Groundwater Dependent Ecosystems
    - Impacts to domestic well users
    - Discussion of topics currently under consideration/debate by the OVGA
    - Review of GSP Chapters and anticipated release dates

Owens Valley Groundwater Sustainability Plan: Response to Comments on Public Review Draft

Prepared By: Owens Valley Groundwater Authority Owens Valley, CA

OWENS VALLEY GROUNDWATER AUTHORITY

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Project # DB 18. 1418. 00

December 9, 2021

The Draft OVGA Groundwater Sustainability Plan was published on September 23, 2021 and circulated for review and comment by the public and interested parties, agencies, and organizations until November 8, 2021. Verbal comments received at public videoconference meetings held on October 6, October 13 hosted by the OVGA and October 20 hosted by Tri-Valley Groundwater Management District during the public comment period were recorded and written responses to those comments are included in this Appendix. Comments were reviewed and discussed by the OVGA Board of Directors on November 18, 2021 and draft response to comments were included in the Final GSP considered by the OVGA on December 9, 2021.

Written comments were received from seven government agencies or environmental groups and from 11 individuals. General comments and responses were prepared to address similar concerns or comments submitted by multiple commenters. The general comments aggregate and paraphrase concepts from individual comments. Individual responses to each comment were prepared including reference to the general comments where appropriate and inserted into each of the submitted letters or email. Comments received are organized in this appendix alphabetically by author.

The OVGA allowed for several formats to submit comments including written comments, email, and submissions via the OVGA website. As a result the format of the comments varied widely. To facilitate preparing responses to each individual comment, the letters or emails were converted to word processing software and in the process slight changes to the original formatting of the document occurred. All text and comments were preserved, however, and only the formatting varied. Scanned versions of the comments in their original format as received are included at the end of this appendix. Responses to comments are in red text.

Appendix 6: Table of Contents

Responses to General Comments

General Comment #1: Several commenters provided typographical, grammar, spelling corrections, or suggested minor wording changes to improve sentence clarity. Suggested changes were incorporated into the GSP where appropriate.

General Comment #2: Multiple comments related to the presence of large areas not subject to SGMA within the Basin and coordination of the GSP implementation with Los Angeles Department of Water and Power (LADWP).

For the GSP to succeed in managing the Basin sustainably, it is important that the GSP work in coordination with the Inyo/Los Angeles Long-Term Water Agreement (LTWA). SGMA expressly exempts lands and pumping managed under the LTWA. Any groundwater basin or portion of a groundwater basin in Inyo County managed pursuant to the terms of the stipulated judgment in City of Los Angeles v. Board of Supervisors of the County of Inyo, et al. (Inyo County Case No. 12908) shall be treated as an adjudicated area pursuant to this section CWC §10720.8 (c).

The OVGA is not party to the LTWA and cannot manage or enforce its provisions but can coordinate with the parties to evaluate the effects of LADWP pumping and ensure the lands subject to the GSP are not adversely affected by LADWP activities. The level of coordination will be determined on a case by case basis. This GSP contemplates that the OVGA will coordinate with Inyo County and LADWP in avoiding or mitigating any such effects on GSP lands, and/or with the LTWA parties to help enforce relevant LTWA provisions that protect the environment and private well owners in a manner consistent with this GSP.

Two provisions of the LTWA may apply to the GSP area. The overall goal of the LTWA is:

> *The overall goal of managing the water resources within Inyo County is to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County.*

The provision to cause no significant effect on the environment which cannot be acceptably mitigated (as defined by CEQA) could apply to GDE on GSP lands or to private wells. With regard to private wells, Section III.G of the LTWA provides:

> *New* [LADWP] *wells will be sited and groundwater pumping shall be managed to avoid causing significant adverse effects on water quality or water levels in non-Department-owned wells in the Owens Valley that are attributable to groundwater pumping by the Department. Any such significant adverse effects shall be promptly mitigated by the Department* [LADWP].

This LTWA provision does not preclude private well owners from pursuing other legal remedies, including appealing to the OVGA to investigate if basin sustainability is being affected.

Additional text contained in this response describing these applications of LTWA provisions to lands subject to SGMA was added to the GSP (Section 2.1.3.1.6)

Finally, the properties owned by Los Angeles within the Basin are not subject to SGMA only to the extent that Los Angeles and its Department of Water and Power conform to the LTWA (See Wat. Code, §10720.8(a)). If Los Angeles' or LADWP's management of such properties is found not to be in conformance with the LTWA, then those properties may be subject to SGMA.

General Comment #3: Adjudicated vs nonadjudicated terminology

The GSP used the term adjudicated lands in the Basin for lands owned by LADWP in Inyo County and managed pursuant to the Water Agreement. Similarly, DWR resource maps depict LADWP lands as "adjudicated" (https://sgma.water.ca.gov/webgis/index.jsp?appid=adjbasin). The GSP is required to address the adjudicated lands if they are relevant to land use in the n the Basin (Section 2.1.3.1.6). These lands are referred to adjudicated for the purposes of this GSP consistent with SGMA. This does not imply that the entire Owens Valley Groundwater Basin has been fully adjudicated, and text in the Final GSP (Section 2.1) was added to make that clear. Because approximately 7000 acres is owned by LADWP in Mono County are not managed according to the LTWA, simply referring to LADWP lands is not equivalent to the lands in the Basin treated as adjudicated. All other lands within the Basin were referenced by DWR as nonadjudicated in the draft GSP. However, Federal and State-owned lands, and Tribal Reservation land are also exempt from SGMA. Clarifying text was added and references have been revised throughout the Final GSP to refer to the GSP area (lands subject to SGMA or potentially subject to SGMA) adjudicated lands (LADWP lands in Inyo County) or LADWP lands (all LADWP owned lands in Inyo and Mono Counties).

General Comment #4: Fish Slough Northeast Spring criteria explanation and thresholds to protect endangered species dependent on the springs.

The values for the spring flow Minimum Threshold and Management Objective were provided by the California Department of Fish and Wildlife staff and scientists based on direct field experience managing the spring outflow for the benefit of endangered species. The rationale is based on first-hand experience and observation that flows approximately at the Management Objective value were sufficient in the past to supply uses downstream. When flows approach the Minimum Threshold, field scientists had difficulty in managing the flow effectively for the benefit of endangered species habitat.

General Comment #5: Data gaps in Tri-Valley Management Area and adequacy of available data to characterize groundwater conditions or pumping effects.

Sufficient data exits to establish that a regional, long-term decline in groundwater levels exists in the Tri-Valley management Area. Additional data is necessary to determine the local effects of these declines and to guide potential management actions if these declines create undesirable results. Specific data gaps are discussed in Appendix 3. The identification of data gaps alone does not invalidate the general conclusions about groundwater conditions and processes within the Tri-Valley Management Area.

The OVGA made repeated public requests for water level and groundwater extraction data for the Tri-Valley and Fish Slough area. Ultimately, reliable, long-term data from four monitoring wells in the Benton area, two wells in Hammil Valley, seven wells in Chalfant Valley, and four wells in Fish Slough (a total of 17 monitoring wells) were obtained from publicly available sources, LADWP, or private land owners. These wells are widely separated geographically, and all show similar and remarkably consistent trends of declining water levels over several decade regardless of seasonal or wet/dry cycles (see the linear regression results in Figure 2-18 of the GSP). The water level declines are consistent with spring flow measurements in Fish Slough that also exhibit steady declines in discharge. Collectively, the data suggest a similar overriding factor(s) is/are affecting water levels over a large region. The observed, chronic declines in groundwater levels mean that outflows consistently exceed inflows. Pumping and reduced recharge due to wet-dry precipitation patterns or longer-term climate change are the most probable primary regional drivers of the aquifer system that could cause the observed declines.

The GSP relied on satellite imagery to estimate irrigated acreage in Tri-Valley (about 3,500 acres), most in Hammil Valley. Based on alfalfa duty of 3-5 acre-feet/year (AFY), approximately 10.5-17.5 thousand AFY of pumping for agriculture is estimated. The Well Vulnerability Analysis (Appendix 11) identified approximately 175 domestic wells in the management area. Assuming *de minimis* use is about 2 AFY, nonagricultural pumping is approximately 350 AFY. Even though these values are approximate, groundwater pumping in Tri-Valley for agriculture comprises more than 97% of total pumping or approximately 33-50 times greater than domestic or household use. The uncertainty in the pumping estimates represents a data gap, but the uncertainty is not large enough to alter the fundamental conclusion.

Six of the 17 wells which were chosen as representative monitoring locations for the GSP (Figure 2-16). The data record includes 20 years of data from the Fish Slough, Benton, and Hammil wells and 30 years of data from the Chalfant wells. Water levels in all representative wells in the Tri-Valley Management Area exhibit steadily declining water levels over several decades through repeated wet and dry periods (Figures 2-18a and b). Since 2000, measured water level declines in Benton are approximately 10 feet, approximately 35-45 feet in Hammil, 9 feet in Chalfant, and 1-4 feet in Fish Slough. The recorded water-level decline diminishes with distance from Hammil Valley consistent with the expected development of a cone of depression centered on the area with the heaviest agricultural pumping.

Other potential causes of groundwater level declines were considered during GSP preparation. If LADWP pumping in northern Owens Valley near Laws was the primary cause of the declines in the Tri-Valley area, then the groundwater levels in Chalfant would respond in a similar fashion. Groundwater levels in Laws fluctuate significantly with wet/dry cycles, managed recharge, and local pumping. Chalfant water levels instead show chronic declines without recovery similar to Fish Slough, Hammil Valley and Benton Valley(Figures 2-18 to 2-20). If significant regional climate change was the primary factor, similar stress of consistently lowering groundwater levels on top of wet/dry cycles would be measured in the other portions of the Basin. This is not the case; trends in most wells in the remainder of the basin are stable. Climate change resulting in reduced recharge could manifest as a declining water level trend, but the

effects of climate change would not be expected to exceed year to year weather variability, and cause nearly perfectly linear water level declines exhibited by wells in Tri-Valley. A continuous pumping overdraft however could cause the observed water level trends.

The existing water level monitoring data in the Tri-Valley do not fully characterize every location in each of the valleys which prevents the construction of accurate groundwater contour maps for this portion of the Basin. Additional water level data are needed to better assess the variability of water levels spatially are more accurate pumping amounts to refine the estimates in the GSP. These data gaps are evaluated and discussed fully in Appendix 3. The Tri-Valley Groundwater Management District is charged with monitoring groundwater levels within their boundary. No groundwater level or pumping information was provided to assist with preparing the GSP. The OVGA welcomes any data the District may possess. Text clarifying the state of the hydrologic data, knowledge about the Tri-Valley area, and existing data gaps was added to the Final GSP in Section 2.2.2.1.

General Comment #6: Several commenters raised questions about the hydrologic connection between Tri-Valley area (Benton, Hammil and Chalfant valleys) and Fish Slough.

Multiple lines of evidence indicate a hydrogeologic connection exists between Tri-Valley and Fish-Slough. The surface drainage area of Fish Slough is far too small to generate observed spring discharge and runoff volumes given annual precipitation rates in the area (Jayko and Fatooh, 2010). Therefore, water discharging from Fish Slough must be sourced from other locations. Due to the physics of groundwater flow, groundwater elevations in the source area must be greater than groundwater elevations in Fish Slough, which excludes areas to the south of Fish Slough as potential sources. Although observed groundwater elevations in Round Valley to the west are sufficiently high to be a potential source of Fish Slough discharge, groundwater elevation trends in that portion of the basin do not show similar chronic declines as would be expected if it was a significant source and north-south trending fault zones likely intercept and limit groundwater flow from the west. Therefore, the primary source area for Fish Slough is most likely located to the north and/or the east, which coincides with Tri-Valley.

Geologic conditions indicate a hydrogeologic connection between Fish Slough and Tri-Valley. Tri-Valley is a sedimentary basin filled with alluvial deposits that readily stores and transmits water due to interconnected pore spaces. The axis of this deep sedimentary basin runs from the northwest in the Hammil Valley area to the southeast towards Fish Slough. Bishop Tuff was deposited on top of alluvial sediments that were present at the surface at the time of the eruption (Stevens et al., 2013) providing a likely groundwater conduit from Tri-Valley to Fish Slough. The lithology surrounding Fish Slough within the potential source area (and outside of Tri-Valley) is primarily welded volcanic ash flow deposits (Bishop Tuff), which have a small percentage of interconnected pore space. As a result, these volcanic ash deposits do not store and transmit water as readily. Tectonic activity such as faulting can create localized zones with increased permeability that allow for groundwater flow. The Fish Slough fault system extends north from Fish Slough and into Hammil Valley, potentially creating a preferential pathway along and roughly parallel to the faults for groundwater to flow from Tri-Valley into Fish