OWENS VALLEY GROUNDWATER AUTHORITY

GENERAL COMMENTS / INSTRUCTIONS

This is an Administrative Draft for preliminary review by OVGA Directors and staff. Some sections are a work in progress and information still in preparation is highlighted.

Figure and Appendix numbers are subject to change.

PRELIMINARY DRAFT

OWENS VALLEY GROUNDWATER AUTHORITY

Certification

This Groundwater Sustainability Plan was prepared in accordance with generally accepted professional hydrogeologic principles and practices. This Plan makes no other warranties, either expressed or implied as to the professional advice or data included in it. This Work Plan has not been prepared for use by parties or projects other than those named or described herein. It may not contain sufficient information for other parties or purposes.

OWENS VALLEY GROUNDWATER AUTHORITY

Name	Name
Title	Title
email	email
address	address
city, state zip	city, state zip

Date signed:

PRELIMINARY DRAFT

Table of Contents

PRELIMINARY DRAFT

PRELIMINARY DRAFT

List of Figures

List of Tables

List of Appendices

1. Joint Powers Authority
2. Long-Term Water Agreement
3. Monitoring Plan/Network and Data Gaps Analysis (and monitoring locations)
4. Sampling and Analysis Plan
5. Communication and Engagement Plan (CEP)
6. Comments and Responses to Comments
7. Hydrogeologic Conceptual Model
8. Subsidence
9. GDEs
10. Water Budget
11. Well Vulnerability Analysis

Acronyms and Abbreviations

Acronym	Acronym definition
AB	assembly bill
ADCP	acoustic doppler current profiler
ACEC	Area of Critical Environmental Concern
AF	acre-feet
AFY	acre-feet per year
amsl	above mean sea level
APN	assessor parcel number
Basin	Owens Valley Groundwater Basin
B	boron
BCM	Basin Conceptual Model
bgs	below ground surface
BMP	best management practices
BOS	bottom of screen
CA	California
CalEPA	California Environmental Protection Agency
CAL FIRE	California Department of Forestry and Fire Protection.
CalGEM	Geologic Energy Management Division (formerly DOGGR)
CASGEM	California statewide groundwater elevation monitoring
CCR	California Code of Regulations
CDCA	California Desert Conservation Area
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CFS	cubic feet per second

CGPS	continuous global position system
CIMIS	California irrigation management information system
Cl	chloride
CSD	community service district
CWC	California Water Code
DBS&A	Daniel B. Stephens & Associates, Inc.
DDW	[SWRCB] Division of Drinking Water
DEM	digital elevation model
DOGGR	Division of Oil, Gas, and Geothermal Resources (reorganized as CalGEM)
DPWM	Distributed Parameter Watershed Model
DQO	data quality objective
DTW	depth to water
DWR	California Department of Water Resources
EGM96	Earth Gravitational Model of 1996
EPA	U.S. Environmental Protection Agency
ET	evapotranspiration
ET_0	reference evapotranspiration
FT or ft	feet
GAMA	[USGS] groundwater ambient monitoring & assessment
GDE and iGDE	groundwater dependent vegetation and DWR indicators of GDE database
GIS	geographic information system
GPS	global positioning system
GBUAPCD	Great Basin Unified Air Pollution Control District
GSA	groundwater sustainability agency
GSP	groundwater sustainability plan

GW	groundwater
HCM	hydrogeologic conceptual model
Hydrodata	hydrologic data server
ICWD	Inyo County Water Department
ID	identification
IWVWA	Indian Wells Valley Groundwater Authority
JPA	Joint Exercise of Powers Authority
LADWP	Los Angeles Department of Water and Power
LAUWMP	Los Angeles Urban Water Management Plan
LiDAR	light detection and ranging
LORP	Lower Owens River Project
LTWA	Inyo/Los Angeles Long Term Water Agreement
NCCAG	natural communities commonly associated with groundwater
M&I	municipal and industrial
MCL	maximum contaminant level
MOU	memorandum of understanding
MWH	Montgomery Watson Harza
MS4	municipal separate storm sewer system
NAD	North American datum
NAVD88	North American vertical datum of 1988
ND	not detected
NGVD29	national geodetic vertical datum of 1929
NO3	nitrate
NPS	U.S. National Park Service.
NWIS	national water information system

OFR	open file report
OLGDP	Owens Lake Groundwater Development Program
OVGA	Owens Valley Groundwater Authority
PBP	priority basin project
PSW	public-supply well
PVC	polymerizing vinyl chloride
QA	quality assurance
QC	quality control
RASA	regional aquifer-system analysis
RP	reference point (elevation)
RWQCB	California Regional Water Quality Control Board
SAP	sampling and analysis plan
SGMA	California Sustainable Groundwater Management Act
SMC	sustainability management criteria
S	
SWL	static water level
SWN	DWR state well number
SWRCB	California State Water Resource Control Board
TAF/yr	thousands of acre-feet per year
TD	total depth
TDS	total dissolved solids
TMDL	total maximum daily load
TNC	The Nature Conservancy
TOS	top of screen
TVGMD	Tri-Valley Groundwater Management District

URL	uniform resource locator (web address)
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WGS84	world geodetic system 1984
WL	water level
WLE	water level elevation
WQ	water quality
WY	water year

Executive Summary (ES) 1 Introduction

ES 1.1 Purpose of the Groundwater Sustainability Plan (GSP or Plan)

The Owens Valley Groundwater Basin and Fish Slough subbasin (Basin) were assigned a low priority status by the California Department of Water Resources (DWR) and are not required to be managed by a Groundwater Sustainability Agency (GSA). GSAs in low priority basins are encouraged to complete a GSP. In 2019, the Owens Valley Groundwater Authority (OVGA) elected to prepare a GSP for the Basin. This document is the GSP, and it was developed in accordance with Sustainable Groundwater Management Act (SGMA) statutory and regulatory requirements. This GSP describes the Basin, develops quantifiable management objectives that account for the interests of beneficial groundwater uses and users, and identifies a group of management actions that will maintain sustainable conditions in the Basin for 20 years after plan adoption. This GSP also contains steps a GSA could undertake to manage pumping to address declining water levels in a portion of the Basin.

ES 1.2 Sustainability Goal

The low priority status of the Basin suggests that, as a whole, groundwater in the Basin is managed sustainably. The sustainability goal of the OVGA is to monitor and manage the Basin by implementing a groundwater monitoring network and database and by adopting management actions that fairly consider the needs of and protect the groundwater resources for all beneficial users in the Basin. The OVGA Board of Directors approved their Guiding Principles to describe commitments and common interests that the OVGA members have agreed on as a way to influence current and future compliance with SGMA. Furthermore, the OVGA will act in support of the following Mission Statement:

> *The Owens Valley Groundwater Authority safeguards the sustainability of the Owens Valley Groundwater Basin through locally tailored management of groundwater resources to protect and sustain the environment, local residents and communities, agriculture, and the economy.*

ES 1.3 Agency Information

This GSP has been developed under the direction of the OVGA. Contact information is shown below:

Owens Valley Groundwater Authority
c/o Inyo County Water Department
135 S. Jackson Street
Independence, CA 93526
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760-878-0001
asteinwand@inyocounty.us

The OVGA formed on August 1, 2017 using a Joint Powers Agreement (JPA) executed by the original members. As presented in the JPA, in accordance with California Government Code Section 6509, the OVGA's powers shall be subject to the restrictions upon the manner of exercising such powers pertaining to the County of Inyo. Since the formation of the OVGA, several changes to the membership occurred in accordance with the JPA provisions to add or terminate members. Starlite CSD was terminated after revision of the Basin boundary, and following the ranking of the Basin as low priority, requests from the Tri-Valley Groundwater Management District, Wheeler Crest CSD, Sierra Highlands CSD, and the Eastern Sierra CSD to terminate their memberships were approved by the OVGA. Requests from the Owens Valley Committee and the Lone Pine Paiute Shoshone Tribe to participate on the Board as Interested Parties (JPA, Article V, Appendix 1) were approved in May 2020. Current membership of the OVGA is:

Big Pine CSD

City of Bishop

County of Inyo

County of Mono

Indian Creek-Westridge CSD

Lone Pine Paiute Shoshone Tribe- Interested Party

Owens Valley Committee – Interested Party

The OVGA is a joint exercise of powers agency administered by a governing board consisting of one primary appointed Director and one alternate from each member agency (see above). The OVGA shall exercise those powers granted by SGMA and shall possess the ability to exercise the common powers of its Members. Voting procedures of the OVGA are described in the JPA, Article IV.

The Bureau of Land Management, US Forest Service, and Los Angeles Department of Water and Power (LADWP) were invited to participate in the OVGA board as Associate Members or Interested Parties and declined to do so. The State Lands Commission (SLC) submitted a statement to join the OVGA as an Interested Party, but the OVGA Board preference was to invite the SLC to participate on a future advisory committee in the Owens Lake area. The SLC has the discretion to make compliance with the GSP a lease condition for any project on the state lands in the Basin.

The estimated cost to implement the GSP is approximately $436,665. The single largest cost is the development of a groundwater model for the Tri-Valley and Fish Slough portion of the Basin. The model is prerequisite to development of land or pumping management to address groundwater concerns and is contingent on acquisition of grant funding. The initial year of the GSP (FY 2022-23) includes three Management Actions and total costs are estimated to be $81,270. Ongoing annual costs thereafter are estimated to be $44,620.

The OVGA anticipates generating revenues sufficient to cover administration and operating costs from member contributions similar to the current funding mechanism. No pumping fees are anticipated in this GSP, but future groundwater development or changes in the Basin priority may require the OVGA to consider fees for analyses and groundwater management. The funding agreements between the members expire 3 months after the GSP is submitted, and it is expected that membership of the OVGA may change in 2022.

ES 1.4 GSP Organization

This GSP is organized according to DWR's "GSP Annotated Outline" for standardized reporting (Ca Dept. Water Resources [DWR] 2016a).

ES 2.0 Plan Area and Basin Setting

ES 2.1 Description of the Plan Area

The Basin covers approximately 1,037 square miles of which significant portions are Federal or State controlled lands. Only 17% of the Basin in Mono County and 2.7% in Inyo County are in private ownership. Approximately 390 square miles owned by the City of Los Angeles is considered adjudicated and therefore exempt from SGMA (CWC, 10720.8(c)). Los Angeles is the largest landowner in Inyo County (about 53% of the land) and also owns the majority of groundwater and surface water rights. The largest landowner in Mono County, the Bureau of Land Management, manages approximately 68% of that county. Also occurring in the Basin are state lands managed by the California State Lands Commission and federal lands managed by the National Park Service (NPS) or the United States Forest Service. Tribal lands in the Basin are managed by the Lone Pine Paiute-Shoshone Tribe, Fort Independence Paiute Tribe, Big Pine Paiute Tribe, Bishop Paiute Tribe, and the Utu Utu Gwaitu Paiute Tribe. There are approximately 14,905 acres of actively farmed lands in the Basin. Typically, each private farm has its own well and water delivery system to provide irrigation. On Los Angeles-owned lands, water delivery for irrigation is managed by LADWP and their lessee.

The main agencies or programs conducting groundwater monitoring and management in the Basin include: the City of Los Angeles (subject to the Inyo/Los Angeles Long Term Water Agreement, LTWA), Tri-Valley Groundwater Management District, the California Statewide Groundwater Elevation Monitoring Program (CASEGM), the Groundwater Ambient Monitoring and Assessment Program (GAMA), local water providers (mutual water companies, community service districts or the City of Bishop), and the Owens Lake Groundwater Development Program (OLGDP). These agencies or programs monitor groundwater levels, water quality and/or extraction in areas throughout the Basin. In addition, LADWP is required to continue water deliveries for irrigation, mitigation, and for dust control, and conducts recharge operations in the Basin. Monitoring associated with these activities is routinely reported by LADWP.

Data acquired from existing monitoring programs conducted by the various agencies or programs listed above were incorporated into an OVGA database management system. Most of the data from existing monitoring networks are publically available and will serve as ongoing sources of data. The OVGA database is publically accessible and was designed to function as a single repository for a wide variety of monitoring data. The database includes a variety of map layers and data for an estimated 4,929 water wells that exist in the Basin.

The Owens Valley Groundwater Basin occupies portions of Inyo and Mono County and the City of Bishop. These local governments have adopted general plans with goals and land use classifications that identify allowable activities within each jurisdiction. The relevant land use plans contain few assumptions regarding water supply, and it is unlikely that the GSP implementation will affect existing plans. Given the overall sustainable conditions in the Basin, the GSP does not propose to immediately change the water demands or operations of existing wells within the Basin. Such measures may be incorporated into future amendments or updates to this GSP. The OVGA may require additional reporting of groundwater extraction in the Basin to complete its database and revise slightly the process for permitting wells in the Basin. The OVGA may inspect permits submitted to Inyo and Mono Counties to update its database and determine if new or replacement wells could cause changes in pumping in the Basin that may affect the sustainability of groundwater conditions. Inyo County and Mono County as groundwater well permitting agencies implement the California Department of Water Resources' updated Water Well Standards. Monitoring and enforcement of these standards and the well permit approval will remain with the Counties.

Outside of the Basin, the Los Angeles Department of Water and Power and potentially the Indian Wells Valley Groundwater Sustainability Agency could influence the sustainable management of groundwater resources in the Owens Valley basin. LADWP exports approximately 100,000 – 500,000 acre-feet per year (AFY) from the Eastern Sierra for municipal use in Los Angeles, and extracts approximately 50,000 – 95,000 AFY of groundwater in the Owens Valley, with annual amounts varying with runoff, local uses, and groundwater and vegetation conditions. These activities may affect the ability of the OVGA to maintain sustainable groundwater management in the basin. The Inyo/Los Angeles LTWA contains provisions to protect private wells and to prevent other significant impacts on the environment that cannot be acceptably mitigated, including in the non-adjudicated portion of the Basin. LADWP's Urban Water Management Plan (LADWP, 2020) projects that over the next 25 years, average deliveries from the Los Angeles Aqueduct (LAA) to the City will decline from the 1985-2014 median of 192,000 AFY to 184,200 AFY by 2045.

California Water Code Sections 10723.2 and 10728 require a GSA consider the interests of all beneficial uses and users of groundwater and provide a written statement describing how interested parties may participate in the development and implementation of the GSP. Beneficial users include any stakeholder who has an interest in groundwater use and management in the Basin. To assist in determining who the specific SGMA stakeholders and beneficial users are, the DWR has issued a Stakeholder Engagement Chart for GSP Development in their 2018 *GSP Stakeholder Communication and Engagement Guidance Document* (DWR, 2018). The OVGA procedures for encouraging public participation are contained in its Communication and Engagement Plan (CEP) and were patterned on the DWR guidance.

A key message of the OVGA is that it is committed to proactive and transparent outreach and engagement with stakeholders and Basin community members throughout GSP planning and SGMA implementation. The CEP describes several essential communication strategies used by the OVGA to encourage active involvement. Opportunities for stakeholder input were 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 the CEP. In addition, staff provided updates and presentations at meetings of the TVGWMD meetings, Mono County Board of Supervisors, and Inyo County Board of Supervisors. Timely notification of opportunities for interested parties to participate in the implementation of the GSP will be given via the channels and strategies described in the CEP.

The OVGA has conducted 35 public Board meetings since its inception, XX included presentation of GSP information as it was developed. All consultant work products were presented to the Board and in public meetings before inclusion in the GSP. XX public workshops were conducted specifically to discuss the GSP contents. To allow for ongoing public engagement, the OVGA will conduct a 60 day comment period on the Draft GSP before adoption by the Board, and responses to comments will be prepared and included the GSP.

ES 2.2 Basin Setting

ES 2.2.1. Hydrogeologic Conceptual Model

Numerous geologic and water resource studies have been conducted in Owens Valley since the early 1900’s, and all relevant information was reviewed to prepare the Owens Valley hydrogeologic conceptual model (HCM). This section summarizes information pertinent to HCM and GSP development.

Owens Valley is located on the eastern side of the Sierra Nevada Mountains in California on the western edge the Basin and Range Province. 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 Basin is comprised of Owens Valley (6-012.01) and Fish Slough subbasin (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 the "Tri-Valley."

The Basin was formed as a result of Basin and Range extensional tectonics that caused the land surface parallel to northwest-southeast trending faults to drop relative to the adjacent mountain blocks. Bedrock beneath the Owens Valley consists of down-dropped, fault-bounded blocks at varying depths of up to several thousand feet below the present land surface. Valley-fill, consisting mainly of sediment shed from the adjacent mountain blocks and also tuff and basalt flows erupting from volcanoes, has accumulated on top of the down-dropped blocks. Bishop Tuff is a Pleistocene rhyolitic ignimbrite that occurs at the land surface north of Bishop and west of Chalfant and Hammil valleys. The tuff is present at depth in Chalfant Valley and northern Owens Valley and overlies basin fill and bedrock. Sedimentary material consists of unconsolidated to moderately consolidated alluvial fan and glacial moraine deposits adjacent to the mountain range fronts and fluvial plain deposits along with deltaic and lacustrine deposits near the axis of the valley. Depositional environments change over relatively short distances resulting in laterally discontinuous sand, gravel, and clay lenses underlying most of the valley; however, laterally extensive clay strata are present beneath Owens (dry) Lake and in the Big Pine area.

Topography of the watershed can be broadly classified as mountain uplands, alluvial fans, volcanic tablelands, and valley floor. The margins of the watershed are primarily composed of the steep, mountainous uplands which are cooler and receive greater precipitation than lower elevation alluvial fans, tablelands, and valley floor comprising the Basin. Long term averages of total annual precipitation are about 57 inches in the Sierra Nevada, 14 inches in the White and Inyo Mountains, and 5.9 inches on the valley floor. The Owens River enters the northern portion of the Basin near Bishop and meanders southward through the valley towards Owens (dry) Lake. Major tributaries flow from the Sierra Nevada to the river or LAA or are diverted for local irrigation and environmental projects. No direct surface-water connection exists between the Tri-Valley area and the Owens River. The Owens Valley is a closed drainage basin and there is no groundwater or natural surface-water outflow.

The Basin occurs on the boundary of the Great Basin and Mojave deserts. The southern part of the basin has vegetation communities characteristic of the hot Mojave Desert to south and the northern part of the basin has communities characteristic of the cooler, higher elevation Great Basin Desert. Drought-tolerant Mojave Mixed Woody Scrub, Blackbush Scrub, and Great Basin mixed scrub are predominant on the alluvial fans. Vegetation communities on the valley floor range from salt-tolerant shadscale scrub, alkali sink scrub, desert greasewood scrub, alkali meadow, and desert saltbush scrub. Groundwater discharge zones which largely occur on the valley floor support alkali meadow, phreatophytic scrub communities, transmontane alkali marsh, woodland, and aquatic habitat.

Predominant soil classes in the Basin are Aridosols (hot and dry desert soils), Entisols (recent soils), Mollisols (soils with thick topsoil) and smaller areas of Histosols (organic soils). Many of the soil map units were unique to the Owens Valley, because of the varied geology, climate, and vegetation and large and isolated survey area.

Approximately 35% of the land area and the majority of water rights in the Basin are owned by LADWP. Because of the importance of water supplied from Owens Valley to Los Angeles, LADWP has developed extensive facilities and monitoring for land management, water storage and export, groundwater production, groundwater recharge, surface water and groundwater monitoring, and dust control. Land and water management in the Tri-Valley portion of the Basin is primarily conducted by private landowners and is less well studied and monitored.

The Owens River flows and tributary streams draining the high elevations of the east slope of the Sierra Nevada are diverted into the LAA. Flow in the Owens River is controlled by a series of reservoirs operated by LADWP and Southern California Edison Corporation, and is supplemented near its headwaters by diversions from Mono Basin. Water-year releases from Pleasant Valley Reservoir, where the Owens River enters the groundwater basin, had a median value of 256,000 AFY and ranged from 75,000 to 444,000 AFY (water year, WY 1959-2017). A WY is the period from October 1 - September 30, and is designated by the calendar year in which it ends. The largest tributary, Bishop Creek, has median annual runoff of 71,000 AFY and ranged from 35,000 to 134,000 AFY for WY 1904-2017. Combined inflows to the Owens Valley for all gaged tributaries ranged from 95,000 to 379,000 AFY, with a median of 160,000 AFY from WY 1988-2017. Analysis of available streamflow data for Goodale, George, Cottonwood, Taboose, and Red Mountain creeks suggest they contribute an additional 37,000 to 40,000 AFY on average, or about 20% of the gaged inflows into the valley. Most small creeks from the White

Mountains are ungauged, but the few data available suggest the contribution is small and almost entirely used for used for irrigation in the Basin. No direct surface-water connection exists between the Tri-Valley area and the Owens River except for an ephemeral wash that occasionally flows from Chalfant into the Laws area during extreme precipitation events. Surface-water that enters the Tri-Valley area as runoff from the surrounding mountains, less any water lost to evapotranspiration or vadose zone storage, is believed to recharge groundwater. Average runoff from the surrounding mountains into the Tri-Valley area has been estimated by studies conducted for this GSP to be approximately 18,000 AFY.

Surface water discharge from Fish Slough into the Owens Valley has declined from approximately 6,500 AFY for WY 1967-1976, to 3,400 AFY for WY 2008-2017. While the proportions of groundwater discharging into Fish Slough are currently unknown, a large portion is believed to come from the Tri-Valley area. Other inflows to the Owens Valley groundwater system are primarily sourced from infiltration of surface-water into alluvial fans near the margins of the valley, with a small amount of recharge derived from direct precipitation on fan surfaces, deep percolation from irrigated agricultural fields, and seepage from losing reaches of the Owens River, Los Angeles Aqueduct, and irrigation. Most natural groundwater discharge occurs on the valley floor in the form of spring flow, wetlands, baseflow to gaining reaches of the Owens River, transpiration by phreatophytic vegetation communities, and evaporation from the playa and brine pool at Owens Lake.

Structural boundaries of the Basin are generally delineated by the contact between alluvium and the bedrock of the adjacent mountain blocks. At the south end of the basin, the boundary is defined by the topographic high between Owens Valley and Rose Valley; there is no groundwater outflow to Rose Valley. The boundary west of Chalfant and Hammil valleys is formed by the contact between valley fill alluvium and the Bishop Tuff. At this boundary, the Bishop Tuff likely overlies valley fill that was present when the tuff was deposited. The bottom boundary of the Basin is bedrock which is hundreds to thousands of feet deeper than the transmissive portion of the overlying aquifer system. Faults roughly parallel the axis of the valley and form barriers to groundwater flow across their strike (orientation) due to offset of high permeability layers and formation of low permeability material in the fault zone. Evidence for faults acting as groundwater flow barriers includes emergence of springs along fault traces and declines in water table elevation across faults. Faults can also serve as conduits to groundwater flow along their strike, and create discharge zones where faults intersect.

The basin's aquifer system can be generalized into a shallow unconfined zone and a deeper confined or semi-confined zone separated by confining unit(s) that are laterally discontinuous. In Fish Slough, relatively thin locally derived alluvium overlies Bishop Tuff. Most of the valley fill in the Basin is clastic material shed from the surrounding mountains, the majority of which is sand and gravel. Alluvial fan sediments are coarse, heterogeneous, and poorly sorted at the head of the fan and finest at the toe, beyond which fans transition to lake, delta, or fluvial plain sediments. The transition zone from fan to valley floor is characterized by relatively clean well-sorted sands and gravels that likely originated as beach, bar, or river channel deposits. This zone is a favored location for LADWP groundwater wells because the well-sorted sandy aquifers provide high well yields and the transition zone corresponds with the alignment of the Los Angeles Aqueduct. Volcanic flows comprise a relatively small volume of the valley fill but are transmissive aquifers and historically supported the largest springs in the Owens Valley. Where lacustrine environments prevailed for long periods of time at Owens Lake and near Big Pine, extensive thick clay confining layers are present. Although the clay layers are disrupted and offset by faulting, the confined nature of the deep aquifer is evident from generally higher heads in the deep aquifer than in the overlying shallow aquifer and the presence of flowing artesian wells near Bishop, Independence, and Owens Lake.

Hydraulic conductivity in Owens Valley and the Owens Lake area ranges from less than 10 ft/day to over 1,000 ft/day. Basalt flows between Big Pine and the Los Angeles Aqueduct Intake are highly conductive and wells that intercept them have the highest production capacity in the valley. A modeling effort in the Tri Valley and Fish Slough region estimated hydraulic conductivities in the range of 0.01 to 125 ft/day, with most of the values falling in the 1 to 20 ft/day range. These values are atypical of coarse alluvial materials and much lower than those from the Owens Valley and Owens Lake. The unusually low values may be due to model calibration artifacts suggesting a significant data gap exists. Hydraulic conductivity, determined from aquifer tests in Owens Valley and the Owens Lake area, ranges from less than 10 ft/day to over 1,000 ft/day.

Groundwater generally flows from recharge areas high on the alluvial fans (areas of high hydraulic head) to discharge areas on the valley floor (areas of low hydraulic head) resulting in groundwater flow directions that parallel topographic gradients. Groundwater pumping has formed local cones of depression around centers of sustained pumping near Birch Creek (south of Big Pine), Aberdeen (north of Independence), and Independence, which locally modify the regional pattern of down-fan flow on the alluvial fans and southerly flow on the valley floor.

ES 2.2.2 Current and Historical Groundwater Conditions

Current groundwater conditions (elevations, storage, water quality, surface water interactions and subsidence) and historical trends in the Basin are summarized in this section. Water level trends are also discussed in detail in section ES 2.2.4.

Benton and Chalfant Valleys show similar rates of groundwater level decline over the past 30 years that average about -0.5 ft/yr with total recorded declines of about 9.5 ft and 15.3 ft, respectively. Hammil Valley water levels exhibit an even faster rate of decline of approximately -1.8 ft/yr based on the limited available data. Water levels in Fish Slough also show persistent groundwater declines since the late 1980s, with timing consistent with declines observed in the Chalfant Valley. However, the rate of water level decline in Fish Slough is lower at approximately -0.15 ft/yr.

Groundwater level fluctuations and trends in the central Owens Valley portion of the Basin vary depending on time and location. This is a result of both complicated geology, the high degree of groundwater and surface-water management in the area, and management according to the LTWA. Generally, groundwater levels appear to be in a dynamic steady state that track hydrologic conditions: water levels increase during wet years and decrease during dry years. The rate at which this increase or decrease occurs appears to be well-specific and likely influenced by multiple local factors such as nearby pumping (predominately by LADWP), managed recharge, well screen interval, and geology. Two major periods of groundwater decline observed in the Owens Valley management area since 1980 coincide with the two major droughts during this period (1986-1992 and 2012-2016). Water levels for most wells reached their deepest values during the 1986-1992 drought, due to the severity of the drought and due to pre-LTWA water management which included the highest annual pumping totals in history by LADWP. Water levels during the more recent drought are generally shallower than the 1986-1992 period due to full, ongoing implementation of the LTWA and a reduction in LADWP pumping. All wells appear to have recovered or mostly recovered from the 2012-2016 drought or are showing increases in groundwater levels since January 2017.

Groundwater levels in the Owens Lake management area are highly dependent on spatial location and screened interval of the well. Pumping stress in this management area is relatively low, constant, and concentrated on the west and south sides of the Lake. Water level trends are generally consistent across the aquifers, with levels decreasing during the 2012-2016 drought and then recovering during the following wet period. Fluctuations typically range between 2 and 8 feet during the period of record. Groundwater elevations in the lower aquifers are greater than those in the upper aquifers, reflecting the general upward gradient under the playa area of the old lake bed.

Groundwater storage is highly correlated with groundwater elevation in the Owens Valley, especially within the GSP area where a large portion of the aquifer system is considered to be unconfined (excluding the Owens Lake area). Previous modeling studies by U.S. Geological Survey, USGS (Owens Valley) and US Filter (Tri-Valley) did not report total storage estimates for the entire groundwater basin because it was not a key parameter, and the models weren't sensitive to the total aquifer thicknesses which is in the predominately lower aquifer or deeper strata. Given the correlation and relatively stable water levels and pumping, groundwater elevation is an adequate indicator for changes in storage. For the Owens Valley and Owens Lake management areas, the lack of a long-term decline in groundwater levels in these areas suggest groundwater storage experiences similar inter-annual fluctuations like those observed in water levels described above. Persistent declines in groundwater elevations observed in the Tri-Valley management area indicate chronic loss of water in storage (see ES 2.2.3 below).

Groundwater quality is generally good in the Basin with the exception of naturally occurring brine near Owens Lake. In Tri-Valley, elevated solute concentrations in one landfill monitoring well are likely due to proximate infiltration of leachate, but other constituents do not appear to show any significant trend, suggesting the observed concentrations are generally indicative of natural conditions in the basin. Major cation, anion and isotope data from several studies are available for Fish Slough subbasin to characterize natural water chemistry, but no data for regulated contaminants is available. Because there is no development in the subbasin, water quality is assumed to be good and reflect natural conditions. Representative wells with recent analytical data in the Owens Valley management area show groundwater quality is generally very good, with none of the representative wells exceeding any of the primary or secondary maximum contaminant levels. Concentrations in the representative monitoring wells for the five constituents that were evaluated (total dissolved solids, sodium, chloride, nitrate, arsenic) generally appear to be stable. Elevated concentrations of arsenic within and adjacent to the Owens Valley management area are naturally occurring due to the numerous volcanic deposits present. Water quality in the Owens Lake Management Area is very poor due to evaporative concentration of solutes. Higher quality water occurs at the lake margins, primarily on the north and west where groundwater recharge is predominately more recent Sierra Nevada runoff. Concentrations of most constituents evaluated appear to increase from north to south, but the limited number of data points makes this far from a definitive trend. Concentrations of total dissolved solids, chloride, and sodium are relatively stable in a given well. Arsenic is the only constituent that shows erratic concentrations that fluctuate greater than the maximum contaminant level.

Subsidence is the permanent compaction of fine-grained sediments due to the increase in the effective stress caused by groundwater or hydrocarbon removal. The evaluation of subsidence for the Owens Valley basin in this GSP was based on geodetic surveys, Interferometric Synthetic Aperture Radar (InSAR) data, and global positioning systems (GPS), extensometers, and tiltmeters. Not surprisingly, none of the GPS stations mounted in bedrock adjacent to the alluvial Basin show evidence of subsidence. InSAR is a satellite-based remote sensing method used to map ground surface elevation change over large areas with high accuracy. InSAR data available from DWR for twenty-six representative sites in the Basin underlain by alluvium were evaluated by studies completed for this GSP. Vertical land surface elevation fluctuations ranged between +0.05 feet and -0.05 feet throughout the basin which is less than the reliable instrumental resolution (0.07 feet). Tri-Valley and Owens Valley Management Areas have historically shown little to no subsidence related to groundwater withdrawal. Tiltmeter data collected in the northern part of Owens Lake playa to monitor land surface elevation changes during short term (7-23 days) groundwater pumping tests showed less than 1 inch of subsidence. The hydrogeologic setting near Owens Lake and measured subsidence after only a short-term groundwater extraction test suggest that moderate potential exists for subsidence in that portion of the Basin.

Three primary types of interconnected surface waters systems were assessed within the non-adjudicated area of the Basin: groundwater discharge into Owens River and tributaries, springs/seeps, and areas dominated by phreatophytic vegetation (species or plant communities that typically transpire more than precipitation) or GDEs. SGMA defines GDEs as *"ecological* *communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface".*

Outside of the adjudicated portion of the Basin, the extent of interconnected surface waters associated with Owens River tributaries is not well monitored, because shallow groundwater measurements are sparse. Local hydrologic and hydrographic information was used to assess the extent of groundwater discharge and interconnected surface water at tributary creeks. It is likely that interconnected surface water near tributaries in the non-adjudicated portion of the Basin on alluvial fans is rare. A sufficiently shallow water table to maintain a connection and groundwater discharge on the alluvial fans is unlikely and not supported by the limited number of available groundwater elevation measurements. Tributaries on the alluvial fans in the Owens Valley and Owens Lake Management Areas are known losing reaches based on stream flow data, and it can be reasonably assumed that the tributary creeks in the Tri-Valley Management Area emanating from the White Mountains are also losing reaches based on the landforms where they occur. Riparian vegetation along tributaries almost certainly subsists on infiltration of surface water run-on.

Local interconnected water also occurs where groundwater emerges at springs or seeps. The differentiation between springs and seeps in this GSP is that seeps lack a discrete point of groundwater discharge that flows across the land surface. Seeps are dominated by phreatophytes and, because of the mapping precision and methods in the studies completed for this GSP, some seeps were undoubtedly included in the identification and mapping of other GDE units. Small areas containing springs were identified in the Tri-Valley Management Area (4.1 acres), Owens Valley Management Area (7.2 ac) and Owens Lake Management Area (2.5 ac). The low estimated spring acreage at the Owens Lake is known to be inaccurate because some seep/discharge areas are probably lumped in with the extensive areas of meadow, marsh (tule), or water body impoundment map units. The Fish Slough spring complex consists of multiple spring systems and has interconnected surface water throughout its length.

Potential GDE units in the Owens Valley Groundwater Basin were identified using the DWR indicators of groundwater dependent ecosystems (iGDE) database to generate a preliminary map. Additional information on vegetation community composition, aerial imagery, depth to groundwater from local wells (where available), plant and species distributions in the area, plant species rooting depths, and local observations from Inyo County Water Department biologists (ICWD, 2020) were also relied upon to prepare the final GDE map. Several improvements to the map should be completed during implementation of this GSP including revising polygon boundaries, especially near Owens Lake.

The Owens Valley Groundwater Basin is ecologically diverse and includes numerous species and habitat that are groundwater dependent. Thirty-six special-status terrestrial and aquatic wildlife species were identified as indirectly or directly groundwater dependent. These data and remote sensing information was used to assess the hydrologic and ecological value and condition of the GDEs within each Management Area or subbasin. Each GDE map unit was characterized and assigned a relative rank to summarize the results of this analysis (high, medium, low). The evaluation of ecological conditions relied primarily on remote sensing data related to vegetation vigor or wetness as well as other monitoring data. The assessment included ranking the vulnerability to changes in groundwater discharge or levels that could substantially alter GDE distribution, species composition, and/or health. Based on the assessment completed for this GSP, the Tri-Valley Management Area was determined to have low ecological value. The Fish Slough subbasin, the Owens Valley Management Area, and the Owens Lake Management Area were determined to have high ecological value. The ecological condition of the GDEs was similarly ranked as fair condition in Tri-Valley, Fish Slough and Owens Valley. Susceptibility to groundwater changes were ranked from moderate to high potential depending on the portion of the Basin. The Owens Lake Management Area had insufficient information (primarily on sensitive species) and difficult mapping which prevented assessing the ecological condition or susceptibility to changes, but these topics are the subject of ongoing studies and presently, pumping is relatively low in this management area.

ES 2.2.3 Water Budget Information

This basin is highly dependent on groundwater for potable supplies, but overdraft conditions have NOT been identified for the overall basin. The most recent evaluation and literature review of previous water budget investigations for the entire basin was completed by Harrington (2016). The Tri-Valley is likely in overdraft based on water level trends, but the amount of excess pumping is poorly constrained by previous water balance estimates and may be as great as 7,600 AFY. In the Owens Valley and Owens Lake Management Areas, recharge and discharge are approximately in equilibrium.

Recharge (mostly from runoff) was poorly quantified in portions of the Valley, especially Tri-Valley and Owens Lake. The recharge component of the water budget for the entire basin, and each of the proposed management areas, as compiled by previous investigators were compared to the results to those derived from using the Basin Characterization Model (BCM).

In the Owens Valley, recharge estimates are based on linear relationships with runoff suggesting modeling of future runoff may be a useful proxy to assess future changes in the Basin groundwater balance. A BCM model incorporating climate change factors recommended by DWR for the Eastern Sierra was used to evaluate the effect of climate change on runoff and recharge. The BCM modeling of future climatic conditions for the watershed suggested a 6% increase in precipitation, but this excess is lost to increased evapotranspiration, 19%. Overall, the amount of recharge is expected to increase by a modest 3% or 7,000 AFY, but surface water runoff was predicted decrease is 6% or 27,000 AFY by 2045.

ES 2.2.4 Management Areas

The varying combinations of topography, geology, and climate over the large area of the Basin have resulted in hydrogeologic conditions varying spatially, generally from north to south. The spatial distribution of the conditions was used to divide the basin into separate management areas which allow for development of SMCs that take into account hydrogeologic conditions. The management areas from north to south are:

- Tri-Valley Management Area including the Fish Slough subbasin
- Owens Valley Management Area
- Owens Lake Management Area

The Fish Slough and Tri-Valley Management Area is the least understood portion of the basin. There have been few hydrogeologic studies conducted in the area and monitoring networks are limited. Hydrologically, the Tri-Valley Management Area is distinct because it has few surface-water features and sources recharge primarily from the White Mountains instead of the Sierra. It is geologically distinct from the Owens Valley Management Area to the south containing alluvium derived primarily from sedimentary and metamorphic rock and the rhyolitic Bishop Tuff as opposed to primarily granitic-derived alluvium, interlayered basalt flows and presences of thick clay layers. Tri-Valley portion of the area is considered to have a single aquifer. A portion of this aquifer is believed to extend under the Bishop Tuff towards Fish Slough where it becomes confined. The southeastern portion of the management area contains a prominent subsurface bedrock high that is coincident with a significant change in hydraulic gradient. This stratigraphy combined with preferential flow along faults/fractures that extend from Hammil Valley south to Fish Slough are believed to result in hydrogeologic connection between Tri-Valley and Fish Slough. Observed chronic declines in groundwater elevations in the Tri-Valley Management Area do not occur in the adjacent Owens Valley Management Area, indicating that groundwater management effects on water levels are largely confined to the Tri-Valley Management Area. Recent geochemical studies comparing Tri-Valley, Fish South and northern Owens Valley groundwater also suggest a link between northern Fish Slough and Tri Valley groundwater. Two calibrated groundwater models with domains along the southern end of the management area suggest that flow exiting the southern boundary of Tri-Valley is a relatively small and a very minor portion of the inflows to the Owens Valley.

The Owens Valley Management Area is fragmented geographically due to LADWP lands in the valley being considered adjudicated under the SGMA. This management area is also hydrogeologically distinct because the majority of it overlies the alluvial fans along the margins of the valley where development is limited and not expected to change due to lack of private land ownership. LADWP pumping and recharge operations are a significant driver of the hydrologic system in this management area, whereas there is relatively little LADWP pumping in the other two management areas. The significantly larger volume of groundwater pumped on LADWP lands means effects of management actions within the Owens Valley management area are expected to be negligible compared with LADWP operations unless new projects are proposed. LADWP has instituted an extensive monitoring network in this portion of the basin, although most monitoring wells are located near the boundary or downgradient of the non-adjudicated area. The majority of groundwater leaving the Owens Valley Management Area flows under LADWP lands in the center of the Basin before entering the Owens Lake Management Area to the south.

The geology of the Owens Lake Management Area aquifer system is less heterogeneous laterally compared to the other two management areas, and exhibits a more layer-cake geology due to the depositional environment of the Pleistocene Owens Lake. Thick lacustrine clay layers separate at least five distinct aquifers and act as confining beds. These clay layers provide the geologic conditions necessary for subsidence to occur, which are largely absent in the other two management areas. The other two management areas also have generally good water quality, while the Owens Lake management area has generally poor water quality (naturally occurring).

ES 3.0 Sustainable Management Criteria

SGMA defines sustainable Groundwater Management as the *"…the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results"* (CWC 10721 (v)). SGMA includes four sustainable management criteria (SMC) components that the GSP is required to define: a sustainability goal, undesirable results, minimum thresholds, and measurable objectives. These four components are described in this section specifically for the three management areas or for the entire Basin where applicable.

SGMA listed six sustainability indicators pertaining to groundwater conditions occurring throughout the basin that can represent undesirable results (CWC Section 10721): chronic lowering of groundwater levels, reduction in groundwater storage, depletion of interconnected surface water, seawater intrusion, degraded water quality, and land subsidence. Measurable objectives and minimum thresholds for five of these indicators are discussed in this section. The Basin is not located near the ocean and therefore not susceptible to seawater intrusion. No SMCs were established for this indicator, and it is not discussed further in this section.

ES 3.1 Sustainability Goal

The Basin, including the Fish Slough subbasin, is currently ranked by DWR as a low priority basin based on multiple factors suggesting that as a whole, groundwater in the basin is managed sustainably. The sustainability goal of the OVGA, therefore, is to monitor and manage the Basin by implementing a groundwater monitoring network and database and by adopting management actions that fairly consider the needs of and protect the groundwater resources for all beneficial users in the Basin. The OVGA is committed to preventing undesirable results and to ensuring the sustainability of the Basin is maintained by establishing SMCs including minimum thresholds and management objectives described in this GSP. The OVGA opposes groundwater export from the Eastern Sierra that would result in negative consequences to groundwater sustainability, the environment, local economy, and residents. The OVGA is proposing a limited number of projects and management actions in this GSP that will improve characterization and monitoring in the Basin and, if necessary, manage demands and supplies to achieve the sustainability goal.

ES 3.2 Undesirable Results

There are currently no documented undesirable results for the indicators throughout the Basin reflecting the overall sustainable conditions. As described in the ES 2.0 Basin Setting, three sustainability indicators exhibit documented trends toward undesirable results in the Tri-Valley Management Area; declining water levels, reduced groundwater storage, and declines in interconnected surface water. Undesirable results therefore were defined in each of the three management areas based on groundwater conditions that could lead to potentially significant and unreasonable effects.

ES 3.2.1 Tri-Valley Management Area

The primary beneficial uses and users of groundwater in the Tri-Valley Management Area include agricultural pumpers, domestic de minimis users, shallow GDE in the Benton, Hammil, and Chalfant valleys, and spring flow and associated GDEs in Fish Slough. Reduction of spring flow in Fish Slough would directly impact several protected species, critical habitat, and GDEs (Section 2.2.2.5). Fish Slough is a federally designated Area of Critical Environmental Concern.

Potential undesirable results in the Tri-Valley Management Area would primarily be related to lowering water levels including potential impacts to production wells' operational costs and drying out of shallow domestic wells. The costs associated with lowering of groundwater levels include increased electrical costs and shortened pump life, costs to lower or replace a pump, and costs to deepen or replace a well. These added costs for a well owner range from a few tens of dollars per year to potentially tens of thousands for drilling a new well. Additionally, loss of monitoring wells and reduced groundwater discharge to GDEs, in particular the springs located in Fish Slough constitute undesirable results. Based on available geologic, hydrologic, and geochemical evidence, pumping in the management area is the cause of declining water levels and spring flow in Fish Slough. The magnitude of overdraft and the pumping effect on spring flow, however, are poorly quantified. For the aquifer system in the Tri-Valley Management Area, lowering of water levels corresponds with reductions in storage. The steady water table decline is concerning, but it is unlikely that the undesirable results related to sustainable yield or available groundwater storage will be exceeded or that a decreased ability to maintain status quo pumping during droughts based on storage constraints will occur during the GSP implementation.

Severe pumping overdraft (which does not presently exist) could cause land subsidence resulting in general infrastructure damage or migration of lower quality deeper groundwater requiring treatment or loss of potable water, but these are unlikely to occur at the current rate of groundwater level decline.

ES 3.2.2 Owens Valley Management Area

The primary beneficial uses and users in the Owens Valley Management Area include community service districts, municipal or mutual water company water providers, domestic de minimis users, and shallow groundwater GDE. Impacts to domestic wells directly caused by lowering of groundwater levels and related changes in storage would include increase electricity costs, costs to adjust pump placement in a well, or to deepen or replace a well. Land subsidence may cause impacts to general infrastructure and would include damage to improvements on private property, public roadways or utilities. Degraded water quality could make groundwater unsuitable for the predominant beneficial uses for agriculture or domestic use.

Potential undesirable results of concern in the Owens Valley Management Area include lowering water levels causing impacts to production wells (increased pumping costs), drying out of shallow domestic or monitoring wells, and impaired GDE. Presently, water levels are stable in the non-adjudicated portion of the management area. Some potential exists for changes in pumping management or installation of new wells in the few areas of privately owned lands to alter local water table conditions in the management area. Impacts from LADWP wells in the adjudicated area would be required to be mitigated by the LTWA.

Given the nature of the aquifer system, lowering of water levels corresponds with reductions in storage. The stable water table trends at present are not concerning in terms of changes in storage due to the depths of the primary aquifer, and it is unlikely that sustainable yield or available groundwater storage will be exceeded or that a decreased ability to maintain status quo pumping during droughts due to storage constraints will occur during the GSP implementation.

Severe pumping overdraft (which does not presently exist) could cause land subsidence resulting in general infrastructure damage or migration of lower quality groundwater requiring treatment or loss of potable water, but these are unlikely to occur due to the relatively stable water levels and general lack of suitable subsurface materials.

ES 3.2.3 Owens Lake Management Area

The primary beneficial uses and users in the Owens Lake Management Area include agricultural or commercial pumpers, community service districts or mutual water company water providers, domestic de minimis users, and GDEs. Impacts to domestic wells directly caused by lowering of groundwater levels and related changes in storage would include increase electrical costs, costs to adjust pump placement in a well, or to deepen or replace a well. Land subsidence may cause impacts to general infrastructure and would include damage to improvements on private property, public roadways or utilities or infrastructure for dust control measures on the lakebed. Degraded water quality could make groundwater unsuitable for the predominant beneficial uses for agriculture, municipal, or domestic use.

Potential undesirable results of concern in the Owens Lake Management Area related to lowering water levels include potential impacts to production wells (increased pumping costs), drying out of shallow domestic or monitoring wells, and impaired GDEs. Presently water levels are stable in the non-adjudicated portion of the management area. The potential exists for future changes in pumping management in the adjudicated area, on privately owned lands, or under the Owens Lake bed managed by the SLC to affect (lower) water levels.

Given the layered nature of the aquifer system, lowering of water levels could correspond with reductions in storage in individual aquifer units. Groundwater levels at present are stable and not concerning, and it is unlikely that undesirable results related to sustainable yields or available groundwater storage will absent increased pumping related to LADWP's OLGDP. Deeper aquifers that may be tapped in the future by LADWP's OLGDP to supply dust control measures will be monitored to track the potential for reduction in storage.

No problems with subsidence or migration of saline groundwater caused by current pumping exist presently, but the potential for these impacts to occur depends on future development of groundwater pumping projects in the management area. Increased pumping could cause land subsidence resulting in infrastructure damage or migration of lower quality groundwater near or under Owens Lake requiring treatment or loss of potable water. The primary subsidence threat is future LADWP pumping under the lakebed from deeper confined aquifers.

ES 3.3 Minimum Thresholds

A Minimum Threshold is defined as "*a numeric value for each sustainability indicator used to define undesirable results*" (Reg. § 351 (t)). A value for each sustainability indicator denoting undesirable results (ES 3.2) must be included in the GSP and consider the beneficial uses and users of groundwater and other interests within the Basin.

ES 3.3.1 Tri-Valley Management Area

Groundwater level declines and storage reductions are closely correlated in unconfined aquifer systems like that in portions of the Tri-Valley Management Area. The minimum thresholds for both indicators are based on water levels and trends at representative monitoring wells. Drying of shallow domestic wells was determined to be the most urgent and significant undesirable result from chronic declines in groundwater levels in the Benton, Hammil, and Chalfant valleys. A well vulnerability assessment was performed for 189 domestic wells in the management area using the limited amount and types of publically available data. The analysis suggested that water levels in few domestic wells are at immediate risk of going dry due to declining water levels and the number remains small if declines continue for several additional years. The minimum threshold water levels at the representative monitoring wells assume continued steady water table declines at the average rate (ES 2.2.2) projected to May 2030 (eight years after adoption of the GSP). At this level, it is expected that between 3 to 8 domestic wells may be at risk of refurbishment or replacement due to declining water levels. Given the uncertainty of the analysis, this number of wells being negatively affected by declining water levels is considered significant and unreasonable. Water levels in monitoring wells and Fish Slough spring flows are highly correlated. Because the water levels in Fish Slough and Tri-Valley have similar long term declining trends (albeit at different rates), a similar extrapolation to estimate 2030 water levels based on rate of water table decline was used to set minimum thresholds in representative monitoring wells in Fish Slough. The minimum thresholds for wells in Fish Slough represent less than 1.5 feet of additional decline.

The minimum threshold for land subsidence was chosen as 0.3 ft (3.6 inches) measured by InSAR. This value is greater than the vertical resolution and historic range of variation observed in the InSAR data, and reflects the limited potential for subsidence based on current geologic understanding of the subsurface materials in the management area.

The primary interconnected surface water depletions of concern in this management area are springs and associated GDE in Fish Slough. Fish Slough Northeast Spring is the primary spring at risk of drying up, and of the three largest spring vents in Fish Slough, its groundwater chemistry was most similar to the Tri-Valley groundwater chemistry. The spring supports threatened and endangered species and associated critical habitat. The CDFW monitor and manage the spring flow for the benefit of the listed species and habitat. An average flow rate of 0.1 cfs from the Fish Slough Northeast Spring was chosen as the minimum threshold for the interconnected surface-water depletion sustainability indicator. The minimum threshold represents the minimum flow rate that is necessary to allow management of flows to maintain current habitat conditions according to the CDFW.

Elevated solute concentrations in the basin are either naturally occurring or are localized and already regulated by State agencies. Recognizing that the OVGA is not a public water supplier and that SGMA does not grant regulatory authority over groundwater quality to GSAs, minimum thresholds for groundwater quality included in this GSP are those set by existing or future regulations.

ES 3.3.2 Owens Valley Management Area

Minimum groundwater elevations observed during the 2012-2016 drought were used to establish the minimum thresholds for groundwater level declines, groundwater storage reductions, and surface water depletions. If no data were available in a representative monitoring well during this time, the minimum groundwater elevation observed since January 1st, 2000 was used. Maintaining water level elevations at or above those historical levels is not anticipated to result in significant and unreasonable impacts in the future. Potential surface water depletions in the management area are limited to the few acres of GDE that may be dependent on shallow water table. Impacts to GDEs are preceded by declines in water levels and maintaining water levels at or above those during the 2012-2016 drought should prevent impairment of GDE caused by pumping in the non-adjudicated area (impacts caused by LADWP would be subject to the LTWA).

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable for the Owens Valley management area. This value is greater than the vertical resolution and historic range of variation observed in the InSAR data and reflects the limited potential for subsidence based on current geologic understanding of subsurface materials in this management area and the relatively stable water levels.

Elevated solute concentrations in the management area are either naturally occurring or localized sources of poor water quality already regulated by State agencies. Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, minimum thresholds for groundwater quality included in this GSP are those set by existing or future regulations.

ES 3.2.3 Owens Lake Management Area

Given that water levels in this management area fluctuate but no long term declining trends are present and that pumping stress is currently low, minimum groundwater elevations observed during the 2012-2016 drought were used to establish the minimum thresholds for groundwater level declines and groundwater storage reductions. If no data were available in a representative monitoring well during this time, the minimum groundwater elevation observed since January 1st, 2000 was used. Maintaining water level elevations at or above historical levels is not anticipated to result in significant and unreasonable impacts in the future. Minimum thresholds based on a reduction in head gradient measured near springs and flowing artesian wells, both vertically and horizontally, may be included in a future GSP update if developed as part of the LADWP's OLGDP.

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable for the Owens Lake management area. This value is greater than the vertical resolution and historic range of variation observed in the InSAR data, and reflects the desire for minimal subsidence in the management area. Additional subsidence monitoring (e.g. extensometers) related to the OLGDP could lead to additional minimum thresholds.

Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, minimum thresholds for groundwater quality adopted by the OVGA are those set by existing or future regulations (e.g., statewide drinking water standards). This reflects the fact that elevated solute concentrations in the basin are either naturally occurring or contaminant sources are localized and already regulated by another agency. Minimum thresholds based on changes in water quality to prevent brine migration may be included in a future GSP update if developed as part of the OLGDP.

ES 3.4 Measureable Objectives

Due to observed groundwater level declines, both interim milestones and 20-year measureable objectives were developed for the Tri-Valley Management area. The Owens Valley and Owens Lake management areas are considered to be in a dynamic steady state condition, therefore the interim milestones in those management areas are equal to the 20-year measureable objective. Due to stable water levels, application of the GSP in the Owens Valley and Owens Lake Management Area would maintain current conditions and would not contribute to undesirable results in the Tri-Valley management area. Stabilizing water levels and spring flow declines in the Tri-Valley Management Area, as proposed by this GSP, would stabilize groundwater flow and spring discharge into the Owens Valley Management Area and not contribute to undesirable results in the Owens Valley Management Area.

ES 3.4.1 Tri-Valley Management Area

Groundwater elevations present when SGMA was enacted on January 1st, 2015 were selected as the 20-year measureable objective for undesirable results that could occur in the Tri-Valley Management Area from chronic groundwater level declines and groundwater storage reductions. Continued declines in groundwater levels are projected until 2027 (5 years after the GSP adoption) during which potential management actions are evaluated and a numerical groundwater model of the area is developed. At the present rate of decline, water levels will remain above the minimum threshold. Following the initial five years in which declines are expected (5-year milestone), this GSP anticipates five years of stabilizing groundwater levels (10-year interim milestone)as projects and management actions begin to come online. The next ten years would require implementation of steps to recover water levels to the 20-year measureable objective value.

A recognized data gap in this management area is insufficient water level monitoring. In future GSP updates, the management objectives may be revised at the present monitoring locations or new management objectives established for additional representative monitoring points. Since there have been no reported significant and undesirable results in Benton, Hammil, or Chalfant valleys directly related to decreased water levels as of the date of this plan, setting long-term sustainability goals at January 1st, 2015 water level elevations (higher than current levels) provides a reasonable margin of safety. Achieving the measurable objective will require either increasing recharge into the aquifer or decreasing pumping. While increasing recharge is typically preferred, it is not a realistic option for the Tri-Valley management area due to the limited availability of water available for import and nearly all runoff in the area already recharging groundwater. Reducing demand or changing land management is the most likely course to arrest chronic groundwater declines and groundwater storage reductions.

Interconnected groundwater and surface-water point discharge in the Tri-Valley Management Area is primarily present in Fish Slough, where groundwater is discharged via springs and seeps and a small area of GDE in Tri-Valley. The GDE in Tri-Valley would benefit from attaining measurable objectives for water levels. A flow rate of 0.5 cfs at the Fish Slough Northeast Spring was selected as the 20-year measureable objective based on recommendations from California Department of Fish and Wildlife (CDFW) managers. The current hydrogeologic conceptual model for the basin indicates that a portion of groundwater discharge into Fish Slough is sourced from Tri-Valley. Therefore, achieving the measurable objective for spring flow will likely require halting declines or raising water levels in Tri-Valley.

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable for the Owens Valley management area. This value is greater than the vertical resolution and historic range of variation observed in the InSAR data. This was chosen because no subsidence has been observed in the management area despite long-term water level declines and the necessary geologic conditions are not considered to be present.

Groundwater quality in the Tri-Valley management area is generally good. Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, the water quality degradation sustainability indicator has been interpreted to mean that projects and management actions undertaken by the OVGA cannot result in additional degradation of water quality. Potential project and management actions in the Tri-Valley Management Area are not expected to adversely impact water quality.

ES 3.4.2 Owens Valley Management Area

Measurable objectives for groundwater level declines and groundwater storage reductions for the Owens Valley Management Area were selected using averages of groundwater elevations measured between 2001 and 2010. For wells constructed after 2010, or for which data were incomplete from 2001 to 2010, the measureable objective was chosen as the average groundwater elevation for the most recent 10 years for which data was available. Interim milestones and long-term measureable objectives were set to the same value because the management area is in a dynamic steady state condition. If groundwater demand does not significantly increase, which is not anticipated, then maintaining the status quo will keep the management area in a sustainable condition.

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable for the Owens Valley management area. This value is greater than the vertical resolution and historic range of variation observed in the InSAR data

Potential surface water depletions in the management area are limited to the few acres of GDE in the non-adjudicated area that may be dependent on shallow water table. Maintaining the steady water level trends should prevent impairment of GDE caused by pumping in this area (impacts from LADWP pumping would be subject to the LTWA). Additional refinement of the mapping of these GDE areas is warranted to assess their susceptibility to water level changes.

Groundwater quality in the Owens Valley management area is generally good, with none of the representative wells exceeding any of the primary or secondary MCLs. Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, the water quality degradation sustainability indicator has been interpreted to mean that projects and management actions undertaken by the OVGA cannot result in additional degradation of water quality within the groundwater basin. Since the Owens Valley management area is currently in a dynamic steady state condition, it does not require project and management actions for water quality at this time.

ES 3.4.3 Owens Lake Management Area

Measurable objectives for groundwater level declines and groundwater storage reductions for the Owens Lake management area were selected using average of groundwater elevations measured between 2001 and 2010. For wells constructed after 2010, or those having no data from 2001 to 2010, the measureable objective was set to the average groundwater elevation for the most recent 10 years for which data was available. Groundwater levels in the Owens Lake management area vary little, and interim milestones and long-term measureable objectives are set at the same value to maintain recent levels and stable trends. Operations within the management area are currently sustainable. As long as groundwater demand does not significantly increase or groundwater inflows do not significantly decrease, maintaining current groundwater levels will keep the management area in a sustainable condition.

The Owens Lake management area is the portion of the groundwater basin most susceptible to subsidence, but pumping historically has been relatively low and no significant and unreasonable subsidence has been measured. Measureable objectives have been set for both groundwater elevations and observed new subsidence. Subsidence is preceded by changes in groundwater elevations. Typically, if groundwater elevations remain above the lowest historical value, then subsidence will be prevented. The same measureable objectives used for the groundwater level decline and groundwater storage reduction sustainability indicators are also applied to subsidence. A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable for the Owens Valley management area. This value is greater than the vertical resolution and historic range of variation observed in the InSAR data. If more sensitive GSP or extensometer data are available in the future as part of an OLGDP, they can be incorporated into future 5-year GSP updates.

Groundwater is discharged at faults, artesian wells or where groundwater flowing toward the lake encounters finer textured lake sediments and flow is deflected to the land surface to form seeps. The same measureable objectives used for the groundwater level decline, groundwater storage reduction, and subsidence sustainability indicators were also applied to interconnected surface-water depletions at springs and seeps. No significant and unreasonable impacts to groundwater dependent ecosystems on the playa caused by pumping have been observed since 2000. Therefore, maintaining current groundwater elevations should maintain the vertical hydraulic gradients that feed the springs and flowing artesian wells that provide vital habitat for species in the area. The use of vegetation monitoring and vertical and horizontal groundwater elevation gradients between nested or cluster wells have been proposed as long-term monitoring criteria to provide early warning of potential changes in discharge due to pumping under the lakebed. Further analysis and data collection required to develop such gradient-based SMCs is ongoing as part of the OLGDP: and may be included in the 5-year updates.

Groundwater quality in the Owens Lake management area is generally poor due to evaporative concentration of solutes. Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, the water quality degradation sustainability indicator has been interpreted to mean that projects and management actions undertaken by the OVGA cannot result in additional degradation of water quality within the groundwater basin. Since the Owens Lake management area is currently in a dynamic steady state condition, it does not require project and management actions at this time.

ES 3.5 Monitoring Network

The monitoring network will track Basin metrics to detect potential negative trends towards minimum thresholds and assess progress towards reaching measurable objectives. The proposed monitoring network is extensive and was derived from multiple established monitoring programs and agencies. Historical groundwater level, quality, pumping, surface water gauging, and meteorological data are housed in an interactive and publically accessible database (owens.gladata.com) that the OVGA anticipates updating on a regular basis. The entire dataset was inspected to choose representative monitoring sites.

The largest and most frequently measured monitoring well network is maintained by LADWP and the Inyo County Water Department. Data from a total of 880 wells with recent water level observations are available in the database, including 126 monitoring wells located within the non-adjudicated portion of the Basin. In addition to groundwater monitoring, LADWP also has an extensive network of surface water gauges located at the perimeter of the basin near the base of the Sierra Nevada, on the valley floor between Fish Slough and Owens Lake. Additional monitoring entities or programs that were a source of data included local water suppliers such CSDs and municipalities, monitoring related to CalEPA regulatory programs (landfills, USTs, etc.), GAMA or CASEGM, and monitoring related to CEQA/NEPA permitted actions. In addition, the OVGA may conduct on-site monitoring as needed to fill data gaps. With the notable exception of the Tri-Valley area, the majority of the significant groundwater extraction wells (LADWP, large CSDs, City of Bishop, and smaller population centers like Laws, Big Pine and Lone Pine) in the Basin are metered with monthly or annual totals included in the monitoring database.

The monitoring network allows for the assessment of hydraulic gradients across all three management areas. The network includes monitoring wells at various depths and in each of the major aquifer hydrostratigraphic units. Wells completed in multiple confined aquifers and clusters of wells with differing vertical screen intervals will be used to assess vertical hydraulic gradients that support GDEs in the Basin.

The combination of generally stable groundwater levels and/or general lack of susceptible subsurface materials with high potential for subsidence, has led to little historical, dedicated subsidence monitoring. The monitoring network includes InSAR data from DWR's publicly available data set at 26 representative sites in the Basin selected based on geographical characteristics and/or hydrogeological settings in areas underlain by susceptible materials.

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 on a site-specific basis required by the State to address localized groundwater contamination (e.g. landfills, leaking storage tank). As a result, most groundwater quality observations acquired by the OVGA and housed in the database are clustered around population centers or landfills in the Basin.

The historical record of hydrographic data acquired varies by location, but often ranges from several years to several decades. Groundwater and surface water data records in the database are sufficient to determine seasonal, inter-annual, and long-term trends. In key areas of interconnected surface water including the springs in Fish Slough and the perimeter of Owens Lake, several groundwater monitoring wells in the network are located in the vicinity of surface water gauging stations. The relationship between interconnected surface water and groundwater discharge will be effectively monitored by examining changes in groundwater head in a nearby monitoring well or cluster of wells to spring discharge. The spatial coverage and frequency of data collection in the monitoring network allows assessment of whether observed trends will maintain water levels, water quality, and ground elevation above minimum thresholds or, in Tri-Valley, determine if monitoring results are progressing towards measurable objectives.

This GSP includes 86 representative monitoring sites (60 wells and 26 subsidence locations) to monitor conditions and SMC for the relevant sustainability indicators to periodically evaluate the sustainability of the Basin. The sites include groundwater monitoring wells throughout the

Basin, surface water flows at Fish Slough springs, and sites for remotely sensed ground elevation measurements. Representative monitoring wells were selected using criteria including recent data availability and reliable monitoring, spatial location, proximity to areas of interest (e.g. non-adjudicated area or groundwater production locations), and length and monitoring frequency. Most wells are part of ongoing monitoring programs from OVGA members and future data availability should not be a limitation. Where necessary in Fish Slough, direct measurements of spring discharge were used to set SMC. Monitoring data at other springs will continue to be acquired and tracked by the OVGA. Similarly, the OVGA will continue to acquire water quality data reported for other purposes and publically available data collected by public water system, and by specific studies in the Basin.

In the Tri-Valley Management Area, a chronic decline in groundwater levels has been detected by the existing monitoring network, but the spatial coverage of monitoring wells in the management area is deemed insufficient. The OVGA will explore the opportunity to expand the monitoring system in the Tri-Valley management area by cooperating with other agencies that may conduct monitoring (e.g. TVGWMD or CDFW) or through implementation of a project to monitor water levels in domestic wells.

Monitoring will be conducted in accordance with a Sampling and Analysis Protocol (SAP) included in the GSP. The SAP was prepared in accordance with DWR's SGMA inspired Best Management Practices (BMP), in particular BMP #1 - M*onitoring Protocols, Standards, and Sites* (DWR, 2016b). Technical guidance documents considered in preparation of the SAP include, but are not limited to, the following documents:

- Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4 (US Enironmental Protection Agency [EPA], 2006)
- Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA, 2001)
- National Field Manual for the Collection of Water-Quality Data (US Geological Survey [USGS] 2018. Individual chapters published as separate documents)
- Groundwater technical procedures of the USGS: U.S. Geological Survey Techniques and Methods 1–A1 (USGS, 2011).

If as a part of ongoing monitoring or if groundwater conditions change or are expected to change, the GSP will be updated to add or alter monitoring locations, methods, or frequency. Management Actions and Projects are included in this GSP to address high priority data gaps and will include an annual review and evaluation of the monitoring network as part of the database maintenance. If new data are acquired, they may be considered when modifying the list of representative monitoring sites.

ES 4.0 Projects and Management Actions to Achieve Sustainability Goal

Groundwater Sustainability Plans must include *"a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin"* (Reg. § 354.44). As established above, the Basin is currently ranked low priority and overall, groundwater conditions are sustainable. The OVGA has chosen to develop this GSP to ensure groundwater conditions in the basin are maintained or improved where applicable. An additional consideration in developing this list of Management Actions and Projects was to not place an undue financial or regulatory burden on local residents recognizing that compliance with SGMA is voluntary for the OVGA. Given the sustainable condition and Low Priority status, the management actions and projects discussed in this section will be implemented at the discretion of the OVGA.

Four proposed Management Actions and Projects are discussed individually below. Design specifics for projects, implementation plans, or OVGA regulations will be prepared as applicable after adoption of this GSP and will be made available for public review and comment before Board decisions to implement an action.

ES 4.1 Proposed Management Action #1: Well Registration and Reporting Ordinance

The purpose of this proposed management action is to address a data gap regarding well locations and pumping amounts in the Basin. Several water providers or commercial pumpers did not respond to voluntary requests to provide data to the OVGA to include in the GSP. In some portions of the basin the data gap is considered high priority. For example, no pumping information was provided for the Tri-Valley Management Area. The ordinance will contain procedures, timing, reporting frequency, and methods to register a well and submit needed information which will be reviewed for quality control and entered in the OVGA database. The OVGA shall determine the timing of when to consider an ordinance following adoption of the GSP; however, this program will be necessary to complete and maintain a current database of pumping locations and amounts. Expected benefits of this management action will be a more accurate and complete database and ready access to groundwater information to all beneficial users in the Basin. If it becomes necessary for the OVGA to regulate pumping amounts or well spacing to prevent well interference or other undesirable results, a more complete registration of non-*de minimus* pumpers is necessary. The ordinance would be exempt from environmental regulations or permitting, and consideration by the OVGA will adhere to all public noticing and review requirements. The low cost of this of this project ($14,370) reflects the nearly complete extraction dataset for the majority of the Basin already obtained by the OVGA.

ES 4.2 Proposed Management Action #2: Well Permit Review Ordinance

The purpose of this proposed management action is to acquire information necessary to maintain an up-to-date database of pumping wells in the Basin. Additionally, the ordinance would allow the OVGA to determine if regulation of new wells under SGMA is applicable and necessary to ensure sustainable conditions are maintained. The proposed ordinance will require well construction permit applications submitted to Inyo or Mono Counties be provided to the OVGA for review. Procedures for communication and any necessary agreements between County Departments responsible for well permits, permit applicants, and the OVGA will be included in the ordinance. The ordinance will specify criteria that the OVGA will use to determine a need to regulate pumping. The scope of the permit review will be tailored as necessary to determine the need for groundwater management based on the potential for a new well to exceed a minimum threshold, to prevent attaining a measureable objective, or to cause other significant and unreasonable effects. The ordinance will describe the conditions the OVGA may place on well construction, location, capacity, or extraction to ensure sustainable groundwater conditions are maintained in the Basin. *De minimis* extractors are exempt from most SGMA provisions including regulation of pumping. The OVGA shall determine the timing of when to consider a Well Permit Review and Ordinance following adoption of the GSP; however, this project will be necessary to maintain a current database of pumping locations and amounts and to determine the need for groundwater regulation. The ordinance would be exempt from environmental regulations or permitting, and consideration by the OVGA will adhere to all public noticing and review requirements.

The low cost of this of this project ($7,920) reflects the relatively low number of well permit applications in the Basin, approximately 40 each year (many in the adjudicated portion).

ES 4.3 Proposed Management Action #3: Increase groundwater level monitoring network

The purpose of this proposed management action is to address a data gap regarding the paucity of water level measurements primarily in the Tri-Valley Management Area. Water level data for Round Valley in the Owens Valley Management Area and south of Olancha in the Owens Lake Management Area are sparse and may also be expanded. This management action consists of two components, a voluntary program of monitoring existing privately-owned wells and a potential program to install additional, dedicated monitoring wells. Construction of new monitoring wells by the OVGA is contingent on acquiring outside funding and developing land access/lease agreements with landowners at suitable locations in the Basin. The current water level monitoring network in the Benton and Hammil Valleys and to a lesser extent Chalfant Valley is insufficient for detailed mapping of groundwater elevations. Without reasonable estimates of the groundwater elevations across the valleys, a domestic well vulnerability assessment is difficult and reliant on several (though reasonable) assumptions. It is not certain the average rate of decline based on the available data is consistent across each valley. For example, some parts of the valleys may be declining faster or slower than the available data suggest.

Following adoption of the GSP, the OVGA will determine whether to implement this management action. First, the OVGA must ascertain whether well owners are willing to participate in a voluntary monitoring program. The program will require the OVGA enter into land access agreements with willing domestic well owners. If it determines additional dedicated monitoring wells are necessary, the OVGA would incur staff costs to procure outside funding and potential lease costs with landowners where new monitoring wells are sited.

The low cost of this of this project ($26,730) reflects the relatively low number of potential domestic well locations to monitor on a semiannual frequency. Ongoing costs of $10,050 are for site visits, data quality control, and data entry.

ES 4.4 Project #4: Tri-Valley Groundwater Model Development

Water levels in the Tri-Valley Management Area have been steadily declining approximately 0.5-2 ft/year for 20-30 years (depending on location and data record). Spring discharge into Fish Slough, an Area of Critical Environmental Concern, likewise has steadily decreased over the last 30 years. Available geologic and hydraulic evidence suggests there is hydrologic connection between the Tri-Valley and Fish Slough areas, and that the declining water levels in Tri-Valley are associated with reduced spring discharge. If these trends continue, spring discharge in northeastern Fish Slough is expected to cease completely within the next few years, which will severely degrade or eliminate a significant portion of remaining habitat for the endangered Owens pupfish and threatened Fish Slough milk-vetch which are dependent on management of flow downstream of the spring.

The lack of a numerical groundwater flow model was identified as a high priority data and knowledge gap by this GSP. Insufficient information exists for the OVGA (or another agency) to design a program to manage pumping to ensure the SMC for water levels in the valleys and spring flow are achieved. It is not feasible or reasonable for the residents and agricultural producers in the Tri-Valley communities to make immediate or drastic reductions in pumping without economic and social hardship or without potentially impacting air quality. The capability to manage groundwater pumping is dependent on an ability to predict the impacts of recharge and pumping on the aquifer system. Greater understanding of the regional hydrogeologic flow system is vital to determine causality and to develop solutions to arrest or reverse the declines in water levels and spring flow discharge observed within Fish Slough. The OVGA proposes to build upon recent studies of source area and water balance by developing a regional hydrogeologic groundwater model to simulate groundwater flow and spring discharge within the Tri-Valley Management Area. Expected benefits from the model include: 1) compile all relevant hydrogeologic information into a single repository, 2) increase regional geologic understanding by developing a 3D geologic model, 3) quantify the amount of recharge and flow paths from specific areas, and 4) provide an indispensable tool for predicting anticipated effects of proposed management actions to address declining spring flow and water levels in the management area.

Presently neither the OVGA, nor its member agencies possess sufficient funding to complete the groundwater model development. The Tri-Valley area includes a Disadvantaged Community and imposition of fees to fund the project is not preferred. Grant funding is actively being sought. Requested funds total $150,000 with up to an additional $150,000 anticipated as matching funds or in-kind contribution to complete the project. Initiation of the project is contingent on obtaining the necessary funding. This is a data compilation and groundwater modeling project. There will be no public noticing requirements, permitting, or regulatory process for this project.

ES 4.5 Additional OVGA Activities

The OVGA has designated the southern portion of the basin including Owens Lake as a separate management area. LADWP is proceeding with plans to produce saline groundwater from aquifers beneath the lakebed to replace potable water from the Los Angeles aqueduct presently used for dust control (dust control regulation or management is not subject to SGMA or this GSP). The Owens Lake Groundwater Development Program (OLGDP) has identified the sensitive resources potentially affected by the project, most which overlap with SGMA sustainability indicators, e.g. water levels, surface water capture (springs), water quality, and subsidence. Details of the potential pumping project including the monitoring methods and locations or management triggers are not yet finalized. A fundamental principal of the OLGDP, however, is to include an adaptive management strategy to evaluate monitoring results, and based on the observations, adjust pumping, monitoring, or management triggers, or take other actions to avoid impacts to sensitive resources.

The application of SGMA and this GSP to the OLGDP is uncertain. Lands managed pursuant to the LTWA are exempt from SGMA (CWC §10720.8), but except for some areas on the edge of the lake, most of the OLGDP is not on LADWP-owned lands. The lakebed is owned and managed by the California State Lands Commission (CSLC), and LADWP operations on state lands are conducted under a CSLC lease. The CSLC could make compliance with an adopted GSP part of their future lease requirements. Given the various sources of uncertainty regarding oversight for the OLGDP, this GSP was prepared assuming it could apply to the lakebed and may be amended in the future. This GSP proposes that the OVGA actively participate in the Owens Lake Groundwater Working Group of stakeholders and coordinate with state and local agencies.

It is anticipated that as the GSP is implemented, the OVGA will require or desire additional grant funding to conduct activities described in the plan. The OVGA is a signatory to the IMRWMG, and staff from the group are experienced and well positioned to identify grant opportunities that may be applicable to the OVGA or its members. The OVGA will support the IMRWMG to provide assistance identifying and acquiring state or federal funding for projects for monitoring, studies, or potential measures to improve groundwater use efficiency or conservation.

Declining water levels in the Tri-Valley Management Area have been documented as discussed above. For a largely unconfined aquifer system, this suggests overdraft is occurring, but the amount of overdraft is not readily apparent in the water balance (Section 2.2.3). If an overdraft condition is confirmed and measures to improve efficiency or land use practices are not effective or not implemented, the OVGA will take steps to develop a pumping plan to ensure sustainable conditions are achieved and undesirable results avoided. This potential management action is dependent on development of a numerical groundwater model to adequately inform OVGA decision makers. Specifics regarding potential management actions that may be implemented in a pumping plan are not possible at the time this GSP was prepared and will be included in future GSP updates.

ES 5.0 Plan Implementation

Implementation of all or parts of this GSP are at the discretion of the OVGA as long as the Basin remains ranked as low priority. To assist the OVGA future decisions regarding implementation, the cost estimates for administration and various management actions or projects were estimated. Costs to implement this GSP that are applicable to the entire Basin and for specific tasks in each Management area are presented separately in Table 5-2.

The estimated cost to implement the GSP is approximately $436,665. The single largest cost is the development of a groundwater model for the Tri-Valley and Fish Slough portion of the Basin. The model is prerequisite to development of land or pumping management to address groundwater concerns and is contingent on acquisition of grant funding. The initial year of the GSP (FY 2022-23) includes three Management Actions and total costs are estimated to be $81,270. Ongoing annual costs thereafter are estimated to be $44,620.

Primary costs consist of staff services with smaller added expense for basic equipment purchases (for monitoring). The assistance of contractors is included for some tasks (primarily monitoring in Tri-Valley Management Area). Additional assumptions for administration include two annual meetings of the OVGA Board, preparation of an annual report for the Board and DWR and budget, staff for routine OVGA/SGMA business, website maintenance, and incidental costs to maintain an active GSA (insurance, fiscal services, general operating expenses). Costs for each Management Action or Project listed above were included, but costs for projects contingent on completion of models or that are expected to be initiated after the 5 year periodic evaluation (Table 4-1) were not estimated.

The OVGA anticipates generating revenues sufficient to cover administration and operating costs from member contributions similar to the current funding mechanism. No pumping fees are anticipated in this GSP, but future groundwater development or changes in the Basin priority may require the OVGA to consider fees for analyses and groundwater management. The funding agreements between the members expire 3 months after the GSP is submitted, and it is expected that membership of the OVGA may change in 2022.

The OVGA JPA (Article III section 3.1.7) requires the Executive Manager prepare and submit an annual report, including a proposed budget, to the OVGA Board of Directors before April 1 of each year. Costs to prepare the annual report are included in the budget. The report will document conditions and progress implementing Management Actions and will comply with CWC §10728 requirements for annual reporting. Every five years after adopting the GSP, the OVGA will evaluate sustainability of the groundwater conditions throughout the Basin. The five year report will evaluate conditions relative to SMC and interim milestones at representative monitoring sites and review the status of Management Actions.

1. Introduction

1.1 Purpose of the Groundwater Sustainability Plan (GSP or Plan)

In 2014, the State of California enacted the Sustainable Groundwater Management Act (SGMA). This law requires groundwater basins in California that are designated as medium or high priority be managed sustainably. The Owens Valley Basin and Fish Slough subbasin were assigned a low priority status by the California Department of Water Resources (DWR) and are not required to be managed by a GSA, but GSAs are encouraged to complete a GSP. In 2019, the Owens Valley Groundwater Authority (OVGA) elected to prepare a GSP and to use awarded DWR Proposition 1 grant funds to support that effort.

Satisfying the requirements of SGMA generally requires four basic activities:

1. Forming one or multiple Groundwater Sustainability Agency(s) (GSAs) to fully cover a basin;
2. Developing one or multiple Groundwater Sustainability Plan(s) (GSPs) that fully cover the basin;
3. Implementing the GSP and managing to achieve quantifiable objectives; and
4. Regular reporting to the California Department of Water Resources.

This document fulfills the GSP requirement for the Owens Valley Basin and Fish Slough subbasin (collectively called the Basin). This GSP describes the Basin, develops quantifiable management objectives that account for the interests of the beneficial groundwater uses and users, and identifies a group of management actions that will maintain sustainable conditions in the Basin for 20 years after plan adoption.

The GSP was developed specifically to comply with SGMA's statutory and regulatory requirements. As such, the GSP uses the terminology set forth in these requirements (see e.g. California Water Code Section 10721 and 23 CCR Section 351) which is oftentimes different from the terminology utilized in other contexts (e.g. past reports or studies, past analyses, judicial rules or findings). The definitions from the relevant statutes and regulations are attached to this report for reference.

This GSP is a planning document. The numbers in this GSP are not meant to be the basis for final determinations of individual water rights or safe yield. This GSP also does not define water rights and none of the numbers in the GSP should be considered definitive for water rights determination purposes.

1.2 Sustainability Goal

The Basin is currently ranked by DWR as a low priority basin suggesting that as a whole, groundwater in the basin is managed sustainably. The sustainability goal of the OVGA is to monitor and manage the Basin by implementing a groundwater monitoring network and database and by adopting management actions that fairly consider the needs of and protect the groundwater resources for all beneficial users in the Basin.

The OVGA Board of Directors approved their Guiding Principles and Communication and Engagement plan at the September 10, 2020 Board meeting. These principles describe commitments and common interests that combined leadership from the OVGA have agreed on as a way to influence current and future compliance with the Sustainable Groundwater Management Act (SGMA). The OVGA Joint Exercise of Powers Agreement (JPA) is the legal foundational document for the groundwater sustainability agency (GSA). These Guiding Principles are intended to be consistent with and in furtherance of the JPA. In the event of a conflict between the JPA and these principles, the JPA takes precedence.

Furthermore, the OVGA will act in support of the following Mission Statement and Strategies, as adopted by the Board of Directors on January 9, 2020:

Mission Statement

The Owens Valley Groundwater Authority safeguards the sustainability of the Owens Valley Groundwater Basin through locally tailored management of groundwater resources to protect and sustain the environment, local residents and communities, agriculture, and the economy.

OVGA Strategies

1. Prepare and implement a Groundwater Sustainability Plan (GSP) as described in the Sustainable Groundwater Management Act (SGMA).
2. Establish standards and criteria for sustainable groundwater conditions and management within the Basin.
3. Implement groundwater management policies, regulations, and projects of the GSP consistent with the authorities granted under SGMA.
4. Monitor groundwater resources as prescribed in the GSP, assess changes in the groundwater basin using best available models and data, and adjust or modify management practices when needed to achieve or maintain sustainability.
5. Report annually and as needed to the OVGA Board and public on groundwater uses and conditions in the Basin.
6. Ensure local resident and stakeholder voices including Federal and State recognized tribes are heard through effective public engagement that invites deliberation, collaboration, and action on groundwater management issues of common importance.

The OVGA will comply with all applicable state and federal regulations and statutes in its efforts to implement SGMA.

GENERAL PRINCIPLES OF UNDERSTANDING

Gen1. SGMA requires that OVGA consider the interests of all Beneficial Uses and Users of groundwater in compliant groundwater basin. More specifically, SGMA requires that OVGA encourage the active involvement of diverse social, cultural, and economic elements of the population within a groundwater basin. The OVGA is committed to an inclusive approach through all aspects of GSP development and SGMA implementation.

Gen2. The OVGA supports a collaborative approach among various local agencies and organizations to support SGMA implementation specifically including all parties with interest in sustainable groundwater management. This approach is in the best interest of the Basin's Beneficial Users because it will maximize effectiveness, keep costs at a minimum, and capitalize on the skills and strengths of various partners. This approach will reflect mutual respect for each participant's role and mission, governmental authorities, expertise, knowledge of groundwater conditions, rights, needs, and concerns.

Gen3. Implementation of SGMA for the OVGA incurs costs, which may be expensive, and all Beneficial Users will need to contribute in some way.

Gen4. Local control of groundwater should be preserved to the maximum extent practicable, and State intervention to implement SGMA should be avoided.

Gen5. 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.

Gen6. OVGA is committed to conduct sustainable groundwater practices that fairly consider the needs of and protect the groundwater resources for all Beneficial Users in the Basin.

Gen7. The OVGA will have an open and transparent process for GSP development and SGMA implementation. Extensive outreach is a priority of the OVGA to inform Beneficial Users about implementation and potential effects of SGMA, and to ensure the OVGA is informed of all Beneficial User input as a means to support OVGA decision-making.

Gen8. SGMA implementation is new with many unknowns and fears. Willingness by all OVGA members and Beneficial Users to adapt, adjust and collaborate in good faith during GSP development (based on science and facts) and SGMA implementation is crucial to the Basin's success.

GOVERNANCE

Gov1. The OVGA operates as a governing public agency, granted with regulatory authorities provided in SGMA.

Gov2. The OVGA's purpose is to implement SGMA in the Basin. The OVGA is committed to develop local SGMA compliance and sustainability solutions, and thereby maintain local control and avoid State intervention and management of local groundwater resources. It is also committed to solutions that will avoid costly litigation between stakeholders.

Gov3. The OVGA Board of Directors and staff have unique responsibilities to serve their respective organizations and interests. While serving the OVGA, these individuals also have a responsibility to serve the interests and regulatory authorities of the OVGA in its required role to identify, achieve, and maintain sustainable groundwater conditions in the Basin. OVGA Directors and staff are committed to fulfill this SGMA-specific responsibility.

Gov4. The OVGA represents and seeks to preserve the groundwater interests of all Beneficial Users and Uses in the Basin fairly and transparently.

Gov5. Discussions among the OVGA Board of Directors, staff, and Beneficial Users may be challenging at times. The OVGA will conduct these discussions in a civil manner with a commitment to respectful discourse among all participants.

COMMUNICATION AND EDUCATION

Com1. In addition to its statutory responsibilities and authorities, the OVGA is committed to provide consistent, transparent educational opportunities for all Beneficial Users about water resources, land uses, and water management in the Basin.

Com2. The OVGA is committed to proactive, transparent, and inclusive outreach and engagement with stakeholders, agencies, and Basin community members in accordance with OVGA's Communications and Engagement Plan.

Com3. The OVGA recognizes the value of open communication with neighboring groundwater resource managers and GSAs.

FUNDING

Fund1. 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.

Fund2. The budgeting process and ongoing management of the OVGA will be fully transparent to all stakeholders. Budgets may be changed by unexpected circumstances but the OVGA Board and staff are committed to follow budget projections as closely as possible. The OVGA recognizes its duty to Basin residents and future generations to ensure that its financial resources are used effectively and responsibly to promote sustainable groundwater conditions.

Fund3. The OVGA is committed to pursuing financial and infrastructure solutions and beneficial partnerships to provide sustainable water supplies within the Basin.

Fund4. The GSP should encourage flexibility to adapt to changes in OVGA membership, funding and planning oversight as the parties build relationships and mutual trust.

Fund5. Data collection and groundwater studies are essential to increase knowledge and to support fact-based groundwater management decisions. Funding and implementation is a priority and shared responsibility among all OVGA members and Beneficial Users.

Fund6. The OVGA will seek alternative sources of funding beyond Basin residents and is committed to prioritize funding choices outside of the local member agencies whenever feasible and appropriate.

SGMA IMPLEMENTATION AND SUSTAINABILITY

Sus1. Future sustainable groundwater conditions will depend on land uses and water demand targets being in balance with available water resources. The OVGA is committed to work with land use agencies in the Basin to promote land use practices and water demand targets that achieve sustainable water resources.

Sus2. The OVGA is committed to reducing groundwater vulnerability and protecting the Basin from undesirable results as defined by the six SGMA indicators of basin health and sustainability and outcomes of climate change.

Sus3. OVGA members and Beneficial Users may have different requirements under different water resource conditions to ensure that minimum thresholds are achieved or exceeded. These potential different requirements will be defined in the GSP and implemented by the OVGA.

Sus4. Groundwater conditions throughout the Basin are not uniform and vary by location, surface water and runoff. While all Beneficial Uses and Users will share the obligation to achieve sustainability, solutions will need to reflect these geographic and hydrogeologic differences.

Sus5. The OVGA recognizes that groundwater recharge occurs through many different means. Natural runoff, applied surface water, precipitation, and creek, canal and ditch losses utilized by Beneficial Users contribute to the Basin recharge. Studies will quantify the availability of such recharge and provisions will be included in the GSP to ensure that future groundwater extractions are consistent with quantified recharge and the sustainable yields of the Basin.

Sus6. Integrated water management is a set of methods to extract, transport, store, use, and share groundwater and surface water throughout a groundwater basin to reduce water supply vulnerability for all water users. 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. It will seek to ensure that all Beneficial Users have necessary water resources. An integrated water management approach may rely on but need not be limited to:

a. Science-based decision-making.

b. Projects and methods to preserve, protect, recover, and restore the Basin aquifers.

c. Collective and individual groundwater use requirements to ensure that groundwater elevations are not depleted below minimum thresholds.

Groundwater dependent ecosystems (GDE's) such as riparian areas adjacent to surface water conveyances, creeks, and the Owens River, wetlands supported by springs and seeps, and terrestrial phreatophytic plant communities are habitat for a multitude of species, including those with State and Federal threatened and endangered status. Unsustainable groundwater management can reduce groundwater discharge and endanger the ecological value and beneficial uses of these GDE's.

Sus7. The OVGA is committed to designing sustainability indicators that avoid significant and unreasonable impacts to GDE's. The OVGA acknowledges the interconnectedness of groundwater and surface water resources in the Basin and that groundwater is critical to sustain extensive areas of GDE's.

Sus8. SGMA requires, and the OVGA is committed to, robust analysis of current and future climate-based conditions to ensure that the Basin accounts for climate change-related impacts. The OVGA is also willing to partner with other natural resource agencies and water providers potentially affected by climate change.

Sus9. Groundwater recharge, surface water quantities, and the base flows of the Basin's tributaries will be impacted by climate change and associated water conditions. The

OVGA will utilize best available science to inform management decisions in light of varying climate.

Under SGMA, groundwater users that extract two acre-feet of groundwater or less per year for domestic purposes are defined as "de minimis." This classification limits the statutory financial and measurement responsibilities of these groundwater extractors and is a means through which some SGMA-related burdens are minimized for this select set of groundwater extractors. In this context:

Sus10. The OVGA is committed to the definition of de minimis and will explore opportunities to minimize SGMA-related impacts to de minimis users, in particular those in disadvantaged communities who rely solely on groundwater.

Sus11. The de minimis classification does not excuse a Beneficial User from their legal responsibility to comply with SGMA.

Sus12. The OVGA will evaluate and account for the incremental impacts that de minimis water users have on the Basin' water budgets.

Sus13. The OVGA is committed to provide appropriate compliance benefits that are afforded to de minimis users but to also ensure that potential groundwater use impacts are not imposed on other Beneficial Users that do not meet the de minimis definition.

Sus14. The OVGA opposes groundwater export from the Eastern Sierra that would result in negative consequences to groundwater sustainability, the environment, local economy, and residents.

1.3 Agency Information (Reg. § 354.6)

This GSP has been developed under the direction of the Owens Valley Groundwater Authority. Contact information for the OVGA is shown below:

Owens Valley Groundwater Authority
c/o Inyo County Water Department
135 S. Jackson Street
Independence, CA 93526
Website: www.ovga.us

ATTN: Aaron Steinwand, Executive Manager
760-878-0001

asteinwand@inyocounty.us

1.3.1 Organization and Management Structure of the Groundwater Sustainability Agency (GSA or Agency)

The OVGA was formed On August 1, 2017 using a Joint Powers Agreement (JPA) (Appendix 1) that was executed by the following original members:

Big Pine CSD	Keeler CSD
City of Bishop	Sierra Highlands CSD
County of Inyo	Starlite CSD
County of Mono	Tri-Valley Water Management District
Eastern Sierra CSD	Wheeler Crest CSD
Indian Creek-Westridge CSD	

The members formed the OVGA in order to jointly exercise their powers as a GSA for the purpose of creating this GSP to be implemented within their combined jurisdictional boundaries in the Basin. The JPA shall remain in effect until terminated by the unanimous written consent of all the active members or when there are less than two members remaining in the OVGA. The OVGA contracted with Inyo County, Mono County, and the City of Bishop to provide staff, fiscal, and legal services. The position of Executive Manager was created, and at the time this GSP was prepared, the position was occupied by the Inyo County Water Director as part of the staff contract with Inyo County.

Since the formation of the OVGA, several changes to the membership occurred in accordance with the JPA provisions to add or terminate members. Following the revision to the Basin boundary to remove the Starlite area from the Basin, the OVGA voted to terminate the participation of the Starlite CSD in the OVGA on March 2019. Following the ranking of the Basin as low priority, requests from the Tri-Valley Groundwater Management District, Wheeler Crest CSD, Sierra Highlands CSD, and the Eastern Sierra CSD to terminate their memberships were approved by the OVGA in early 2020. Requests from the Owens Valley Committee and the Lone

Pine Paiute Shoshone Tribe to participate on the Board as Interested Parties (JPA, Article V, Appendix 1) were approved in May 2020.

1.3.2 Legal Authority of the GSA

As presented in the JPA, in accordance with California Government Code Section 6509, the OVGA's powers shall be subject to the restrictions upon the manner of exercising such powers pertaining to the County of Inyo. Further descriptions of the powers are contained in Article II, Section 2 of the JPA (Appendix 1). In addition, the OVGA shall exercise those powers granted by SGMA and shall possess the ability to exercise the common powers of its Members.

1.3.3 Estimated Cost of Implementing the GSP and the GSA's Approach to Meet Costs

The estimated cost to implement the GSP is approximately $436,665. The single largest cost is the development of a groundwater model for the Tri-Valley and Fish Slough portion of the Basin. The model is prerequisite to development of land or pumping management to address groundwater concerns and is contingent on acquisition of grant funding. The initial year of the GSP (FY 2022-23) includes three Management Actions and total costs are estimated to be $81,270. Ongoing annual costs thereafter are estimated to be $44,620.

The OVGA anticipates generating revenues sufficient to cover administration and operating costs from member contributions similar to the current funding mechanism. No pumping fees are anticipated in this GSP, but future groundwater development or changes in the Basin priority may require the OVGA to consider fees for analyses and groundwater management. The funding agreements between the members expire 3 months after the GSP is submitted, and it is expected that membership of the OVGA may change in 2022.

A full description of the anticipated costs and revenue to implement this GSP is included in Section 5.

1.4 GSP Organization

This GSP is organized according to DWR's "GSP Annotated Outline" for standardized reporting (DWR, 2016a). The Preparation Checklist for GSP Submittal in DWR formatting is provided in Table 1-1.

Table 1-1. Preparation Checklist for GSP Submittal.

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
Article 3. Technical and Reporting Standards				
352.2		Monitoring Protocols	· Monitoring protocols adopted by the GSA for data collection and management · Monitoring protocols that are designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin	sdfsdfas
Article 5. Plan Contents, Subarticle 1. Administrative Information				
354.4		General Information	· Executive Summary · List of references and technical studies	xxx

PRELIMINARY DRAFT

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
354.6		Agency Information	· GSA mailing address · Organization and management structure · Contact information of Plan Manager · Legal authority of GSA · Estimate of implementation costs	xxx
354.8(a)	10727.2(a)(4)	Map(s)	· Area covered by GSP · Adjudicated areas, other agencies within the basin, and areas covered by an Alternative · Jurisdictional boundaries of federal or State land · Existing land use designations · Density of wells per square mile	xxx
354.8(b)		Description of the Plan Area	· Summary of jurisdictional areas and other features	xxx
354.8(c) 354.8(d) 354.8(e)	10727.2(g)	Water Resource Monitoring and Management Programs	· Description of water resources monitoring and management programs · Description of how the monitoring networks of those plans will be incorporated into the GSP	xxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			· Description of how those plans may limit operational flexibility in the basin · Description of conjunctive use programs	
354.8(f)	10727.2(g)	Land Use Elements or Topic Categories of Applicable General Plans	· Summary of general plans and other land use plans · Description of how implementation of the GSP may change water demands or affect achievement of sustainability and how the GSP addresses those effects · Description of how implementation of the GSP may affect the water supply assumptions of relevant land use plans · Summary of the process for permitting new or replacement wells in the basin · Information regarding the implementation of land use plans outside the basin that could affect the ability of the	xxxxxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			Agency to achieve sustainable groundwater management	
354.8(g)	10727.4	Additional GSP Contents	**Description of Actions related to:** · Control of saline water intrusion · Wellhead protection · Migration of contaminated groundwater · Well abandonment and well destruction program · Replenishment of groundwater extractions · Conjunctive use and underground storage · Well construction policies · Addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects · Efficient water management practices · Relationships with State and federal	xxxxxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			regulatory agencies · Review of land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity · Impacts on groundwater dependent ecosystems	
354.10		Notice and Communication	· Description of beneficial uses and users · List of public meetings · GSP comments and responses · Decision-making process · Public engagement · Encouraging active involvement · Informing the public on GSP implementation progress	xxx
Article 5. Plan Contents, Subarticle 2. Basin Setting				

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
354.14		Hydrogeologic Conceptual Model	· Description of the Hydrogeologic Conceptual Model · Two scaled cross-sections · Map(s) of physical characteristics: topographic information, surficial geology, soil characteristics, surface water bodies, source and point of delivery for imported water supplies	xxx
354.14(c)(4)	10727.2(a)(5)	Map of Recharge Areas	· Map delineating existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas	xxx
	10727.2(d)(4)	Recharge Areas	· Description of how recharge areas identified in the plan substantially contribute to the replenishment of the basin	xxxxxxxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
354.16	10727.2(a)(1) 10727.2(a)(2)	Current and Historical Groundwater Conditions	· Groundwater elevation data · Estimate of groundwater storage · Seawater intrusion conditions · Groundwater quality issues · Land subsidence conditions · Identification of interconnected surface water systems · Identification of groundwater-dependent ecosystems	xxx
354.18	10727.2(a)(3)	Water Budget Information	· Description of inflows, outflows, and change in storage · Quantification of overdraft · Estimate of sustainable yield · Quantification of current, historical, and projected water budgets	
	10727.2(d)(5)	Surface Water Supply	· Description of surface water supply used or available for use for groundwater recharge or in-lieu use	xxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
354.20		Management Areas	· Reason for creation of each management area · Minimum thresholds and measurable objectives for each management area · Level of monitoring and analysis · Explanation of how management of management areas will not cause undesirable results outside the management area · Description of management areas	xxx
Article 5. Plan Contents, Subarticle 3. Sustainable Management Criteria				
354.24		Sustainability Goal	· Description of the sustainability goal	xxx
354.26		Undesirable Results	· Description of undesirable results · Cause of groundwater conditions that would lead to undesirable results · Criteria used to define undesirable results for each sustainability indicator · Potential effects of	xxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			undesirable results on beneficial uses and users of groundwater	
354.28	10727.2(d)(1) 10727.2(d)(2)	Minimum Thresholds	· Description of each minimum threshold and how they were established for each sustainability indicator · Relationship for each sustainability indicator · Description of how selection of the minimum threshold may affect beneficial uses and users of groundwater · Standards related to sustainability indicators · How each minimum threshold will be quantitatively measured	xxx
354.30	10727.2(b)(1) 10727.2(b)(2) 10727.2(d)(1) 10727.2(d)(2)	Measurable Objectives	· Description of establishment of the measurable objectives for each sustainability indicator · Description of how a reasonable margin of safety was established for each measurable objective · Description of a reasonable path to	xxx

PRELIMINARY DRAFT

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			achieve and maintain the sustainability goal, including a description of interim milestones	
Article 5. Plan Contents, Subarticle 4. Monitoring Networks				
354.34	10727.2(d)(1) 10727.2(d)(2) 10727.2(e) 10727.2(f)	Monitoring Networks	· Description of monitoring network · Description of monitoring network objectives · Description of how the monitoring network is designed to: demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features; estimate the change in annual groundwater in storage; monitor seawater intrusion;	xxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			determine groundwater quality trends; identify the rate and extent of land subsidence; and calculate depletions of surface water caused by groundwater extractions · Description of how the monitoring network provides adequate coverage of Sustainability Indicators · Density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends · Scientific rational (or reason) for site selection · Consistency with data and reporting standards · Corresponding sustainability indicator, minimum threshold, measurable objective, and interim milestone	
354.36		Representative Monitoring	· Description of representative sites · Demonstration of adequacy of using groundwater elevations as proxy for other	xxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			sustainability indicators · Adequate evidence demonstrating site reflects general conditions in the area	
354.38		Assessment and Improvement of Monitoring Network	· Review and evaluation of the monitoring network · Identification and description of data gaps · Description of steps to fill data gaps · Description of monitoring frequency and density of sites	xxx
Article 5. Plan Contents, Subarticle 5. Projects and Management Actions				
354.44		Projects and Management Actions	· Description of projects and management actions that will help achieve the basin's sustainability goal · Measurable objective that is expected to benefit from each project and management action · Circumstances for implementation · Public noticing · Permitting and regulatory process	xxx

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			· Time-table for initiation and completion, and the accrual of expected benefits · Expected benefits and how they will be evaluated · How the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included. · Legal authority required · Estimated costs and plans to meet those costs · Management of groundwater extractions and recharge	
354.44(b)(2)	10727.2(d)(3)		· Overdraft mitigation projects and management actions	N/A
Article 8. Interagency Agreements				

PRELIMINARY DRAFT

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
357.4	10727.6		**Coordination Agreements shall describe the following:** · A point of contact · Responsibilities of each Agency · Procedures for the timely exchange of information between Agencies · Procedures for resolving conflicts between Agencies · How the Agencies have used the same data and methodologies to coordinate GSPs · How the GSPs implemented together satisfy the requirements of SGMA · Process for submitting all Plans, Plan amendments, supporting information, all monitoring data and other pertinent information, along with annual reports and periodic evaluations · A coordinated data management system for the basin	N/A

GSP Regulations Section	Water Code Section	Requirement	Description	Section(s) or Page Number(s) in the GSP
			· Coordination agreements shall identify adjudicated areas within the basin, and any local agencies that have adopted an Alternative that has been accepted by the Department	

2. Plan Area and Basin Setting

2.1 Description of the Plan Area (Reg. § 354.8)

The Owens Valley Groundwater Basin occupies portions of Inyo and Mono County, CA (Figure 2-1). The Basin covers approximately 1,037 square miles of which about 390 square miles is considered adjudicated and therefore exempt from the SGMA (CWC, 10720.8(c), Figure 2-2). Groundwater management of the adjudicated area is subject to provisions of the Inyo/Los Angeles Long Term Water Agreement (LTWA, Appendix 2)

2.1.1 Summary of Jurisdictional Areas and Other Features and Maps (Reg. § 354.8 a and b)

Significant portions of the basin are Federal or State controlled lands (Figure 2-3). Figure 2-4 summarizes the general land use patterns across the basin with the predominant classification being desert or semi-desert. Small percentages of the basin are designated as developed. An estimated 4,929 water wells are known to exist in the Basin with the majority being in the adjudicated area (Figure 2-5). Many areas in the non-adjudicated portions of the basin have no or only a few wells per square mile although some data gaps exist due to lack of voluntary reporting of well locations.

2.1.2 Water Resources Monitoring and Management Programs (Reg. § 354.8 c, d, e)

Data acquired from existing monitoring programs conducted by various agencies or individuals in the Basin to comply with state or legal agreements and requirements were incorporated into the OVGA database management system to inform the GSP preparation. Most of the existing monitoring networks are publically accessible and will serve as ongoing sources of data. None of the existing monitoring networks or programs should limit operational flexibility in the Basin. The OVGA database is publically available and was designed to function as a single repository for a wide variety of monitoring data. It includes basic querying, exporting, and graphing (i.e., water level hydrographs) tools for public use. The quantity and quality of the assembled data are sufficient to characterize conditions in the Basin and develop the GSP. The Inyo County Water Department plans to use OVGA database as a repository for LADWP data for their daily operations in the future, and therefore it is anticipated to be updated regularly as additional

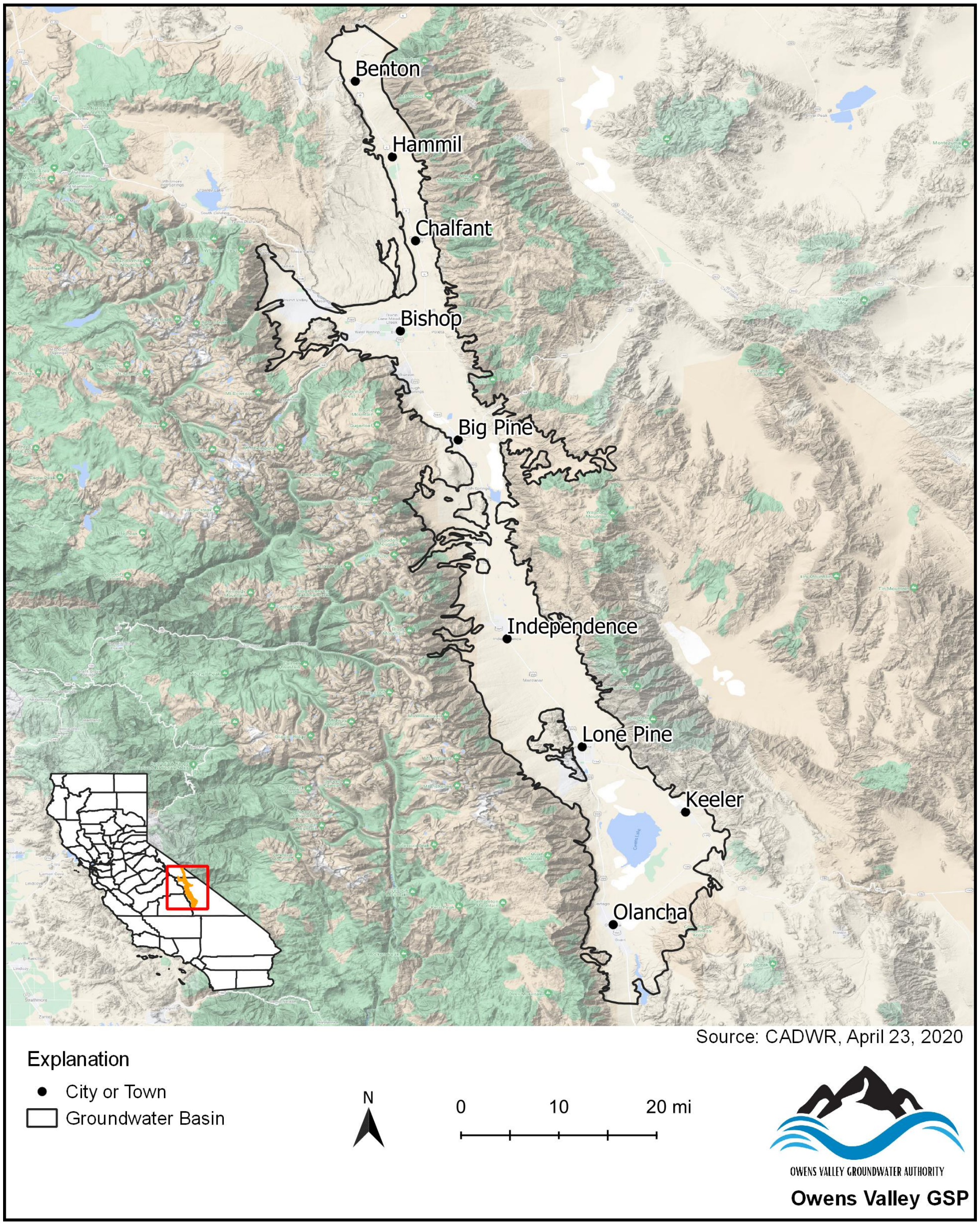

Figure 2-1. Map of the Owens Valley Groundwater Basin

PRELIMINARY DRAFT

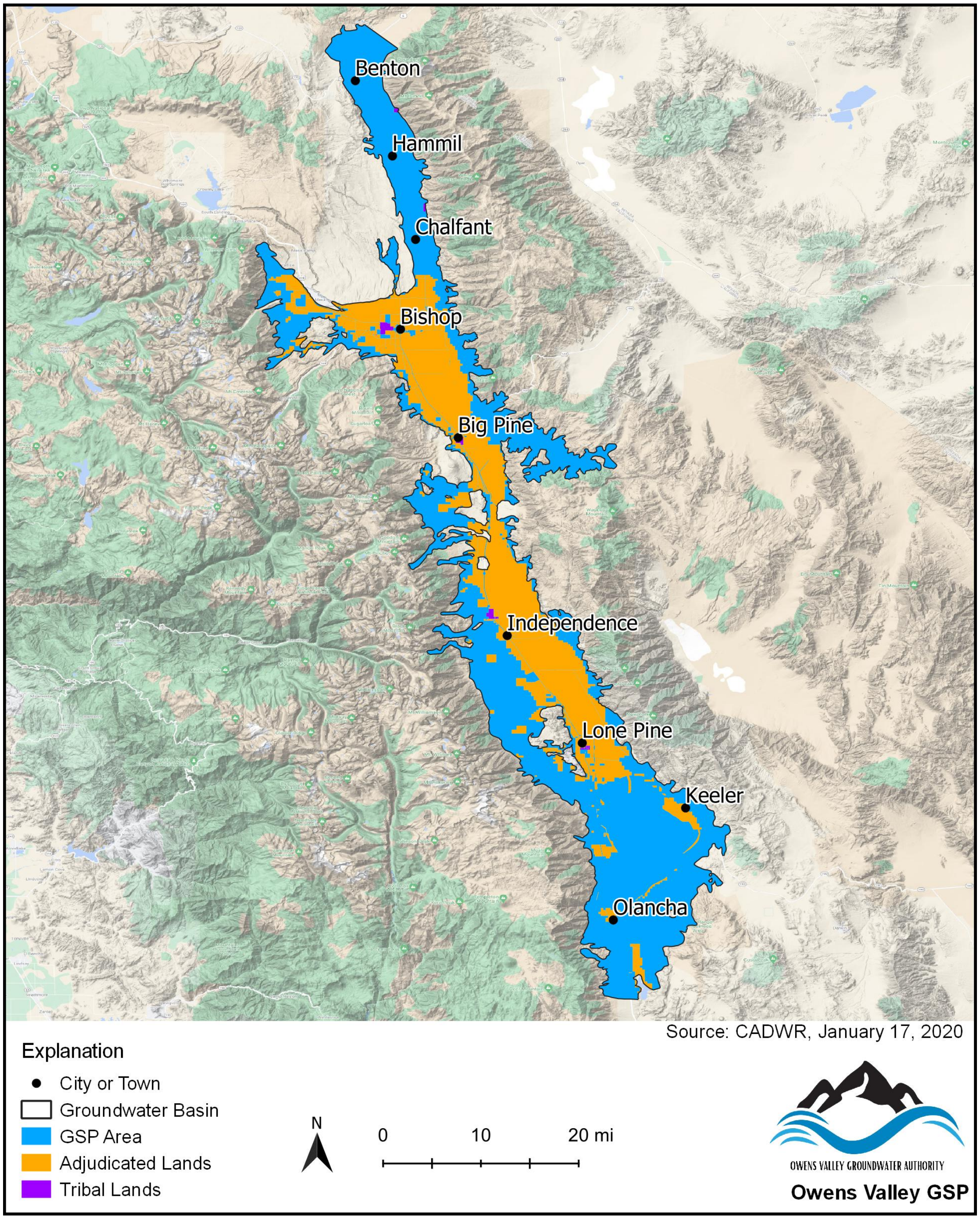

Figure 2-2. Map of the GSP area, including adjudicated and non-adjudicated lands.

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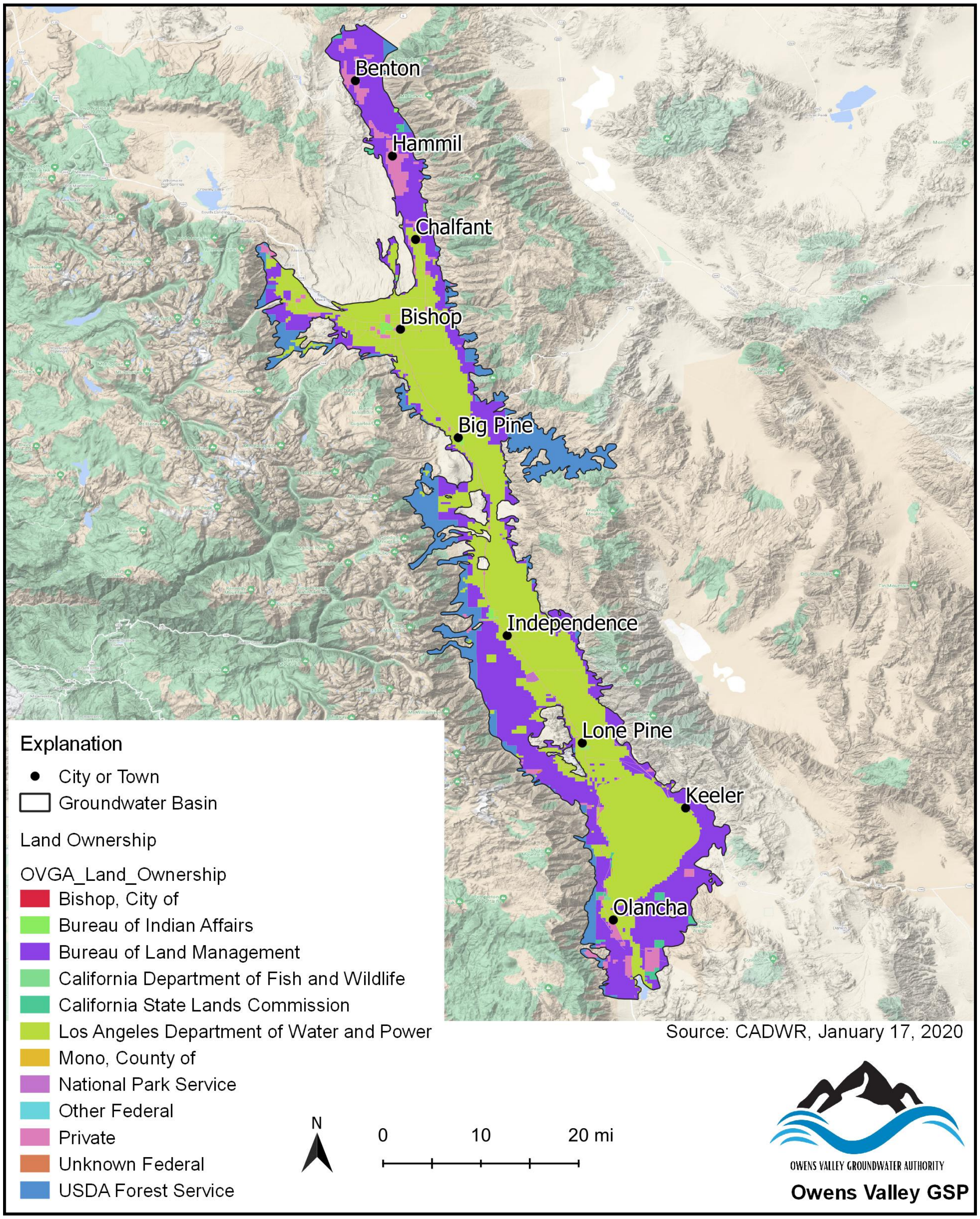

Figure 2-3. Land ownership of the Basin

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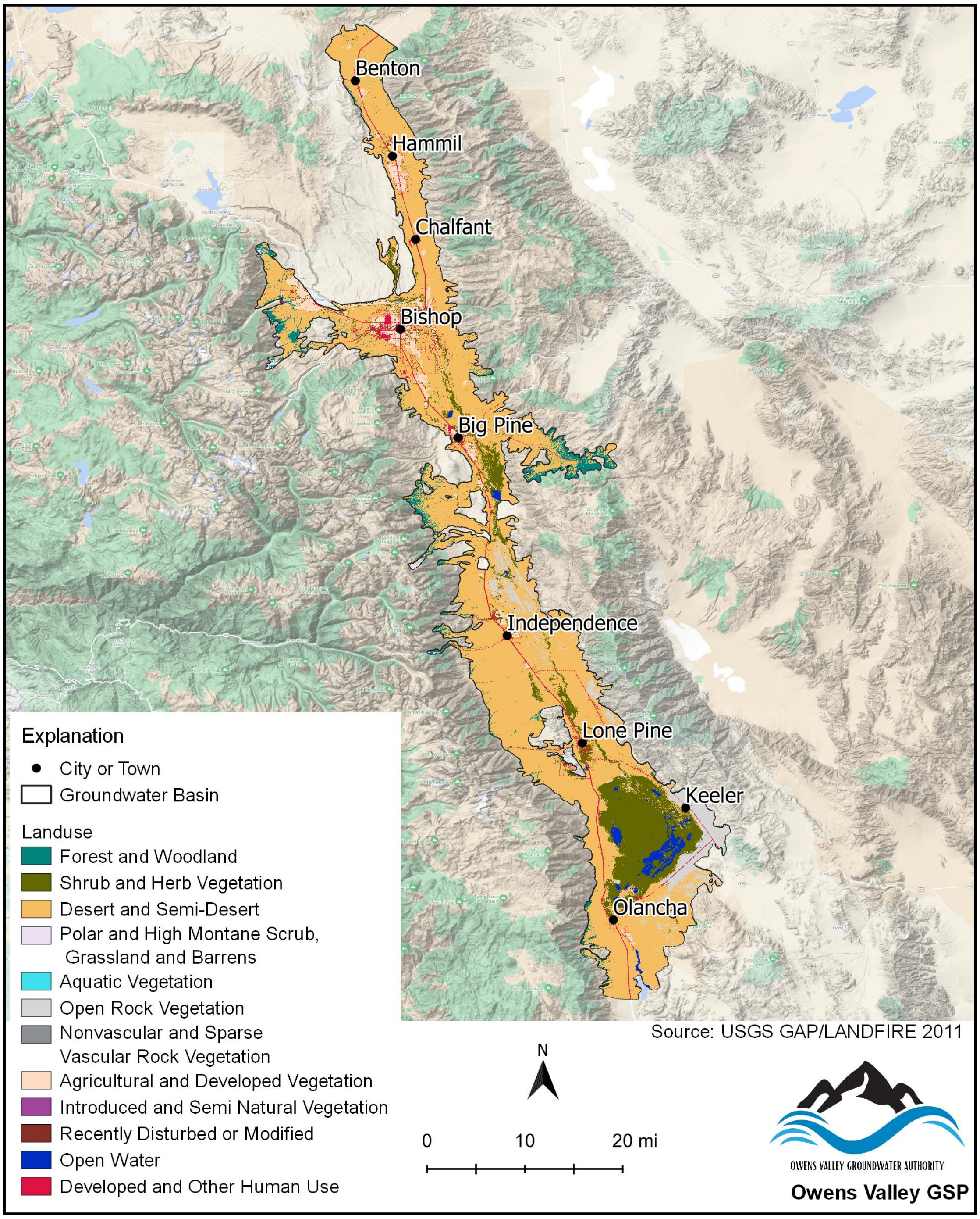

Figure 2.-4. Land use within the Basin.

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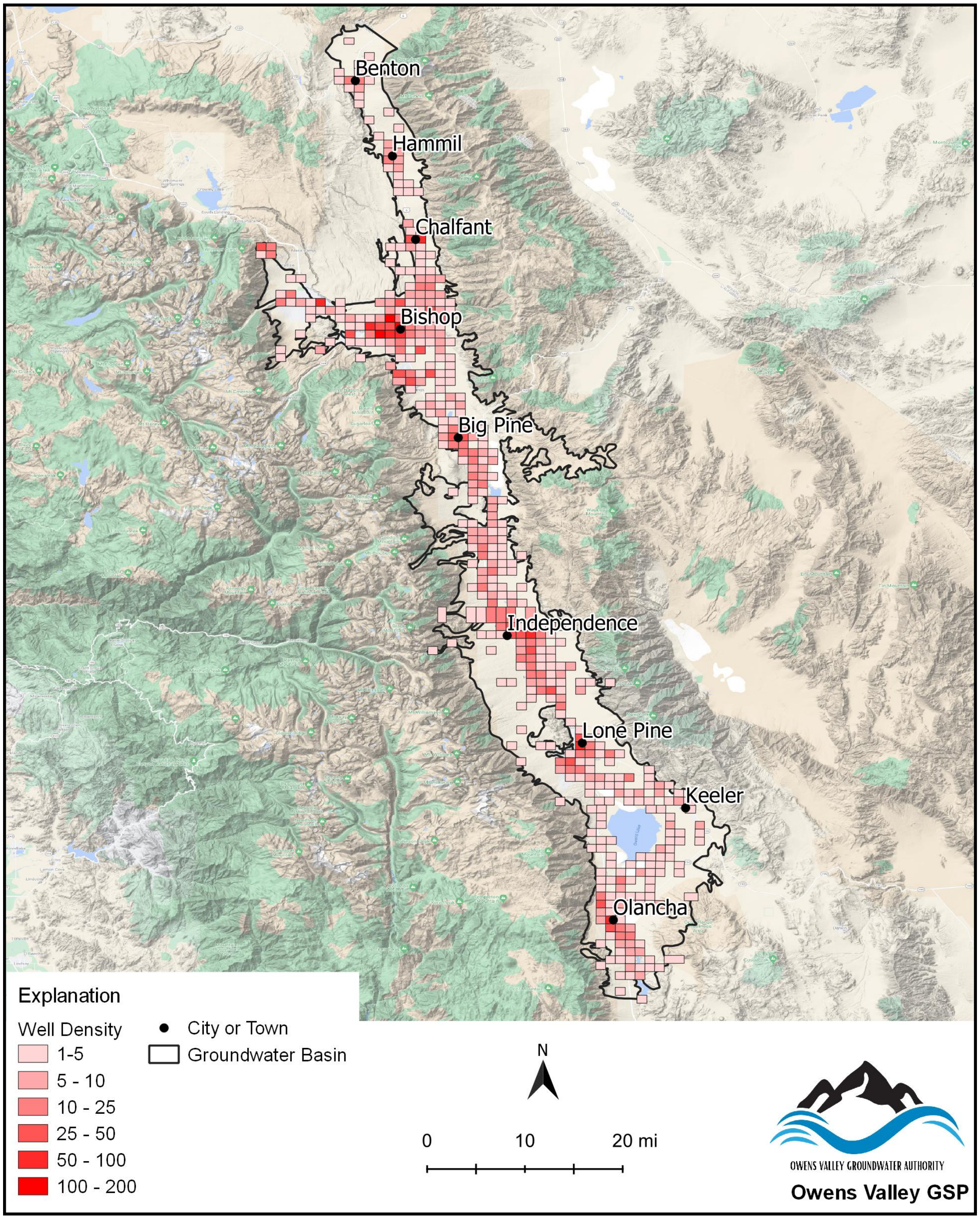

Figure 2.5. Density of groundwater wells in the Basin.

PRELIMINARY DRAFT

data are collected and become available for import. The OVGA will determine the timing of the acquisition of data to update the database from other sources as funding and the scope of the GSP implementation in a low priority basin requires. The OVGA will also determine whether to require reporting of missing data collected by pumpers or to implement additional monitoring programs to fill identified data gaps (see Section 4, below).

Existing monitoring and management programs are described in detail in the Monitoring and Data Gaps Analysis, Appendix 3. A brief summary is provided here but the reader is referred to the appendix for complete information. Additional information on how the OVGA intends to QA/QC data collected in the future to assess sustainability and to inform GSP annual reporting and 5-year updates is provided in the Sampling and Analysis Plan (Appendix 4).

<u>Inyo/Los Angeles Long Term Water Agreement (LTWA):</u> Much of the land and the majority of surface and groundwater rights in the Basin are owned by the City of Los Angeles and managed according to the LTWA (Appendix 2). In accordance with the LTWA, water resources including groundwater pumping on Los Angeles-owned lands in Inyo County are managed "*…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.*" Los Angeles has developed an extensive monitoring program of reservoir storage; surface flows in natural water courses, canals, ditches and the Los Angeles aqueduct; groundwater levels and pumping; and natural and managed groundwater recharge amounts. Lands managed pursuant to the LTWA are considered adjudicated and exempt from SGMA, so the reader is referred to the Inyo County Water Department (inyowater.org) for detailed information regarding Los Angeles activities in the Basin.

The LTWA contains provisions granting Inyo County reasonable access to LADWP property and monitoring stations for independent monitoring necessary to implement the LTWA and each agency shall make any data or information pertaining to conditions in the Basin available. Much of the hydrologic data provided to the OVGA by Inyo County for the database was obtained under the data sharing provisions of the LTWA. The monitoring and data sharing arrangement with LADWP will continue, and Inyo County will maintain that portion of the OVGA database.

<u>Tri-Valley Groundwater Management District:</u> In most of the Mono County portion of the Owens Valley, groundwater management is the responsibility of the Tri-Valley Groundwater Management District (TVGMD). The TVGMD was formed by an act of the California legislature in response to concern over possible groundwater export from the area. Groundwater pumping in the Tri-Valley area is primarily used for agricultural irrigation and domestic purposes, with agriculture being the dominant use. The TVGMD is authorized to implement an area-wide well monitoring program, but it is not clear that a pumping or water level monitoring program exists. No groundwater data were provided to the OVGA by the TVGMD. As noted by Langridge et al. (2016), the TVGMD is a functioning public agency which holds periodic public meetings, but with no permanent staff and no employees on payroll (legal counsel is provided by Mono County). The scope of the district's activities appears to be limited and primarily focused on preventing groundwater export from the area. The OVGA or TVGMD could expand the groundwater elevation dataset in the Tri-Valley area at a relatively low cost by creating a voluntary monitoring program relying on private domestic wells. Several landowners have expressed interest in participating in such a program. It is not known if groundwater production measurements exist. Surface water flow monitoring data, if they exist, were not provided (except from LADWP for Piute Creek).

There is no groundwater extraction within Fish Slough due to its status as an Area of Critical Environmental Concern. Surface water and groundwater data in Fish Slough were available from LADWP, Bureau of Land Management, ICWD and/or CDFW and incorporated into the OVGA database. It is expected that these data sources will continue to be publically available.

<u>California Statewide Groundwater Elevation Monitoring Program (CASEGM):</u> The CASGEM program provides groundwater elevation data to track seasonal and long-term trends in groundwater elevations in California groundwater basins. LADWP reports monitoring data for the CASGEM Program from a network of representative monitoring wells that capture trends and seasonal fluctuations in groundwater elevations in the shallow unconfined and deep confined aquifer systems throughout the adjudicated portion of the Basin in Inyo County. Wells in the network were selected based on geographic distribution and the type of aquifer to be monitored. Given the large number of existing monitoring wells owned by LADWP, it was not necessary to install additional wells for the purposes of this program. All wells are located on the adjudicated portion of the Basin land, except for those on state land at Owens Lake. Groundwater level is measured each April and October. The frequency and timing of

measurement ranges from monthly to semiannually and is sufficient to define the seasonal variations due to natural hydrologic occurrences and pumping for human uses based on the record of data collected since the 1970's. For semiannual monitoring programs, April measurements generally coincide with the annual highest water level and October measurements the lowest.

Groundwater Ambient Monitoring and Assessment Program (GAMA): The Groundwater Ambient Monitoring and Assessment Program gathers groundwater quality monitoring data collected throughout California by several monitoring entities. Landfill operators (e.g., near Benton, Chalfant, etc.) collect water levels quarterly and report these data to the GAMA program. Water quality data in the OVGA database were acquired from the GAMA GeoTracker Database.

Local Water Providers: Public requests for monitoring, production, or water quality data, resulted in data provided by the City of Bishop, Eastern Sierra Community Service District, Indian Creek-Westridge Community Service District, and Wheeler Crest Community Service District. Additional well location, water level, and water quality data for public water systems were obtained from publically available sources (WHICH?). No data were provided by the small mutual water companies or other CSDs in the Basin; however, the missing data constitute a small portion of the total basin pumping necessary to characterize the Basin trends. The OVGA may consider obtaining extraction and monitoring data that water providers routinely are required to report to the state to incorporate into the OVGA database.

Owens Lake Master Project: The non-adjudicated portion of the basin around Owens Lake is potentially subject to SGMA. Outflow from the aquifer system near the Lake is primarily by evaporation, and concentration of solutes (primarily salts) in the groundwater has resulted in generally poor groundwater quality, and therefore limited pumping demand. The amount of pumping for domestic supply is also relatively small due to the low population density. Available monitoring data in this portion of the basin are adequate, but it is a smaller dataset compared to the rest the Basin in Inyo County. Most groundwater elevation and pumping data obtained were related to LADWP activities and were provided as part of the LTWA. Pumping records were requested from Crystal Geyser Roxane, but no response was received. Similarly, no groundwater production totals for agricultural fields south of Owens Lake or other pumpers were obtained.

Owens Lake is owned and managed by the State of California, and it is uncertain whether the LTWA applies to activities on the lakebed (see section 2.1.3 below). For the purposes of this

GSP, the lakebed was considered part of the non-adjudicated portion of the basin. LADWP (or OVGA) activities on the lakebed must be permitted and conducted in cooperation with the California State Lands Commission. Groundwater extractions on the Lake may increase in the future if a proposed Owens Lake Groundwater Development Project (OLGDP) by LADWP is implemented to replace some of the high quality aqueduct water it currently uses for dust suppression activities on the playa with low quality groundwater extracted from the Owens Lake aquifer system. As part of that project, LADWP has conducted extensive groundwater evaluations and expanded the monitoring infrastructure; however, much of the monitoring began more recently than in the rest of the Basin. In addition to the LADWP monitoring data, the Great Basin Unified Air Pollution Control District (GBUAPCD) provided water levels for shallow (<30 ft) piezometers and spring flow rates in the Owens Lake area. Additional well location, water level and water quality data were obtained from publically available sources (e.g. GAMA) and added to the OVGA database.

Land Management: Irrigation, Mitigation, Owens Lake Dust Control: The LTWA requires that water deliveries continue on approximately 18,017 acres of Los Angeles-owned lands used for irrigation, habitat, mitigation, and recreation in the Basin. Approximately 85,000 AFY is suppled for these uses from combined surface and groundwater sources. Since 2006, LADWP and Inyo County have initiated the Lower Owens River Project (LORP), the largest of the habitat mitigation projects, that provides flows of 40 cubic feet per second (cfs) for the 62-mile reach of Owens River below the Los Angeles Aqueduct intake. When this flow reaches the Owens (dry) Lake delta, it is either used for dust control or pumped back to the Los Angeles Aqueduct. Beginning in 2002, Los Angeles has operated a dust control project on the Owens Lake playa, applying up to 75,000 AFY to control dust emissions. Monitoring data for these activities are included in the database.

Conjunctive Use: There are no conjunctive use programs in the Basin. In the adjudicated portion of the Basin, LADWP conducts recharge operations in years with higher snowpack and runoff and attempts to recover some recharged water by pumping in succeeding years. Some of these recharge operations occur on alluvial fans in the non-adjudicated area to prevent runoff from exceeding the LAA capacity. These activities are exempt from SGMA, but are mentioned because of the effect LADWP management has on measured water levels in the non-adjudicated portion of the Basin. In the non-adjudicated portion of the Basin, pumping is relatively constant to supply local uses such as municipal supply, domestic supply, or agriculture.

2.1.3 Land Use Elements or Topic Categories of Applicable General Plans (Reg. § 354.8 f)

Private land ownership in Mono and Inyo counties is about 17% and 2.7% of the total land area, respectively. LADWP is the largest landowner in Inyo County controlling about 53% of the land in the Basin. The Bureau of Land Management has ownership to about 68% of the land in the Mono County portion of the Basin. Tables 2-1, 2-2, and 2-3 provide additional breakdown on the land ownership in these counties, as well as the City of Bishop.

Table 2-1. Summary of Inyo County land ownership for lands overlying the Basin.

Land Owner	Area (acres)	Area (%)
Los Angeles Department of Water and Power	309,708	53.0
Bureau of Land Management	180,990	31.0
USDA Forest Service	71,576	12.2
Private	15,704	2.7
California State Lands Commission	3,258	0.6
Bureau of Indian Affairs	1,949	0.3
National Park Service	786	0.1
California Department of Fish and Wildlife	361	0.1
Other Federal	127	0.0
City of Bishop	50	0.0
Total	584,509	100.0

Table 2-2. Summary of Mono County land ownership for lands overlying the Basin.

Land Owner	Area (acres)	Area (%)
Bureau of Land Management	53,778	68.08
Private	13,898	17.59
City of Los Angeles Department of Water and Power	7,016	8.88
USDA Forest Service	2,971	3.76
California State Lands Commission	911	1.15
Bureau of Indian Affairs	241	0.31
California Department of Fish and Wildlife	173	0.22
County of Mono	4	0.01
Total	78,993	100.00

Table 2-3. Summary of City of Bishop land use zoning.

Land Use / Zoning Category	Area (acres)	Area (%)
Low Density Residential (A-R)	31	2.87
Single Family Residential (R-1)	186	17.34
Low Density Multiple Residential (R-2)	11	1.02
Medium High Density Residential (R-2000)	75	6.98
Medium High Density Residential and Offices (R-2000-P)	11	1.03
Multiple Residential (R-3)	139	12.91
Multiple Residential and Offices (R-3-P)	8	0.75
Residential Mobil Homes (R-M)	9	0.79
General Commercial and Retail (C-1)	169	15.75
General Commercial (C-2)	65	6.04
Commercial Highway Services (C-H)	49	4.52
General Industrial (M-1)	65	6.01
Business Park (BP)	11	1.00
Office and Professional (O-P)	4	0.34
Public (P)	158	14.69
Open Space (O-S)	85	7.95
Total	1,074	100.00

2.1.3.1 *Summary of General Plans and Other Land Use Plans*

The Basin includes land areas under the jurisdiction of three local governments: The County of Inyo, the County of Mono, and the City of Bishop. A fourth local government entity, the City of Los Angeles, owns extensive land and water rights within the Basin, and for the purposes of SGMA, lands owned by the City of Los Angeles are considered adjudicated and not subject to SGMA. Each local government has adopted a general plan with land use classifications that identify allowable activities within each classification. Also, within the Basin are state lands managed by the California State Lands Commission; federal lands managed by the Bureau of Land Management, NPS, and the United States Forest Service; and tribal lands managed by the Lone Pine Paiute-Shoshone Tribe, Fort Independence Paiute Tribe, Big Pine Paiute Tribe, Bishop Paiute Tribe, and the Utu Utu Gwaitu Paiute Tribe.

2.1.3.1.1 Inyo County

The Inyo County General Plan was approved by the Inyo County Board of Supervisors in 2002. That version of the General Plan was used to complete this GSP, which will be updated as necessary to reflect all future updates to the Inyo County General Plan. Section 8.5 of the 2001 Inyo County General Plan provides planning goals related to water resources including:

- Providing an adequate and high-quality water supply to all users within the County
- Protecting and preserving water resources for the maintenance, enhancement, and restoration of environmental resources
- Protecting and restoring environmental resources from the effects of export and withdrawal of water resources

The vast majority of all land in Inyo County is owned by either the Federal government (~92%), the City of Los Angeles (~4%), and the State of California (~2.5%) (Inyo County Planning Department, 2013). Within the Inyo County land overlying the Basin, approximately 53% is owned by the City of Los Angeles. A breakdown of the Inyo County lands overlying the Basin and their associated land ownership is provided in Table 2-1 (California Department of Forestyr and Fire Protection [CAL FIRE], 2020).

2.1.3.1.2 Mono County

The Mono County General Plan was approved by the Mono County Board of Supervisors in 1992 and the last comprehensive update was in 2015. The Mono County General Plan 2015 update was used to complete this GSP. Section 05 Conservation-Open Space element of the Mono County General Plan provides planning goals related to water resources including:

- Goal 3: Ensure the availability of adequate surface and groundwater resources to meet existing and future domestic, agricultural, recreational, and natural resource needs in Mono County
- Goal 4: Protect the quality of surface and groundwater resources to meet existing and future domestic, agricultural, recreational, and natural resource needs in Mono County

The vast majority of land in all of Mono County is owned by either the Federal government (~85%), the City of Los Angeles (~3%), and the State of California (~4%) (Mono County Planning Department, 2009). Within the Mono County land overlying the Basin, approximately 9% is owned by the City of Los Angeles and is adjudicated from this GSP. A breakdown of the Mono County lands overlying the Basin and their associated land ownership is provided Table 2-2 (CAL FIRE, 2020).

2.1.3.1.3 City of Bishop

The City of Bishop has direct land use jurisdiction within its city limits. The General Plan for the City of Bishop was approved by the City of Bishop Planning Commission in 2001 and was last updated in 2011. The 2011 General Plan discusses the City's goals for several elements, including land use and public services and facilities, and was used complete this GSP. Chapter 7, Section V and Chapter 9, Section V of the General Plan for the City of Bishop provides planning goals related to water resources including:

- Provide adequate water supply, storage, transmission, and distribution facilities to all areas of the City, both existing and planned
- Ensure that productive resources, including water resources, are not allowed to deteriorate due to misuse, overuse, or abuse

The majority of land in the City if Bishop is zoned for residential use (~40%), commercial use (~30%), and public use (15%) (City of Bishop Planning Department, 2011). Approximately 8% of the City of Bishop land overlying the Basin is zoned as open space. A summary of the City of Bishop lands and their associated zoning is shown in Table 2-3.

2.1.3.1.4 Federal Lands

The BLM prepares Resource Management Plans that serve as land management blueprints. In the southern end of the Owens Valley, a small portion of the Basin is within the California Desert Conservation Area (CDCA). The CDCA comprehensive land-use management plan was completed in 1980 and revised in 1999. Additionally, the same southern portion of the Owens Valley is within the BLM's West Mojave Plan area which established a habitat conservation plan for sensitive plants and species in the region. The BLM is currently developing a management plan for the Fish Slough Area of Critical Environmental Concern, which will include best management practices for both groundwater and surface water resources. Since this plan is still in the development phase and not finalized, we cannot yet assess how it will impact water resources in the Basin.

2.1.3.1.5 Agricultural Land Use

There are approximately 14,905 acres of actively farmed land overlying the Basin. Typically, each farm has its own well and water delivery system for its respective crops or water delivery is managed by LADWP and their lessee. The primary crop grown in the Owens Valley is alfalfa (4,130 acres), with other miscellaneous crops (1,152 acres) such as grain and hay constituting a minority of production. The majority of actively farmed land in the Owens Valley is dedicated to pasture for cattle (9,623 acres). A map of actively farmed land overlying the Basin is provided in Figure 2-6 (Department of Water Resources, 2016).

2.1.3.1.6 Adjudicated Lands within the Owens Valley Groundwater Basin

Section 10720.8(c) of the California Water Code states that portions of Basin managed according to the Inyo/Los Angeles Water Agreement shall be treated as adjudicated and are therefore exempt from SGMA. However, since management of water resources in the adjudicated lands has the potential to impact the GSP and the achievement of sustainability in the basin, the following has been included as a relevant land use plan within the basin.

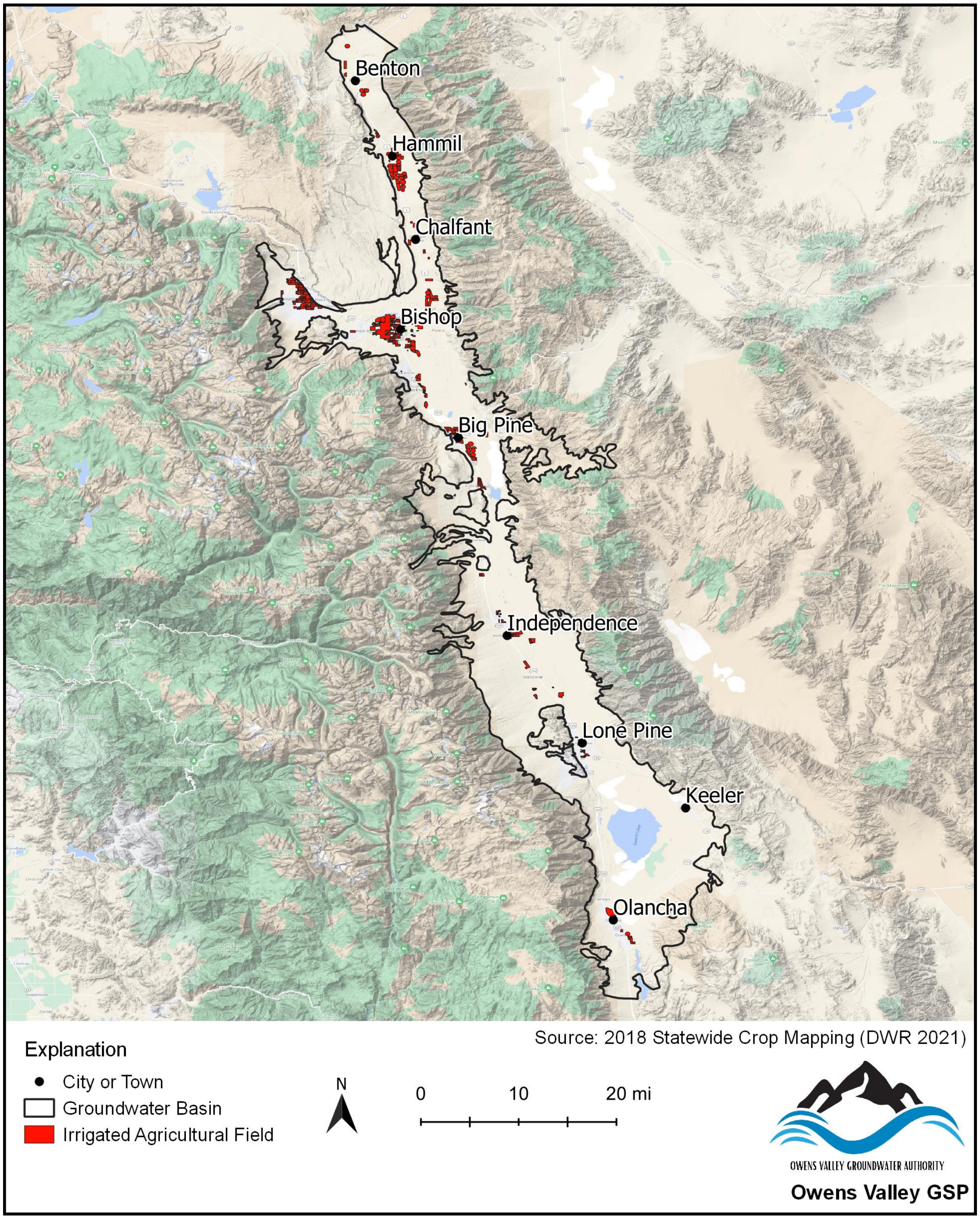

Figure 2-6. Locations of actively farmed lands in the Basin.

PRELIMINARY DRAFT

Stipulation and Order for Judgement in Superior Court of California Case No. 12908, City of Los Angeles vs. County of Inyo: This Stipulation and order relates to lands inside the Basin, but outside the jurisdiction of GSA and GSP. The City of Los Angeles and County of Inyo have entered into an agreement (LTWA) concerning Los Angeles's water and land management activities within Inyo County. The LTWA settled litigation between the Los Angeles and Inyo County through a stipulated order under the jurisdiction of the California Superior Court. Approximately two-thirds of the groundwater extraction within the basin is regulated by the LTWA and not subject to this GSP. The LTWA regulates Los Angeles's groundwater pumping to avoid overdraft, protect groundwater dependent ecosystems, and non LADWP wells. The LTWA also has provisions for maintaining irrigated lands within the Inyo County portion of the basin, mitigating negative impacts of Los Angeles's pumping, monitoring hydrologic and ecologic conditions, and resolving disputes between the parties. The LTWA also contains provisions for an annual audit of Los Angeles's groundwater pumping and water use on Los Angeles's land in the Bishop area to satisfy a Court order ("Hillside Decree"). The decree prohibits Los Angeles from exporting groundwater from the Bishop Area. Although this GSP does not regulate Los Angeles's groundwater extraction, because Los Angeles is the principal water rights holder and groundwater extractor in the basin, its activities are necessarily considered in the basin-wide water budget and conceptual model contained in this GSP.

2.1.3.1.7 Owens Lake Groundwater Development Program

Several land management and resource planning documents exist for the Owens Lake area in the southern portion of the Owens Valley Basin. LADWP is responsible for dust mitigation of the Owens Lake under orders from the Great Basin Unified Air Pollution Control District and the U.S. EPA. The Owens Lake lakebed is owned by the California State Lands Commission, with long term leases to LADWP for their dust mitigation obligations including water management and habitat enhancement. LADWP is in the planning stage of the proposed Owens Lake Master Project, which will coordinate LADWP's dust control activities and habitat maintenance at Owens Lake. As a component of the Master Project, the Owens Lake Groundwater Development Program (OLGDP) is currently being developed by LADWP with the objective of using groundwater from beneath Owens Lake to provide a portion of the water demand for dust mitigation on Owens Lake in an environmentally sustainable manner. LADWP proposes to implement the OLGDP in a phased manner as described on the OLGDP website and included below:

To better understand the Owens Lake geohydrology, LADWP is utilizing an Adaptive Management Strategy for the development of groundwater at Owens Lake to ensure groundwater dependent resources are protected.

The plan is to implement OLGDP in three (3) Phases:

- *Phase I is to develop a baseline which includes conducting a variety of studies to update the current conceptual model of Owens Lake groundwater system. Based on the studies conducted, a management plan is developed, and Hydrologic Monitoring, Management, and Mitigation Plan (HMMMP) is prepared. The HMMMP will support preparation of environmental documentation and in acquiring necessary leases and permits.*
- *Phase II is the start of groundwater pumping at a rate lower than what is determined to be sustainable while leaning more on the groundwater system and the effect of resources around the lake.*
- *Phase III is full implementation of the groundwater pumping to supply a portion of water needed for dust mitigation at Owens Lake.*

Inyo County and LADWP are currently in dispute over the applicability of the LTWA to LADWP's proposed groundwater extraction at Owens Lake; however, the parties have agreed to place the dispute on hold while they develop a mutually satisfactory groundwater management plan (the HMMMP discussed above). As part of the OLGDP, LADWP is developing resource protection protocols that lay out monitoring and sustainability criteria for protecting non-LADWP groundwater users and groundwater dependent habitat, while avoiding land subsidence and air quality impacts. The OVGA may evaluate whether these resource protection criteria are suitable for inclusion in the GSP as sustainability criteria for resources at Owens Lake. If Inyo County and LADWP's dispute results in findings or agreement that LADWP's groundwater development is not subject to the LTWA, then the OVGA may be responsible for implementing SGMA at Owens Lake if adherence to the GSP is made a condition of the lease by CSLC. If the dispute results in findings or agreement that the LTWA applies to LADWP's proposed groundwater development, then lakebed would be considered adjudicated with respect to SGMA, and the Inyo/LA Water Agreement would be the management plan for the proposed groundwater development.

2.1.4 Description of How Implementation of the GSP May Change Water Demands or Affect Achievement of Sustainability and How the GSP Addresses Those Effects

The GSP does not propose to immediately change the water demands within the basin. Additional study is necessary before the OVGA or another agency can address portions of the Basin with declining water levels. Therefore, this GSP is not proposing immediate projects or management actions that would alter the operations of well owners in the basin and therefore impact the beneficial uses and users of groundwater. Future updates of the GSP may contain such measures following completion of planned studies if conditions warrant or if new groundwater extraction projects potentially subject to oversight by the OVGA arise.

2.1.5 Description of How Implementation of the GSP May Affect the Water Supply Assumptions of Relevant Land Use Plans

The Basin is ranked low priority by the DWR and implementation of the GSP is voluntary and the discretion of the OVGA. The OVGA will determine the timing of possible actions described in the GSP to implement. The OVGA decisions will be guided by its Mission Statement and Guiding Principles. The OVGA guiding principles are consistent with the goals of plans described in Section 2.1.3. The relevant land use plans contain few assumptions regarding water supply, and it is unlikely that the GSP implementation will affect existing plans.

2.1.6 Summary of the Process for Permitting New or Replacement Wells in the Basin

Basin well permits are issued by Inyo and Mono Counties within their respective boundaries. The Inyo County Environmental Health Department is responsible for issuing water well permits within Inyo County boundaries. Inyo County water well permit requirements are outlined in Chapter 14.24 of the Inyo County Code. The Mono County Environmental Health Department is responsible for issuing water well permits within the County's boundaries. Mono County water well permit requirements are outlined in Chapter 7.36 of the Mono County Code.

Each well permitting agency, as a minimum standard, implements the California Department of Water Resources' updated Water Well Standards, which include requirements to avoid sources of contamination or cross-contamination, proper sealing of the upper annular space (e.g., first

50 feet), disinfection of the well following construction work, use of an appropriate casing material, and other requirements. Each agency then specifies any additional requirements in its municipal code that apply to well installation and destruction within its boundaries. These can include meeting certain septic system setback criteria and construction and sealing requirements.

The permitting agencies monitor and enforce these standards by requiring drilling contractors with a valid C-57 license to submit permit applications for the construction, modification, reconstruction (i.e., deepening), or destruction of any well within their jurisdiction. The processing and issuance of a water well permit is currently considered a largely ministerial action, meaning permits are issued to drillers meeting California Water Well Standards and County permitting requirements notwithstanding errors in the application. In certain circumstances, however, such as when installing a well could cause the spread of contaminants to uncontaminated water zones, the Counties may have discretion in issuing a well permit to protect environmental health.

In the adjudicated portion of the basin, the Los Angeles Department of Water and Power (LADWP) constructs new and replacement wells by a process where LADWP proposes wells to a joint Inyo County/LADWP technical committee that evaluates the proposed wells for their potential negative impacts and develops monitoring and management programs. Once this evaluation is complete, the permitting for construction of new and replacement wells by LADWP is as described above for other wells in the basin.

2.1.7 Information Regarding the Implementation of Land Use Plans Outside the Basin that Could Effect of the Ability of the Agency to Achieve Sustainable Groundwater Management

The Los Angeles Department of Water and Power and potentially the Indian Wells Valley Groundwater Sustainability Agency could influence the sustainable management of groundwater resources in the Owens Valley basin.

Los Angeles Department of Water and Power Urban Water Management Plan: Los Angeles exports approximately 100,000 – 500,000 AFY from Owens Valley for municipal use in Los Angeles, and extracts approximately 50,000 – 95,000 AFY of groundwater, with annual amounts varying with runoff conditions. These activities may affect the ability of the Owens Valley

Groundwater Authority to achieve sustainable groundwater management in the basin. The Los Angeles Department of Water and Power Urban Water Management Plan 2020 (LAUWMP, 2020) projects that over the next 25 years, average deliveries from the Los Angeles Aqueduct (LAA) to the City would decline from the 1985-2014 median of 192,000 acre-feet per year to 184,200 acre-feet per year by 2045 due to climate change, but this decline will be offset by water conservation efforts, water recycling, storm water capture, and local (southern California) groundwater sources (LAUWMP, p 11-3). The LAUWMP projected deliveries lump surface water and groundwater export into overall LAA deliveries, so the effect, if any, on Los Angeles's groundwater pumping was not defined. Additionally, there is considerable uncertainty as to the effect of climate change on water availability. The oversight or regulatory structure and scope of a potential groundwater project at Owens Lake are also unknown.

Indian Wells Valley Groundwater Sustainability Plan: The Indian Wells Valley Groundwater Basin (DWR, 2020a. Bulletin 118 Basin No. 6-054) lies south of the Owens Valley. It is designated as a critically overdrafted basin, and as such, the GSA for the basin, the Indian Wells Valley Groundwater Authority (IWVGA), completed a GSP in January 2020. In their GSP, the IWVGA proposes a number of projects to bring the basin into a sustainable condition including a project for development of an imported water supply. Two options are proposed, one to construct a 50-mile pipeline from the Antelope Valley to Indian Wells Valley to transport water purchased from the State Water Project (SWP) to Indian Wells Valley. The second option proposed is to withdraw water from the LAA along its route through the Indian Wells Valley for groundwater recharge, and purchase SWP water that would be diverted from the SWP to the LAA to replace the water diverted to Indian Wells Valley. Of the two options, diverting water from the LAA was projected to be far less costly than transporting water from Antelope Valley. IWVGA would need negotiate an agreement with the City of Los Angeles to acquire, divert or trade water from the LAA. Depending on the terms of such an agreement, Los Angeles may be motivated to increase water transfers from Owens Valley to maximize water diversions to Indian Wells Valley, with potential negative effects on sustainable groundwater management in Owens Valley. The IWVGA proposal would conflict with the OVGA sustainability guiding principle, Sus.14 (Section 1.2).

Inyo County is a member of the IWVGA and a property owner in the Basin. Groundwater production in Owens Basin for export and use in the Indian Wells Basin would be subject to SGMA, though no groundwater development or export project has officially been proposed. An export project from Owens Basin may also be subject to regulation by Inyo County under its groundwater Ordinance 1004.

2.1.8 Additional GSP Elements (Reg. § 354.8 g)

Relationships with State and federal regulatory agencies: The Bureau of Land Management and US Forest Service were invited to submit a statement of interest to participate in the OVGA board as Associate Members or Interested Parties and declined to do so. The State Lands Commission submitted a statement to join the OVGA as an Interested Party, but the OVGA Board preference was to invite the Commission to participate on a future advisory committee in the Owens Lake management area. The Commission has the discretion to make compliance with the GSP a lease condition for any project on the state lands in the Basin. Commission members or staff are able to attend and comment at OVGA Board and outreach meetings or contact the OVGA staff.

2.1.9 Notice and Communication (Reg. § 354.10

California Water Code Sections 10723.2 and 10728 require that a GSA shall consider the interests of all beneficial uses and users of groundwater and provide a written statement describing how interested parties may participate in the development and implementation of the GSP. The OVGA adopted Communication and Engagement Plan (CEP) attached as Appendix 5 is that written statement.

2.1.9.1 Description of beneficial uses and users in the basin

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 are any stakeholder who has an interest in groundwater use and management in the Basin. Their interest may be GSA activities, GSP development and implementation, and/or water access and management in general. Essentially all residents in the Basin rely on groundwater for drinking water, household, and business uses and are considered beneficial users.

The DWR has issued a Stakeholder Engagement Chart for GSP Development in their 2018 *GSP Stakeholder Communication and Engagement Guidance Document*. That 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 (Table 2-4).

Table 2-4. Stakeholder Engagement list for OVGA GSP Development. This table will continue to be updated during GSP implementation.

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 - Starlite - Wheeler Crest	Consult and/or involve to ensure land use policies are supporting the GSP
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	Inform and/or involve to avoid negative impact to these users

PRELIMINARY DRAFT

	- Bishop Unified School District - Eastern Sierra College Center - Eastern Sierra Unified School District - Lone Pine Unified School District - Round Valley School District • Domestic 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 - North Lone Pine	Collaborate to ensure sustainable management of groundwater

	- 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	Inform, involve and/or collaborate to sustain a vital ecosystem and ensure basin sustainability.

	- 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	
Tribes & Tribal Organizations	• Tribes - Benton Paiute Tribe - Big Pine Tribe - 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	Inform, involve, and/or consult with tribal government
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	• Regional water management groups (IRWM regions)	Inform, involve, and collaborate to improve

Management	- Inyo Mono IRWMP • Recycled Water Coalition	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

2.1.9.2 Basin Governance and Decision-Making

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. The Lone Pine Paiute Shoshone Tribe and Owens Valley Committee are Interested Party Members (Appendix 1, JPA Article V). Voting procedures of the OVGA are described in the JPA Article IV.

The OVGA is administered by a governing board consisting of one primary appointed Director and one alternate from each member agency. All OVGA Board of Directors meetings are public, noticed, held, and conducted in accordance with the Ralph M. Brown Act open and public meeting law. The OVGA provides advance notice to the public of its regular monthly Board meetings by direct email to an interested party list and through posting agendas and supporting material in agenda packets on its website https://ovga.us/. The Board meetings and workshops are recorded. The Board may occasionally establish 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 committees, and input from technical consultants. Furthermore, the OVGA and their staff representatives will engage with Basin stakeholders through the strategies outlined in the OVGA Communications and Engagement Plan (CEP) to help inform the OVGA's decisions.

2.1.9.3 *Public engagement opportunities*

Opportunities for stakeholder input were 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 the CEP. In addition, staff provided regular updates and presentations at meetings of the TVGWMD meetings, Mono County Board of Supervisors, Inyo County Board of Supervisors, and the Bishop City Council. Timely notification of opportunities for interested parties to participate in the development and implementation of the GSP will be given via the channels and strategies described in the Communications and Engagement Plan (2020).

To allow for ongoing public engagement, the OVGA conducted a 60 day comment period on the Draft GSP before consideration by the Board. Responses to comments were prepared and included in Appendix 6 of the GSP. DWR will also conduct a 60 day period following submission of this GSP for evaluation to solicit comments regarding this GSP. Interested parties may review this GSP and submit comments (DWR may or may not respond to comments, but the comments will be considered during their evaluation).

2.1.9.4 *List of public meetings informing the public on GSP development*

The OVGA has conducted over 34 public Board meetings since its inception. All consultant work products were presented to the Board in public meetings before inclusion in the GSP. XX public workshops were conducted specifically to discuss the GSP contents. A complete list of public meeting is included in Table 2-5.

Table 2-5. List of public meetings where GSP or components were developed and discussed.

Group	Dates
OVGA Board	TBCompleted
Stakeholder workshops	
Interested Parties	TVGWM regular meeting: 2 presentations and counting plus the survey meetings Tribes:
Inyo County Board of Supervisors	Keep?
Mono County Board of Supervisors	keep?
Bishop City Council	I presented once. Staff updates?
Other	Direct mailer including a survey to residents of Tri-Valley Management Area (responses included in Appendix 6); 3 Presentations to the TVGMD

2.1.9.5 *Encouraging active involvement*

A key message of the OVGA is that it is committed to proactive and transparent outreach and engagement with stakeholders and Basin community members throughout GSP planning and SGMA implementation. The CEP describes several essential communication strategies used by the OVGA to encourage active involvement. The transition to digital meetings and communication due to COVID-19 complicated outreach but generally, meeting attendance was approximately the same or increased as the public familiarity with internet communications and the OVGA gained more experience with the technology.

PRELIMINARY DRAFT

2.2 Basin Setting

The basin setting is summarized in the following sections that describe the physiography, climate, vegetation, soils, geology, and hydrogeologic framework. More detailed information can be found in Appendix 7, Hydrogeologic Conceptual Model (HCM).

2.2.1 Hydrogeologic Conceptual Model (Reg. § 354.14)

Numerous geologic and water resource studies have been conducted in Owens Valley since the early 1900's. A detailed review of all previous work is beyond the scope of this report, but relevant information was reviewed during development of the Owens Valley HCM. The sections below summarize information pertinent to GSP development. For a more detailed description of the HCM, see Appendix 7.

2.2.1.1 Physiography

Owens Valley is located on the eastern side of the Sierra Nevada Mountains in California on the western edge the Basin and Range Province (Figure2-7). 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 Basin is comprised of Owens Valley (6-012.01) and Fish Slough subbasin (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 the "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 Owens River enters the northern portion of the groundwater basin near Bishop and then meanders southward through the valley towards Owens (dry) Lake (Figure 2-8). Numerous tributaries drain the Sierra Nevada and enter the western portion of the groundwater basin.

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. Surface-water and groundwater generally flow from north to south to the Owens Lake, the natural terminus of the watershed.

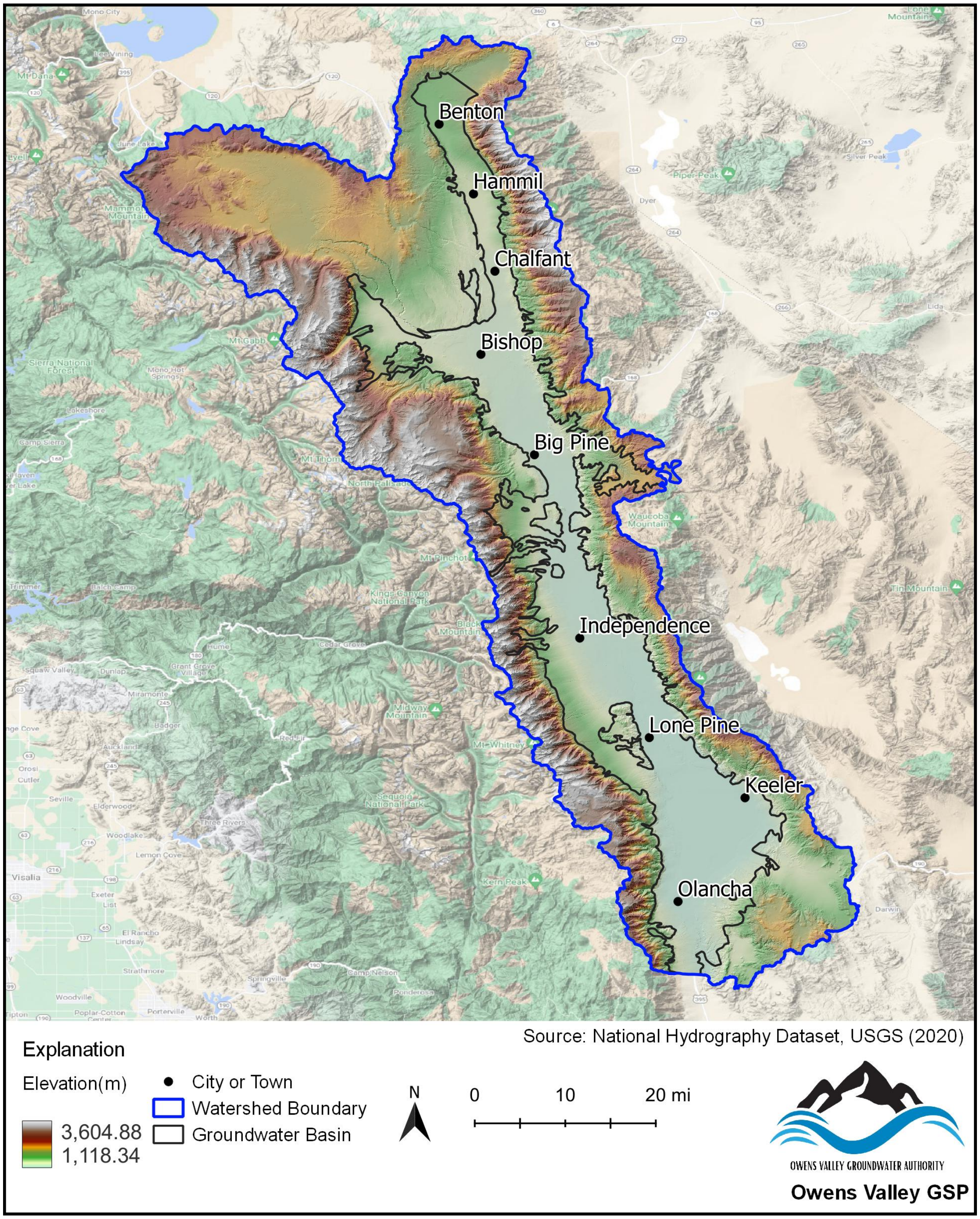

Figure 2-7. Physiography of the Basin

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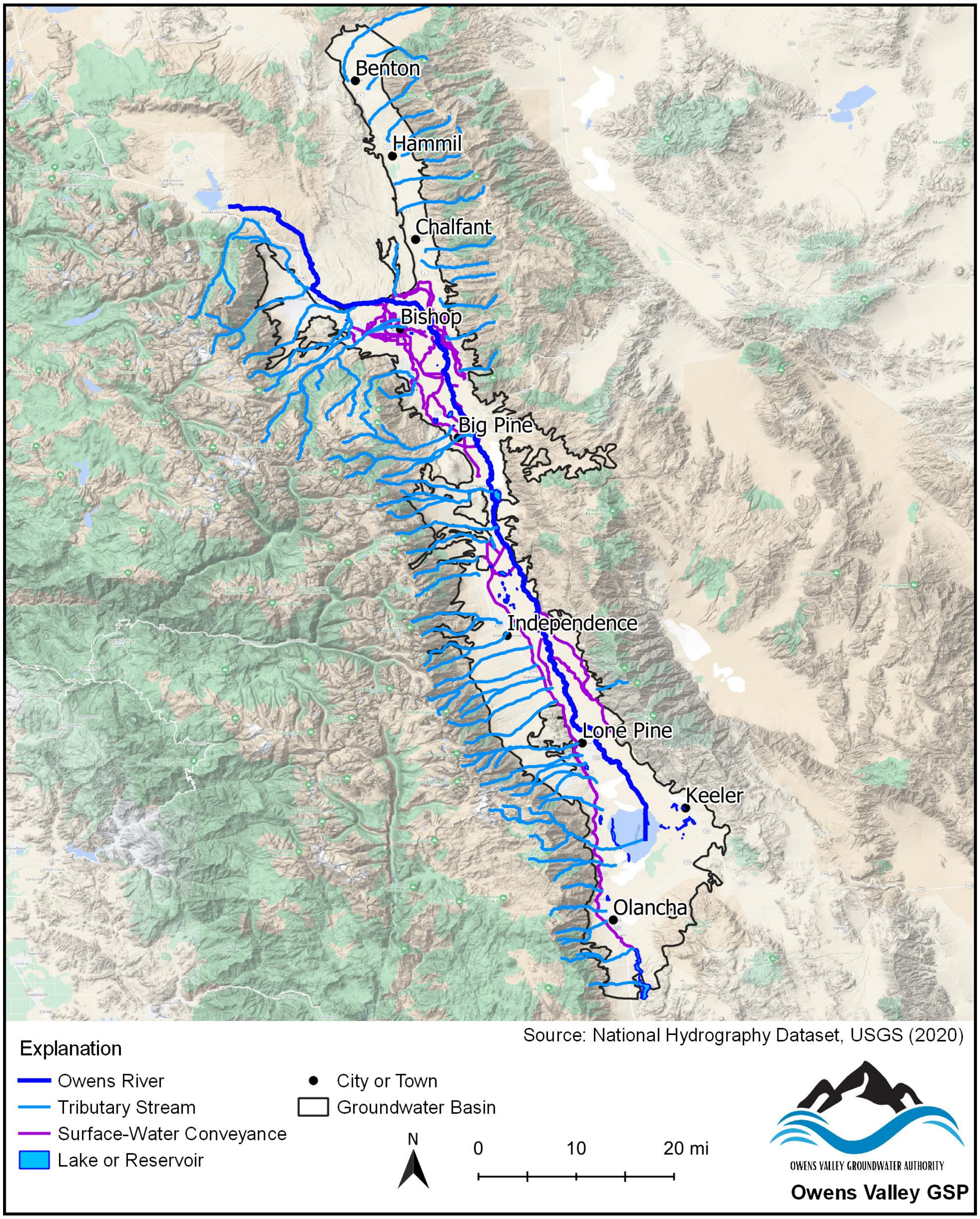

Figure 2-8. Major surface water features of the Basin

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. Diversion of surface-water for irrigation within the valley and exported south via the LAA desiccated the lake by 1926 (Saint-Amand et al., 1986). With the exception of very wet years, Owens (dry) Lake is a playa with a small brine pool. Over 100 mi^2 of the lakebed is managed to control dust emissions.

2.2.1.2 Climate

Climate in Owens Valley watershed is strongly correlated with elevation. The high elevation portions of the watershed are cooler (Figure 2-9) and receive the greatest amount of precipitation (Figure 2-10), primarily as snow from October-March. The watershed experiences a strong precipitation gradient from west to east due to the "rain shadow effect" caused by the Sierra Nevada and results in highly variable precipitation in the watershed. Long term averages of total annual precipitation (1981-2010) are about 57 inches in the Sierra Nevada, 14 inches in the White and Inyo Mountains, and 5.9 inches on the valley floor (PRISM Climate Group, n.d.). Average annual reference evapotranspiration on the Owens Valley floor is approximately 59 inches (Steinwand et al., 2001).

2.2.1.3 Vegetation

Native vegetation covers most the Owens Valley watershed (Figure 2-11) as the majority of land area is under federal, state, or municipal ownership. The groundwater basin lies on the boundary of the Great Basin and Mojave deserts. Consequently, the southern part of the basin has vegetation communities such as Mojave creosote bush scrub characteristic of the hot Mojave Desert to south and the northern part of the basin has communities such as Big Sagebrush scrub characteristic of the cooler, higher elevation Great Basin Desert. At higher elevations in the watershed, vegetation types include Pinyon-Juniper woodland, montane forest and meadow, subalpine forest and meadow, alpine plants, and barren terrain above timberline (Danskin, 2000). Vegetation communities range from salt-tolerant shadscale scrub, alkali sink scrub, desert greasewood scrub, alkali meadow, and desert saltbush scrub on the low elevations of the valley floor, to more drought-tolerant Mojave Mixed Woody Scrub, Blackbush Scrub, and Great Basin mixed scrub on alluvial fans (Danskin, 2000; Davis et al., 1998).

In the arid environment of the Owens Valley, vegetation communities are mediated by hydrology. On alluvial fan surfaces, where the water table is generally deep and disconnected from the root zone, plants subsist on precipitation alone. Near tributary stream channels,

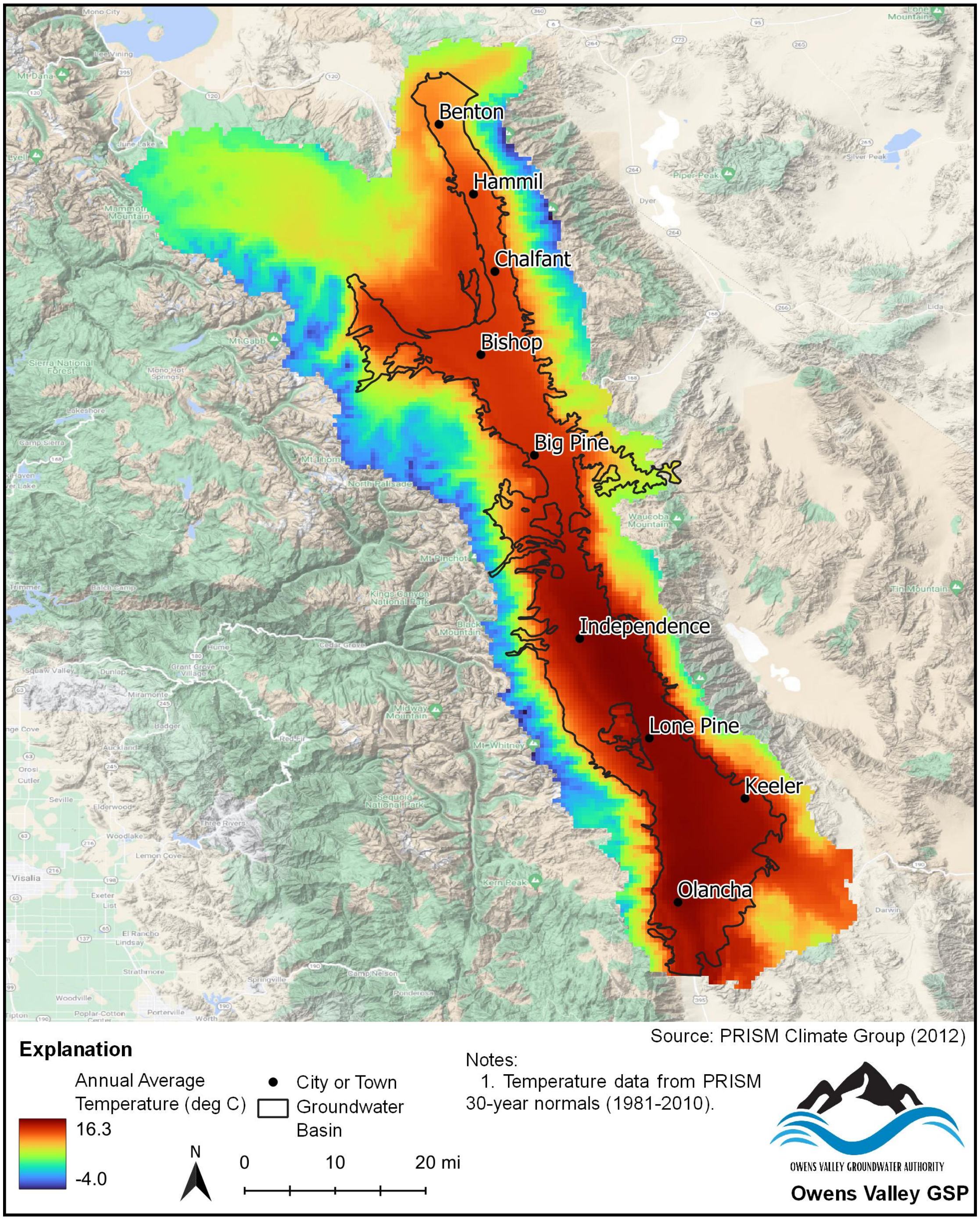

Figure 2-9 Mean Annual Temperature of the Basin,

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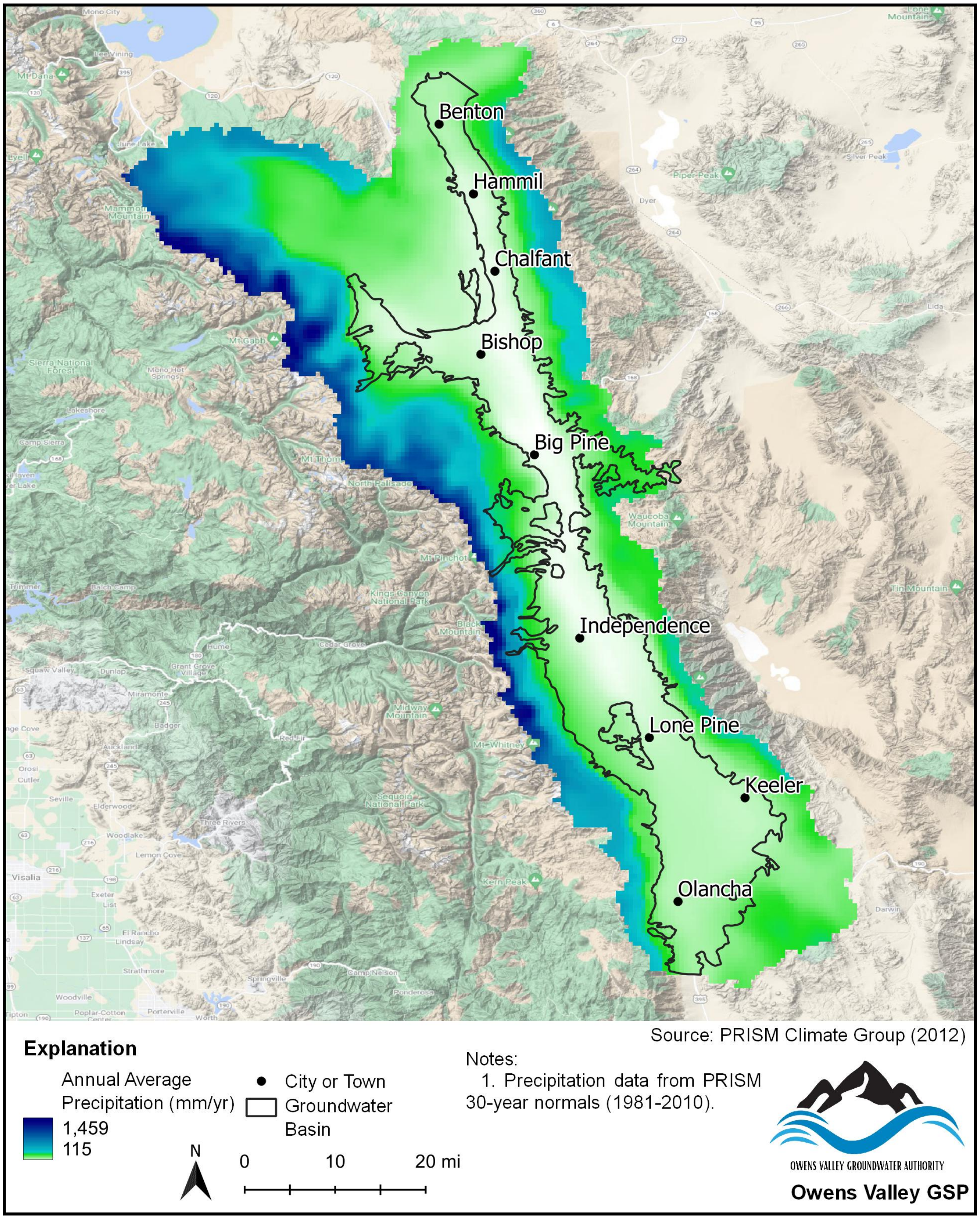

Figure 2.10. Mean annual precipitation of the Basin.

PRELIMINARY DRAFT

Figure 2.-11. Vegetation Communities in the Basin.

ditches, canals, and along the Owens River, surface-water run-on and infiltration supports riparian communities. Areas of shallow groundwater on the valley floor support alkali meadow, alkali sink scrub, shadscale scrub, and desert saltbush scrub communities on most of the adjudicated portion of the basin floor. Groundwater discharge zones support alkali meadow, phreatophytic scrub communities, transmontane alkali marsh, and aquatic habitat.

2.2.1.4 Soils

The large geographic extent and complex geology of Owens Valley results in a wide range of soil types. A total of 467 unique soil map units were identified within the Owens Valley watershed, with 263 overlying the groundwater basin (Soil Survey Staff, 2002). Predominant soil classes in the Basin are Aridosols (hot and dry desert soils), Entisols (recent soils), Mollisols (soils with thick topsoil) and smaller areas of Histosols (organic soils).

Figure 2-12a shows a general summary of these map units classified by soil surface texture, which covers approximately 78% and 91% of the watershed and groundwater basin area, respectively. Surface soil textures are dominated by sands and gravels, primarily silty sand which alone accounts for 46% of the groundwater basin area (Table 2-6). Finer grained soil textures such as silts and clays make up approximately 25% of the area and are generally located adjacent to the Owens River.

Additional maps of soil properties are presented in Figures 2-12b-d, including soil drainage class, saturated conductivity, and salinity.

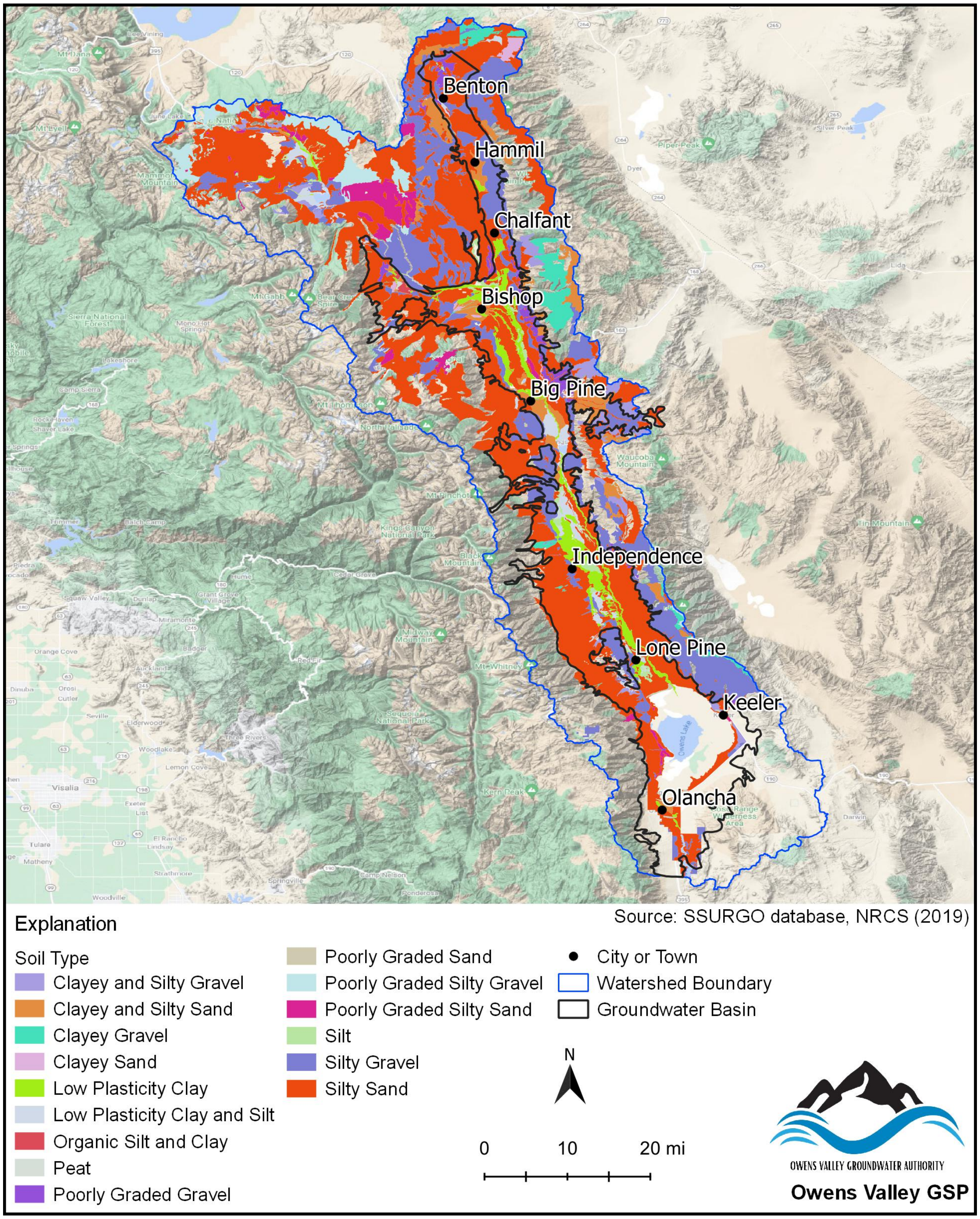

Figure 2-12a. Distribution of soil surface textures in the Basin.

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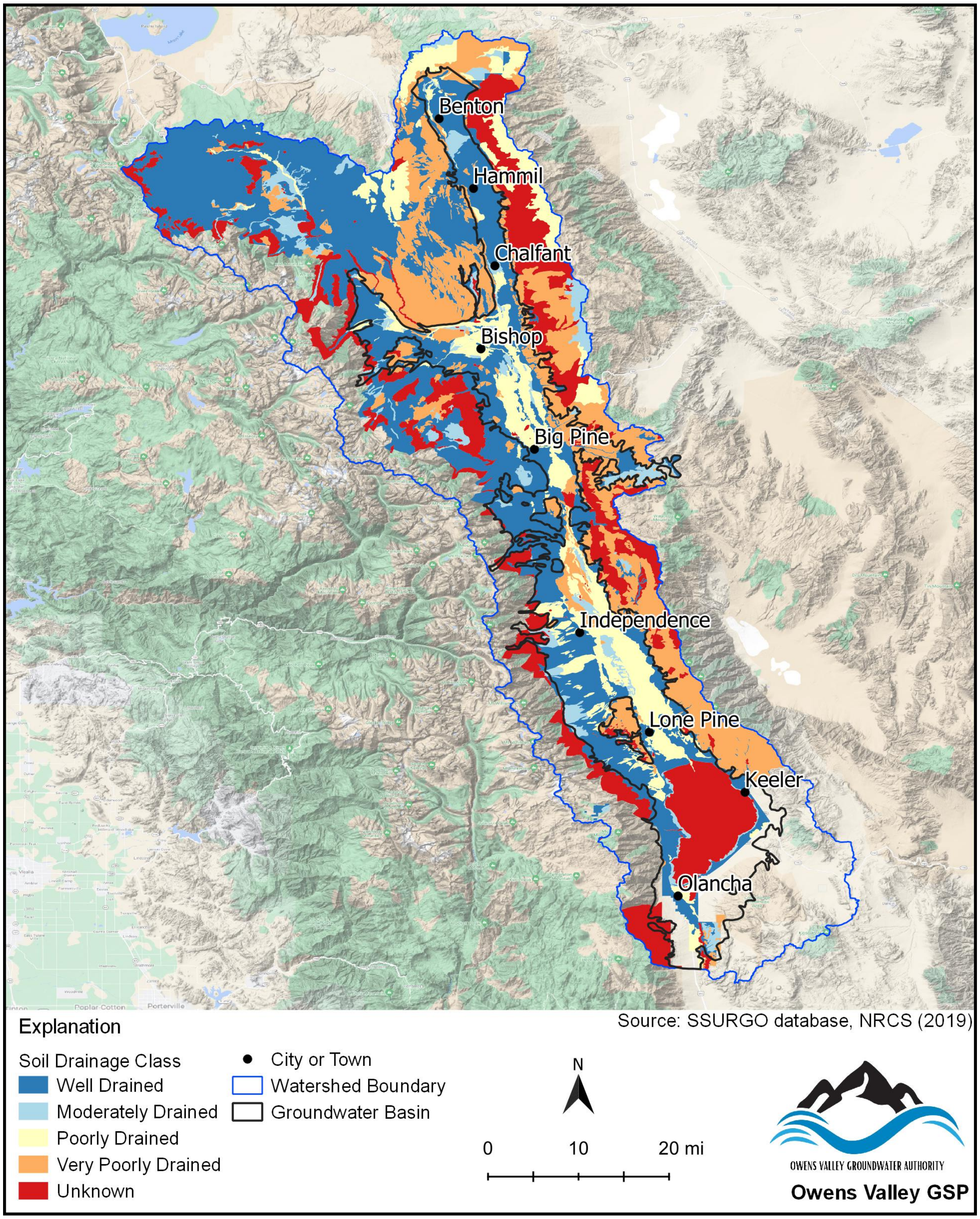


Figure 2-12b. Distribution of soil drainage classes in the Basin.

PRELIMINARY DRAFT

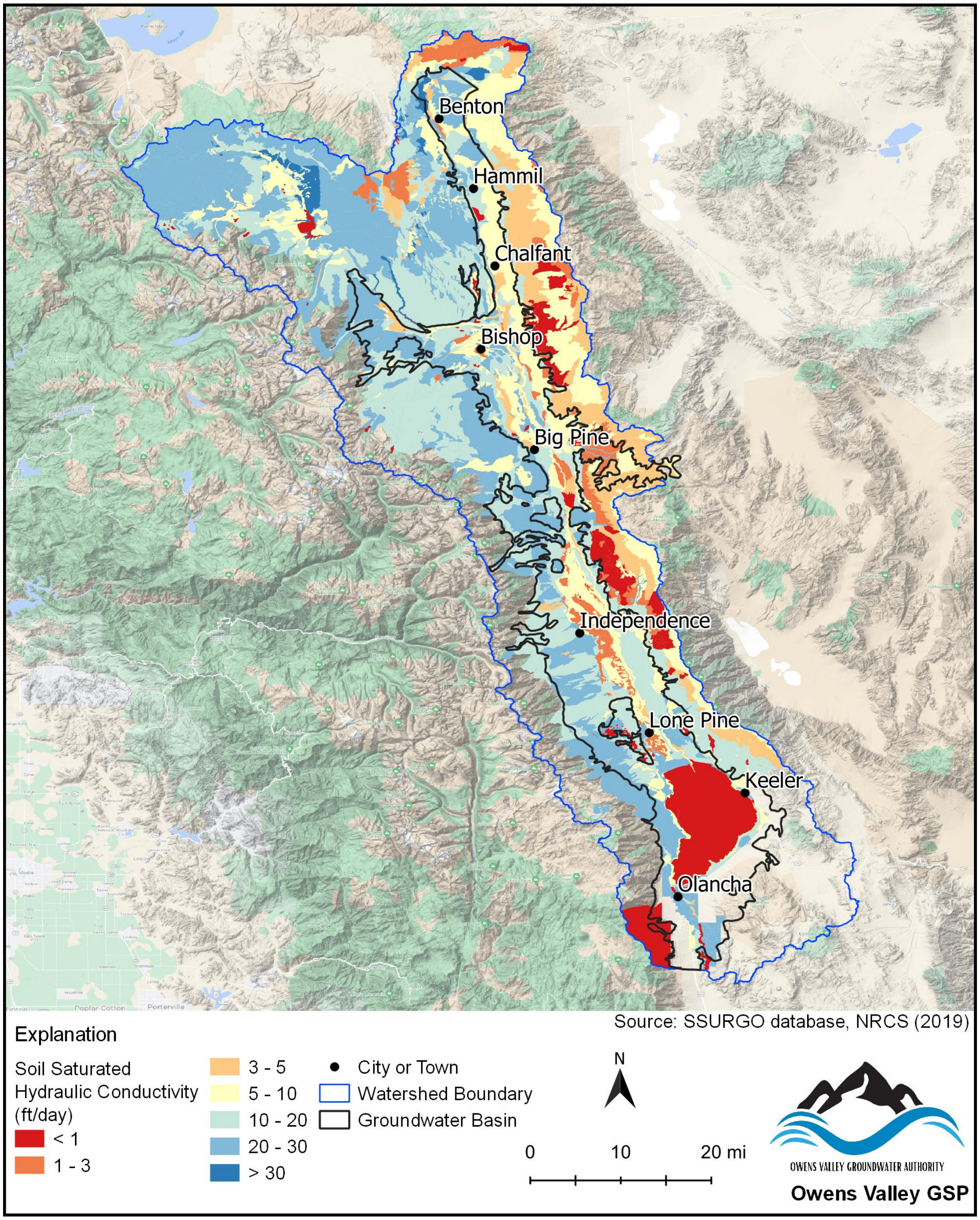


Figure 2-12c. Categories of soil saturated hydraulic conductivity in the Basin.

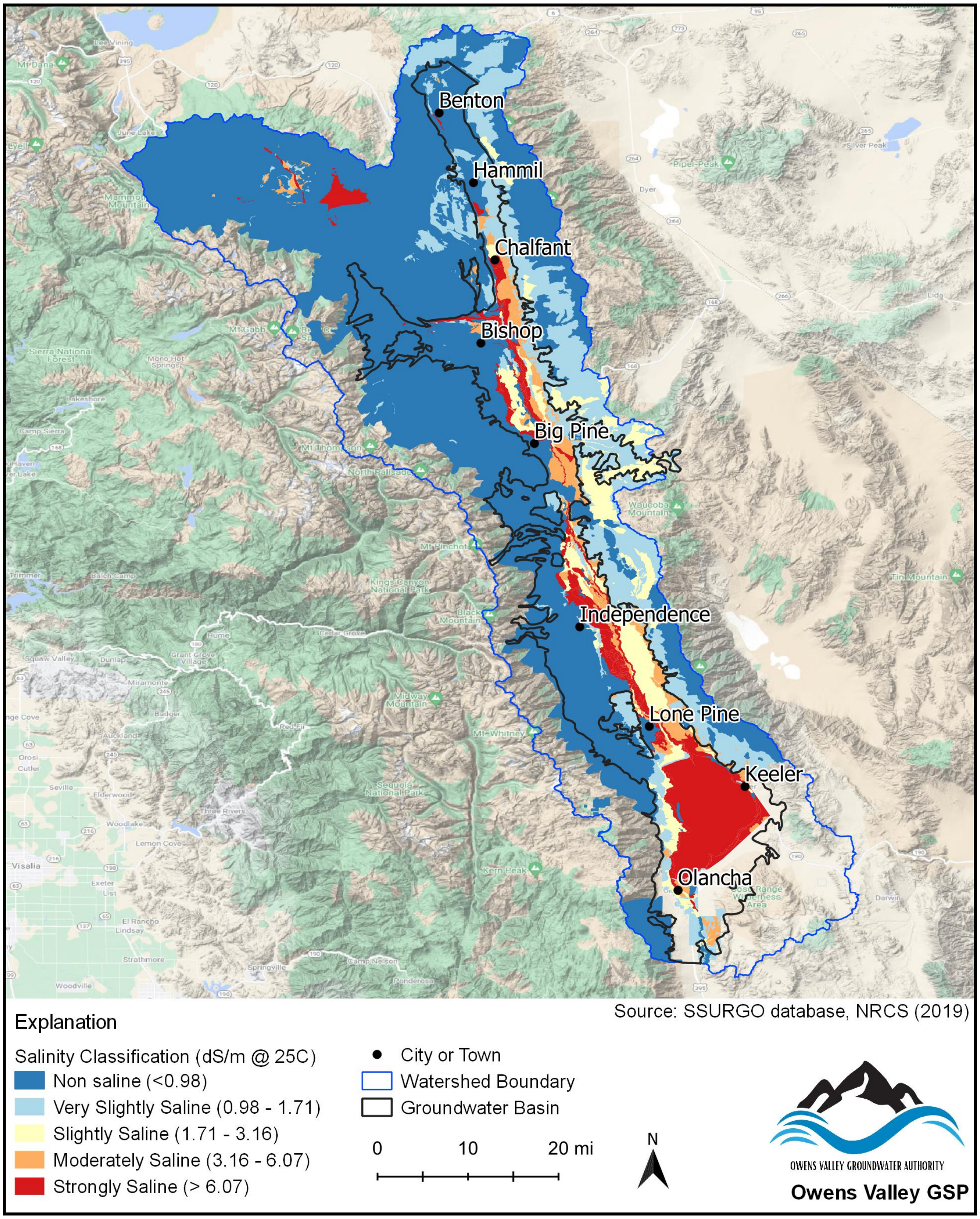


Figure 2.12-d. Soil salinity in the Basin.

PRELIMINARY DRAFT

Table 2-6 . Summary of groundwater basin soil texture composition.

Soil Type	Area (acres)	Area (%)
Silty Sand	303,182	45.69
Unknown	82,501	12.43
Silty Gravel	76,900	11.59
Low Plasticity Clay	51,732	7.80
Clayey and Silty Sand	29,202	4.40
Poorly Graded Gravel	17,933	2.70
Low Plasticity Clay and Silt	17,277	2.60
Silt	10,726	1.62
Clayey and Silty Gravel	4,364	0.66
Clayey Gravel	2,888	0.44
Poorly Graded Silty Sand	2,872	0.43
Organic Silt and Clay	1,681	0.25
Clayey Sand	1,607	0.24
Poorly Graded Sand	1,457	0.22
Peat	333	0.05

2.2.1.5 Geology

The geologic history of Owens Valley is a complex mixture of rifting, faulting, volcanism, and deposition, as shown in Figure 2-13. To the west, the Sierra Nevada consists of uplifted granitic and metamorphic rocks, locally mantled by glacial and volcanic deposits. To the east, the White-Inyo Range consists of Paleozoic sediments, Mesozoic volcanic rocks, and metamorphic rocks that have been folded, faulted, and intruded by granitic plutons, and are locally mantled with Quaternary sediments and Tertiary volcanic rocks. The present topography was produced by extensional faulting that initiated in the Miocene and produced northwest trending faults (Hollett et al., 1991). A later phase producing north-south trending normal and strike slip faults initiated in the Pliocene or Pleistocene and is still active (maps of Owens Valley faults in Slemmons et al., 2008). The contact between low permeability fault-bounded mountain blocks and more permeable valley-fill material generally forms the bedrock boundaries of groundwater basin; however, the basin boundary west of Chalfant and

PRELIMINARY DRAFT

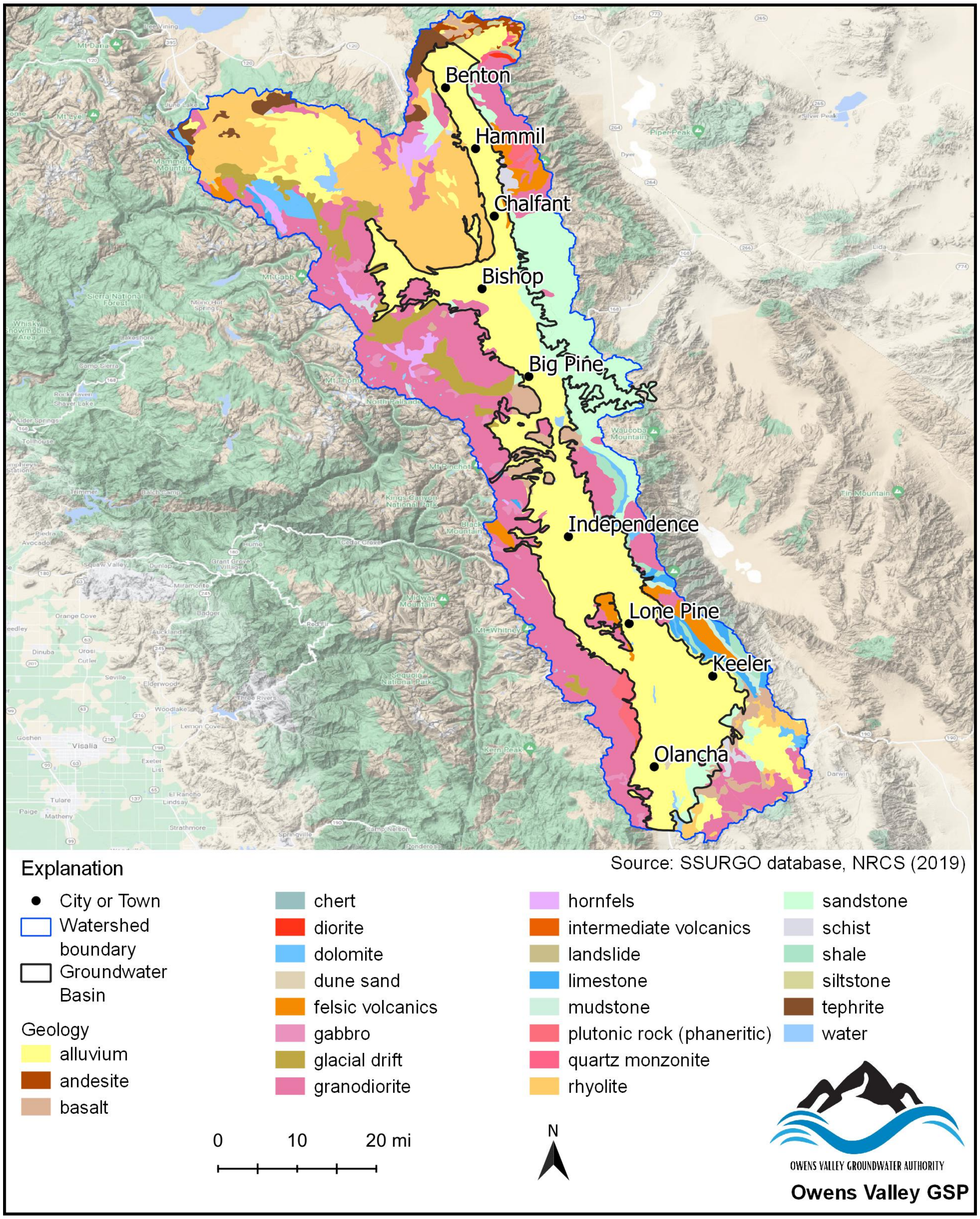


Figure 2-13. Geology of the Basin

PRELIMINARY DRAFT

Hammil valleys is formed by the edge of the surficial expression of the Bishop Tuff, a Pleistocene rhyolitic ignimbrite that overlies basin fill and bedrock (Hollett et al., 1991).

Owens Valley was formed as a result Basin and Range extensional tectonics that caused land surface parallel to the fault traces to subside. This subsidence created space into which valley fill has accumulated, consisting mainly of sediment shed from the adjacent mountain blocks. Volcanic flows erupting from volcanoes formed due to crustal thinning as a result of the extension are interbedded with the valley fill in some locations. Sedimentary material consists of unconsolidated to moderately consolidated alluvial fan and glacial moraine deposits adjacent to the mountain range fronts, fluvial plain deposits near the axis of the valley, deltaic deposits, and lacustrine deposits. Sedimentary strata are variable vertically and laterally. Depositional environments change over relatively short distances resulting in laterally discontinuous sand, gravel, and clay lenses. Laterally extensive clay strata are present beneath Owens (dry) Lake and in the Big Pine area. Owens Lake expanded and contracted during Pleistocene glacial and interglacial periods, periodically rising above the topographic high at the south end of Owens Valley and spilling into Rose and Indian Wells Valleys.

Volcanic rocks are present as valley fill in the basaltic cinder cones and flows of the Big Pine Volcanic Field south of Big Pine, in small basaltic plugs west of Bishop, and in the northern Owens Valley as Bishop Tuff. Bishop Tuff is a rhyolitic welded tuff erupted from the Long Valley Caldera 767 ka (Crowley et al., 2007), northwest of Owens Valley. Bishop Tuff dominates the land surface north of Bishop and west of Chalfant and Hammil Valleys, and is present at depth in Chalfant Valley, Laws, and the Bishop area according to well logs. Basalt flows south of Big Pine emanate from vents along the range front and are interstratified with valley-fill sediments. Basalts between Big Pine and Independence are the highest permeability aquifer materials found in Owens Valley.

Structural geology and geometry of the Owens Valley groundwater basin is dominated by faulting related to regional tectonism, with both normal and strike slip components. Faults at the margins of the basin are generally normal faults with the basin down-dropped relative to the mountain blocks. Faults found in the valley-fill are generally parallel to the axis of the valley. The Owens Valley Fault extends from Owens (dry) Lake to north of Big Pine. Other faults occur as branches of the range front faults and Owens Valley Fault. A number of springs occur along faults where they act as barriers to flow across the fault plane. In the Volcanic Tableland, the

Bishop Tuff is broken by many north-south and northwest-southeast oriented fault scarps, the largest of which forms the eastern boundary of Fish Slough, north of Bishop and west of Chalfant Valley.

Bedrock beneath the Owens Valley fill consists of down-dropped, fault-bounded blocks at varying depths. Numerous geophysical methods have been used to define the form and depth of the bedrock surface (Danskin, 1998; Montgomery Watson Harza [MWH], 2010, 2011b; Pakiser et al., 1964). These demonstrated that the bedrock beneath the valley is not a single down-dropped block, but rather is a series of deep basins separated by relatively shallow bedrock divides. The deepest part of the basin is beneath Owens (dry) Lake and is overlain by over 8,000 feet of valley fill, and another deep portion estimated to have valley fill of about 4,000 feet thick lies between Bishop and Big Pine (Hollett et al., 1991). Valley-fill strata within the deeper portions of the basin have a "stacked bowl" configuration with the deepest part of each stratigraphic horizon occurring in the deepest part of the basin.

2.2.1.6 Hydrogeologic Framework

Approximately 35% of the land area and the majority of water rights in Owens Valley groundwater basin are owned by the LADWP for the purpose of exporting water from the eastern Sierra to Los Angeles (Figure 2-3). Los Angeles has developed extensive facilities for water storage and export, land and water management, groundwater production, groundwater recharge, surface-water and groundwater monitoring, and dust control. Because of the importance of water supplied from Owens Valley to Los Angeles, LADWP monitoring is extensive and considerable study has been devoted to Owens Valley hydrology. Conversely, Chalfant, Hammil, and Benton valleys are less studied and monitoring is relatively sparse as LADWP owns little land in those areas.

The primary surface-water features in the groundwater basin are the Owens River and its tributaries draining the eastern slope of the Sierra Nevada (Figure 2-8). The Owens River flows from Long Valley, enters the northwest potion of the groundwater basin, and flows south towards Owens (dry) Lake. Streams draining the high elevations of the east slope of the Sierra Nevada join either the Owens River or are diverted into the Los Angeles Aqueduct. Like many watersheds in the Basin and Range Province, the Owens Valley is internally drained with the natural terminus of the watershed at Owens (dry) Lake. Owens Lake dried up in the 1920s due to upstream diversions of the Owens River and its tributaries for irrigation within the valley and export to Los Angeles. Flow in the Owens River is controlled by a series of reservoirs operated by LADWP and Southern California Edison Corporation (SCE), supplemented near its headwaters by diversions through the Mono Craters Tunnel from the Mono Basin. Water-year (WY; period from October 1 - September 30 designated by the calendar year in which it ends) releases from Pleasant Valley Reservoir, where the Owens River enters the groundwater basin, had a median value of 256,000 acre-feet per year (AFY) and ranged from 75,000 to 444,000 AFY from WY 1959-2017.

Numerous tributary streams drain the east slope of the Sierra Nevada. The largest of these, Bishop Creek, has median annual runoff of 71,000 AFY and ranged from 35,000 to 134,000 AFY for WY 1904-2017. Combined inflows to the Owens Valley for all gaged tributaries ranged from 95,000 to 379,000 AFY, with a median of 160,000 AFY from WY 1988-2017. This excludes runoff for five tributaries (Goodale, George, Cottonwood, Taboose, and Red Mountain creeks) that were previously gaged but no longer monitored. Analysis of available streamflow data for these gages indicate they contribute a combined total of approximately 37,000 to 40,000 AFY on average, or about 20% of the gaged inflows into the valley. Piute, Coldwater, and Silver creeks, flow into the Owens Valley from the White Mountains. Flows in those creeks are monitored and almost all water is used for irrigation.

No direct surface-water connection exists between the Tri-Valley area and the Owens River except for an ephemeral wash that occasionally flows from Chalfant into the Laws area during extreme precipitation events. Surface-water that enters the Tri-Valley area as runoff from the surrounding mountains, less any water lost to evapotranspiration or vadose zone storage, is believed to recharge groundwater. Flow data for Tri-Valley streams is very limited, with only one long-term LADWP gage established in the southern portion of the Tri-Valley for Piute Creek. The western slopes of the White Mountains have streams that have been described as perennial, with high flows during the snowmelt period or following intense rainstorms (Phillip Williams and Assoc [PW&A], 1980). Most of these streams are either diverted for irrigation or rapidly infiltrate into the alluvial fans once they enter the valley floor. Runoff from the surrounding mountains into the Tri-Valley area has been estimated to range from about 16,500 to 27,000 AFY on average (MHA, 2001; PW&A, 1980). Results from a Distributed Parameter Watershed Model (DPWM), a rainfall-runoff model which accounts for snowpack, that simulates conditions in the Tri-Valley from WY 1995-2019 produces average and median inflows of about 18,000 and 13,500 AFY, respectively (See DPWM Technical Memorandum, Appendix 10).

The Fish Slough subbasin, located to the north of Bishop and to the west of Chalfant Valley in the volcanic tablelands, is a federally-designated Area of Critical Environmental Concern (ACEC) due to the presence of rare plants and animals. Habitat in the subbasin is supported by groundwater discharge to springs and seeps along faults. Some of this discharge becomes surface-water runoff that flows approximately four miles and eventually enters the Owens Valley north of Bishop. Annual runoff volume from Fish Slough has steadily declined by approximately 78 AFY over the last half century. Mean annual volume reported at LADWP Station 3216 (Fish Slough at L.A. Station #2) was 6,500 AFY for WY 1967-1976, and 3,400 AFY for WY 2008-2017. While the sources of groundwater discharging into Fish Slough is currently unquantified, a large portion is believed to come from the Tri-Valley area (Jayko & Fatooh, 2010; Zdon, et al. 2019).

Inflows to the Owens Valley groundwater system are primarily sourced from infiltration of surface-water into alluvial fans near the margins of the valley, with a small amount of recharge derived from direct precipitation on fan surfaces, deep percolation from irrigated agricultural fields, and seepage from losing reaches of the Owens River, Los Angeles Aqueduct, and irrigation ditches in the valley. Groundwater flows from recharge areas high on the alluvial fans (areas of high hydraulic head) to discharge areas on the valley floor (areas of low hydraulic head) resulting in groundwater flow directions that parallel topographic gradients. Most natural groundwater discharge occurs on the valley floor in the form of spring flow, wetlands, baseflow to gaining reaches of the Owens River, transpiration by phreatophytic vegetation communities, and evaporation from the playa and brine pool at Owens Lake.

The basin boundaries are generally delineated by the contact between alluvium and the bedrock of the adjacent mountain blocks. At the south end of the basin, the boundary is defined by the topographic high between Owens Valley and Rose Valley. This portion of the basin boundary is in alluvium, and it was previously hypothesized that a permeable pathway south to Rose Valley could exist. However, potentiometric data indicate the basin is indeed closed and there is no groundwater outflow to Rose Valley (MWH, 2013). The boundary west of Chalfant and Hammil valleys is formed by the contact between valley-fill alluvium and the Bishop Tuff. At this boundary, the Bishop Tuff likely overlies valley fill that was present when the tuff was deposited. The northeastern boundary of Benton Valley is jurisdictional, formed by the California-Nevada state line. The bedrock boundary at the bottom of the valley fill has been characterized by geophysical methods (Pakiser et al., 1964), revealing the basal bedrock forms deep basins separated by bedrock highs. The deepest part of the basin is beneath Owens Lake, and is estimated to be about 8,000 feet deep. Another deep basin is present between Big Pine and Bishop, estimated to be about 4,000 feet deep. Other basins are present east of Lone Pine and beneath Hammil Valley. Shallow bedrock is present between Chalfant Valley and Laws, between Benton and Chalfant valleys, and between Big Pine and the Los Angeles Aqueduct intake.

Valley fill material is highly heterogeneous and although sedimentary strata generally cannot be traced over long distances, the basin's aquifer system can be generalized into a shallow unconfined zone and a deeper confined or semi-confined zone separated by a given confining unit. A review of 251 driller's logs of wells in Owens Valley found that 89% of wells had indications of low permeability material in the well log (MWH, 2003). This three-layer conceptual model was used in numerical groundwater flow models for Owens Valley (Danskin, 1988, 1998) and the Bishop-Laws area (Harrington, 2007). The shallow zone is nominally about 100 feet thick and the transmissive portion of the deeper zone extends to approximately 1,000 feet below land surface. Tri-Valley is generally underlain by a single aquifer of alluvium derived from the White Mountains and the Casa Diablo/Blind Springs area to the west.

Most of the valley fill is clastic material shed from the surrounding mountains, the majority of which is sand and gravel. Alluvial fan sediments are coarse, heterogeneous, and poorly sorted at the head of the fan and finest at the toe, beyond which fans transition to lake, delta, or fluvial plain sediments (Hollett et al., 1991). The transition zone from fan to valley floor is characterized by relatively clean well-sorted sands and gravels that likely originated as beach, bar, or river channel deposits. This zone is a favored location for LADWP groundwater wells because the well-sorted sandy aquifers provide high well yields and the transition zone corresponds to the alignment of the Los Angeles Aqueduct. Extraction of groundwater from the transition zone has impacted groundwater dependent vegetation such that LADWP has implemented a number of revegetation, irrigation, and habitat enhancement projects to mitigate the effects of groundwater pumping (see LADWP and ICWD, 2021 annual reports).

Although volcanic flows comprise a relatively small volume of the valley fill, the most transmissive aquifers in the Owens Valley occur in basalt flows between Big Pine and Independence. Historically, the largest springs in Owens Valley occurred where high permeability basalt flows terminate against lower permeability sediments or are in fault contact with sediments. Most of these large springs stopped flowing shortly after 1970 due to increased LADWP groundwater pumping.

Hydraulic conductivity, determined from aquifer tests in Owens Valley and the Owens Lake area, ranges from less than 10 ft/day to over 1,000 ft/day (see Danskin, 1998; MWH, 2013 Table 3-6). Where lacustrine sedimentation has prevailed for long periods of time at Owens Lake and Big Pine, extensive thick clay confining layers are present. Although the clay layers are disrupted and off-set by faulting, the confined nature of the deep aquifer is evident from generally higher heads in the deep aquifer than in the overlying shallow aquifer and the presence of flowing artesian wells near Bishop, Independence, and Owens Lake.

A modeling effort in the Tri Valley and Fish Slough region estimated hydraulic conductivities in the range of 0.01 to 125 ft/day, with most of the values falling in the 1 to 20 ft/day range (MHA, 2001). These values are atypical of coarse alluvial materials and much lower than those from the Owens Valley and Owens Lake possibly due to model calibration artifacts.

The principal geologic structures affecting groundwater flow are the basin's bedrock boundaries and faults in the valley-fill material (Figure 2-14). The bedrock boundaries delineate the geometry of permeable valley fill. Faults parallel the axis of the valley where they form barriers to groundwater flow due to offset of high permeability layers and formation of low permeability material in the fault zone resulting from fault motion. Evidence for faults acting as groundwater flow barriers includes emergence of springs along fault traces and declines in water table elevation across faults. North of the Alabama Hills, blocks of aquifer are compartmentalized by en echelon faults, restricting lateral flow into the compartment. Recharge to the compartment is limited to local sources such as a stream segment within the compartment or precipitation. Absent lateral inflow and tributary infiltration, the effects of pumping may be more long-lasting in compartmentalized areas because recharge may be limited to direct precipitation, which provides relatively low recharge amounts in the basin.

Groundwater pumping has formed local cones of depression around centers of sustained pumping near Birch Creek (south of Big Pine), Aberdeen (north of Independence), and Independence, which locally modify the regional pattern of down-fan flow on the alluvial fans and southerly flow on the valley floor. The presence of cones of depression in the Tri-Valley area is suggested by the declining water levels and locus of pumping occurring in Hammil

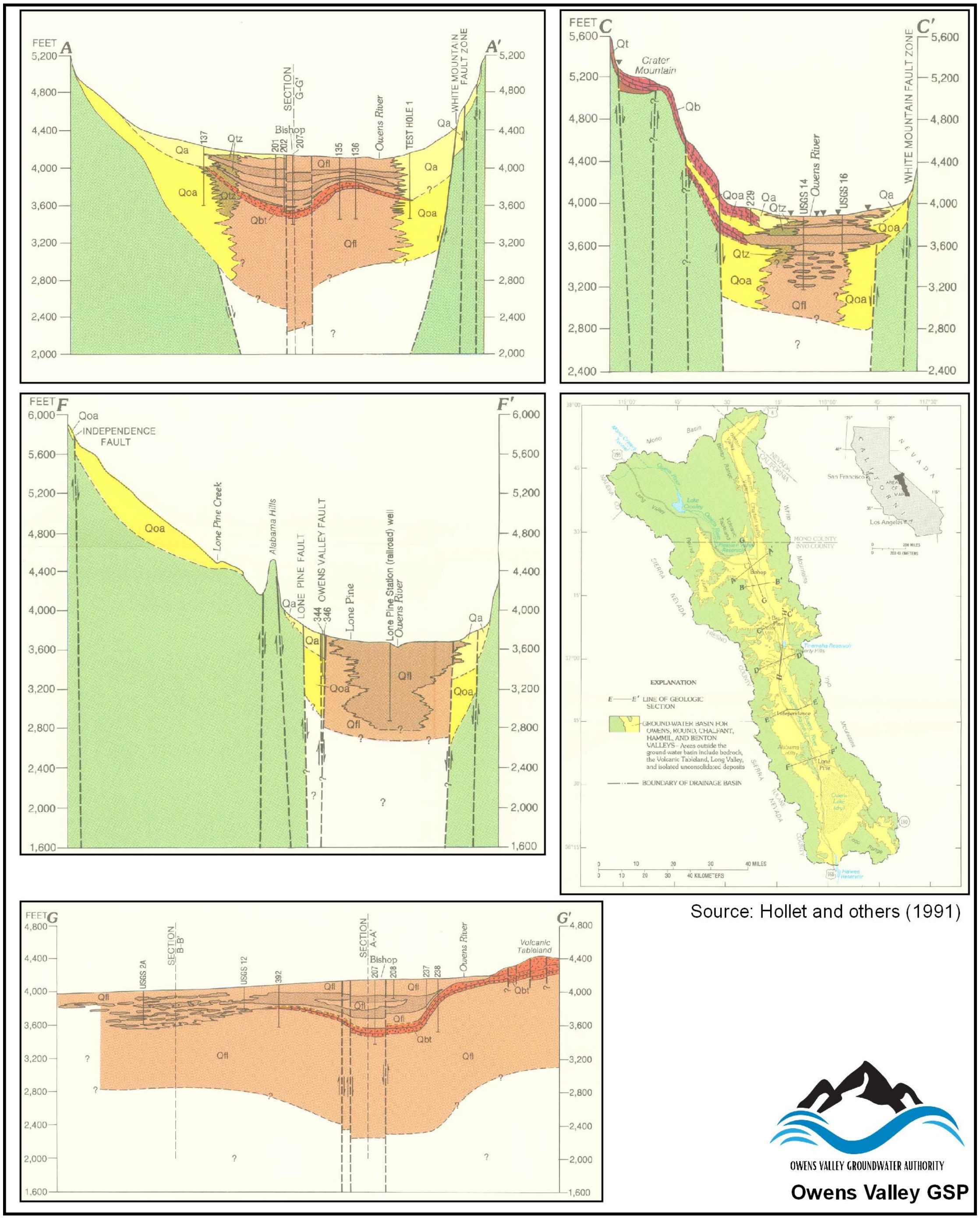


Figure 2-14. Geologic cross sections of the Basin.

Valley, but the monitoring data are insufficient to characterize the potentiometric surface across the valleys.

2.2.2 Current and Historical Groundwater Conditions (Reg. § 354.16)

Current groundwater conditions and historical trends in the Owens Valley are summarized below by management area (See Section 2.2.4). More detailed information can be found in Appendix 3).

2.2.2.1 Groundwater Elevation

Water level trends were analyzed at four representative wells in the Tri-Valley management area (Figure 2-15). The black line on the plot displays a linear regression, with the rate of decline and coefficient of determination (R^2) displayed. In general, water levels have been slowly but steadily declining since the late 1980s. Benton and Chalfant Valleys show similar rates of decline that average about -0.5 ft/yr, with total historical declines of about 9.5 ft and 15.3 ft, respectively. Hammil Valley water levels show an even faster rate of decline of approximately -1.8 ft/yr based on limited data.

Water levels in Fish Slough also show persistent groundwater declines since the late 1980s, with timing consistent with declines observed in the Chalfant/Benton valleys (Figure 2-16). The rate of water level decline in Fish Slough is lower than Tri Valley areas, approximately -0.15 ft/yr.

Groundwater levels and trends in the Owens Valley management area vary depending on time and location. This is a result of both complicated geology, the high degree of groundwater and surface-water management in the area, and the LTWA. Figure 2-17 shows the locations of representative monitoring wells in the Owens Valley management area. Generally, groundwater levels appear to be in a dynamic steady state that tracks hydrologic conditions: water levels increase during wet years and decrease during dry years (Figures 2-18a through 2-18d). The rate at which this increase or decrease occurs during a given period appears to be well-specific, likely influenced by multiple local factors such as nearby pumping, managed surface water spreading (managed aquifer recharge), well screen interval, and geologic conditions.

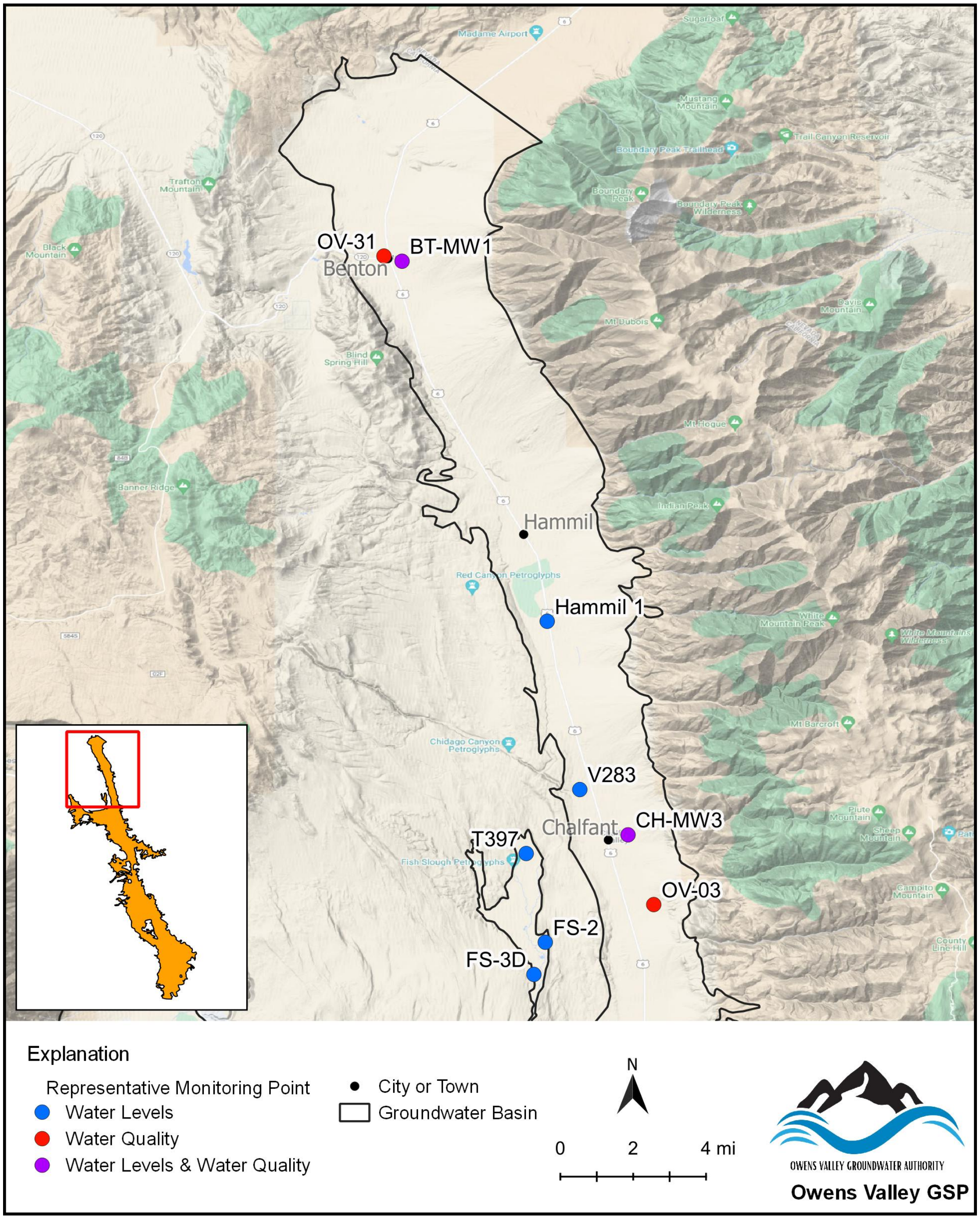


Figure 2.-15. Representative monitoring well locations in Tri-Valley Management Area.

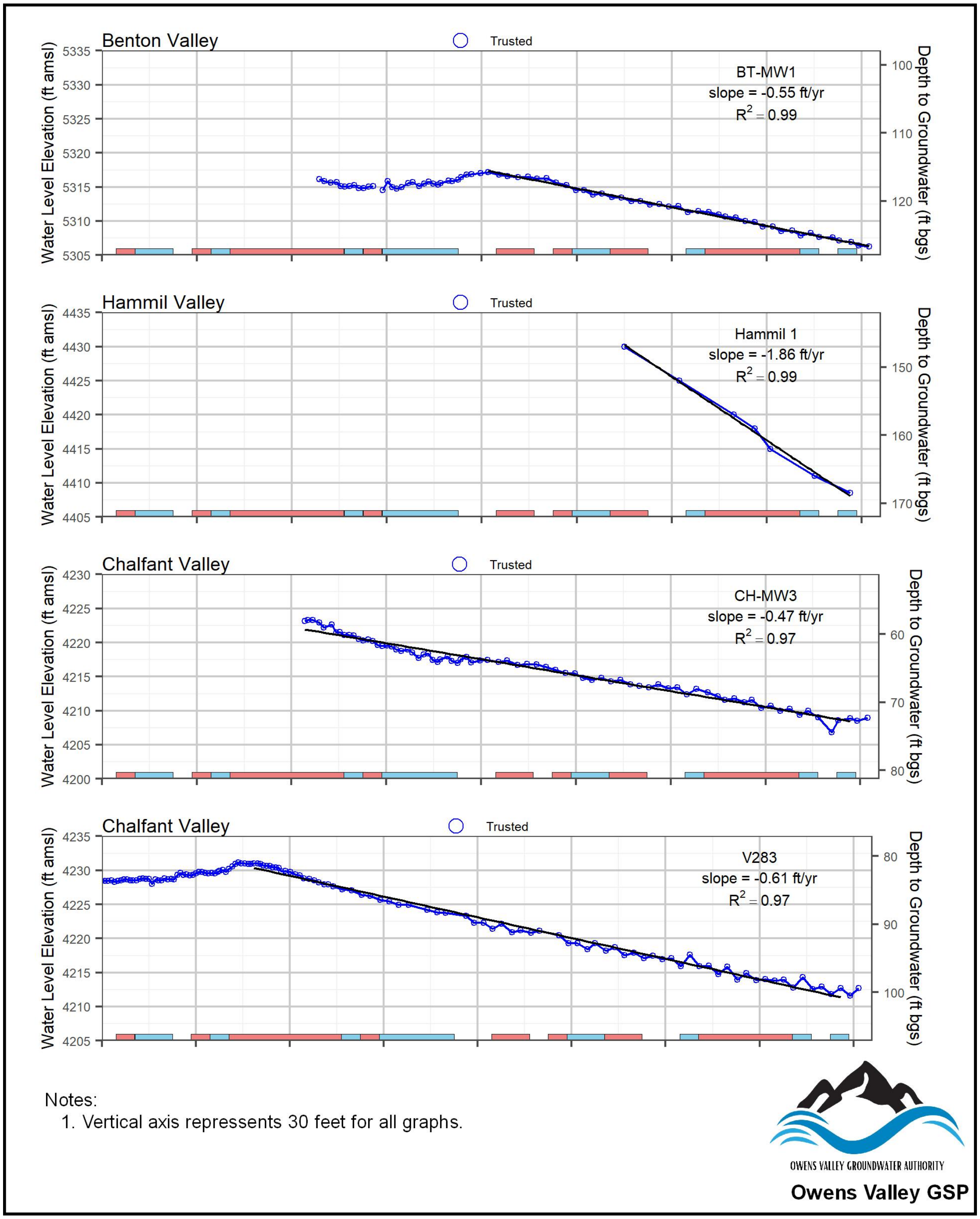


Figure 2-16a. Groundwater elevations for monitoring locations in Tri-Valley.

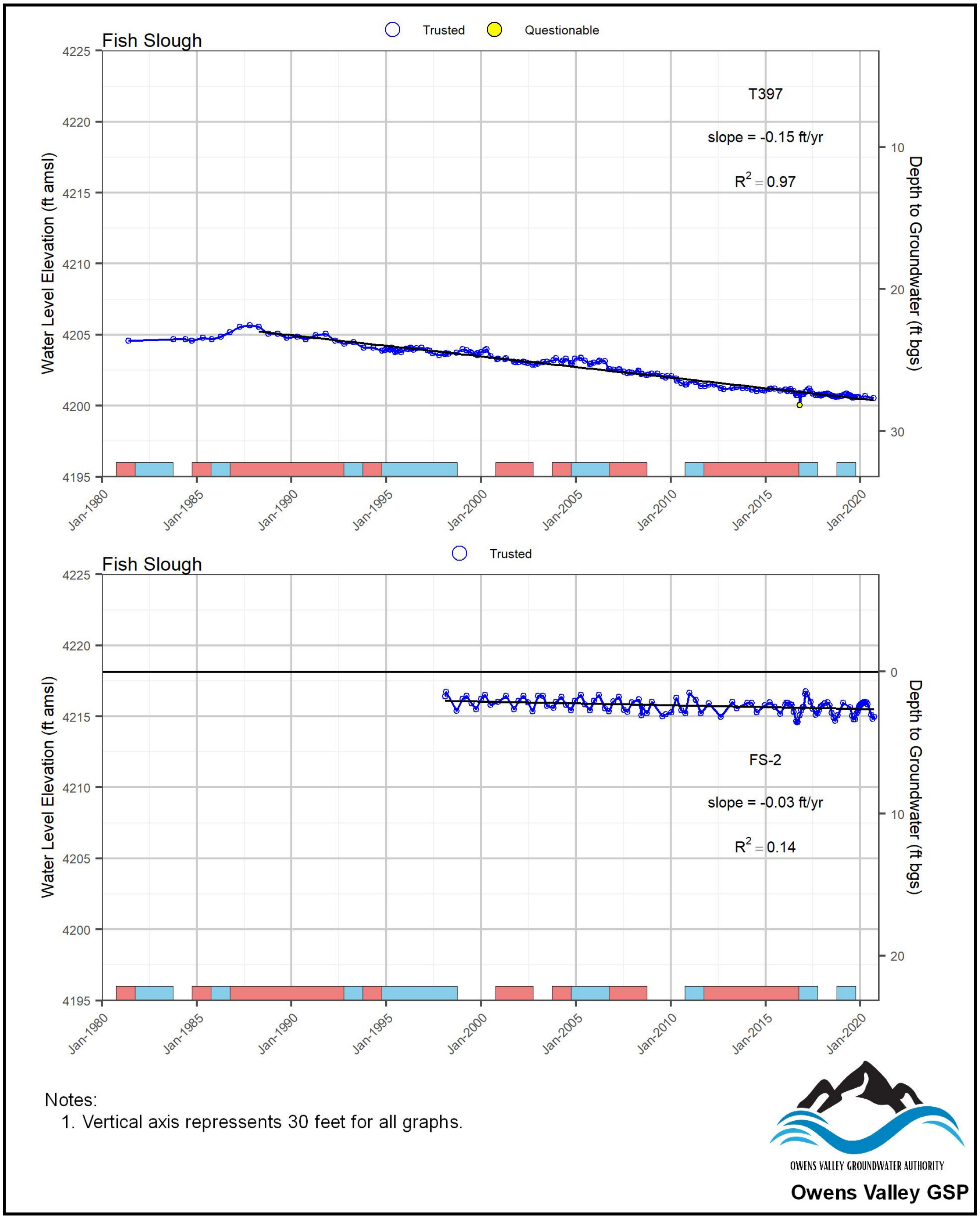


Figure 2-16b. Groundwater elevations for monitoring locations in Fish Slough.

PRELIMINARY DRAFT

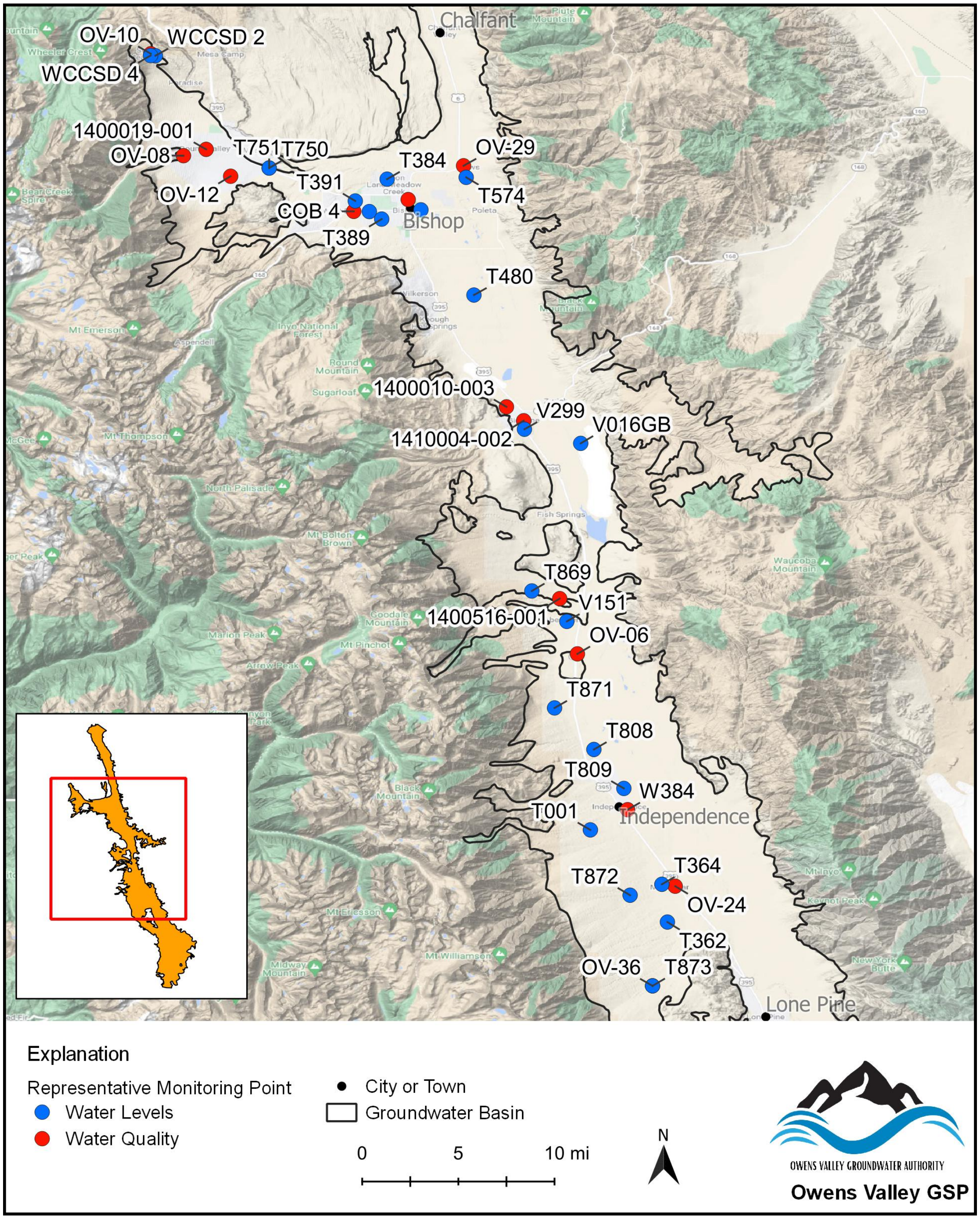


Figure 2-17. Representative monitoring locations in Owens Valley Management Area.

PRELIMINARY DRAFT

The two major periods of groundwater decline observed in the Owens Valley Management Area since 1980 coincide with the two major droughts during this period (1986-1992 and 2012-2016). Water levels for most wells reached their lowest values during the 1986-1992 drought, due to the severity of the drought and also due to pre-LTWA water management which included the highest annual pumping totals in history by LADWP. Water levels during the more recent drought are generally higher than the 1986-1992 period due to full, ongoing implementation of the LTWA and a reduction in LADWP pumping. All wells appear to have recovered or mostly recovered from the 2012-2016 drought or are showing increases in groundwater levels since January 2017. Where possible, Figures 2-18a through 2-18d are annotated with the aquifer zone (unconfined or confined) the well is believed to be screened in. Wells with screen intervals within 100 ft bgs or wells with dry observations were assumed to be screened in the shallow unconfined aquifer zone.

Groundwater levels in the Owens Lake Management Area are highly dependent on spatial location and screened interval of the well. This is due to a combination of effects of the highly stratified geology that includes five separate aquifers, the asymmetric depth of this portion of the basin which results in a great deal of lithostatic pressure exerted on the lower aquifers on the western side of the management area, and this area being the natural terminus of the groundwater basin. This results in water level elevations (pressure of hydraulic head) that can vary over 80 ft within the same aquifer unit (see Figure 19 in MWH, 2013). However, within a given well, water levels show relatively minor fluctuations. Locations of representative monitoring wells are shown in Figure 2-19, with water level trends for each aquifer system discussed below.

Figure 2-20a shows water level elevations for a single well screened from 30-40 ft bgs and three shallow piezometers screened between 3 and 10 ft bgs. Water levels appear to be in a dynamic steady state condition, showing both seasonal fluctuations and multi-year trends. Water levels decrease during dry years and increase during wet periods. Pumping stress in this management area is relatively constant and low. While shallow piezometer data is only available through early 2010, water levels in T588 located north of Owens Lake quickly recovered following the 2012-2016 drought. For the time period that data are available, water levels in the shallow aquifer system have fluctuated about 16 feet in T588 (Lone Pine) and about 4 feet in the shallow piezometers.

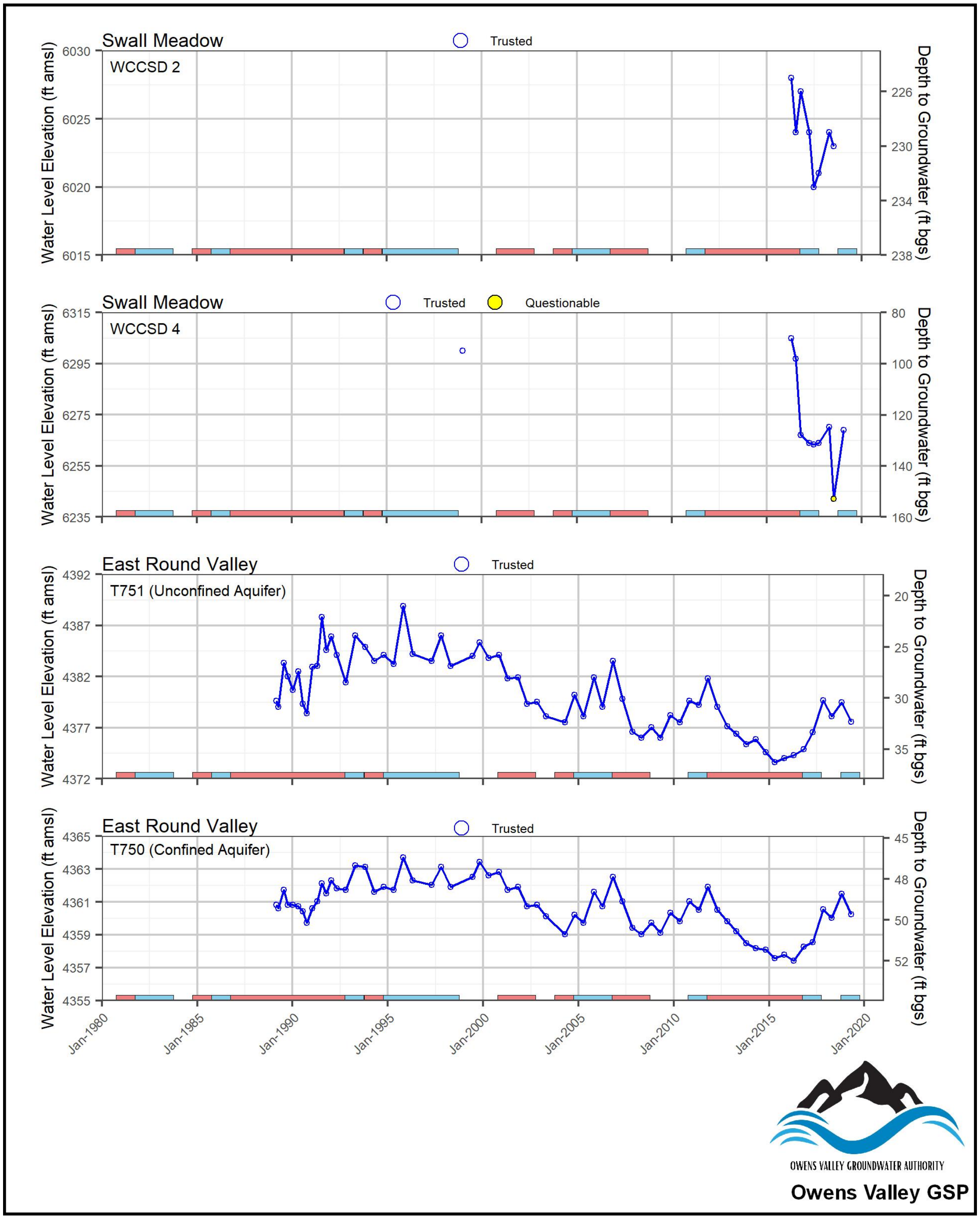


Figure 2-18a. Groundwater elevations for monitoring locations in the Owens Valley.

PRELIMINARY DRAFT

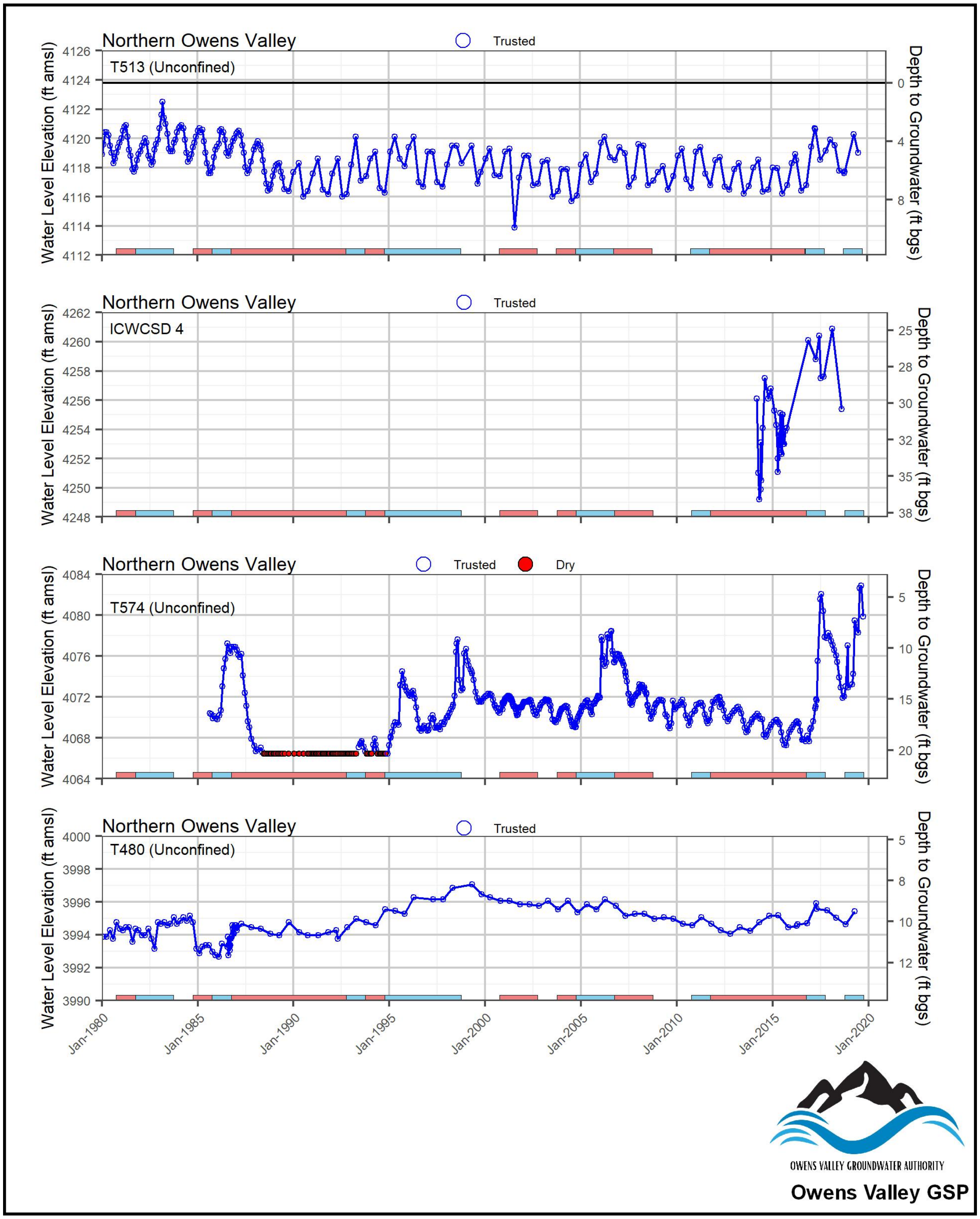


Figure 2-18b. Groundwater elevations for monitoring locations in the Owens Valley

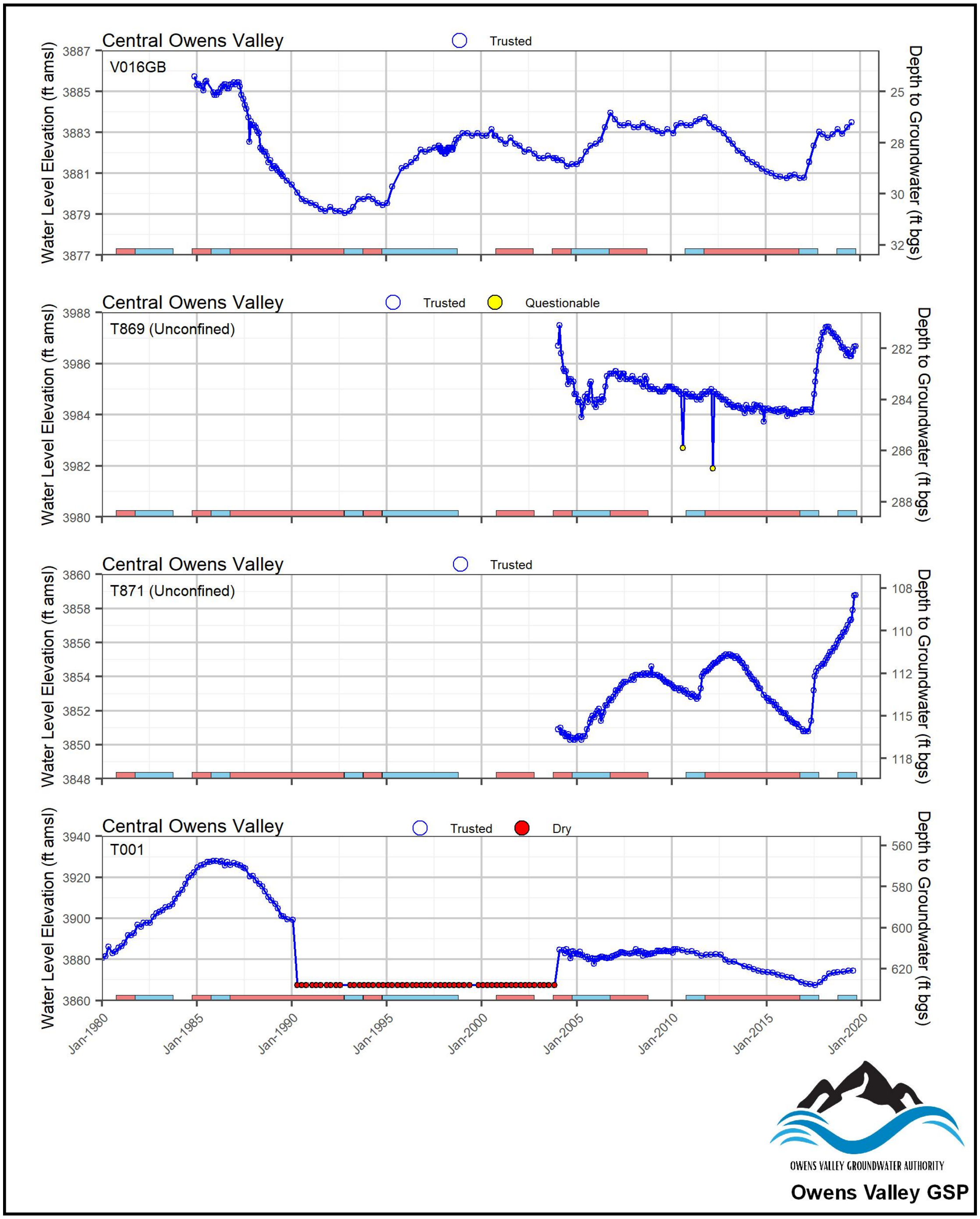


Figure 2-18c Groundwater elevations for monitoring locations in the Owens Valley

PRELIMINARY DRAFT

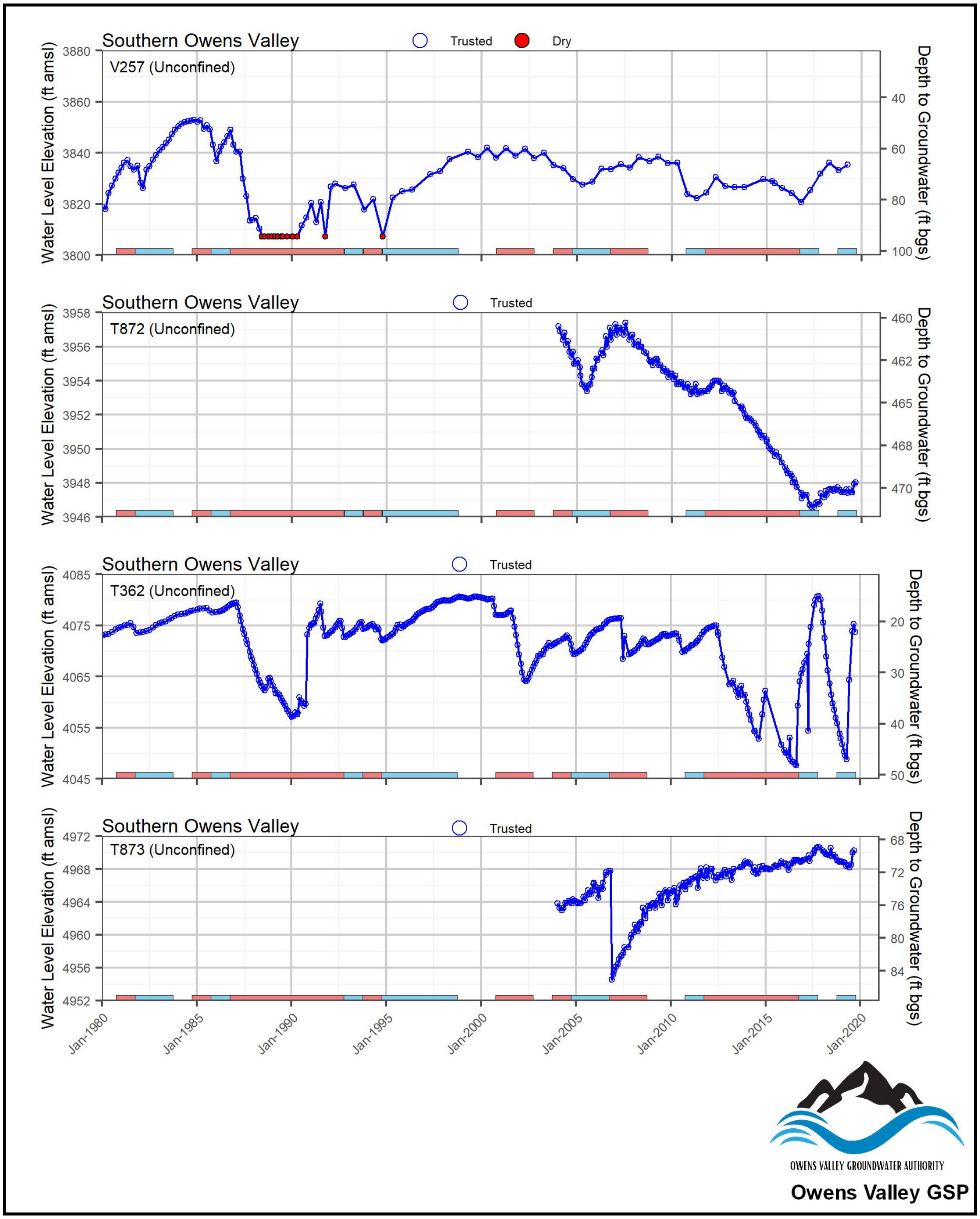


Figure 2-18d. Groundwater elevations for monitoring locations in the Owens Valley

PRELIMINARY DRAFT

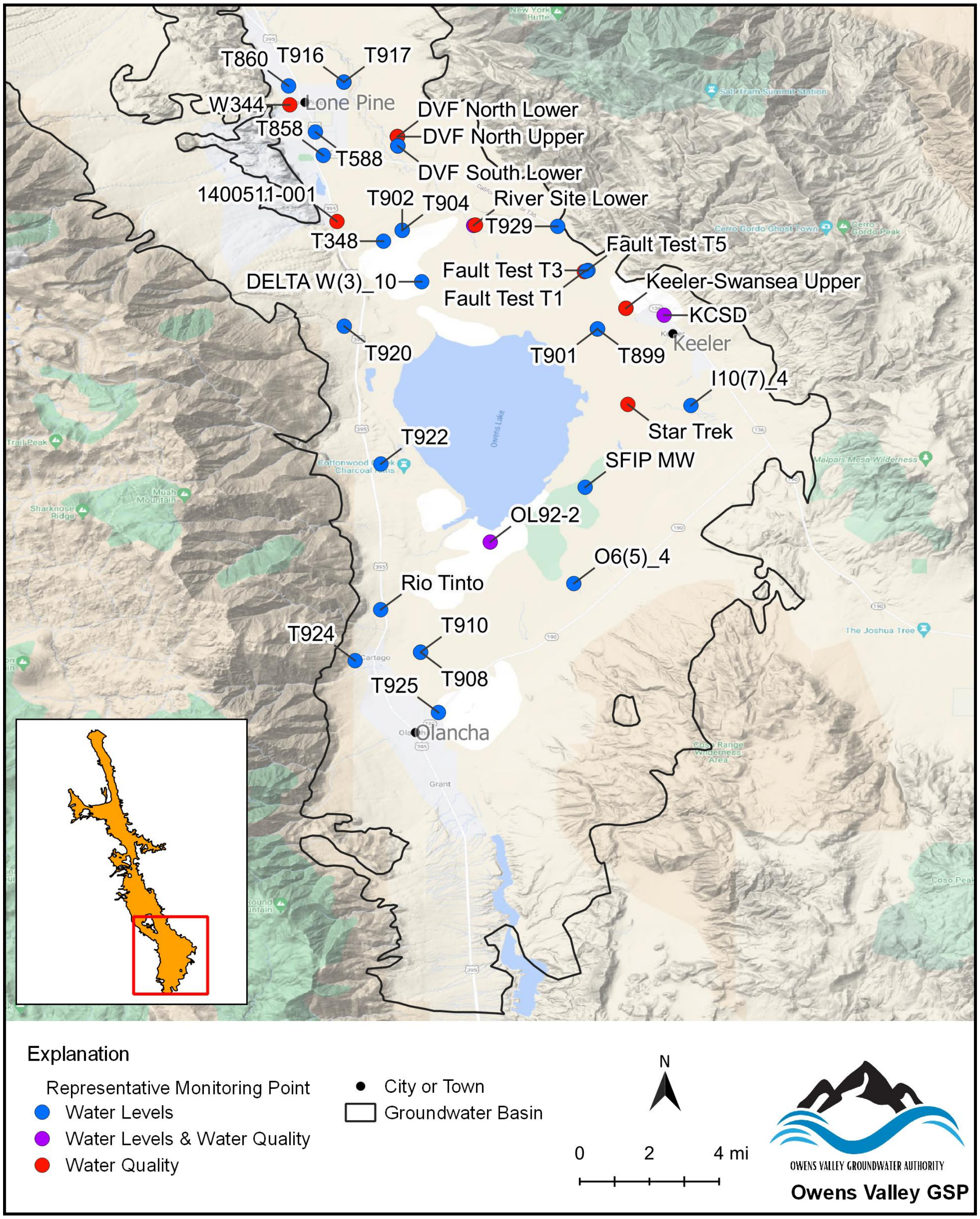


Figure 2-19. Representative monitoring locations in Owens Lake Management Area.

PRELIMINARY DRAFT

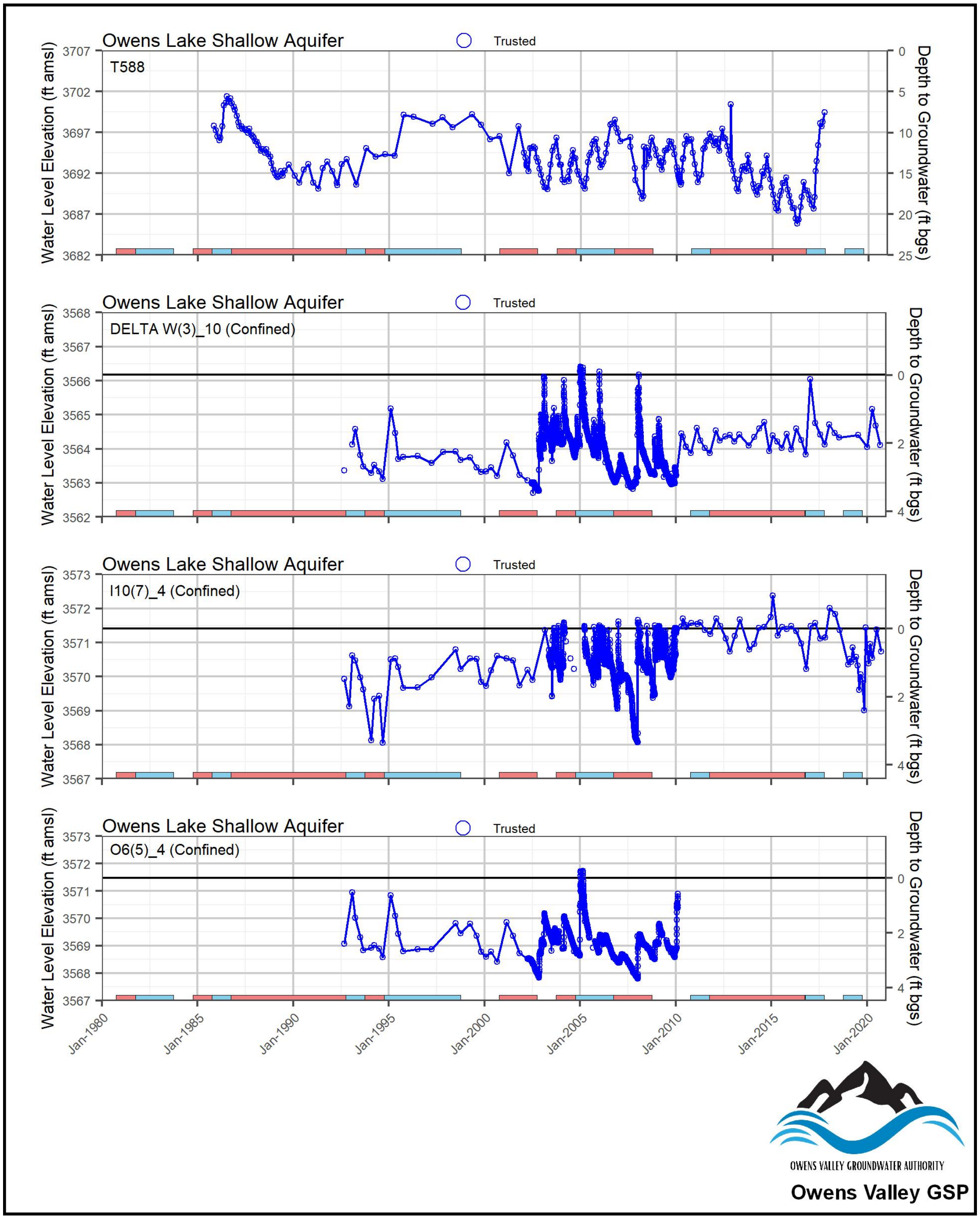


Figure 2-20a Groundwater elevations for monitoring locations near Owens Lake

PRELIMINARY DRAFT

Water level data for Aquifers 1-5 are presented in Figures 2-20b through 2-20f. Water level trends are generally consistent across the aquifers, with levels decreasing during the 2012-2016 drought and then recovering during the following wet period. These fluctuations typically range between 2 and 8 feet during the period of record. Groundwater elevations in the lower aquifers are greater than those in the upper aquifers, reflecting the general upward gradient under the playa area of the lake bed.

2.2.2.2 Groundwater Storage

Groundwater storage is highly correlated with groundwater elevation in the Owens Valley, especially within the GSP area where a large portion of the aquifer system is considered to be unconfined (excluding the Owens Lake area). Previous modeling studies by USGS and US Filter do not report total storage estimates for the entire groundwater basin because it was not a key parameter, and the models weren't sensitive to the total (predominately lower aquifer) thicknesses. Groundwater models developed by LADWP cover the majority of the Owens Valley between Laws and Owens Lake. These models may provide the best estimate for change in storage, but neither the models nor the estimated water budgets were provided to the OVGA. Given the correlation, the relatively stable water levels and pumping, and the thickness of Basin aquifers, groundwater elevation is an adequate indicator for tracking and estimates of storage.

In the Owens Valley and Owens Lake Management areas, average water level trends have remained relatively constant, and groundwater levels are in a dynamic steady state with groundwater level changes fluctuating a few feet to tens of feet over the past 50 years. Although no current estimates of recent groundwater storage changes have been made for the Owens Valley and Owens Lake management areas, the lack of a long-term decline in groundwater levels in these areas suggest groundwater storage experiences similar and minor inter-annual fluctuations like those observed in water levels.

Persistent declines in groundwater elevations observed in the Tri-Valley management area indicate chronic loss of water in storage, with preliminary estimates ranging from between 900 to 7,600 ac-ft/yr (Section 2.2.3).

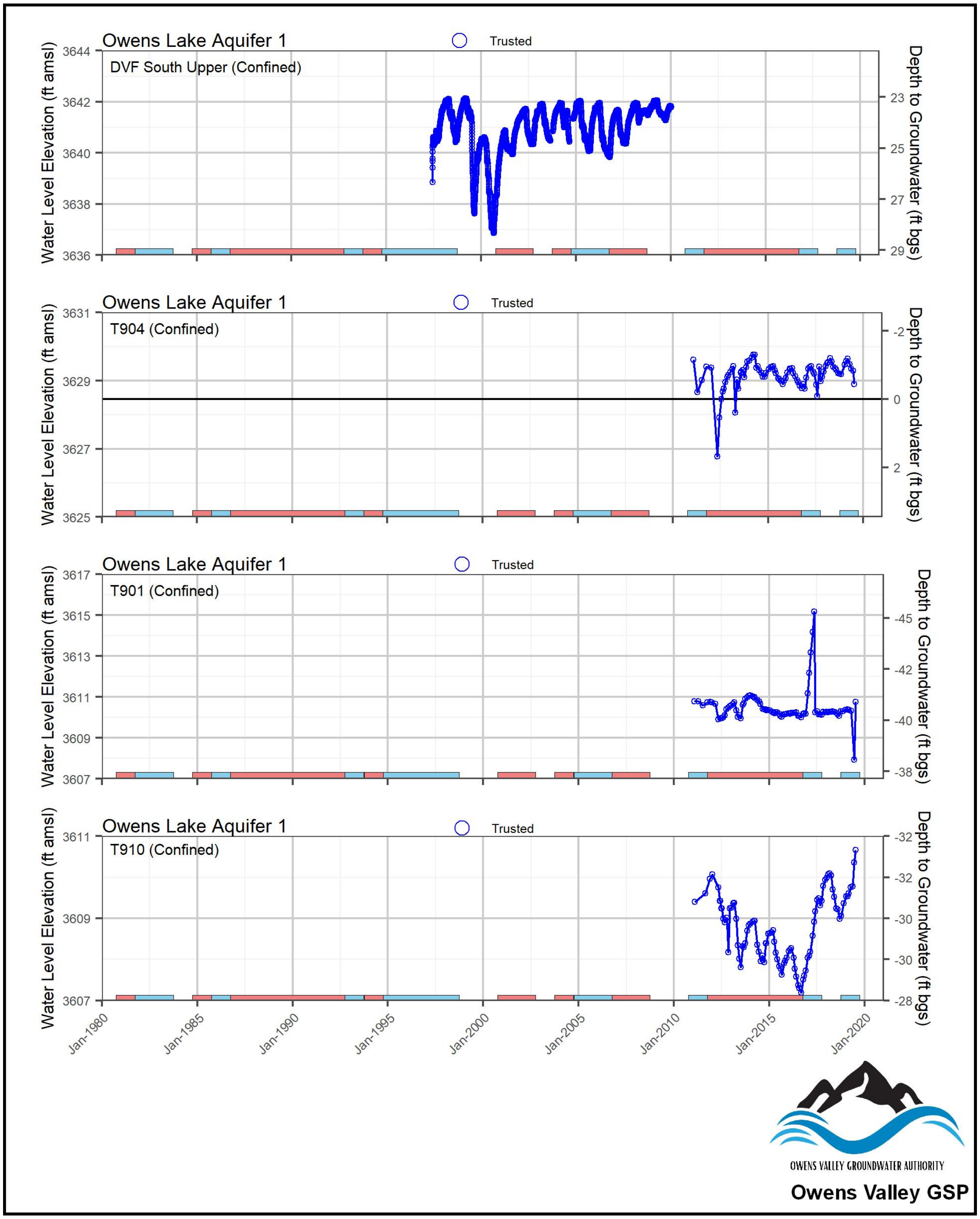


Figure 2-20b Groundwater elevations for monitoring locations near Owens Lake.

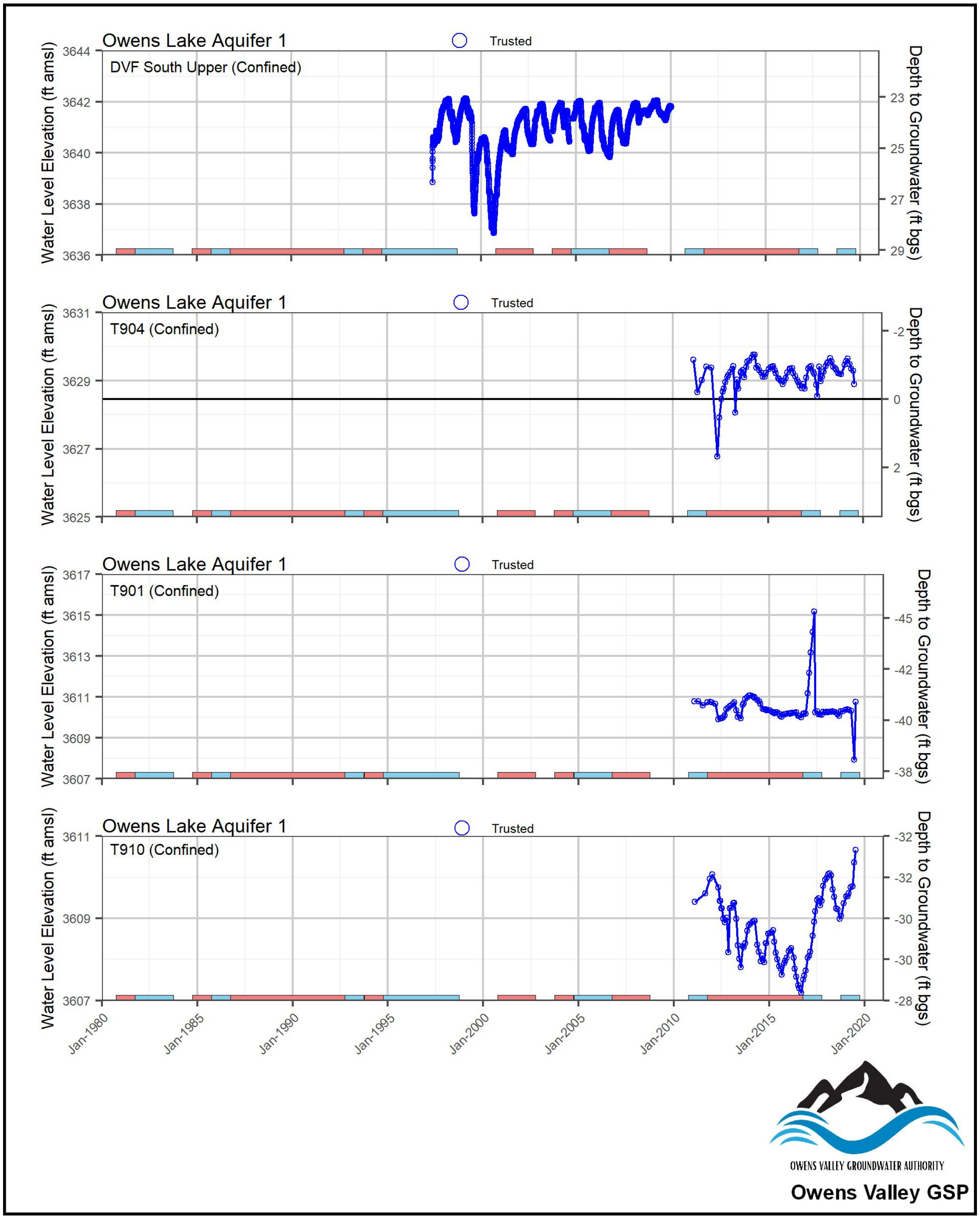


Figure 2-20c Groundwater elevations for monitoring locations near Owens Lake

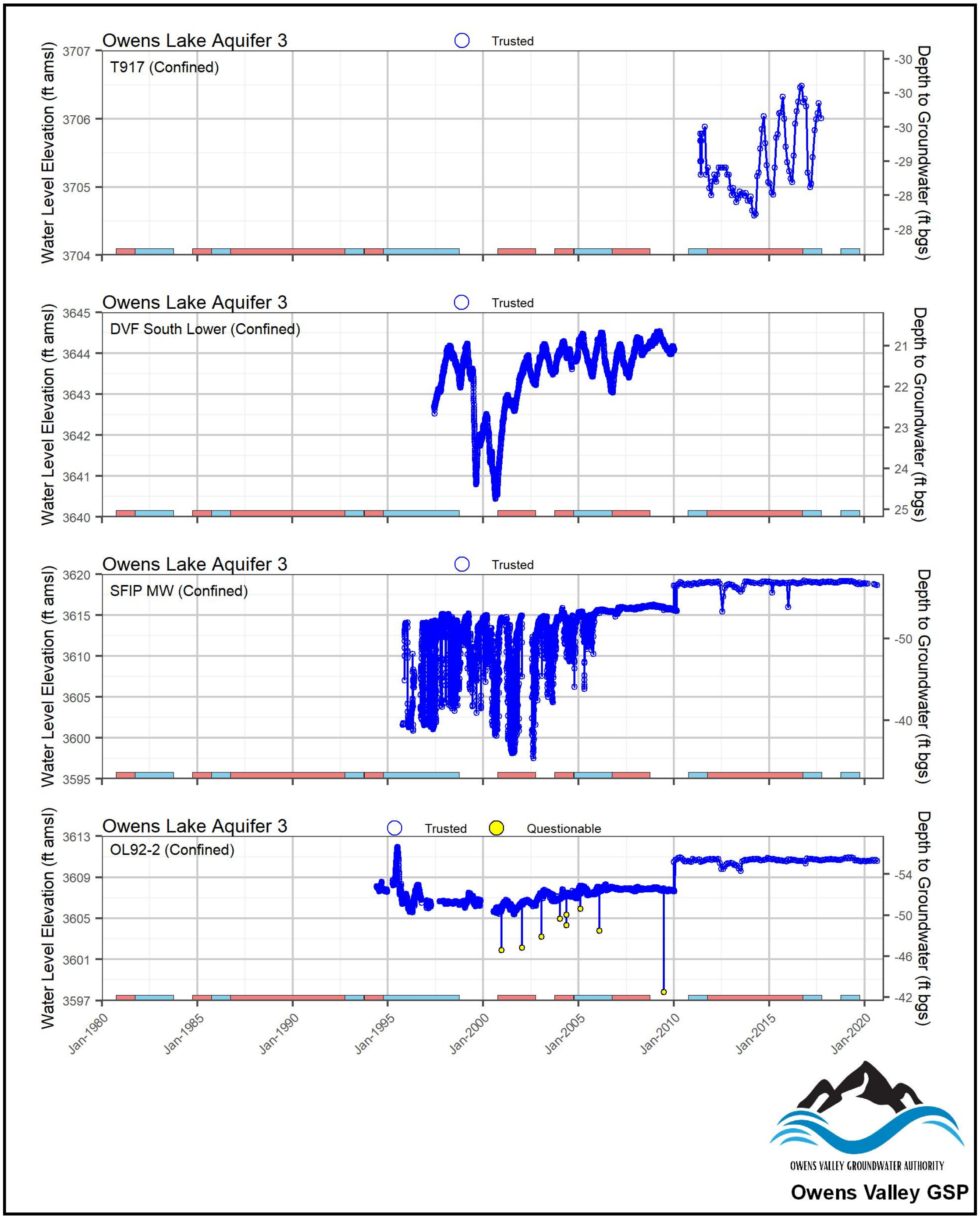


Figure 2-20d Groundwater elevations for monitoring locations near Owens Lake

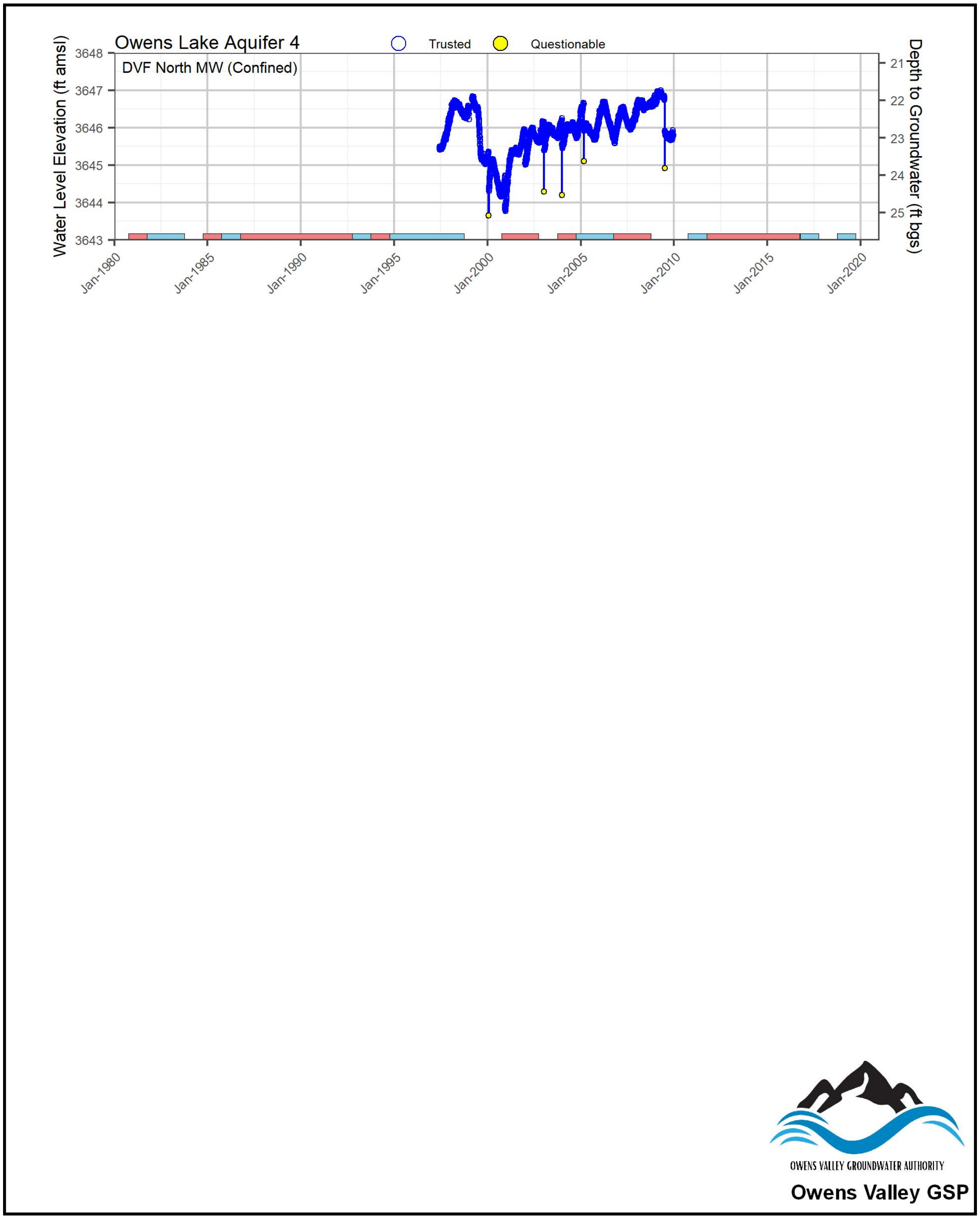


Figure 2-20e Groundwater elevations for monitoring locations near Owens Lake

PRELIMINARY DRAFT

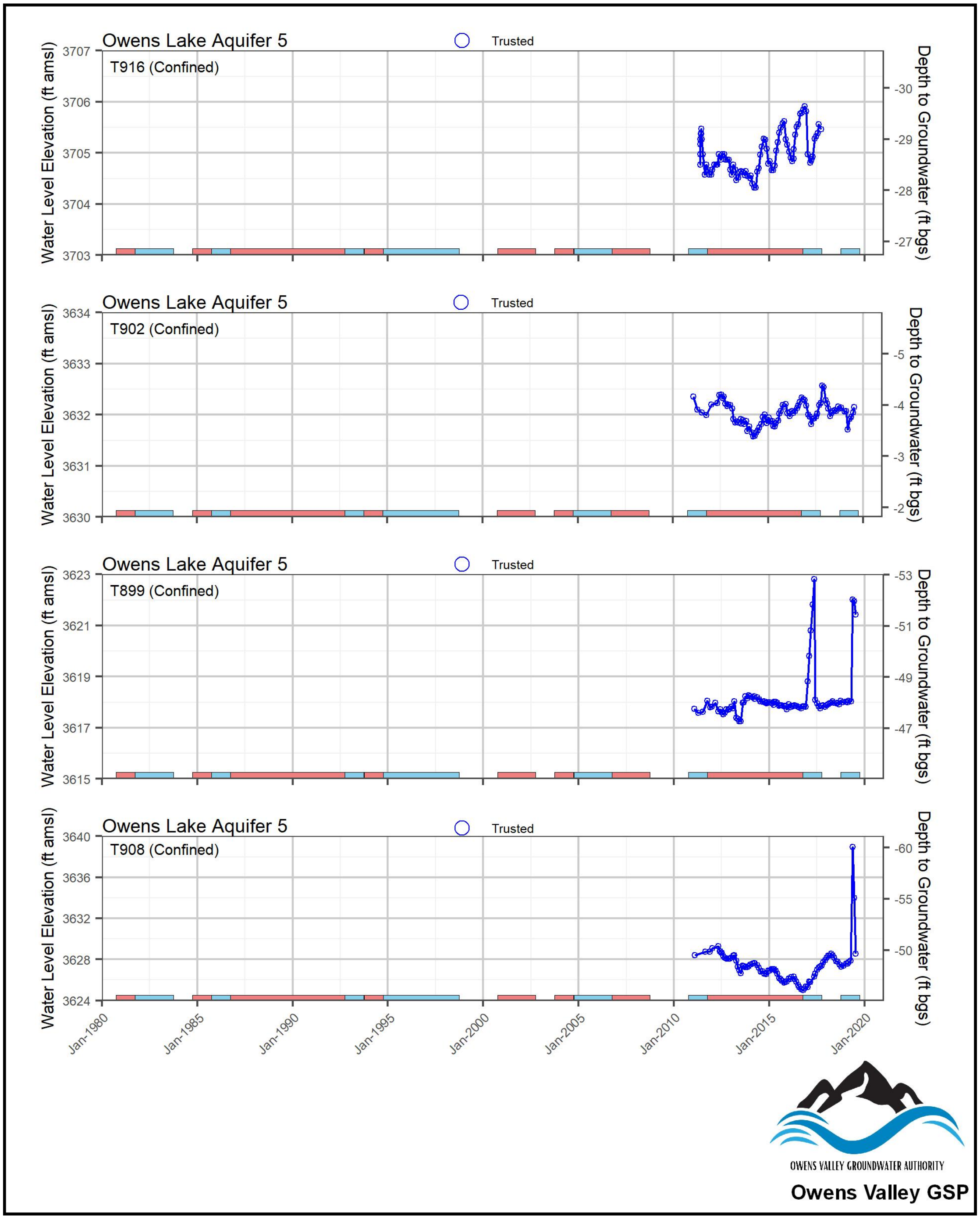


Figure 2-20f Groundwater elevations for monitoring locations near Owens Lake

PRELIMINARY DRAFT

2.2.2.3 Water Quality

Representative wells with recent water quality data in the Tri-Valley management area are shown in Figure 2-21. Groundwater quality is generally good, with only CH-MW3 exceeding the secondary standard for TDS. CH-MW3 is a landfill monitoring well, so the elevated solute concentrations are likely due to proximate infiltration of leachate. The other constituents that were evaluated do not appear to show any significant trend, suggesting the observed concentrations are generally indicative of natural conditions in the basin. No water quality data is available for the Fish Slough subbasin as of 2018, but since there is no development in that area water quality is assumed to be consistent with natural conditions as reflected in water quality data from several geochemistry studies (summarized in Zdon, et al., 2019).

Representative wells with recent analytical data in the Owens Valley management area (Figure 2-22) show groundwater quality is generally very good, with none of the representative wells exceeding any of the primary or secondary MCLs (Figures 2-22a through 2-22d). Concentrations in the representative monitoring wells for the five constituents evaluated (nitrate, sodium, chloride, arsenic, total dissolved solids) generally appear to be stable over the last three decades. Nitrate concentrations, which are a common concern for many California groundwater basins, are typically less than 2 mg/L as N and below the MCL of 10 mg/L as N.

Elevated concentrations of arsenic above the MCL of 10 µg/L are observed in some wells (OV-32, 1400036-001, F131, OVU-02, and OV-35, see OVGA database) within and adjacent to the Owens Valley management area. These are naturally occurring due to the numerous volcanic deposits present in this portion of the basin which commonly contain high arsenic concentrations. Municipal wells with elevated concentrations above the MCL for a given constituent are typically operated on a stand-by basis only (City of Bishop, 2008). The City of Bishop Well 1, COB1 is on Stand-by due to levels of fluoride (2.2 mg/L-2.5mg/L) that are above the state limit for fluoride is 2.0 mg/L. Both fluoride and As are indicators of volcanic materials in the aquifer (either in place or alluvium derived from Bishop Tuff or other volcanics).

Locations of representative monitoring wells for the Owens Lake management area are shown in Figure 2-23 Each of the five aquifers has at least one well with recent water quality data for all five contaminants of concern (Figures 2-23a through 2-23e). In general, water quality in this portion of the basin is very poor due to evaporative concentration of solutes. Higher quality water occurs at the lake margins, primarily on the north and west where groundwater recharge

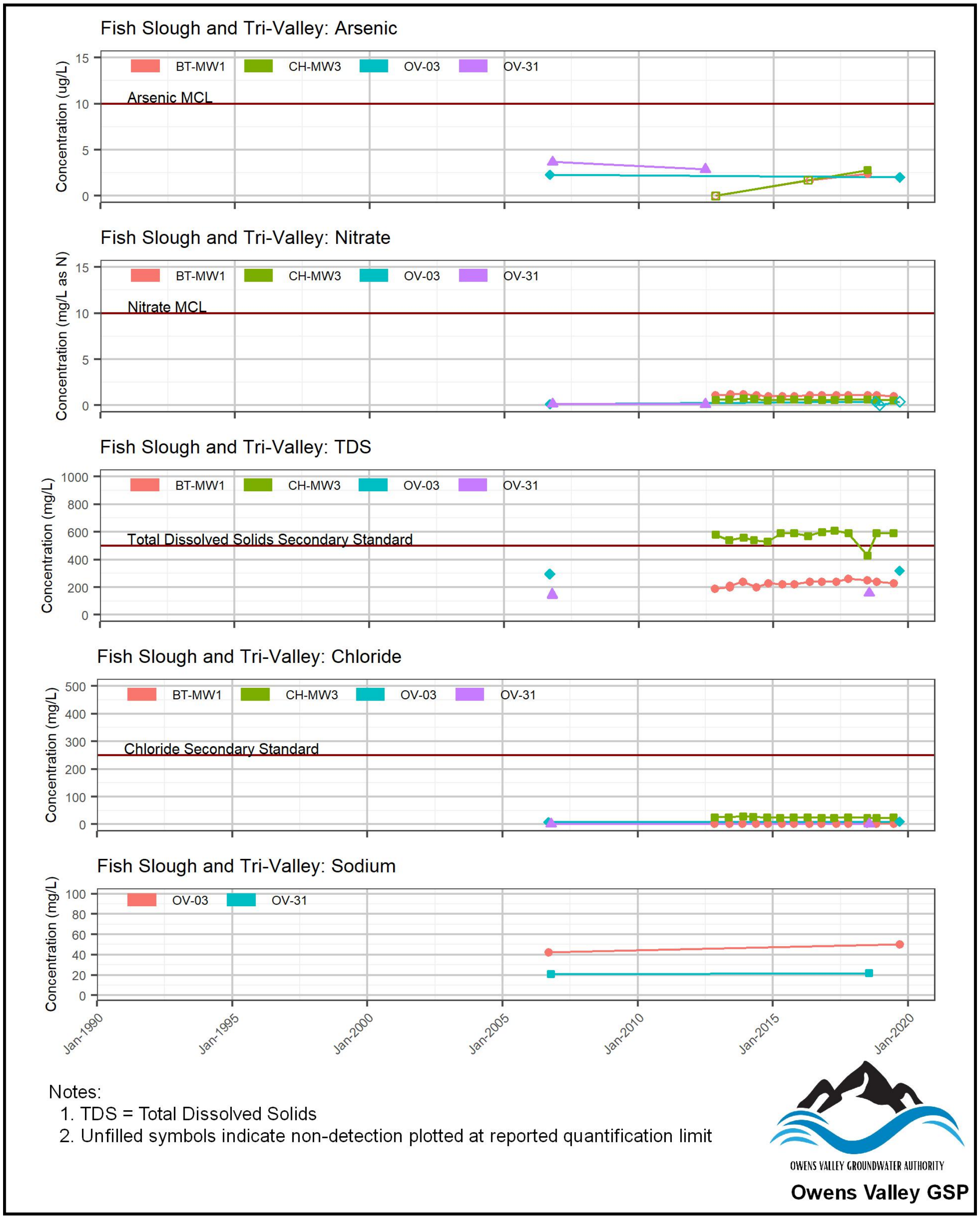


Figure 2-21. Water quality for representative monitoring wells in Tri-Valley and Fish Slough.

PRELIMINARY DRAFT

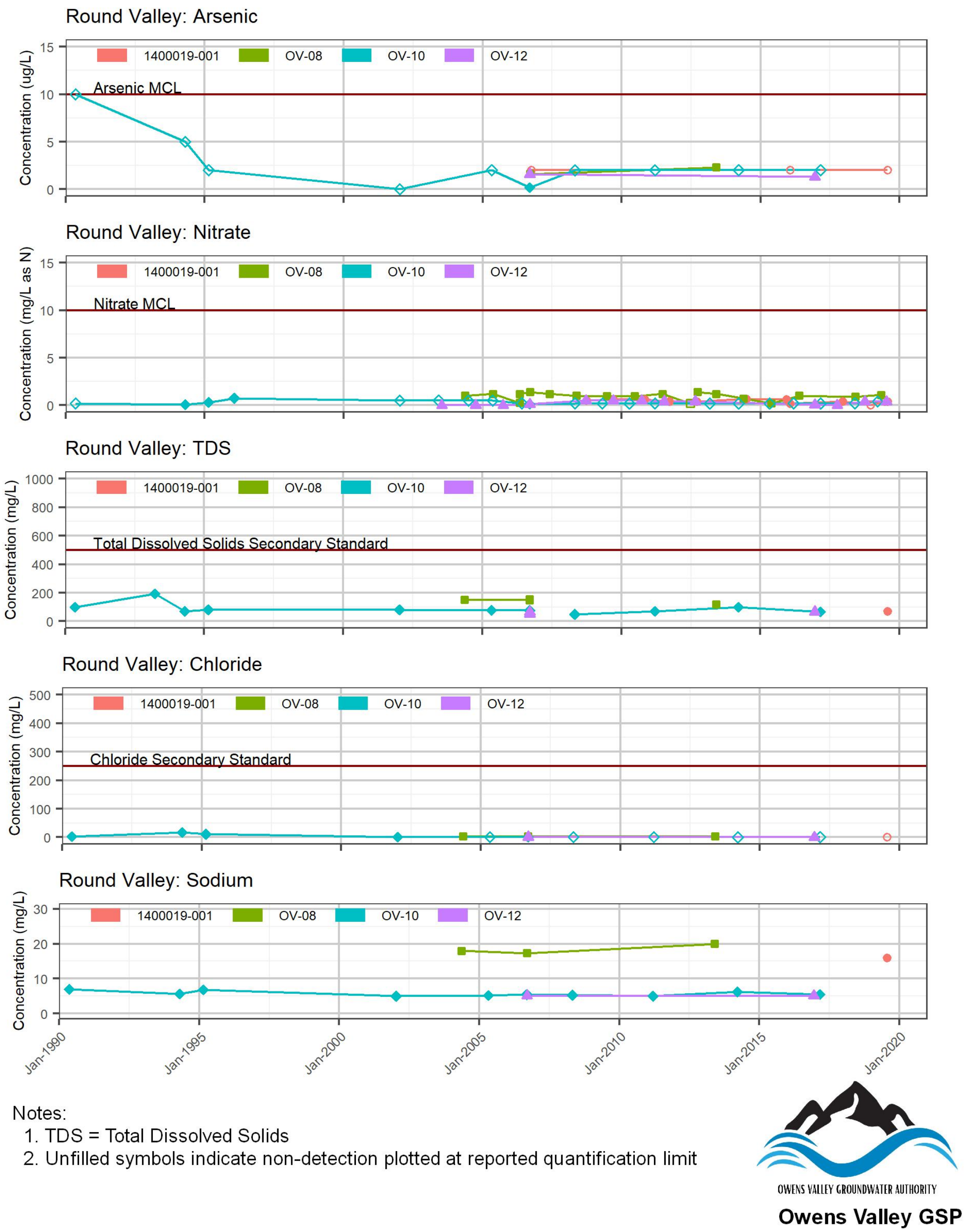


Figure 2-22a. Water quality for representative monitoring wells in Owens Valley

PRELIMINARY DRAFT

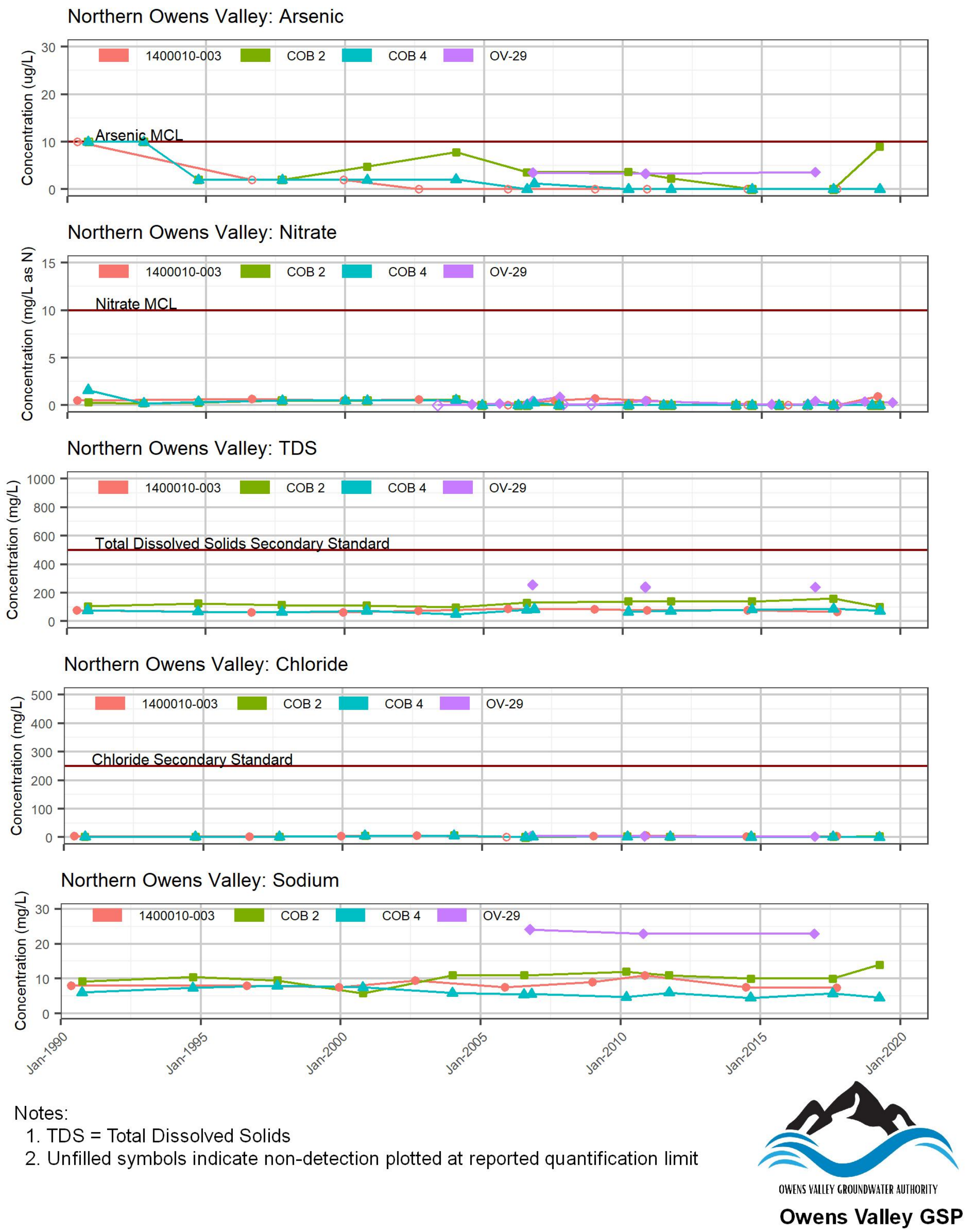
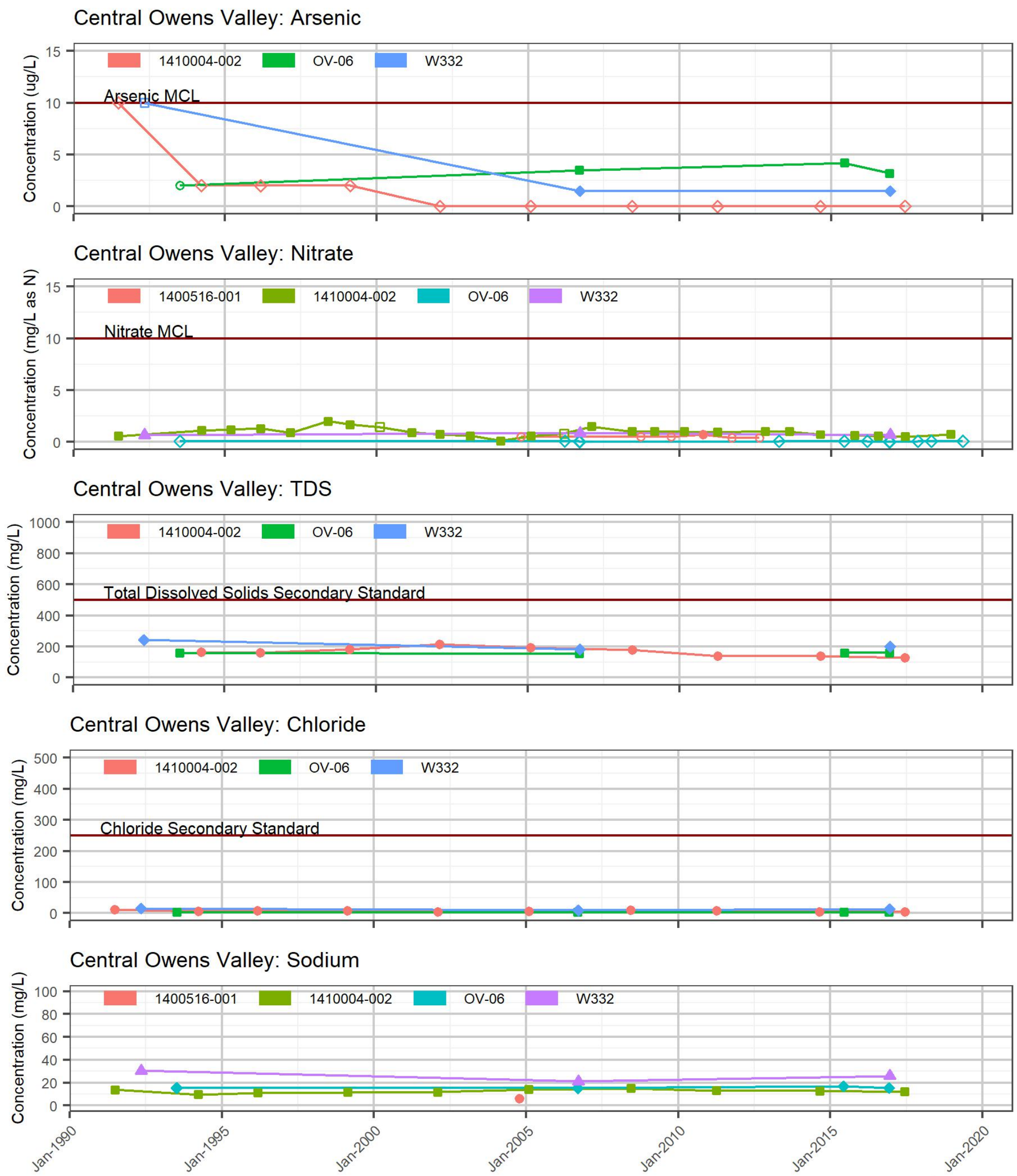


Figure 2-22b Water quality for representative monitoring wells in Owens Valley

PRELIMINARY DRAFT



Notes:
1. TDS = Total Dissolved Solids
2. Unfilled symbols indicate non-detection plotted at reported quantification limit

OWENS VALLEY GROUNDWATER AUTHORITY

Owens Valley GSP

Figure 2-22c. Water quality for representative monitoring wells in Owens Valley

PRELIMINARY DRAFT

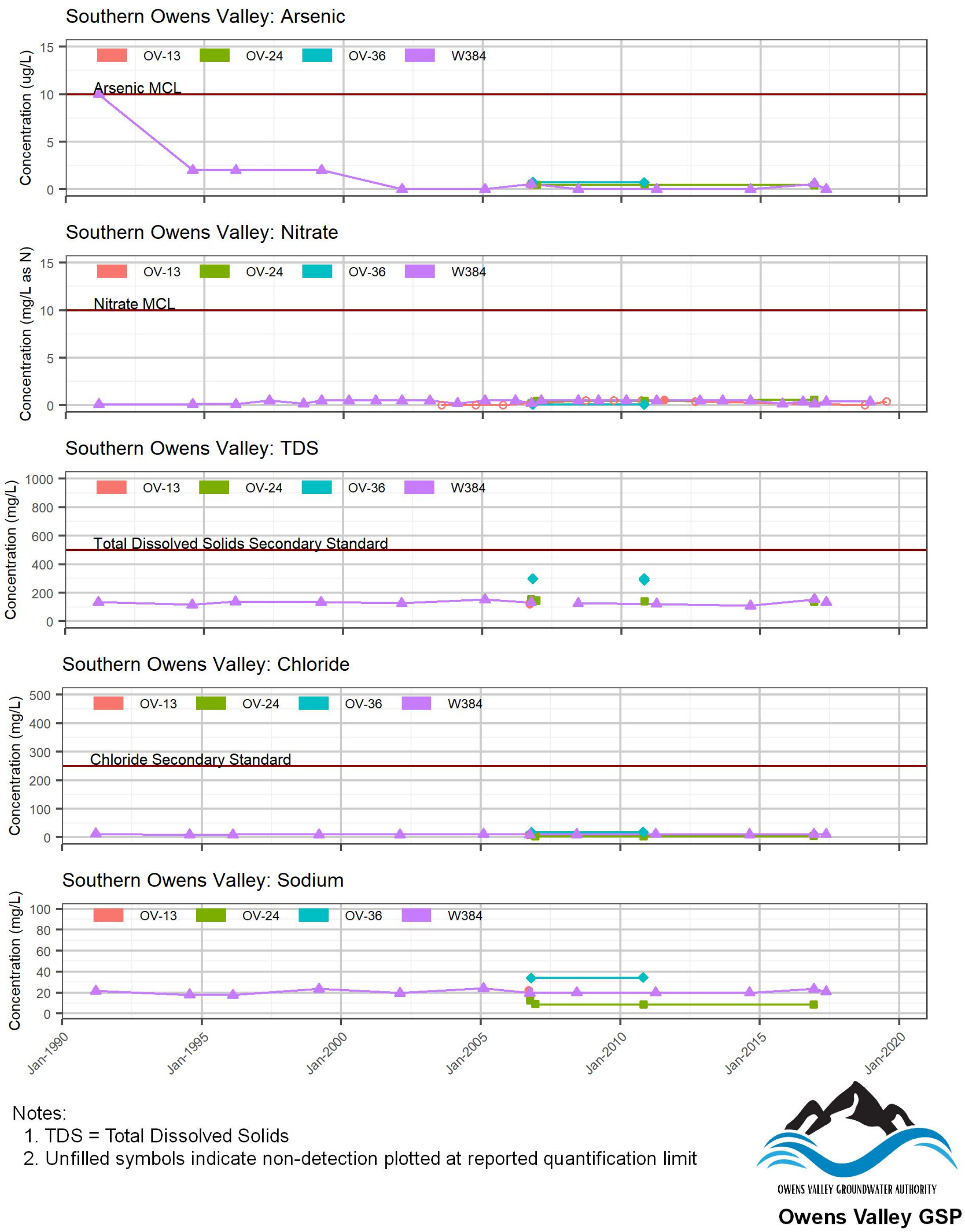


Figure 2-22d. Water quality for representative monitoring wells in Owens Valley.

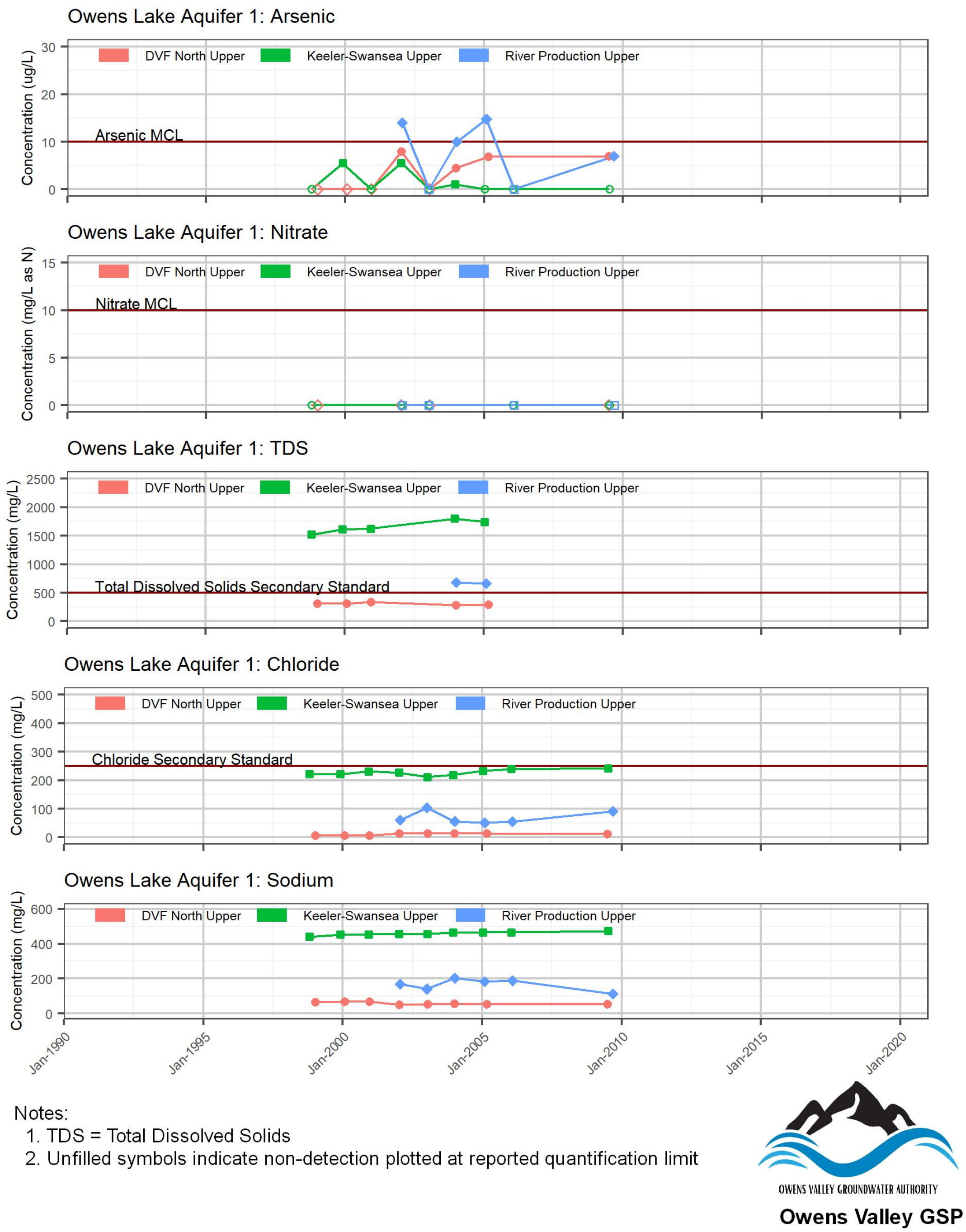


Figure 2-23a. Water quality for representative monitoring wells in Owens Lake

PRELIMINARY DRAFT

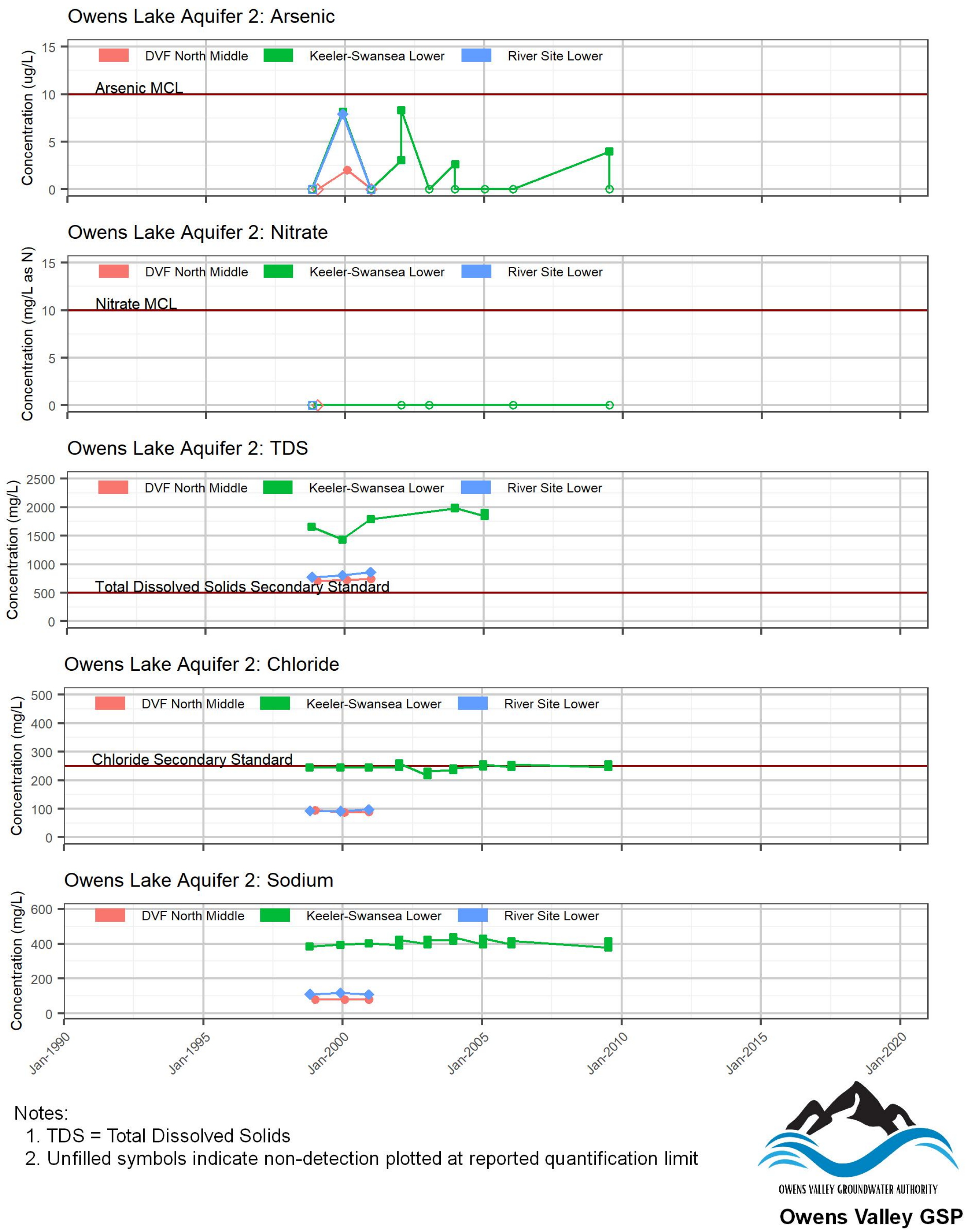


Figure 2-23b. Water quality for representative monitoring wells in Owens Lake

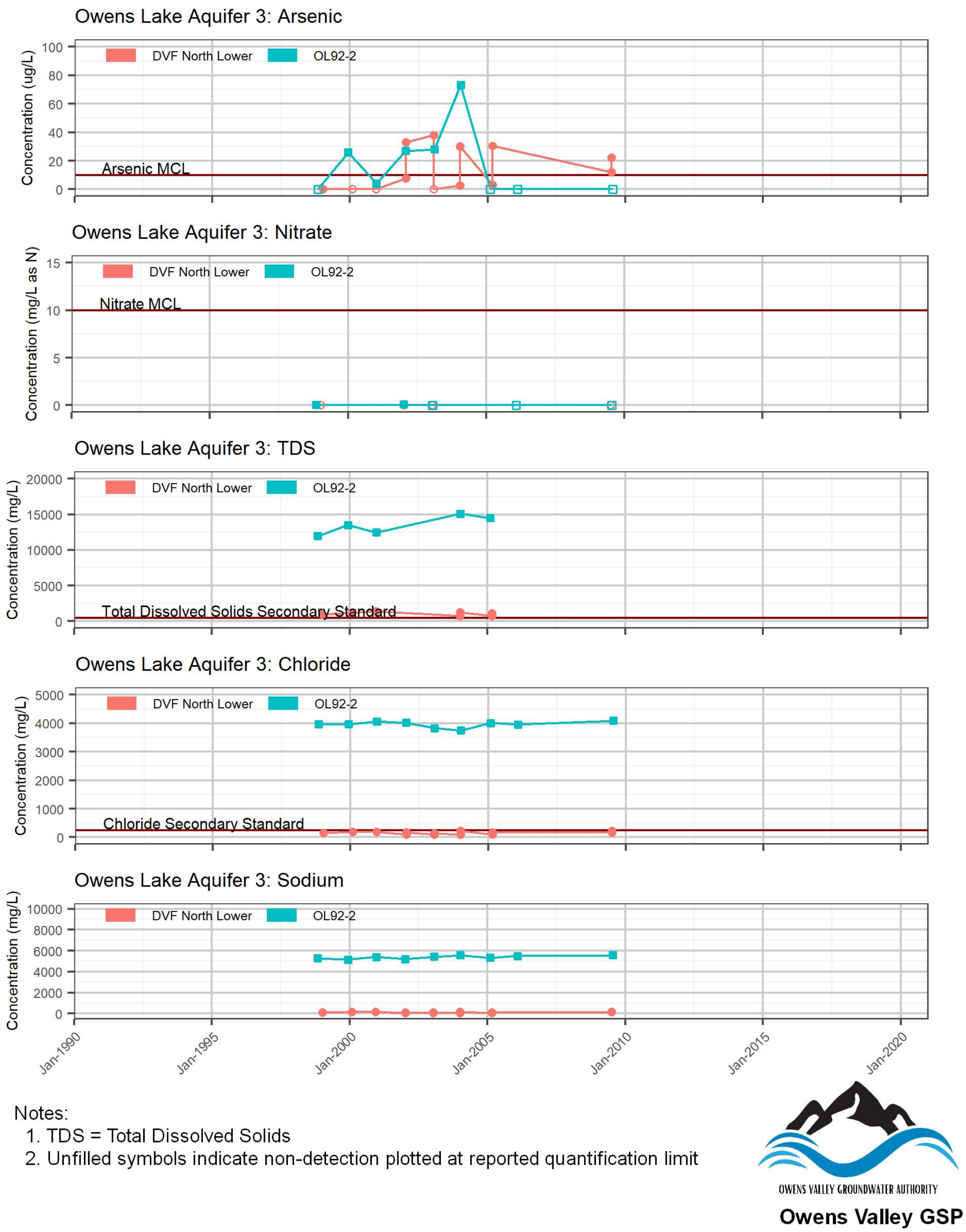
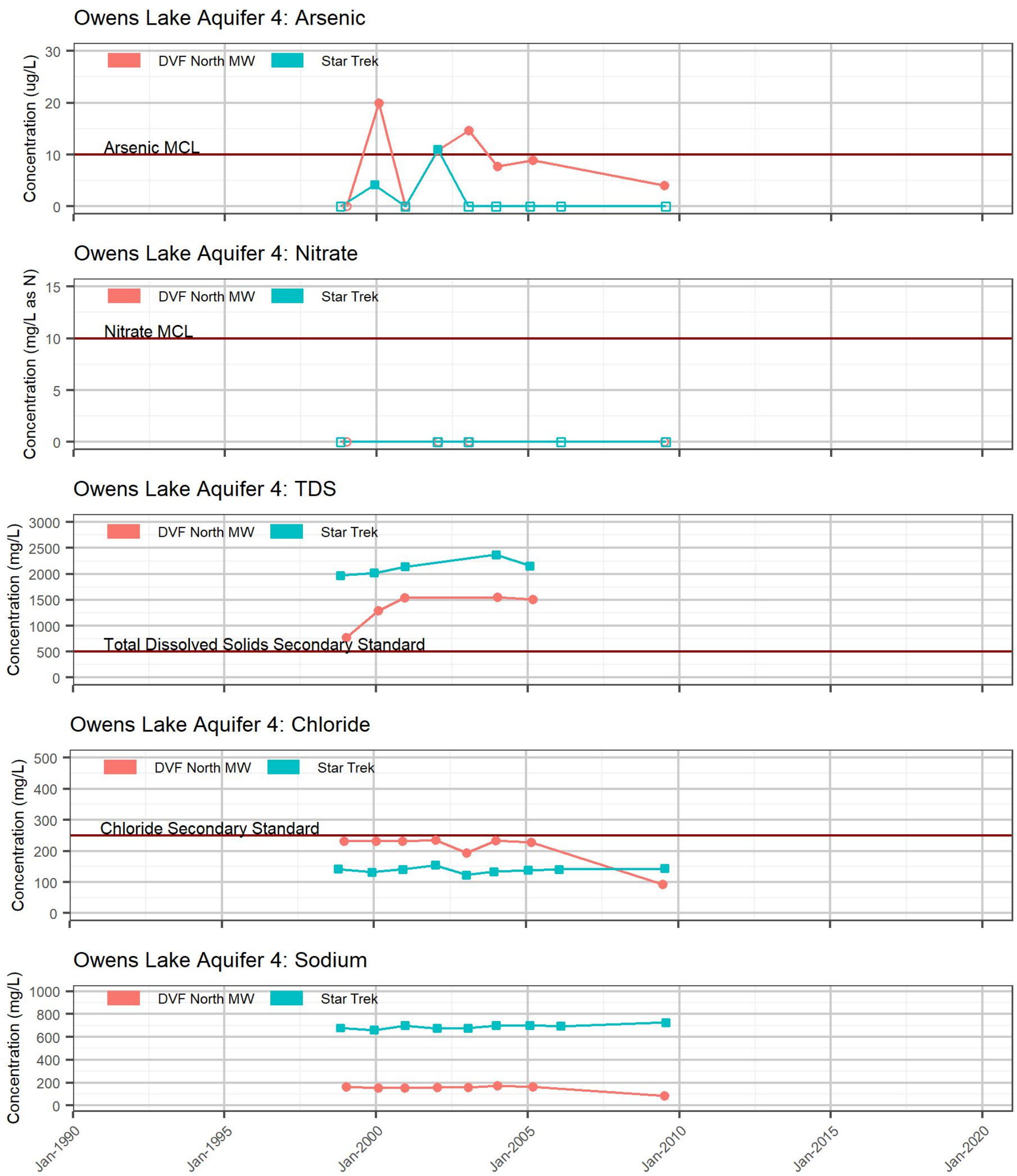


Figure 2-23c. Water quality for representative monitoring wells in Owens Lake

PRELIMINARY DRAFT

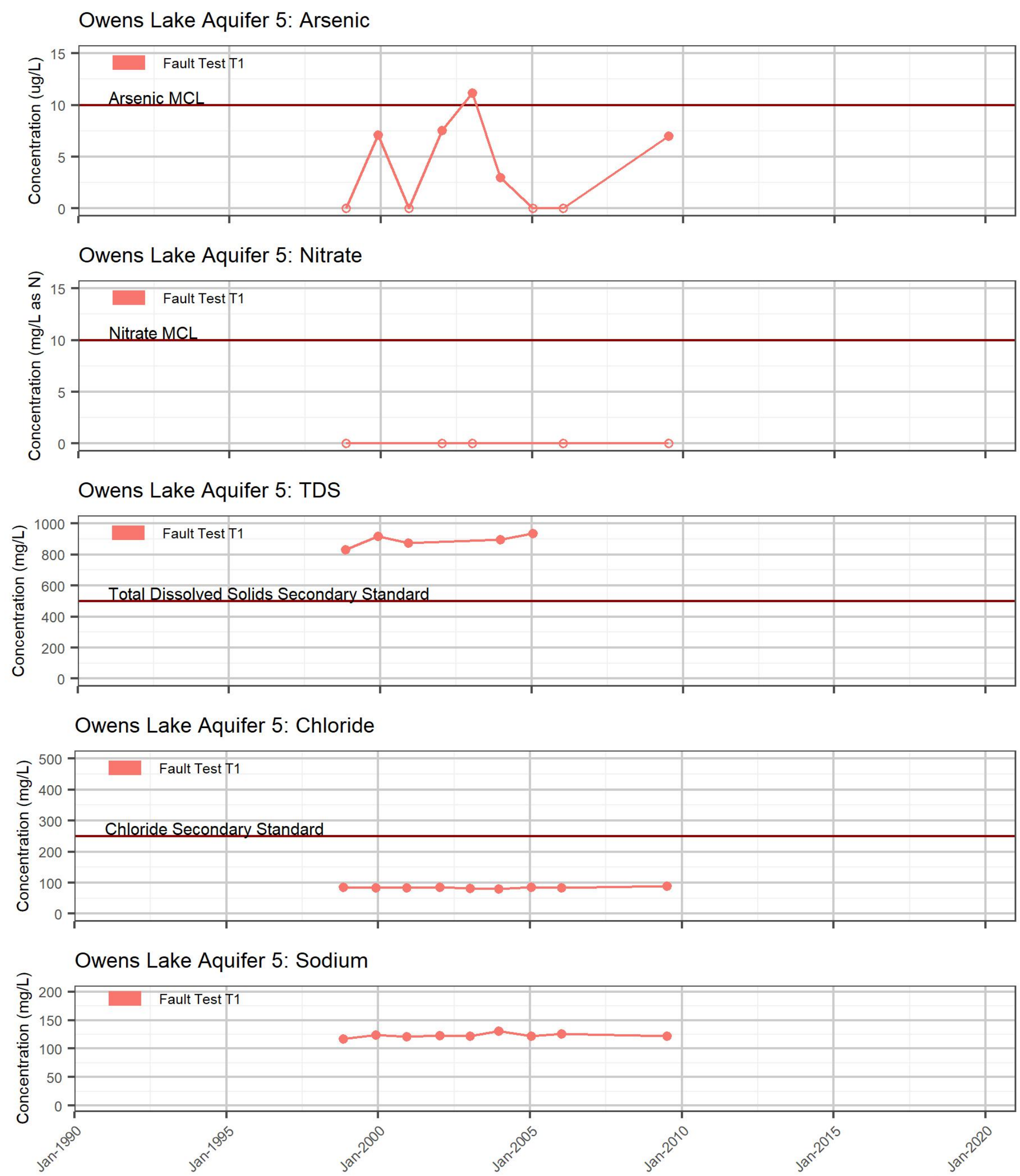


Notes:
1. TDS = Total Dissolved Solids
2. Unfilled symbols indicate non-detection plotted at reported quantification limit

OWENS VALLEY GROUNDWATER AUTHORITY
Owens Valley GSP

Figure 2-23d. Water quality for representative monitoring wells in Owens Lake.

PRELIMINARY DRAFT



Notes:

1. TDS = Total Dissolved Solids
2. Unfilled symbols indicate non-detection plotted at reported quantification limit

OWENS VALLEY GROUNDWATER AUTHORITY

Owens Valley GSP

Figure 2-23e. Water quality for representative monitoring wells in Owens Lake

PRELIMINARY DRAFT

is predominately more recent Sierra Nevada runoff. Concentrations of most constituents evaluated appear to increase from north to south, suggesting concentrations vary more in the horizontal direction than they do in the vertical direction. While the limited number of data points makes this far from a definitive trend it is consistent with the conceptual model of groundwater flow and evaporative discharge for this portion of the basin. Concentrations of TDS, chloride, and sodium are relatively stable within a given well. Arsenic is the only constituent that shows erratic concentrations that fluctuate between non-detectable to nearly an order of magnitude greater than the MCL of 10 µg/L. Nitrate was not detected in any of the representative monitoring wells, and is typically observed at concentrations below the MCL of 10 mg/L as N.

2.2.2.4 Subsidence

Subsidence directly related to subsurface fluid extractions (e.g., groundwater and hydrocarbons) has been observed for several decades in California. Permanent compaction of fine-grained sediments occurs due to the increase in the effective stress caused by fluid removal. A detailed discussion of the geomechanics associated with subsidence is beyond the scope of this section of the GSP document; however, other publications listed in Appendix 8 describe the geomechanics associated with subsidence. This section summarizes the available data and historical conditions related to subsidence in the Basin. Available data examined as part of preparing the GSP and conclusions from that study are also reviewed. The reader is referred to Appendix 8 for a complete discussion.

In 2014, DWR prepared a report summarizing recent, historical, and estimated future subsidence potential for groundwater basins included in DWR Bulletin 118 (DWR, 2020a). The stated intent of the document was to provide screening- level information with respect to subsidence. DWR lists Owens Valley basin with low potential for future subsidence. The ranking was determined from long-term water level trends (well records greater than 10 years) above historical lows and no documented subsidence. Inyo County and the City of Bishop (2017) reports no documented subsidence in their jurisdictions. The County of Mono Regional Transportation Plan & General Plan Update (2015 Draft EIR), Mono County and the Town of Mammoth Lakes (2019) report that no subsidence has been documented due to fluid withdrawals.

The evaluation of subsidence for the Owens Valley basin in this GSP was based on review of the following lines of evidence:

- Geodetic surveys;
- Interferometric Synthetic Aperture Radar (InSAR) data; and
- GPS, extensometers and tiltmeters.

UNAVCO monitors continuously operating geodetic instrument networks, including Continuous Global Positioning Systems (CGPS) stations that measure three-dimensional positions of a point near earth's surface. Several CGPS stations are found near the basin with surface elevation data extending back to 2007. All stations (with one possible exception) are mounted outside of the alluvial basins and in bedrock, suggesting any vertical movement is likely caused by tectonic movement rather than compaction of fine-grained materials due to groundwater withdrawal. Not surprisingly, none of the CGPS stations showed persistent evidence of subsidence.

InSAR is a satellite-based remote sensing method used to map ground surface elevation change over large areas with high accuracy. In this method, satellites emit electromagnetic pulses that produce measurements upon their return. These measurements are processed to create synthetic aperture radar images to calculate the relative change in elevation over time. InSAR data available from DWR at 26 representative sites in the basin located in areas underlain by alluvium were selected based on special geographical characteristics and/or hydrogeological settings. Vertical land surface elevation fluctuations recorded by the stations generally ranged between +0.05 feet and -0.05 feet throughout the basin which is less than the reliable instrumental resolution.

Neponset Geophysical Corporation (1999) reported on a tiltmeter survey conducted in the northern part of Owens Lake playa. The study monitored land surface elevation changes during the performance of three short term (7-23 days) groundwater pumping tests by the Great Basin Air Pollution Control District. The maximum measured deformation of 0.0363 feet (0.43 inches) was recorded, but resulted in only 0.0077 feet (0.09 inches) of net subsidence (inelastic subsidence) after recovery following cessation of pumping.

Each of the proposed management areas has a slightly different susceptibility to subsidence that is rooted in a two key factors:

- The hydrostratigraphic setting (i.e., are the geologic units fine-grained); and

- Is the water level below, or projected to be below, the historical lows in the future?

Typically, both of these factors must be present to initiate subsidence. Monitoring data or site-specific subsidence evaluations can be used to support a subsidence susceptibility ranking. Based on review of available historical reports, geodetic survey data, satellite imagery, tiltmeter, and groundwater level data for the Basin, the Tri-Valley and Owens Valley Management Areas have historically shown little to no subsidence related to groundwater withdrawal, even through multiple droughts, varying pumping, and record low water levels. Based on the hydrogeologic setting and demonstrated initiation of subsidence after only a short-term groundwater extraction test at Owens Lake, the subsidence susceptibility ranking for the lakebed portion of the Owens Lake management area has a moderate potential for subsidence.

2.2.2.5 *Surface Water – Groundwater Interconnection*

The OVGA is required to identify whether significant depletions of interconnected surface water occur in the Basin such that reduced surface water flow or levels have significant and unreasonable adverse impact on beneficial uses of the surface water. Three primary types of interconnected surface water systems were assessed within the non-adjudicated area of the Basin: Owens River and tributaries, springs/seeps, and areas dominated by phreatophytic vegetation (i.e. the species or plant communities that typically transpire more than precipitation) or GDEs. SGMA defines GDEs as *"ecological communities of species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface"* (23 CCR § 351(m)). The reader is referred to Appendix 9 for a complete discussion of the methods used by the OVGA to identify and assess interconnected surface water and GDEs. While the analysis focused on the non-adjudicated portion of the Basin, groundwater and vegetation data and studies from the entire Basin were used to provide context and assist this analysis.

Owens River and tributaries: The Basin has no natural surface-water outlet, and surface water naturally drains into the Owens River and flows to Owens Lake where it evaporates (Figure 2-8). The Owens River is managed as part of the Los Angeles Aqueduct system, and river water is diverted for use in the Basin or exported. Some sections of the Owens River (including the Lower Owens River Project, LORP) is a gaining reach where groundwater emerges from aquifers at certain times of the year, primarily in winter (Danskin, 1998). Nearly the entire river and system of canals and ditches associated with the LAA occurs within the adjudicated area except for a small section of the LORP located on the Owens Lake playa. Flows in that section of the river are controlled by management provisions of the LORP.

Outside of the adjudicated portion of the Basin, the extent of interconnected surface waters associated with Owens River tributaries is less well known. Because shallow groundwater measurements are sparse, local hydrologic and hydrographic information was used to assess the extent of interconnected surface water at tributary creeks.

It is likely that interconnected surface water near tributaries in the non-adjudicated portion of the Basin is rare. Groundwater depths generally increase greatly from under the valley floor toward the mountains due to the steep, upsloping topography, and the landforms the tributaries cross are not groundwater discharge zones. Tributaries on the alluvial fans in the Owens Valley and Owens Lake Management Areas are known losing reaches based on the extensive set of LADWP hydrographic data. It can be reasonably assumed that the tributary creeks in the Tri-Valley Management Area emanating from the White Mountains are also losing reaches based on the landforms where they occur. Recharge from these areas may support GDE on the valley floor located to the west and south of the tributaries. Given that phreatophytic vegetation on the fans occurs in narrow bands along the tributaries, a sufficiently shallow water table to maintain a connection and groundwater discharge into the tributary is unlikely and not supported by available groundwater elevation measurements. The tributary riparian vegetation almost certainly subsists on infiltration of surface water run-on.

The tributaries are local fisheries managed by CDFW, and some have minimum instream flow requirements. Because the tributaries are losing reaches, groundwater management is unlikely to interfere with those flow requirements.

Springs: Local interconnected water occurs where groundwater emerges at springs or seeps. The differentiation between springs and seeps in this GSP is that seeps lack a discrete point of groundwater discharge that flows across the land surface. Seeps are dominated by phreatophytes and because of the mapping precision and methods in this analysis, some seeps were undoubtedly included in the identification and mapping of other GDE units. There are numerous seeps and springs mapped in the Basin (Figure 2-24). Most are located along faults or at geologic contacts. Most of the springs in Figure 2-25 are either outside the Basin Boundary or on the edge of the Basin. Many springs at higher elevations or near the Basin boundary probably consist of a local recharge/discharge zone and are not necessarily connected directly with the basin fill aquifer system. Such springs are unlikely to be affected by pumping in the alluvial aquifers. Several springs and seeps are known to occur around Owens Lake and some were included in the GDE polygons in that area. Other than Fish Slough, no other data were identified to evaluate changes in flow through time outside of the adjudicated area.

Small areas containing springs were identified in the Tri-Valley Management Area (4.1 acres), Owens Valley Management Area (7.2 ac) and Owens Lake Management Area (2.5 ac). The low estimated spring acreage at the Owens Lake is known to be inaccurate because some seep/discharge areas are probably lumped in with the extensive areas of meadow, marsh (tule), or water body impoundment map units (see below and Appendix 9)

The Fish Slough spring complex lies in Fish Slough Valley, north of Bishop and consists of multiple spring systems, from small seeps to fourth-order springs (discharge between 0.22 to 1 cfs). Because there is no upstream surface inflow except infrequent ephemeral runoff, nearly all the flow in Fish Slough is derived from groundwater. Several major springs are located along the Fish Slough fault zone consisting of a series of north-south trending normal faults. Based on surface topography, faulting, and inferred subsurface geology, Hollett et al. (1991) identified the Tri-Valley area as one of the potential water sources for Fish Slough, which was supported by geochemical analysis by Zdon et al. (2019).

Fish Slough is spring fed and has interconnected surface water throughout its length. Surface flow originates from springs that drain into a perennial channel that flows south through Fish Slough to the Owens River. The combined discharge of the Fish Slough spring complex is measured at a gauge on Fish Slough about two miles north of its confluence with the Owens River, where spring discharge is equal to the flow measurement plus unmeasured evapotranspiration from the wetland minus recent precipitation. The hydrograph shows annual variations in flow arising from winter precipitation events and summer evapotranspiration and a decline in mean annual flow (see Section 2.2.16).

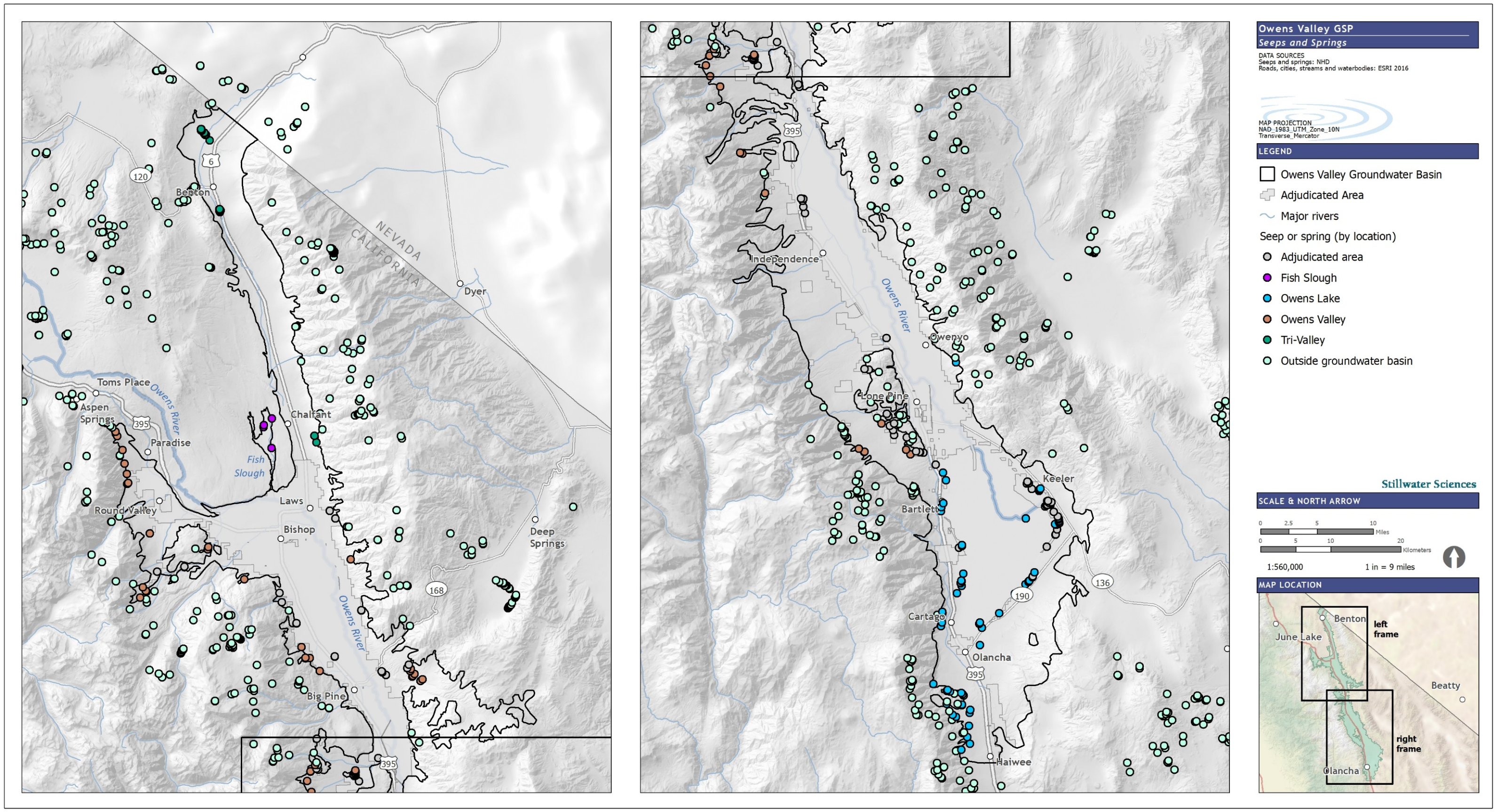


Figure 2-26. Seeps and Springs in the Owens Valley Groundwater Basin and vicinity.

PRELIMINARY DRAFT

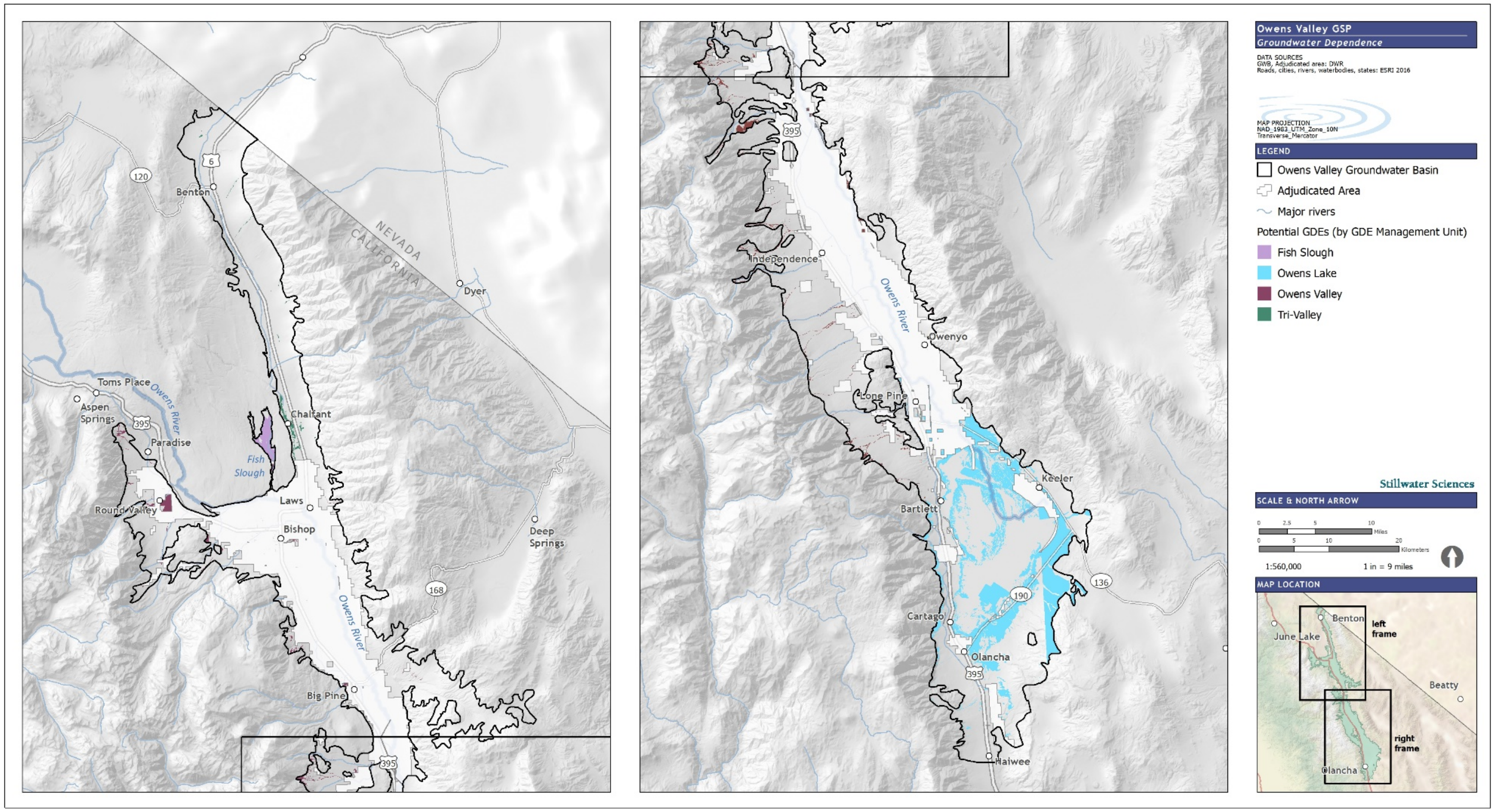


Figure 2-27. Final GDE map including vegetation polygons kept and removed by ICWD. The Kept polygons represent GDE communities consistently mapped within the adjudicated as well as extensive areas on Owens Lake that are dust control measures.

PRELIMINARY DRAFT

GDEs: Potential GDE units in the Owens groundwater basin were identified using the California Department of Water Resources' (DWR) indicators of groundwater dependent ecosystems (iGDE) database (Klausemeyer et al., 2018). The database is published online and referred to as the Natural Communities Commonly Associated with Groundwater dataset (DWR, 2020b) which includes vegetation and wetland natural communities. The iGDE database was reviewed in a geographic information system (GIS) and used to generate a preliminary map that served as the primary basis for identification of potential GDEs. This dataset is a combination of publicly available data and uses the following sources to identify potential GDEs in the Owens groundwater basin:

- Vegetation Classification and Mapping Program (VegCAMP), California Department of Fish and Wildlife
    - Central Mojave Vegetation Database (United States Geologic Survey [USGS] 2002)
    - Fish Slough (California Department of Fish and Wildlife [CDFW] 2014)
    - Manzanar National Historic Site (United States National Park Service, 2012)
- Classification and Assessment with Landsat of Visible Ecological Groupings (CalVeg) – United States Department of Agriculture - Forest Service (USDA 2014)
- Fire and Resource Assessment Program (FRAP) – California Department of Forestry and Fire Protection (CAL FIRE, 2015)
- National Wetlands Inventory - Version 2.0 (NWI v2.0), U.S. Fish and Wildlife Service (USFWS 2018)
- National Hydrography Dataset (NHD) – Springs and seeps, (USGS 2016)

In addition to the sources identified by the iGDE database listed above, the final GDE map includes vegetation data from the following sources:

- Vegetation Mapping and Classification of the Jawbone Canyon Region and Owens Valley (Menke et al. 2020)
- Delineation of Waters of the United States for the Owens Lake Playa (Jones and Stokes and GBUAPCD, 1996).

Additional information on vegetation community composition, aerial imagery, depth to groundwater from local wells (where available), plant and species distributions in the area, plant species rooting depths, and local observations from Inyo County Water Department biologists (ICWD, 2020) were also relied upon to prepare the GDE map. These data were reviewed and augmented with additional vegetation mapping datasets to produce a final map of potential GDE units (Figure 2-27).

Rohde et al. (2018) recommended that maps of likely GDEs to prepare a GSP be compared with local groundwater elevations to determine where groundwater is within the rooting depth of potential phreatophytic species, and assigning GDE status to vegetation communities if water table depth is within 30 feet of the ground surface, or where interconnected surface waters are observed. This is not possible in the parts of the Basin where groundwater data were relatively sparse outside of the adjudicated area. Instead the final GDE map incorporated a combination of local expertise of biologists at the ICWD and literature on groundwater dependence of plant communities in the Owens Valley. The extensive history of studies of GDEs in the valley to manage LADWP's groundwater pumping had previously established the typical DTW ranges for plant communities that are unavailable in other basins. ICWD has extensive data linking groundwater depth and species occurrence (e.g., Manning 1997; Elmore et al., 2003) as well as measurements of evapotranspiration (ET) using measurements of stomatal conductance (Steinwand et al., 2001) and eddy covariance (Steinwand et al., 2006). These ET measurements can be compared with measurements of local rainfall to determine the portion of the plant water needs that are supplied by groundwater. As a result, ICWD has a detailed local understanding of what plant species and vegetation communities are likely to be phreatophytic and those that are likely not connected to groundwater. The preliminary map was reviewed by ICWD to help determine which polygons included by the iGDE database and map (DWR, 2020b) are likely to be dominated by phreatophytic species in the Owens Valley. Polygon boundaries on the iGDE map were not redrawn. The ICWD analysis was used wherever the final assessment was based on CalVeg, FRAP, or VegCAMP (Mojave VegCAMP or Fish Slough). See Appendix 9 for a complete description of the methods.

The final map of potential GDE locations is shown in Figure 2-27 for each Management Area or subbasin, and overall acreages summarized in Table 2-7. Several improvements to the map in Figure 2-27 should be completed during implementation of this GSP before the five year assessment or if there is a change in prioritization of the Basin. The ICWD review of iGDE mapped polygons was primarily based on local knowledge and ground truth of whether the species and plant communities at the locations typically would require water in excess of precipitation. Discrimination of the water source tapped by the vegetation or adjusting polygon boundaries in the field was beyond the scope of this evaluation. As a result, areas of higher vegetation cover on tributaries are reflected in the potential GDE map, but as described above, these narrow bands of vegetation are likely dependent on surface water run-on and infiltration and not a shallow water table.

The iGDE map captured extensive areas on Owens Lake that are part of the water-based dust control measures. It was difficult to segregate the iGDE polygon boundary between spring and seeps that border the lake and the shallow flood or managed vegetation dust control measures located more toward the center of the lake. That boundary will be more precisely mapped using information prepared in the next GSP update. Also, areas of low cover phreatophytes occurring in dunes surrounding the lake were not captured in the iGDE map. Mapping and studies of the groundwater dependence of those areas is an ongoing study part of the OLGDP. The GSP and GDE map will be updated as new data or refinements based on additional ground truth are available or if the Basin is reprioritized. The remainder of the map polygons outside the lakebed and tributaries in Figure 2-27 likely represent plant communities that are consistently mapped within the adjudicated area as GDE. The details of the relationship between groundwater levels and vegetation health or susceptibility to the declining water levels in the vicinity of Tri-Valley and Fish Slough is hampered by identified data gaps in groundwater monitoring or modeling. Management Actions and Projects to address those data gaps are included in Section 4.

Table 2-7. Extent of GDEs by management area and subbasin.

Management area	Owens Valley	Owens Lake	Tri-Valley	Fish Slough	Total
Total Area (acres)	184,788	170,491	71,839	2,943	430,061
GDE extent (acres)	6,115	46,129	1,033	2,191	55,468
Percent of area composed of GDEs (%)	3.3	27.1	1.4	74.4	12.9

<u>*Threatened and endangered species, and critical habitat:*</u> The Owens Valley Basin is ecologically diverse and includes numerous species and habitat that are groundwater dependent. Thirty-six special-status terrestrial and aquatic wildlife species were identified as indirectly or directly groundwater dependent (Appendix 9). Species endemic to Owens Valley that are likely to be

found within one or more of the management areas include: Owens pupfish (*Cyprinodon radiosus*), Owens tui chub (*Siphateles bicolor snyderi*), Owens speckled dace (*Rhinichthys osculus ssp*), Owens Valley vole (*Microtus californicus vallicola*), and Owens Valley springsnail (*Pyrgulopsis owensensis*). Appendix 9 provides additional information on special-status terrestrial and aquatic animal species that may occur in the Basin including regulatory status, habitat associations, and likelihood to occur in management areas. In addition, 25 special-status plant species were documented within the Owens Valley Basin, 18 of which are identified as certain or likely to be dependent on groundwater.

Owens Valley, Owens Lake, and Fish Slough management areas overlap with USFWS-designated critical habitat for four federally listed species: Fish Slough milk-vetch (*Astragalus lentiginosus* var. *piscinensis*), Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*), Sierra Nevada yellow-legged frog (*Rana sierrae*), and yellow-billed cuckoo (*Coccyzus americanus occidentalis*) (USFWS 2005, USFWS 2008, USFWS 2016, USFWS 2020). The acreage of critical habitat for each species within the Owens Valley, Owens Lake, Tri-Valley, management areas is summarized in Appendix 9.

Habitat management and special-status species recovery plans have been implemented in the Owens Valley Basin and include protections for special-status species and associated habitats. These plans include *Owens Basin Wetland and Aquatic Species Recovery Plan Inyo and Mono Counties, California* (USFWS 1998), *Owens Lake Habitat Management Plan* (LADWP, 2010), *Owens Valley Land Management Plan* (LADWP and Ecosystem Sciences, 2010), and the *LADWP Habitat Conservation Plan* (LADWP, 2015). No provision of this GSP conflicts with those plans.

GDE Value and Conditions: Hydrologic and ecological value and condition of the GDEs in Figure 2-27 within each Management Area or subbasin were characterized and assigned a relative rank to summarize the results of the this analysis (high, medium, low, see Rohde et al. 2018). Fish Slough is a designated ACEC with substantially different ecology than the primarily agricultural land use of the Benton, Hammil, and Chalfant valleys and was evaluated separately from those valleys. The evaluation of ecological conditions relied primarily on remote sensing data related to vegetation vigor or wetness as well as other monitoring data (Appendix 9). The evaluation also included an assessment of the vulnerability to changes in groundwater discharge or levels that could substantially alter their distribution, species composition, and/or health. Historical impacts to GDEs that have already occurred outside the adjudicated area were documented in the available datasets and therefore not reflected in the results. The results of the ecological evaluation are shown in Table 2-8.

The Tri-Valley Management Area was determined to have low ecological value because: (1) it supports a relatively small number of special-status species and ecological communities, (2) contains no designated critical habitat for federally listed species, (3) supports few species that are directly dependent on groundwater (two mollusks), and (4) includes few species or ecological communities that are vulnerable to changes in groundwater conditions. Additional groundwater and vegetation mapping and monitoring is necessary to assess the susceptibility of the GDE in Tri-Valley to pumping management.

The Fish Slough subbasin was determined to have high ecological value because: (1) it supports a moderate number of special-status species and ecological communities, (2) contains designated critical habitat for the federally listed and highly endemic Fish Slough milk-vetch, (3) supports two fish and two mollusk species that are directly dependent on groundwater, and (4) includes several species and ecological communities that are highly or moderately vulnerable to changes in groundwater conditions.

The Owens Valley Management Area was determined to have high ecological value because: (1) it supports a relatively large number of special-status species and ecological communities, (2) contains a relatively large amount of designated critical habitat for four federally listed species, (3) supports two amphibians and three mollusk species that are directly dependent on groundwater, and (4) includes species and ecological communities that are highly or moderately vulnerable to changes in groundwater conditions.

The Owens Lake Management Area was determined to have high ecological value because: (1) it supports a relatively large number of special-status species and ecological communities, (2) supports one amphibian, two fish, and one mollusk species that are directly dependent on groundwater, and (3) includes species and ecological communities that are highly or moderately vulnerable to changes in groundwater conditions.

The ecological condition of the GDEs were similarly ranked based on a variety of vegetation and other monitoring data (Appendix 9). The results are shown in Table 2-8. Ranks describing the susceptibility to groundwater changes were also included based on categories developed by Rohde et al. (2018) based hydrologic data, climate predictions, and remote sensing measures of aggregate GDE changes in each management area or subbasin since the baseline time (since 1985). See Appendix 9 for a detailed description of these categories and supporting data.

The health of GDEs has been monitored extensively in the adjudicated area of the Basin by ICWD using similar remote sensing of vegetation coupled with targeted field verification. Applying a similar approach to GDEs where they occur outside the adjudicated area would allow the OVGA to efficiently monitor GDEs. This was not a SGMA requirement and not included as Management Action (Section 4). If necessary, the GSP can be updated to include additional monitoring as it becomes available.

Table 2-8 Ecological Condition rank for each management area or subbasin.

Management area	Owens Valley	Owens Lake	Tri-Valley	Fish Slough
Ecological Value	High	High	Low	High
Ecological Condition	Fair	Undetermined†	Fair	Fair
Susceptibility to GW changes	Moderate	Undetermined	Low	High

†: Difficult to determine using methods adopted for the GSP analysis. Historically there has been low amounts of groundwater pumping in the Owens Lake Management Area. Potential pumping effects on GDEs are the subject of LADWP's ongoing studies.

2.2.3 Water Budget Information (Reg. § 354.18)

The water budget information contained in this section is a summary of the findings presented in Appendix 10 containing the Water Budget Technical Memorandum. For more details, the reader is referred to the appendix.

This basin is highly dependent on groundwater supplies for potable supplies, but overdraft conditions have NOT been identified for the overall basin. In recognition of the varying hydrogeologic conditions in the basin, the OVGA has identified three management areas (see Section 2.2.4): Tri-Valley, Owens Valley, and Owens Lake (Figure 2-28). The water budget for the entire basin, and each of the management areas, as compiled by previous investigators were compared to the results to those derived from using the Basin Characterization Model (BCM) (Flint et al., 2013) software package.

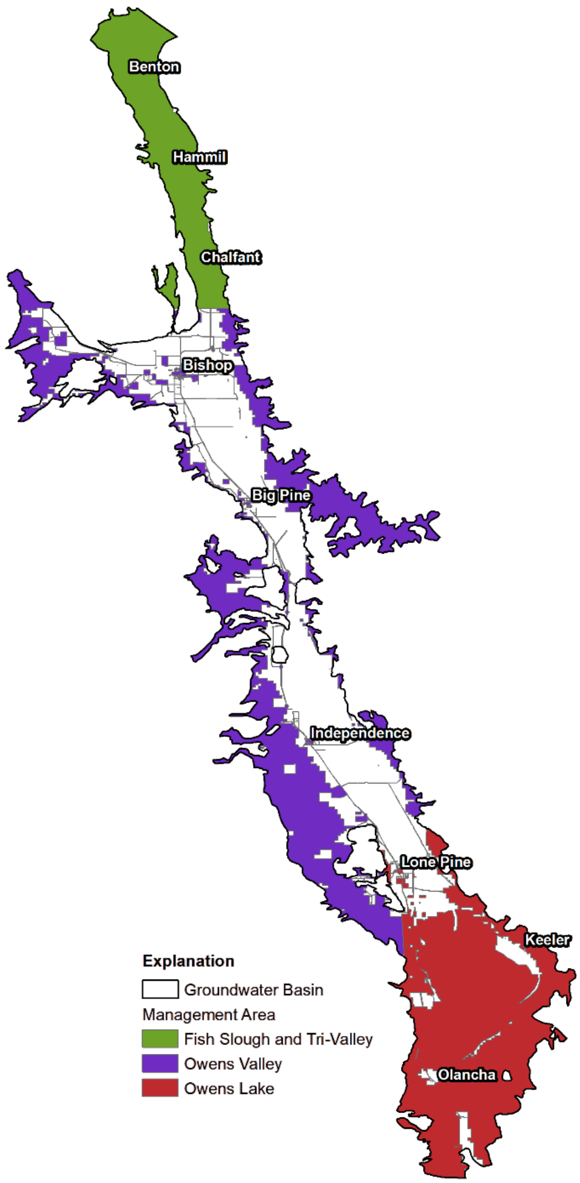


Figure 2.28. Owens Valley Management Areas

The BCM software packet was selected for use in the basin due to the lack of availability of groundwater flow models. LADWP has developed several groundwater models in Owens Basin that are primarily focused on their extraction well fields. These models probably represent the most rigorous synthesis of the hydrologic conditions in their domain, but unfortunately these models are not publicly available, and the OVGA was not able to obtain copies of the models via cooperative communication channels. Consequently, the BCM was selected to help quantify the historical (1986-2016), current (2006-2016), and future water budgets (with the simulated impacts of climate change). Use of the BCM in the absence of a numerical groundwater model is consistent with the guidance offered in DWR's Draft Handbook for Water Budget Development (DWR, 2020c). A shortcoming of the BCM is that it deals only with the land surface system and is silent on the river and streams, as well as groundwater systems. The resultant BCM water budget only pertains to the recharge component of the groundwater balance. Danskin (1998) conducted a detailed evaluation of the Owens Valley Management Area including recharge from tributaries and the mountain front. Results of that analysis are included in work by Harrington (2016).

2.2.3.1 *Previous Investigations*

Harrington (2016) completed the most recent evaluation of the water budget for the basin. He summarized several studies of the water budget for the entire Owens Valley groundwater basin and also prepared estimates for the groundwater budgets for the Tri-Valley, Owens Valley, and Owens Lake to identify some of the regional differences in the Basin (Table 2-9). In each of the subareas the greatest uncertainty was in the recharge value with the difference being 51,100 acre-feet between the low and high estimates. Pumping in the Tri-Valley Management area was also uncertain and was estimated based on acreage and approximate water duty of alfalfa plus the estimated domestic use.

Table 2-9 Owens Valley Groundwater Basin Water Budget (Harrington,2016) and results of BCM analysis prepared as part of this GSP.

Management Area	Recharge (AFY)	Discharge (AFY)	
		Pumping	ET, springs seeps, water course baseflow
Tri-Valley region	17,000-43,000 BCM: 23,000	16,200-19,600	5,000[1]
Owens Valley	183,800 BCM: 188,000	98,000[2]	84,00
Owens Lake	29,500-55,000 BCM: 26,000 ignores down valley flow	2300[3]	51,400
Subtotal	230,800-281,900	116,500-119,900	141,400
Total	220,200-271,300[4]	251,902-260,300	

1: 4,400 AFY groundwater discharge at Fish Slough plus 600 AFY discharge in Chalfant Valley

2: 78,000 AFY pumping by LADWP plus 10,000 AFY by non-LADWP pumpers, plus 10,000 AFY from flowing wells

3: Includes 2,000 AFY for irrigation and 300 AFY for water bottling plant

4: 10,600 AFY was subtracted to account for overlap with Owens Valley (Danskin, 1998) and Owens Lake (MWH, 2011a-c) study areas.

2.2.3.2 BCM – Land System Water Budget

The land system water budget are presented in tabular format. Table 2-10 presents a summary of the current (2006-2016) land system water budget for Owens basin (Figure 2-29) and the three management areas (Figure 2-28).

The BCM analyses was divided into the contributing area (CA) (the watershed area that drains into the basin or management area [MA]) and the basin area itself or management area (MA). Groundwater levels in wells with long data records in the Tri-Valley management areas are showing long-term declining trends. The Land Surface System water budget highlights that recharge from precipitation or surface water run-on is very limited (1,000 AFY) and highlights the importance of subsurface groundwater flow to maintain water levels. A groundwater flow model of this management area is needed to quantitatively determine how to ensure the water levels are sustained in the future.

Table 2-10. Summary of Current Land System Water Budget.

Average (1000s TAFY)	Precipitation	Evapotranspiration	Runoff	Recharge	Vadose Zone Storage
Owens Basin CA	1622	689	410	234	289
Owens GWB	333	224	4	20	85
Owens Valley CA	1225	489	356	188	192
Owens Valley MA	141	85	3	16	36
Fish Slough and Tri-Valley CA	211	111	25	22	54
Fish Slough and Tri-Valley MA	37	24	0	1	12
Owens Lake CA	212	106	32	25	49
Owens Lake MA	85	66	0	1	18

CA = Contributing Area; MA = Management Area; GWB = Ground Water Basin

Figure 2-29. In preparation

PRELIMINARY DRAFT

Comparing range in recharge from Harrington (2016) with the BCM estimate for each management area is useful to narrow the most likely range for recharge values. Comparing the discharge estimates to the likely recharge estimates can then be used to estimate a potential water balance/overdraft. Using the more robust and measured trends in long-term groundwater elevation monitoring data, one can make general inferences as to the likelihood of each area being in balance.

For the Tri Valley management area, the BCM estimates recharge near the lower end of Harrington's recharge range (23,000 AFY), and when compared to the totals of pumping and natural discharge (ET, springs seeps, discharge, surface water outflow), it is likely that this management area is in overdraft. This would be consistent with the long-term groundwater elevation declines observed in Benton, Hammill, Chalfant, and Fish Slough monitoring wells.

For the Owens Valley management area, the BCM estimate of recharge agrees well with Harrington's estimate and is slightly more than the combined discharge components. Long-term (decadal) monitoring data confirm this likely balance when observing the management area as a whole with groundwater levels decreasing during extended drought, but recovering during periods of above average recharge (dynamic steady state).

For the Owens Lake management area the BCM values are at the lower end of Harrington's recharge estimate and well below the combined pumping and natural discharge estimates. However, long-term monitoring data show the management area is not experiencing groundwater level declines and that the area is also in dynamic steady state. Possible causes for this discrepancy between water balance and water level data is that the recharge estimates fail to include the amount of surface water applied to the lake by LADWP for the purpose of dust mitigation (averaging approximately 60,000 AFY for 2006-2015) and the recharge values may underestimate the amount down valley flow.

2.2.3.3 *Sustainability in Owens Basin*

The degree of sustainability of the Owens Basin overall can be semi-quantitatively inferred if the runoff and recharge from the contributing area (headwaters) entering the Owens Valley groundwater basin is in excess of the water exports by LADWP. The LADWP Annual Reports were used to estimate the amount of water transferred outside the basin.   LADWP pumping in the most recent thirty years (1990-2016) has been below 100,000 AFY and the export of water via the LA Aqueduct has been below 500,000 AFY. From the BCM model water budget analysis the total long term average runoff entering Owens valley is 470,000 AFY and the recharge from the contributing area (headwater) to the valley is 252,000 AFY. Since the BCM estimated runoff and recharge are higher than the reported pumping and export of water, the basin as a whole is unlikely to be in overdraft and it is reasonable to assume that the basin will be in balance if these historical values are maintained in the future.

Previous investigations of the water balance, supplemented with the BCM refinement of recharge estimates in Tri-Valley, indicates that the Owens Valley and Owens Lake Management Areas are not in overdraft is consistent with the water level monitoring showing nearly steady state conditions. However, based on monitoring well data and a comparison of recharge and discharge, the Tri Valley management area appears to be in overdraft. A simple method that combines the lateral extent of the alluvial aquifer, typical yield values for alluvial sediments, and the amount of groundwater level decline suggests that the area has experienced average annual overdraft of up to 7,600 AFY over the past three decades. The result of this alternate method is greater than suggested by the water balance method by a few thousand AFY. The uncertainty of the estimates of overdraft is a significant data/knowledge gap.

2.2.3.4 Future Water Balance

In the Owens Valley, recharge estimates are based on linear relationships with runoff (see Danskin, 1998, Green Book, 1990) suggesting modeling of future runoff may be a useful proxy to assess future changes in the Basin groundwater balance. DWR future climate change factors for the Owens basin suggest that temperatures will increase by approximately 2.6 degree F by mid-century and precipitation will increase by 0.3%. The USGS has already made future climate runs using the BCM model for a subset of climate model inputs, CCSM4; CNRM-CM5; GFDL-CM3; MIROC5. For the purpose of this GSP, the CCSM4 scenario 8.5 was selected for the Owens Basin to evaluate future water budgets as this scenario showed a similar range in temperature as suggested by DWR.

Table 2-11. Future Water Budget for Land Surface System-Entire Owens Basin.

Average (1000 AFY)	Precipitation	Evapotranspiration	Runoff	Recharge
Historical	2091	1047	473	275
Future	2214	1250	446	282
Difference	123	203	-27	7
Change(%)	6%	19%	-6%	3%

As descried in Appendix 10, the BCM modeling of future climatic conditions for the Owens River Basin and watershed includes a modest (6%) increase in precipitation, but this excess is lost to increased evapotranspiration (19%). Overall, the amount of recharge is expected to increase by a modest 3% (7 TAFY by 2045) due to climate change. But surface water runoff decreases by 6% (27,000 ac-ft by 2045).

For comparison, LADWP conducted studies in 2011 and 2020 utilizing global climate models to evaluate the effect of climate change on the Sierra Nevada (LADWP, 2020). The studies were conducted to forecast the effects of climate change on the LADWP water supply reliability. The studies aggregated the results of 16 models in 2011 and 20 models in the 2020 study for the greenhouse gas emission scenario RCP 8.5. This scenario essentially assumes no concerted effort to reduce emissions will be implemented. By 2045, LADWP's modelling study estimated an approximately 3°F temperature increase and essentially no change in precipitation (the mean change from the 20 model results was just above zero). LADWP's predicted temperature and precipitation changes are comparable to DWR climate change factors. LADWP also predicted that runoff will decline 0.165% annually or about 7,770 AFY by 2045. LADWP (2020) projected that over the next 25 years, average deliveries from the Los Angeles Aqueduct (LA Aqueduct) to the City would decline from the 1985-2014 median of 192,000 acre-feet per year to 184,200 acre-feet per year by 2045 due to climate change,

Given the model uncertainty and different methods, the BCM and LADWP runoff predictions are comparable, with the LADWP models predicting less reduction in runoff due to climate change (approximately 8,000 ac-ft vs. 27,000 ac-ft in the BCM). It is important to note that the portion of the watershed in the two modelling exercises were different. LADWP did not include runoff in the Tri-Valley management areas, but both models included the Sierra Nevada portion of the contributing area where the bulk of runoff occurs.

2.2.3.5 *Description of surface water supply used or available for use for groundwater recharge or in-lieu use*

Surface water rights for nearly all Owens River tributary streams are owned by City of Los Angeles. Smaller holders of water rights exist but the sum of private water rights as a portion of the runoff into the Basin is negligible compared to LADWP water rights. The Los Angeles City Charter City prevents LADWP from selling or transferring water rights without a vote of City Council which is considered unlikely during the implementation of this GSP. In large runoff years, LADWP typically diverts surface water into numerous recharge basins on the valley floor and across alluvial fans for the purpose of groundwater recharge. The Owens Basin is a closed basin, and no surplus surface water or groundwater naturally exits the basin.

Surface water used for irrigation in Tri-Valley area (Benton, Hammil, and Chalfant) is predominantly associated with pre-1914 water rights. Except in extreme instances following storms, surface runoff remains in the Tri-Valley area. Any water associated with these large storms leaving the Tri-Valley area recharges the northern Laws area of the Owens Valley. More typically, runoff from the White Mountains is either diverted for irrigation or infiltrates in the creeks on the alluvial fans to recharge groundwater. A portion of the runoff and surface water used for irrigation also supports local recharge.

2.2.4 Management Areas (Reg. § 354.20)

The varying combinations of topography, geology, and climate over the large area of the Owens Valley groundwater basin has resulted in hydrogeologic conditions varying spatially, generally from north to south. These can be broadly grouped into three categories representing the hydrogeologic conditions. The spatial distribution of these categories are used in the GSP to divide the basin into separate management areas (Figure 2-28) which allow for development of unique SMCs that take into account hydrogeologic conditions present in the area. The management areas from north to south are:

- Tri-Valley management area including the Fish Slough subbasin

- Owens Valley management area
- Owens Lake management area

In accordance with the JPA, Article II, Section 4.3, the OVGA formally voted to create management areas on August 12, 2021. The sections below provide the rationale for separating the basin into the three management areas. See Appendix 3 for more detailed information about monitoring networks, available datasets and identified data gaps for each management area.

Table 2-12. Acreage and proportion of the Basin of the three Management Areas.

Management Area	Area (acres)	% of total
Owens Valley	184,788	43.0
Owens Lake	170,491	39.6
Tri-Valley	74,782	17.4
Total	430,061	100

2.2.4.1 *Tri-Valley Management Area*

The Fish Slough subbasin, located to the north of Bishop and to the west of Chalfant Valley in the volcanic tablelands, is a federally-designated Area of Critical Environmental Concern (ACEC) due to the presence of rare plants and animals. Although little precipitation falls directly on the Fish Slough subbasin, habitat is supported by groundwater discharged to springs and seeps along faults. While the amounts of groundwater discharging into Fish Slough are poorly quantified, existing evidence suggests a large portion comes from the Tri-Valley area (Jayko & Fatooh, 2010; Zdon et al., 2019).

The Fish Slough and Tri-Valley management area is the least understood portion of the basin. There have been few hydrogeologic studies conducted in the area and monitoring networks are limited. Hydrologically, the Tri-Valley Management Area is distinct because it has few surface-water features and sources recharge primarily from the White Mountains instead of the Sierra. It is geologically distinct from the Owens Valley Management Area to the south containing alluvium derived primarily from sedimentary and metamorphic rock and the rhyolitic Bishop Tuff as opposed to primarily granitic-derived alluvium, interlayered basalt flows and presences of thick clay layers. Tri-Valley portion of the area is considered to have a single aquifer. A portion of this aquifer is believed to extend under the Bishop Tuff towards Fish Slough where it becomes confined. The southeastern portion of the management area contains a prominent subsurface bedrock high that is coincident with a significant change in hydraulic gradient. This stratigraphy combined with preferential flow along faults/fractures that extend from Hammil Valley south to Fish Slough are believed to result in hydrogeologic connection between Tri-Valley and Fish Slough. Observed chronic declines in groundwater elevations in the Tri-Valley Management Area do not occur in the adjacent Owens Valley Management Area, indicating that groundwater management effects on water levels are largely confined to the Tri-Valley Management Area. Recent geochemical studies comparing Tri-Valley, Fish South and northern Owens Valley groundwater also suggest a link between northern Fish Slough and Tri Valley groundwater. Two calibrated groundwater models with domains along the southern end of the management area suggest that flow exiting the southern boundary of Tri-Valley is relatively small and a very minor portion of the inflows to the Owens Valley.

As noted, observed chronic declines in groundwater elevations in the Tri-Valley Management Area do not occur in the other two management areas. This is consistent with the conceptual model developed for the basin. Future management actions would seek to stabilize groundwater levels in the Tri-Valley Management Area and therefore arrest any declines to the small groundwater flux across the management area boundary. Similarly, maintaining water levels in the Owens Valley and Owens Lake Management Areas should preserve the existing water balance and down valley flow supporting conditions near the lake.

2.2.4.2 *Owens Valley Management Area*

The Owens Valley Management Area is fragmented geographically due to LADWP lands in the valley being considered adjudicated under the SGMA. However, this management area is hydrogeologically distinct because the majority of it overlies the alluvial fans along the margins of the valley where development is limited and not expected to change due to lack of private land ownership. In addition, LADWP pumping operations outside of the GSP area could have a significant impact to the hydrologic system within the Basin, whereas there is relatively little LADWP pumping in the other two management areas. LADWP has created an extensive monitoring network in this portion of the basin, although most wells are located on lands adjacent to the Owens Valley management area and are commonly down gradient of the GSP area. The majority of groundwater leaving the Owens Valley Management Area flows onto

LADWP lands before entering the Owens Lake Management Area to the south. The significantly larger volume of groundwater pumped on LADWP lands means effects of management actions within the Owens Valley Management Area are expected to be negligible compared with LADWP operations unless new pumping projects are proposed.

2.2.4.3 *Owens Lake Management Area*

The Owens Lake management area's aquifer system geology is less heterogeneous compared to the other two management areas, and exhibits a more layer-cake geology due to the depositional environment of the Pleistocene Owens Lake. Thick lacustrine clay layers separate distinct aquifers and act as confining beds. These clay layers provide the geologic conditions necessary for subsidence to occur, which are largely absent from the other two management areas. The other two management areas also have generally high water quality, while the Owens Lake Management Area has generally poor water quality. This is a naturally occurring phenomenon related to evaporative concentration at the terminus of the closed basin. Monitoring network density for this area is generally high, both horizontally and vertically in the aquifer system. The management goal for Owens Lake is to maintain current conditions, which will not impact the other two management areas defined in the basin.

3. Sustainable Management Criteria

SGMA defines sustainable Groundwater Management as the *"…the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results"* (CWC 10721 (v)). SGMA includes four sustainable management criteria (SMC) components that the GSP is required to define: a sustainability goal, undesirable results, minimum thresholds, and measurable objectives. These four components are described in this section specifically for the three management areas or for the entire Basin where applicable.

SGMA listed six sustainability indicators pertaining to groundwater conditions occurring throughout the basin that can represent undesirable results (CWC Section 10721): chronic lowering of groundwater levels, reduction in groundwater storage, depletion of interconnected surface water, seawater intrusion, degraded water quality, land subsidence. Measurable objectives and minimum thresholds for five of these indicators are discussed in this section. The Basin is not located near the ocean and therefore not susceptible to undesirable results from seawater intrusion. No SMC were established for this indicator, and it is not discussed further in this section.

3.1 Sustainability Goal (Reg. § 354.24)

The Basin is currently ranked by DWR as a low priority basin suggesting that as a whole, groundwater in the basin is managed sustainably. The prioritization of the Basin, including the Fish Slough subbasin, relied on existing data and considered the following factors (CWC Section 10933(b)):

1. The population overlying the basin or subbasin.
2. The rate of current and projected growth of the population overlying the basin or subbasin.
3. The number of public supply wells that draw from the basin or subbasin.
4. The total number of wells that draw from the basin or subbasin.
5. The irrigated acreage overlying the basin or subbasin.

6. The degree to which persons overlying the basin or subbasin rely on groundwater as their primary source of water.
7. Any documented impacts on the groundwater within the basin or subbasin, including overdraft, subsidence, saline intrusion, and other water quality degradation.
8. Any other information determined to be relevant by the department, including adverse impacts on local habitat and local stream flows.

The sustainability goal of the OVGA is to monitor and manage the Basin by implementing a groundwater monitoring network and database and by adopting management actions that fairly consider the needs of and protect the groundwater resources for all beneficial users in the Basin. The OVGA is committed to preventing undesirable results and to ensuring the sustainability of the Basin is maintained by establishing SMC including minimum thresholds and management objectives described in this GSP. The OVGA opposes groundwater export from the Eastern Sierra that would result in negative consequences to groundwater sustainability, the environment, local economy, and residents.

The OVGA recognizes that different hydrologic characteristics, land, and water management and concerns exist within the Basin and has established separate management areas in this GSP (Section 2.2.4). Developing SMC particular to each management area was necessary to protect the resources and beneficial uses and users of groundwater specific to each area. Within each management area, information from the basin setting (Section 2) was used to establish the sustainability goal and measures. Water levels trends in the Owens Valley and Owens Lake Management Areas are stable, and the proposed SMC were established based on maintaining water levels within historical ranges. For the Tri-Valley Management Area, the OVGA relied on previous studies of hydrology and geology and the history of monitoring information from existing monitoring wells and spring flows. Water levels and Fish Slough spring flows have been steadily declining in this management area, and the proposed SMC were established to prevent impacts to private wells by stabilizing the water table at 2015 elevations. Spring flow SMC were based on recommended flows to manage threatened ecosystems downstream of the springs based on the expertise of agencies with land management responsibility in Fish Slough. Pumping induced subsidence and water quality are presently not a serious problem in the Basin.

Sustainability measures are included in this GSP to monitor those indicators and intervene to prevent undesirable results from occurring.

3.1.1 Sustainability Measures

The OVGA is proposing a limited number of projects and management actions that will improve characterization and monitoring in the Basin and if necessary manage demands and supplies to achieve the sustainability goal. These projects are briefly summarized in this section and described in greater detail in Section 4.

1) Monitoring Network and Database: This measure is applicable to all management areas. The OVGA will monitor groundwater resources as prescribed in this GSP, assess changes in the groundwater basin using best available models and data, and report annually and as needed to the OVGA Board and public on groundwater uses and conditions in the Basin. Monitoring data will be maintained in a publically accessible form. In addition, the OVGA has selected representative monitoring locations in each management area to track conditions to compare with established sustainability criteria. These criteria are described in detail in Section 3.5 below.

2) If necessary, the OVGA may implement groundwater management policies, regulations, projects, or studies consistent with the authorities granted under SGMA. The OVGA will develop such measures to devise or modify management practices when needed to achieve or maintain the sustainability goal within management areas. Actions to address data gaps, and maintain an up-to-date database are included in Section 4.

3) The Tri-Valley Management Area exhibits declining water levels and spring flow in Fish Slough; however, lack of a groundwater model to evaluate and assess pumping effects prevents immediate measures to alter pumping or land management. This GSP includes a plan for additional studies predicated on acquiring outside funding to prepare a numerical groundwater model.

4) Ensure local resident and stakeholder voices including Federal and State recognized tribes are heard through effective public engagement that invites deliberation, collaboration, and action on groundwater management issues of common importance as the GSP is implemented. The OVGA is committed to work with land use agencies in the Basin to promote land use practices and water demand goals that sustain water resources.

The OVGA recognizes that 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.

The Sustainability Goal will be achieved within 20 years of Plan implementation by setting criteria to maintain water levels and applicable water quality standards, continuing monitoring, and adopting regulations as necessary. Where concerns over lowering water levels are observed, the OVGA proposes to conduct studies to determine the pumping effects from other possible causes and, if necessary, develop the a pumping plan to prevent significant and unreasonable effects (Section 3.4).

3.2 Undesirable Results (Reg. § 354.26)

There are currently no documented undesirable results for the indicators throughout the Basin reflecting the overall sustainable conditions. As described in the Basin Setting (Section 2.2.2), three sustainability indicators exhibit documented trends toward undesirable results in the Tri-Valley Management Area; declining water levels, reduced groundwater storage, and declines in interconnected surface water. Undesirable results therefore were defined based on groundwater conditions that could lead to potentially significant and unreasonable effects in each of the three management areas.

3.2.1 Tri-Valley Management Area

Undesirable results for the relevant sustainability indicators for the Tri-Valley Management Area are presented in Table 3-1 and described below.

<u>Cause of groundwater conditions which may lead to undesirable results:</u> Potential Undesirable Results of concern in the Tri-Valley Management Area would primarily be related to lowering water levels including potential impacts to production wells (increased pumping costs), drying out of shallow domestic or monitoring wells and reduced groundwater discharge to GDEs, in particular the springs located in Fish Slough. Based on available geologic, hydrologic, and geochemical evidence, pumping in management area in excess of recharge is the cause of lowering water levels. The magnitude of overdraft and the pumping effect on spring flow, however, are poorly quantified (Table 2-9 and Section 2.2.3). The susceptibility of domestic and

Table 3-1. Undesirable results identified for the Tri-Valley Management Area.

Sustainability Indicator	Undesirable Results
Chronic Lowering of GW elevation	Increased pumping costs Drying out shallow domestic wells Loss of existing monitoring wells Reduced groundwater discharge to Fish Slough
Reduction in GW Storage	Decreased ability to maintain status quo pumping during extended drought periods
Depletion of Interconnected SW	Reduction of groundwater discharged to the surface resulting in impairment of GDEs
Land Subsidence	General infrastructure damage
Degraded WQ	Increased treatment costs, Loss of potable water supplies

monitoring wells to lowering water levels was assessed in this GSP and is described below and in Appendix 11.

For the type of aquifer system in the Tri-Valley Management Area, lowering of water levels corresponds with reductions in storage. The steady water table decline is concerning, but it is unlikely that sustainable yield or available groundwater storage will be exceeded or that a decreased ability to maintain status quo pumping during droughts will occur during GSP implementation due to the thickness of the aquifer compared to the lesser groundwater level declines.

Severe pumping overdraft (which does not presently exist) could cause land subsidence resulting in general infrastructure damage or migration of lower quality deeper groundwater requiring treatment or loss of potable water, but these are unlikely to occur at the current rate of pumping due to the small magnitude of declines and subsurface materials.

Criteria used to define undesirable results: Because the sustainability goal is to prevent undesirable results from occurring in the future, criteria to define them in this GSP were necessarily based on the analysis of future monitoring results or reporting by residents. Water level, spring flow, water quality and subsidence monitoring data collected during the GSP implementation will be assessed to compare with SMC included in this GSP. Future projects to address data gaps that limit the understanding of the Tri-Valley Management Area may alter the SMC used to define undesirable results in a future update of this GSP. Potential management actions and projects are included to develop and implement suitable measures to stabilize water level declines and spring flows.

An analysis to estimate the potential for impacts to domestic wells was completed to assist definition of the undesirable results for chronically declining water levels in the Benton, Hammil, and Chalfant valleys. The well vulnerability analysis (Appendix 11) was based on the most pertinent factors (e.g. height of water column above pump setting or well bottom) to evaluate the possibility that significant and unreasonable effects to domestic wells may occur. The analysis relied on several assumptions due to the lack of information specifically describing parameters needed to complete the analysis for each domestic and agricultural well. The assumptions, though reasonable, limit the confidence in the conclusions beyond determining that whether the number of vulnerable wells is few or many and whether significant and unreasonable effects are eminent or possible much later in the planning horizon of this GSP. This data gap regarding conditions in domestic wells may be addressed through the proposed Management Actions or by inspection of domestic wells upon request by the well owner to acquire data and complete a well-specific assessment (Section 4 below).

Potential effects on the beneficial uses and users of groundwater: The primary beneficial uses and users in the Tri-Valley management area include agricultural pumpers, domestic *de minimis* users, shallow GDE in the Benton, Hammil, and Chalfant valleys, and spring flow and associated GDEs in Fish Slough. Impacts to domestic wells directly caused by lowering of groundwater levels and related changes in storage would include increased electrical costs and shortened pump life, costs to lower or replace a pump, and costs to deepen or replace a well. These added costs for a homeowner range from a few tens of dollars per year to potentially tens of thousands for a drilling a new well.

Reduction of spring flow in Fish Slough would directly impact several protected species, critical habitat, and GDEs (Section 2.2.2.5). Land subsidence may cause impacts to general infrastructure including damage to improvements on private property, public roadways, or utilities. Degraded water quality could make groundwater unsuitable for the predominant beneficial uses for agriculture or domestic use.

3.2.2 Owens Valley Management Area

Undesirable results for the relevant sustainability indicators for the Owens Valley Management Area are presented in Table 3-2 and described below.

Table 3-2. Undesirable results identified for the Owens Valley Management Area.

Sustainability Indicator	Undesirable Results
GW elevation	Increased pumping costs Drying out shallow domestic wells Loss of existing monitoring wells
GW Storage Reduction	Decreased ability to maintain status quo pumping during extended drought periods
SW Depletion	Reduction of groundwater discharged to the surface resulting in impairment of GDEs
Land Subsidence	General infrastructure damage
Degraded WQ	Increased treatment costs, Loss of potable water supplies

Cause of groundwater condition which may lead to undesirable results: Potential undesirable results of concern in the Owens Valley Management Area include lowering water levels causing impacts to production wells (increased pumping costs), drying out of shallow domestic or monitoring wells and impaired GDE. Presently water levels are stable in the non-adjudicated portion of the management area. The potential exists for changes in pumping management or installation of new wells in the adjudicated area affecting the remainder of the management area. Similarly, wells newly installed in the few areas of privately owned lands in the non-adjudicated area could alter the local water table conditions.

Given the nature of the aquifer system, lowering of water levels corresponds with reductions in storage. The stable water table trends at present are not concerning, and it is unlikely that sustainable yield or available groundwater storage will be exceeded or that a decreased ability to maintain status quo pumping during droughts will occur during the GSP implementation.

Severe pumping overdraft (which does not presently exist) could cause land subsidence resulting in general infrastructure damage or migration of lower quality deep groundwater requiring treatment or loss of potable water, but these are unlikely to occur.

Criteria used to define undesirable results: Because the goal is largely to prevent undesirable results from occurring in the future if Basin conditions change, criteria to define them in this GSP were necessarily based on the analysis of future monitoring results. Water levels, spring flow, water quality, and subsidence monitoring data collected during GSP implementation will be assessed annually to compare with SMC included in this GSP.

P*otential effects on the beneficial uses and users of groundwater:* The primary beneficial uses and users in the Owens Valley management area include community service districts, municipal or mutual water company water providers, domestic *de minimis* users, and shallow GDE. Impacts to domestic wells directly caused by lowering of groundwater levels and related changes in storage would include increased electricity costs, costs to adjust pump placement in a well, or to deepen or replace a well. Land subsidence may cause impacts to general infrastructure and would include damage to improvements on private property, public roadways or utilities. Degraded water quality could make groundwater unsuitable for the predominant beneficial uses for agriculture or domestic use.

3.2.3 Owens Lake Management Area

Undesirable results for the relevant sustainability indicators for the Owens Lake Management Area are presented in Table 3-3 and described below.

Cause of groundwater condition which may lead to undesirable results: Potential undesirable results of concern in the Owens Lake Management Area related to lowering water levels include potential impacts to production wells (increased pumping costs), drying out of shallow domestic or monitoring wells, and impaired GDEs. Presently water levels are stable in the non-adjudicated portion of the management area. The potential exists for future changes in pumping management in the adjudicated area, on privately owned lands, or under Owens Lake managed by the State Lands Commission to affect the remainder of the management area.

Table 3-3. Undesirable results identified for the Owens Lake Management Area.

Sustainability Indicator	Undesirable Results
GW elevation	Increased pumping costs Drying out shallow domestic wells Loss of existing monitoring wells
GW Storage Reduction	Decreased ability to maintain status quo pumping during extended drought periods
SW Depletion	Reduction of groundwater discharged to the surface resulting in impairment of GDEs
Land Subsidence	General infrastructure damage Damage to conveyance infrastructure
Degraded WQ	Increased treatment costs, Loss of potable water supplies

Given the nature of the aquifer system, lowering of water levels corresponds with reductions in storage except for the immediate vicinity of Owens Lake where multiple stacked deeper aquifers are present. Lower aquifers that may be tapped in the future by LADWP to supply dust control measures will be monitored to track the potential for reduction in storage. The steady water table trend at present is not concerning, and it is unlikely that sustainable yield or available groundwater storage will be exceeded or that a decreased ability to maintain status quo pumping during droughts will occur during the GSP implementation based on current pumping amounts.

Pumping could cause land subsidence resulting in infrastructure damage or migration of lower quality groundwater near or under Owens Lake requiring treatment or loss of potable water. No problems with subsidence or migration of saline groundwater caused by pumping exist presently, and the potential for these impacts to occur depends on future development of groundwater pumping projects in the management area. The primary subsidence threat is future pumping under the lakebed from deeper confined aquifers.

Criteria used to define undesirable results: This GSP was prepared primarily to prevent potential undesirable results from occurring in the Basin. For that situation, criteria to define undesirable results are necessarily based on the analysis of future monitoring results or reporting by residents. Water level, spring flow, water quality, and subsidence monitoring data collected during the GSP implementation will be assessed to compare with SMC included in this GSP.

P<u>*otential effects on the beneficial uses and users of groundwater:*</u> The primary beneficial uses and users in the Owens Lake management area include agricultural or commercial pumpers, community service districts or mutual water companies, domestic *de minimis* users, and GDE. Impacts to domestic wells directly caused by lowering of groundwater levels and related changes in storage would include increased electrical costs, costs to adjust pump placement in a well, or to deepen or replace a well. Land subsidence may cause impacts to general infrastructure would include damage to improvements on private property, public roadways or utilities or infrastructure for dust control measures on the lakebed. Degraded water quality could make groundwater unsuitable for the predominant beneficial uses for agriculture, municipal, or domestic use.

3.3 Minimum Thresholds (Reg. § 354.28)

A Minimum Threshold is defined as "*a numeric value for each sustainability indicator used to define undesirable results*" (Reg. § 351 (t)). A value for each sustainability indicator denoting undesirable results (Section 3.2) must be included in the GSP and consider the beneficial uses and users of groundwater and other interests within the Basin. The sections below describe the rationale behind the development of the minimum thresholds for the relevant sustainability indicators for management areas in the Basin.

3.3.1 Tri-Valley Management Area

3.3.1.1 Groundwater Level Declines and Groundwater Storage Reductions

Groundwater level declines and storage reductions are closely correlated in unconfined aquifer systems like that in the Tri-Valley Management Area. The minimum thresholds for both indicators are based on water levels and trends at representative monitoring wells (Section 3.5 below).

Drying of shallow domestic wells was determined to be the most urgent and significant undesirable result from chronic declines in groundwater levels in the Benton, Hammil, and Chalfant valleys. A well vulnerability assessment was performed for 189 domestic wells in the management area using the limited amount and types of publically available data (Appendix

11). This is a large sample set, but the total number of domestic wells in the three valleys is not accurately known. The analysis suggested that water levels in approximately 8 (4%) wells potentially are deep enough to prevent the wells from producing presently, but all 8 of these wells are over 50 years old. Because no wells in the Tri-Valley area have been reported going dry, it is possible that these older wells are no longer the primary water supply for the property. If the present rate of water level declines of 0.5-2.0 ft/yr (Section 2.2.2) persist and are representative for all areas within the three valleys, approximately 11 (6%) wells could experience problems by 2025 and 16 (8%) by 2040 (both values include the 8 wells that may currently be dry). There is significant uncertainty in the domestic well vulnerability assessment due to the assumptions required, but few domestic wells appear to be at immediate risk of going dry due to declining water levels, and the number remains small if declines continue for 5 years (Appendix 11).

The minimum threshold water levels at the representative monitoring wells assume continued steady water table declines at the average rate (Appendix 3) projected to May 2030 (eight years after GSP adoption) and Table 3-4. At this level, it is expected that between 3 to 8 domestic wells may be at risk of refurbishment or replacement. This number of wells being negatively affected by declining water levels is considered significant and unreasonable. Management actions and projects are included in this GSP to prevent this undesirable result from occurring by stabilizing water levels at levels above the minimum threshold (Sections 3.4 and 4).

Because the water levels in Fish Slough and Tri-Valley have similar long term declining trends (albeit at different rates), a similar extrapolation to estimate 2030 water levels based on rate of water table decline was used to set minimum thresholds in representative monitoring wells in Fish Slough (FS-2, FS3-D, and T397). The minimum thresholds for wells in Fish Slough represent less than 1.5 feet of additional decline.

Table 3-4. Tri-Valley management area minimum thresholds for groundwater level declines and groundwater storage reductions at representative monitoring points.

Representative Monitoring Well	Minimum Threshold Elevation (ft amsl)
BT-MW1	5,301
Hammil 2a	4,401
CH-MW2	4,204
FS-2	4,214
FS-3Da	4,179
T397	4,199

3.3.1.2 *Land Subsidence*

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable. This value is greater than the vertical resolution and historic range of variation observed in the InSAR and reflects the limited potential for subsidence based on current geologic understanding of the management area's subsurface materials.

3.3.1.3 *Interconnected Surface-Water Depletions*

The primary interconnected surface water depletions of concern in this management area are springs and associated GDE in Fish Slough. Fish Slough Northeast Spring is the primary spring at risk of drying up, and of the three largest spring vents in Fish Slough, its water chemistry was most similar to the Tri-Valley groundwater chemistry (Zdon, et al., 2019). The spring supports threatened and endangered species and associated critical habitat. The CDFW monitor and manage the spring flow for the benefit of the listed species and habitat. An average flow rate of 0.1 cfs from the Fish Slough Northeast Spring (SW3208) is being used as the minimum threshold for the interconnected surface-water depletion sustainability indicator. The minimum threshold represents the minimum flow rate that is necessary to allow management of flows to maintain current habitat conditions according to the CDFW (Alisa Elsworth, CDFW personal communication).

3.3.1.4 *Water Quality Degradation*

Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, minimum thresholds for groundwater quality included in this GSP are those set by existing or future regulations (e.g., statewide drinking water standards). This approach reflects the fact that elevated solute concentrations in the basin are either naturally occurring or that sources of poor water quality are localized and already regulated by State agencies.

3.3.2 Owens Valley Management Area

3.3.2.1 *Groundwater Level Declines, Groundwater Storage Reductions, and Interconnected Surface Water Depletions*

Minimum groundwater elevations observed during the 2012-2016 drought were used to establish the minimum thresholds for groundwater level declines and groundwater storage reductions and surface water depletions. If no data were available for representative monitoring well during this time, the minimum groundwater elevation observed since January 1st, 2000 was used. These values are presented in Table 3-5. No significant and unreasonable impacts within the management area were reported during this time period. Therefore, maintaining water level elevations at or above those recorded during that time is not anticipated to result in significant and unreasonable impacts in the future. Potential surface water depletions in the management area are limited to the few acres of GDE that may be dependent on shallow water table. Maintaining the steady water level trend should prevent impairment of GDE caused by pumping in the non-adjudicated area.

3.3.2.2 *Land Subsidence*

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable. This value is greater than the vertical resolution and historic range of variation observed in the InSAR and reflects the limited potential for subsidence based on current geologic understanding of the management area's subsurface materials.

Table 3-5. Owens Valley management area minimum thresholds groundwater level declines and groundwater storage reductions at representative monitoring points.

Representative Monitoring Point	Minimum Threshold (ft amsl)
ICWCSD 4	4,249
T001	3,867
T362	4,047
T364	3,898
T384	4,165
T389	4,216
T391	4,296
T480	3,994
T513	4,113
T574	4,067
T750	4,357
T751	4,373
T808	3,834
T809	3,823
T869	3,983
T871	3,850
T872	3,946
T873	4,954
V016GB	3,880
V151	3,827
V151	3,827
V299	3,901
WCCSD 2	6,020
WCCSD 4	6,263

3.3.2.3 *Water Quality Degradation*

Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, minimum thresholds for groundwater quality adopted by the OVGA are those set by existing or future regulations (e.g., statewide drinking water standards). This reflects the fact that elevated solute concentrations in the basin are either naturally occurring or sources are localized and already regulated by another agency.

3.3.3 Owens Lake Management Area

3.3.3.1 *Groundwater Level Declines and Groundwater Storage Reductions*

Minimum groundwater elevations observed during the 2012-2016 drought were used to establish the minimum thresholds for groundwater level declines and groundwater storage reductions. If no data were available in a representative monitoring well during this time, the minimum groundwater elevation observed since January 1st, 2000 was used. These values are presented in Table 3-6. No significant and unreasonable impacts within the management area were reported during this time period. Therefore, maintaining water level elevations at or above those recorded during that time is not anticipated to result in significant and unreasonable impacts in the future.

3.3.3.2 *Land Subsidence*

A minimum threshold of 0.3 ft (3.6 inches) of subsidence measured by InSAR has been proposed as less than significant and reasonable. This value is greater than the vertical resolution and historic range of variation observed in the InSAR. As noted earlier, additional subsidence monitoring with associated minimum thresholds would be appropriate if LADWP proceeds with its OLGDP.

Table 3-6. Owens Lake management area measureable objectives for groundwater level declines and groundwater storage reductions at representative monitoring points.

Aquifer Unit	Representative Monitoring Point	Minimum Threshold (ft amsl)
1	DVF South Upper	3,636
1	T901	3,607
1	T904	3,626
1	T910	3,607
2	DVF South Middle	3,639
2	Fault Test T3	3,620
2	Fault Test T5	3,617
2	Keeler-Swansea Lower	3,618
2	River Site Lower	3,594
3	DVF South Lower	3,640
3	OL92-2	3,605
3	SFIP MW	3,511
3	T917	3,704
4	DVF North MW	3,643
5	T899	3,617
5	T902	3,631
5	T908	3,625
5	T916	3,704
Owens Lake	DELTA W(3)_10	3,562
Owens Lake	I10(7)_4	3,568
Unknown	KCSD	3,612
Unknown	O6(5)_4	3,567
Unknown	Rio Tinto[a]	--
Unknown	T348	3,630
Unknown	T588	3,685
Unknown	T858	3,666

Unknown	T860	3,708
Unknown	T920	3,600
Unknown	T922[a]	--
Unknown	T924	3,590
Unknown	T925[a]	--
Unknown	T929[a]	--

a. Newly established representative monitoring point or data not currently available. Measureable objective will be established in future GSP updates.

3.3.3.3 *Interconnected Surface-Water Depletions*

Minimum groundwater elevations observed during the 2012-2016 drought were used to establish the minimum thresholds for interconnected surface-water depletion. If no data were available during this time, the minimum groundwater elevation observed in the well since January 1st, 2000 was adopted. These values are presented in Table 3-6. No significant and unreasonable impacts within the management area were reported during this time period. Therefore, maintaining water level elevations at or above those recorded during that time is not anticipated to result in significant and unreasonable impacts in the future.

Minimum thresholds based on a reduction in head gradient measured near springs and flowing artesian wells, both vertically and horizontally may be included in a future GSP update. Further analysis and data collection are required to develop these thresholds which are part of the ongoing collaborative LADWP OLGDP.

3.3.3.4 *Water Quality Degradation*

Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, minimum thresholds for groundwater quality adopted by the OVGA are those set by existing or future regulations (e.g., statewide drinking water standards). This reflects the fact that elevated solute concentrations in the basin are either naturally occurring or sources are localized and already regulated by another agency.

3.4 Measureable Objectives (Reg. § 354.30)

The sections below describe the rationale behind development of the measureable objectives for the five sustainability indicators for the Basin management areas. Due to observed declines in groundwater levels, both interim milestones and 20-year measureable objectives are presented for the Tri-Valley Management Area. The Owens Valley and Owens Lake Management Areas are considered to be in a dynamic steady state condition. Interim milestones for measureable objectives in those management areas are identical to the 20-year value. Due to generally stable water levels, application of the GSP proposed management actions and projects in the Owens Valley and Owens Lake Management Area would maintain conditions and would not cause undesirable results in the Tri-Valley Management Area. Stabilizing water levels and spring flow declines in the Tri-Valley Management Area would potentially increase groundwater flow and spring discharge into the Owens Valley Management Area and, therefore, not cause undesirable results in Owens Valley area.

3.4.1 Tri-Valley Management Area

3.4.1.1 Groundwater Level Declines and Groundwater Storage Reductions

Groundwater elevations present when SGMA was enacted on January 1st,, 2015 were selected as the 20-year measureable objective for undesirable results that could occur in the Tri-Valley Management Area from chronic groundwater level declines and groundwater storage reductions (Table 3-7).

The 20-year measureable objectives and interim milestones for water levels of representative monitoring wells in the Tri-Valley Management Area are shown in Table 3-7. Interim milestones reflect the continued declines and eventual stabilization and recovery in groundwater levels to the 20-year measurable objective. Continued declines are projected for the next five years (2027, 5-year milestone)) while potential management actions are evaluated and a numerical hydrologic model of the area is developed. Following the initial five years of decline, this GSP anticipates five years of stabilizing groundwater levels as projects and management actions begin to come online (10-year milestone). The next ten years involves recovering water levels to the 20-year measureable objective value, which are set at January 1st, 2015 water levels.

A recognized data gap in this management area is insufficient water level monitoring. In future GSP updates, the management objectives may be revised at the present locations or new management objectives established for additional representative monitoring points. Since there have been no reported significant and undesirable results directly related to decreased water levels in Benton, Hammil, or Chalfant valleys of the date of this Plan, setting long-term sustainability goals at January 1st, 2015 water level elevations (higher than current levels) provides a reasonable margin of safety.

Achieving the 20-year measurable objective will require either increasing recharge into the aquifer or decreasing pumping. While increasing recharge is typically preferred, it is not a realistic option for the Tri-Valley management area due to the limited availability of water available for import and nearly all runoff in the area already recharging groundwater. Reducing demand is the most likely course for arresting the chronic groundwater declines and groundwater storage reductions. This can take many forms such as improving irrigation efficiencies, retiring less productive agricultural lands, changing crop types, or deficit irrigation. Development of any of these strategies necessarily follows steps in this GSP to address data gaps in this management area and probably acquisition of funding. Uncertainty in the water budget and the lack of a numerical groundwater flow model for the area prevents an accurate assessment of how much groundwater pumping in Tri-Valley would need to be reduced to achieve the measureable objectives. More accurate characterization of the groundwater deficit is a priority project in this GSP.

Table 3-7. Fish Slough and Tri-Valley management area measureable objectives for groundwater level declines and groundwater storage reductions at representative monitoring points.

Representative Monitoring Point	Groundwater Elevation (ft amsl)			
	5-year Interim Milestone	10-year Interim Milestone	15-year Interim Milestone	20-year Measurable Objective
BT-MW1	5,303	5,303	5,306	5,309
CH-MW2	4,207	4,207	4,209	4,211
FS-2	4,215	4,215	4,216	4,217
FS-3D[a]	--	--	--	--

PRELIMINARY DRAFT

Hammil 2[a]	--	--	--	--
T397	4,199	4,199	4,200	4,201

a. Newly established representative monitoring point. Measureable objectives will be established in future GSP updates.

3.4.1.2 *Land Subsidence*

The measureable objective for land subsidence in the Tri-Valley Management Area has been set to less than 0.07 ft (0.84 inches), the vertical resolution of the remotely sensed inteferometric synthetic-aperture radar (InSAR) data provided by DWR (TRE Altamira, 2021; Towill, 2021). This value for the objective was chosen because no subsidence has been observed in the management area despite long-term water level declines and the necessary geologic conditions are not considered to be present (see Appendix 8).

3.4.1.3 *Interconnected Surface-Water Depletions*

Interconnected groundwater and surface-water point discharge in the Tri-Valley Management Area is primarily present in Fish Slough, where groundwater is discharged via springs and seeps and a small area of GDE in Tri-Valley. A flow rate of 0.5 cfs at the northeast spring (SW3208) was selected as the 20-year measureable objective (Table 3-8). This was selected based on the flow rate recommended by the CDFW for maintaining a healthy environment for the Owens Pupfish and Fish Slough Milk Vetch (Alisa Elsworth, CDFW, personal communication). CDFW is the custodial agency responsible for managing the outflow from the spring to support endangered species habitat and associated wetlands.

Table 3-8. Tri-Valley management area measureable objectives for interconnected surface-water depletions at representative monitoring points.

Representative Monitoring Point	Northeast Spring Flow Rate (cfs)			
	5-year Interim Milestone	10-year Interim Milestone	15-year Interim Milestone	20-year Measurable Objective
SW3208	0.1	0.1	0.3	0.5

PRELIMINARY DRAFT

Similar to the projected path for water level declines and storage reduction, spring flows are projected to decrease over the next five years while more data is collected and models are developed to better inform management actions. Spring flows are projected to stabilize over the following five years (10-year interim milestone) as projects and management actions begin to come online. The next 10 years involves recovering spring flows measured at the northeast spring (SW3208) to the 20-year measureable objective value of 0.5 cfs.

The current hydrogeologic conceptual model for the basin sources a portion of groundwater discharge into Fish Slough from Tri-Valleys. Therefore, achieving the measurable objective for spring flow will likely require increasing the flow gradient from Tri-Valley into Fish Slough, which translates to increasing water levels in the valleys. Potential management actions for achieving this are discussed above in Section 3.2.1.1 and in Section 4.

Potential surface water depletions in the Tri Valley itself are limited to the few acres of GDE that may be dependent on shallow water table. Stabilizing water level trends from Benton to Chalfant should prevent impairment of GDE caused by pumping. Additional refinement of the mapping of these areas is warranted to assess their susceptibility to water level changes.

3.4.1.4 Water Quality Degradation

Groundwater quality in the Tri-Valley Management Area is generally good, with only a single well exceeding the secondary drinking water standard of 500 mg/L for total dissolved solids (see Figure 2-21 and Appendix 3). This well is located on a landfill site that is already regulated by the California State Water Resources Control Board.

Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, the water quality degradation sustainability indicator has been interpreted to mean that projects and management actions undertaken by the OVGA cannot result in additional degradation of water quality within the groundwater basin. Potential project and management actions in the Tri-Valley Management Area will likely be focused on demand reduction and are not expected to adversely impact water quality.

Constituents of concern identified in the Tri-Valley Management Area by stakeholders are arsenic, chloride, nitrate, total dissolved solids, and sodium. Measureable objectives for these constituents have been set to the average observed concentration since January 1st, 2000 (Table 3-9). In general, observed solute concentrations in the management area are naturally occurring.

Elevated values from landfill monitoring wells are believed to be localized and an artifact of limited water quality data for the Tri-Valley management area. Water quality impacts from landfill leachate are already regulated by the State Water Resources Control Board under the Porter-Cologne Water Quality Control Act. The OVGA will report water quality conditions, and will alert and coordinate with responsible agencies as needed if water quality conditions appear to decline in the future.

Table 3-9. Average concentrations for constituents of concern in the Tri-Valley Management Area.

Representative Monitoring Point	Average Concentration since January 1st, 2000				
	As (ug/L)	Cl (mg/L)	NO_3 (mg/L as N)	TDS (mg/L)	Na (mg/L)
BT-MW1	2.4	2.0	1.1	227	--
CH-MW3	2.8	25.1	0.6	565	--
OV-03	2.2	8.8	0.1	301	44.9
OV-31	3.4	1.8	0.2	151	21.3

3.4.2 Owens Valley Management Area

3.4.2.1 Groundwater Level Declines and Groundwater Storage Reductions

Measurable objectives for groundwater level declines and groundwater storage reductions for the Owens Valley management area were selected using averages of groundwater elevations measured between 2001 and 2010 (Table 3-10). For wells constructed after 2010, or for which no data were available from 2001 to 2010, the measureable objective was set to the average groundwater elevation for the most recent 10 years for which data was available. No significant and unreasonable impacts from groundwater level declines or groundwater storage reductions were reported within the management area since 2001.

Interim milestones and long-term measureable objectives are set to the same value because the management area is in a dynamic steady state condition. Water level elevations typically reflect weather conditions, with levels generally increasing during wet years and decreasing during dry years. Operations within the management area are currently sustainable. As long as groundwater demand does not significantly increase, which is not anticipated, then maintaining the status quo will keep the management area in a sustainable condition.

3.4.2.2 Land Subsidence

The measureable objective for land subsidence in the Owens Valley management area has been set to less than 0.07 ft (0.84 inches) measured by remotely sensed interferometric synthetic-aperture radar (InSAR). This is equal to the vertical resolution of the InSAR data provided by DWR (TRE Altamira, 2021; Towill, 2020). It was chosen because no subsidence has been observed in the management area, and the necessary geologic conditions required for subsidence are not considered to be present (see Appendix 8).

3.4.2.3 Interconnected Surface-Water Depletions

Potential surface water depletions in the management area are limited to the few acres of GDE that may be dependent on shallow water table. Maintaining the steady water level trends should prevent impairment of GDE caused by pumping in the non-adjudicated area. Additional refinement of the mapping of these areas is warranted to assess their susceptibility to water level changes.

3.4.2.4 Water Quality Degradation

Groundwater quality in the Owens Valley management area is generally good, with none of the representative wells exceeding any of the primary or secondary MCLs (see Figures 4-20 through 4-23 in Appendix 3). Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, the water quality degradation sustainability indicator has been interpreted to mean that projects and management actions undertaken by the OVGA cannot result in additional degradation of water quality within the groundwater basin. Since the Owens Valley management area is currently in a dynamic steady state condition it therefore does not require project and management actions for water quality at this time.

Table 3-10. Owens Valley management area measureable objectives for groundwater level declines and groundwater storage reductions at representative monitoring points.

Representative Monitoring Point	Measureable Objective (ft amsl)
ICWCSD 4	4,254
T001	3,880
T362	4,072
T364	3,903
T384	4,168
T389	4,224
T391	4,303
T480	3,995
T513	4,117
T574	4,071
T750	4,360
T751	4,379
T808	3,846
T809	3,829
T869	3,985
T871	3,852
T872	3,955
T873	4,963
V016GB	3,882
V151	3,834
V151	3,834
V299	3,914
WCCSD 2	6,023
WCCSD 4	6,274

Constituents of concern identified in the Owens Valley management area by stakeholders are arsenic, chloride, nitrate, total dissolved solids, and sodium. Measureable objectives for these constituents have been set to the average observed concentration since January 1st, 2000 (Table 3-11). In general, observed solute concentrations in the management area are naturally occurring. Localized water quality impacts occur primarily from leaking underground storage tanks (USTs), and are already regulated by the State Water Resources Control Board under the Porter-Cologne Water Quality Control Act. The OVGA will report water quality conditions, and will alert and coordinate with responsible agencies as needed if water quality conditions appear to decline in the future.

3.4.3 Owens Lake Management Area

3.4.3.1 Groundwater Level Declines and Groundwater Storage Reductions

Measurable objectives for groundwater level declines and groundwater storage reductions for the Owens Lake management area were selected using averages of groundwater elevations measured between 2001 and 2010 (Table 3-12). For wells constructed after 2010, or those having no data from 2001 to 2010, the measureable objective was set to the average groundwater elevation for the most recent 10 years for which data was available. No significant and unreasonable impacts due to groundwater level declines or groundwater storage reductions have been reported in the management area.

Groundwater levels in the Owens Lake management area are extremely consistent and vary little (Figures 2-20, and Appendix 3). Observations typically vary less than 5 ft within a well, with larger water level changes explained by short term pumping tests performed nearby. The limited natural variation in groundwater levels and groundwater storage in the Owens Lake management area, combined with the absence of reported impacts historically, indicate the selected measurable objective values will keep the Owens Lake management area in a sustainable condition.

Table 3-11. Average concentrations for constituents of concern in the Owens Valley management area.

Representative Monitoring Point	Average Concentration since January 1st, 2000				
	As (ug/L)	Cl (mg/L)	NO_3 (mg/L as N)	TDS (mg/L)	Na (mg/L)
1400010-003	--	4.4	0.7	78.3	8.7
1400019-001	--	--	0.5	70	16
1400516-001	--	--	0.7	--	5.9
1410004-002	--	6.1	0.8	165.3	13.1
COB 2	5.2	3.4	0.5	127.1	10.6
COB 4	1.5	2.6	0.4	76.5	5.6
OV-06	3.5	3.3	--	159.7	15.7
OV-08	1.8	3.2	1	145.4	18.2
OV-10	0.2	0.7	0.1	74.9	5.4
OV-12	1.5	0.9	0.2	60.6	5.1
OV-13	0.5	9.6	0.4	123	22.1
OV-24	0.5	4.8	0.5	145.1	9.8
OV-29	3.5	3.8	0.4	244.9	23.3
OV-36	0.8	17.9	0.1	295.7	34.4
W384	0.6	10.3	0.2	134.8	21.1

Interim milestones and long-term measureable objectives are set at the same value because the management area is in a dynamic steady state condition. Water level elevations typically reflect water-year type conditions, with levels generally increasing during wet years and decreasing during dry years. Operations within the management area are currently sustainable. As long as groundwater demand does not significantly increase or groundwater inflows do not significantly decrease, then maintaining current pumping volumes will keep the management area in a sustainable condition.

3.4.3.2 Land Subsidence

The Owens Lake management area is the only portion of the groundwater basin covered by the GSP where geologic conditions necessary for subsidence are considered present. Measureable objectives have been set for both groundwater elevations and observed subsidence measured using GPS, InSAR, and extensometers. No subsidence in the Owens Lake management area has been observed, and therefore measureable objectives for subsidence are defined by the vertical resolution of the available measurements.

The same measureable objectives used for the groundwater level decline and groundwater storage reduction (Table 3-7) sustainability indicators are also applied to subsidence. Subsidence is strongly correlated with changes in groundwater elevations. Typically, as long as groundwater elevations remain above the lowest observed value, then subsidence will be prevented. The established measureable objectives for groundwater level decline and groundwater storage reduction are conservative from a subsidence perspective, as the average value of groundwater elevations for a given period is always greater than the minimum observed value.

Table 3-12. Owens Lake management area measureable objectives for groundwater level declines and groundwater storage reductions at representative monitoring points.

Aquifer Unit	Representative Monitoring Point	Measureable Objective (ft amsl)
1	DVF South Upper	3,641
1	T901	3,610
1	T904	3,629
1	T910	3,608
2	DVF South Middle	3,643
2	Fault Test T3	3,623
2	Fault Test T5	3,623
2	Keeler-Swansea Lower	3,618
2	River Site Lower	3,633
3	DVF South Lower	3,643
3	OL92-2	3,607
3	SFIP MW	3,613

3	T917	3,705
4	DVF North MW	3,645
5	T899	3,618
5	T902	3,632
5	T908	3,627
5	T916	3,704
Owens Lake Shallow	DELTA W(3)_10	3,563
Owens Lake Shallow	I10(7)_4	3,570
Unknown	KCSD	3,613
Unknown	O6(5)_4	3,569
Unknown	Rio Tinto[a]	--
Unknown	T348	3,633
Unknown	T588	3,693
Unknown	T858	3,670
Unknown	T860	3,711
Unknown	T920	3,601
Unknown	T922[a]	--
Unknown	T924	3,592
Unknown	T925[a]	--
Unknown	T929[a]	--

a. Newly established representative monitoring point or data not currently available. Measureable objective will be established in future GSP updates.

Continuous Global Positioning (CGPS) stations generally have the smallest vertical resolution of the subsidence observations being used. Vertical resolution of CGPS data is station dependent. The more data collected by the station the more accurate the vertical resolution, so older stations tend to have greater vertical resolution compared to newly installed stations. A review of USGS CGPS stations completed in bedrock that have been in operation for over a decade around Owens Lake show a consistent vertical resolution of +/-0.1 ft. The LADWP operates the only GPS monitoring network on the playa (see Figure 4-3 in Appendix 8), but data from this network were not available for inclusion in the GSP. If these data are available in the future, they can be incorporated into future 5-year updates. Vertical resolution of extensometer data is also station dependent, but typically on the order of a thousandth of a foot (Michelle Sneed, personal communication). No extensometers have been installed in the Owens Lake management area as of the date of this report, but two locations have been proposed in the northern and eastern portions of the management area (see Figure 6-1 in Appendix 8).

Currently the only available data of observed subsidence is from InSAR. The measureable objective for land subsidence in the Owens Lake management area has been set to less than 0.07 ft (0.84 inches). This is equal to the vertical resolution of the InSAR data provided by DWR (TRE Altamira, 2021; Towill, 2020).

3.4.3.3 Interconnected Surface-Water Depletions

The majority of surface-water that would naturally enter the Owens Lake management area is diverted to the Los Angeles Aqueduct for export out of the basin. The combination of limited surface-water inflows and the presence of thick clay layers at the surface results in effectively little exchange of water between streams and the groundwater system in the Owens Lake management area. However, groundwater is discharged to the surface along faults and by flowing artesian wells that form springs and small wetlands that provide vital habitat for species in the area. Groundwater is discharged where groundwater flowing toward the lake encounters finer textured lake sediments or encounters fault zones, and flow is deflected to the land surface to form seeps.

The diffuse nature of many of these springs/seeps and the very flat topography of the area make it extremely difficult to measure spring discharge accurately. The use of vertical and horizontal groundwater elevation gradients between nested wells have been proposed as long-term monitoring criteria to provide early warning of potential changes in discharge, but further analysis and data collection are required to develop such gradient-based SMC. It is anticipated these will be included in the 5-year updates to the GSP if necessary to manage pumping conducted under the lakebed. Until gradient-based criteria are established, groundwater elevations are used as a proxy for measurable objectives.

The same measureable objectives used for the groundwater level decline, groundwater storage reduction, and subsidence (Table 3-7) sustainability indicators are also applied to interconnected surface-water depletions. No significant and unreasonable impacts to groundwater dependent ecosystems on the playa caused by pumping have been observed during either of the two averaging periods used. Therefore, maintaining current groundwater elevations should keep the vertical hydraulic gradients that feed the springs and flowing artesian wells that provide vital habitat for species in the area.

3.4.3.4 Water Quality Degradation

Groundwater quality in the Owens Lake management area is generally very poor. Recognizing that the OVGA is not a public water supplier nor does SGMA grant regulatory authority over groundwater quality to GSAs, the water quality degradation sustainability indicator has been interpreted to mean that projects and management actions undertaken by the OVGA cannot result in additional degradation of water quality within the groundwater basin. Because the Owens Lake management area is currently in a dynamic steady state condition, it therefore does not require project and management actions at this time.

Constituents of concern identified in the Owens Lake management area are arsenic, chloride, nitrate, total dissolved solids, and sodium. Measureable objectives for these constituents have been set to the average observed concentration since January 1st, 2000 (Table 3-13). Observed solute concentrations in the management area are naturally occurring. Localized water quality impacts occur primarily from leaking underground storage tanks (USTs), and are already regulated by the State Water Resources Control Board under the Porter-Cologne Water Quality Control Act. The OVGA will report water quality conditions, and will alert and coordinate with responsible agencies as needed if water quality conditions appear to decline in the future.

Table 3-13. Average concentrations for constituents of concern in the Owens Lake management area.

Aquifer Unit	Representative Monitoring Point	Average Concentration since January 1st, 2000				
		As (ug/L)	Cl (mg/L)	NO_3 (mg/L as N)	TDS (mg/L)	Na (mg/L)
1	DVF North	6.6	11.1	--	304.9	58.5
1	Keeler-Swansea	3.3	228.9	--	1,722.5	461.9
1	River	11.5	69.4	--	670.8	166

PRELIMINARY DRAFT

2	DVF North	2	88.6	--	738.1	80.4
2	Keeler-Swansea	4.5	245.2	--	1,903.2	409.8
2	River Site	--	97.6	--	861.9	110
3	DVF North	19.9	155.6	--	1,081.3	124.5
3	OL92-2	33	3,958.6	0.1	14,014	5,431.4
4	DVF North MW	11	206.5	--	1476	149.1
4	Star Trek	11	139.4	--	2223	696.6
5	Fault Test T1	7.2	84.1	--	902.4	123.9
Unknown	1400511-001	--	--	0.4	95	4
Unknown	KCSD	53	103.8	0.1	864.1	157.4
Unknown	W344	0.6	7	0.3	123.3	13.8

3.5 Monitoring Network

A detailed description of current and historical monitoring in the Basin can be found in Appendix 3: Monitoring Plan and Data Gaps Analysis. The representative monitoring locations and graphs of historical data are included there. The sections below briefly summarize the current monitoring network. Historical groundwater level, quality, extraction, surface water gauging, and meteorological data have been uploaded to the publically available OVGA database. The OVGA anticipates updating this database on a regular basis (annually or more frequently) as additional data (post-2020) is made available by the various reporting agencies.

3.5.1 Description of Monitoring Network (Reg. § 354.34)

The objective for the monitoring network is to monitor Basin conditions to maintain sustainable groundwater conditions, detect negative trends towards minimum thresholds and assess progress towards reaching or sustaining measurable objectives. The proposed monitoring network is extensive, with sufficient number of locations and monitoring frequency to track changes in groundwater levels, water quality, depletions of interconnected surface water, and subsidence over time.

Multiple entities have established monitoring programs in the Basin and have provided data to the OVGA. The data are housed in an interactive and publically accessible database which can be viewed at owens.gladata.com. Brief descriptions of existing water resource management and monitoring programs are included in Section 2.12; data sources are described fully in Appendix 3.

The largest and most frequently measured monitoring well network is maintained by LADWP and the Inyo County Water Department. Data from a total of 880 wells with recent (January 1st, 2010 and later) water level observations in the basin have been acquired by the OVGA. Most of the data are from LADWP monitoring programs. The vast majority of these wells are located on adjudicated lands, but there are more than 126 wells with recent water level data identified within the GSP area. Additional monitoring entities or programs include local water suppliers such as CSDs and municipalities, monitoring related to CalEPA regulatory programs (landfills, USTs, etc.), GAMA or CASEGM (see Section 2.12), and monitoring related to CEQA/NEPA permitted actions. In addition, the OVGA may conduct on-site monitoring as needed to fill data gaps, but the level of effort necessary will be small compared to the quantity of data acquired from the extensive set of existing monitoring programs.

In addition to groundwater monitoring, LADWP also has an extensive network of surface water gauges on canals, ditches, creeks and streams located from the perimeter of the basin (base of mountains) and on the valley floor to the Owens Lake. The surface gauging stations have automated data loggers typically recording flow at 15 minute intervals with data totaled and available online or downloaded at monthly intervals. Inyo County receives monthly surface water flow totals, annual runoff measurements, and recharge forecasts from LADWP for the Owens Valley and Owens Lake management areas in the Basin. These measurements and forecasts are based on the stream gauging and meteorological data (precipitation, snow pillows, snow courses, etc.) collected throughout the Sierra from Mono Basin to Olancha/Cartago and at numerous locations across the Owens Valley floor. These data have been added to the OVGA database.

Monitoring data frequency varies by entity. LADWP typically collects monthly or bimonthly measurements. Water levels at landfills in the basin are collected on a quarterly basis. Municipalities appear to collect water level data on a quarterly to annual basis. Most of the data appear to be collected manually. There is no evidence of a groundwater level telemetry system operational in the Basin except some surface water measurements are reported in real time by LADWP. Pressure transducers that collect several daily observations at regular intervals are deployed, primarily by LADWP, throughout the basin in areas of interest; for example, a transducer network is currently deployed (as of summer 2020) in the southern portion of Fish Slough and adjacent portion of the Owens Valley to collect data at one-hour intervals. Another network was deployed in the Owens Lake area from about the mid-1990s to early 2010. The ICWD typically conducts monitoring monthly or annually. More frequent site visits or deployment of a small number of continuous recorders are implemented for projects in specific areas.

From the extensive set of monitoring locations in the database, representative locations for the water level monitoring network were selected using criteria including recent data availability and reliable monitoring, spatial location, proximity to areas of interest (e.g. no- adjudicated area or groundwater production locations), and length and monitoring frequency of the historical data record. The rationale for the subset of representative monitoring locations is discussed in greater detail in Section 3.5.3 below.

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 UST). As a result, most groundwater quality observations acquired by the OVGA and housed in the database are clustered around population centers in the Basin. A total of 115 wells in the Basin have had at least three analytical results for the constituents of concern arsenic (As), chloride (Cl), sodium (Na), nitrate (NO_3), or total dissolved solids (TDS) since January 1, 2010, with 82 of these wells located within the GSP area.

With the notable exception of the Tri-Valley area, the majority of the significant groundwater extraction wells (LADWP, large CSDs, City of Bishop, and smaller population centers like Laws, Big Pine and Lone Pine) in the Basin are metered with monthly or annual totals included in the monitoring network/database. Lack of metered pumping data for the Tri-Valley area is discussed as a data gap in Section 3.5.4. Also, steps the OVGA will undertake to acquire the necessary data to maintain the database are described in Section 4.

The combination of generally stable groundwater levels and/or general lack of susceptible subsurface materials with high potential for subsidence, has led to little historical, dedicated subsidence monitoring. Changes in the Owens Valley surface elevations are more often associated with seismic events. However, as described in Appendix 8, the Owens Valley monitoring network includes InSAR data from DWR's publicly available data set (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub). Figures 5-1 and 5-2 from Appendix 8 display the locations and data from the InSAR set. Continuous Monitoring GPS data was also examined for this GSP preparation to substantiate the InSAR data set and to confirm the lack of historical subsidence, but existing sites are not located in alluvium. This program is not currently slated to be part of the monitoring network. If necessary, subsidence monitoring may be revised to more accurately detect surface elevation changes if pumping projects under or around the Owens Lake are implemented.

3.5.1.1 Description of the Monitoring Network Capabilities

The historical record of hydrographic data acquired thus far varies by location, but often ranges from several years to several decades. The majority of the Basin monitoring network locations have at least quarterly, and usually monthly or more frequent monitoring of surface water and groundwater, which is sufficient to detect both seasonal and multi-year trends. Typical seasonal and intra-annual changes include: 1) rising groundwater levels during the winter from recharge and when phreatophytic vegetation is senescent; 2) rising surface water levels in spring from runoff associated with winter snowmelt; 3) summer declines in both surface and groundwater levels from decreasing runoff and increasing evapotranspiration and pumping demand; 4) minimum flows and groundwater levels generally in the fall. Multi-year trends are typically related to drought or wet periods because pumping has been relatively constant for several decades. Comparing recently collected measurements with the extensive record of historical data for ongoing and anticipated trends in hydrologic conditions will permit the OVGA to distinguish seasonal, annual or weather events like multi-year droughts from increased pumping stress. Continued data collection is a requirement of the various data-collecting agencies (described in Section 2.1.2), and the OVGA anticipates maintaining the hydrologic data in the database during the GSP implementation period largely by acquiring data collected by other agencies.

Key areas of interconnected surface water include the springs in Fish Slough and the perimeter of Owens Lake. In these areas, several groundwater monitoring wells in the network are located in the vicinity of surface water gauging stations. The relationship between interconnected surface water and groundwater discharge can be effectively monitored by comparing changes in groundwater head in a nearby monitoring well to spring discharge in surface water gauge. The historical relationship between groundwater levels and spring flow in Fish Slough is evident. Similar relationships are expected to be developed in the Owens Lake area as more data are collected as part of the ongoing Owens Lake Groundwater Development Project and incorporated into the OVGA database.

As noted in Sections 3.2 and 3.3, the spatial coverage and frequency of data collection in the monitoring network allows qualitative and often quantitative (e.g. ICWD, 2021 annual report) assessment of whether water trends will maintain water levels above minimum thresholds or if levels are progressing towards measurable objectives. Surface water and groundwater levels changes can be summarized on annual time-steps for integration into water budgets and/or modelling efforts. Precipitation, runoff, extraction, and water export values generated by the monitoring network can also be totaled for use in modeling efforts (see Section 2.0 Water Budget). Impacts to beneficial users or significant changes in groundwater conditions can be monitored using wells located upgradient and downgradient from the use of interest. Although data gaps have been identified, primarily in the Tri-Valley area, the GSP includes has management actions to address those gaps using public outreach efforts, inter-agency cooperation, or by pursuing grants for studies and projects (see Section 4).

3.5.1.2 Monitoring Network Applicability to Specific Sustainability Indicators

Chronic Lowering of Groundwater Levels, Reduction in Storage or flow directions: As described in Section 2.2.2.2, water level monitoring is related to groundwater storage and is sufficient to assess whether undesirable effects from change in storage is occurring. The monitoring network in the Basin is comprised of groundwater monitoring wells completed in both the water-table aquifer and deeper zones. The majority of monitoring wells have deep enough screen intervals that even during the severe 2012-2016 drought the wells did not go dry preventing loss of water level (or water quality) data. The representative monitoring wells have multi-decadal history and provide a solid basis for later comparison of trends and SMCs (even in Tri-Valley) to project changes in groundwater levels to avoid chronic declines in groundwater levels. Chronic lowering of groundwater levels in the Owens Valley and Owens Lake management areas have not been observed and are unlikely. Similarly, unreasonable changes in groundwater storage are also unlikely. In the Tri-Valley management areas, a chronic decline in groundwater levels has been detected by the existing monitoring network, ranging from 0 to 2 feet of decline per year for multiple decades. The OVGA will explore the opportunity to expand the monitoring system in the Tri-Valley management area by cooperating with other agencies that may conduct monitoring (e.g. TVGWMD or CDFW) or through acquisition of water levels in domestic wells to close additional data gaps in this management area. The scope of the latter effort will be dependent on voluntary cooperation by residents, but the OVGA is not dependent on implementing additional monitoring to detect and quantify a chronic decline in groundwater levels.

The monitoring network allows for the assessment of hydraulic gradients across all three management areas. The network includes monitoring wells at various depths and in each of the major hydrostratigraphic units. Groundwater generally flows north to south and west to east in the Basin. A groundwater flow path from Tri-Valley to Fish Slough is also hypothesized. Flows paths related to changes in groundwater gradient are unlikely to undergo significant change, but would be detected by the network given the numerous of monitoring locations covering upgradient and downgradient portions of the Basin and in the major aquifers.

Degraded Groundwater Quality: The OVGA will continue to acquire water quality data reported for other purposes and publically available data collected for specific studies in the Basin. The distribution and number of monitoring locations allows groundwater elevation monitoring to supplement and assess the need for additional groundwater quality monitoring. For example, if new pumping stress in the Owens Lake management area led to a significant change in gradient and associated flow path which could cause migration of deeper, saline water, the network's deep and shallow monitoring wells would detect those changes. This provides the OVGA advance warning to implement additional monitoring or management recommendations to prevent degraded water quality. In the Tri-Valley and Owens Valley management areas, water quality is high, especially in the primarily undeveloped areas at the basin margins near the recharge sources. The potential for degraded water quality is low due to this lack of development and related sources of contamination. The network is capable of monitoring changes in water quality in these areas by acquiring publically reported water quality data and studies.

Land Subsidence: As noted in Sections 2.2 and 3.2.3.2, most of the Basin has low susceptibility to subsidence because the combination of chronic groundwater declines and wide-spread susceptible subsurface materials do not exist (Table 7.2, Appendix 8). No historical subsidence has been noted despite numerous droughts and fluctuations in water levels. Based on the low potential for subsidence and the generally sustainable management in the basin, the existing InSAR data supplied by DWR along with the monitoring of groundwater level changes are adequate for the Tri Valley and Owens Valley management areas.

In the Owens Lake management area, thick subsurface clay layers along with the proposed LADWP OLGDP could potentially lead to subsidence. The management area is rated as having a moderate susceptibility for subsidence (Table 7.2, Appendix 8). If the proposed LADWP groundwater development program proceeds, then the monitoring network will need to be increased and made correspondingly more accurate. As part of the OLGDP, LADWP has proposed to monitor surveyed ground surface locations and install two extensometer locations. As a participant on the Owens Lake Groundwater Working Group the OVGA could insist that survey points, extensometer, or tiltmeter monitoring be instituted, and could add these new locations to the GSP. The combination of groundwater level and subsidence monitoring with the existing ground surface (surveyed/InSAR data) and potential future site-specific monitoring will detect potential subsidence in vulnerable areas on the lakebed.

Depletions of Interconnected Surface/Ground Water: Where relevant, direct measurements of spring discharge will continue at existing stations and be updated in the database. In addition, where groundwater discharge to the surface is primarily related to the amount of upward groundwater gradient, groundwater elevation measurements are an effective proxy for determining impacts to interconnected surface/groundwater. This is especially true at locations where groundwater changes can be compared to surface water flow changes. For example, the relationship between declining groundwater level at Fish Slough in monitoring well T397 is correlated with declining surface water discharge from the neighboring Fish Slough Northeast Spring measured at SW3208 gauge. Examining hydraulic head differences in well clusters consisting of adjacent monitoring wells with differing vertical screen intervals is an additional way to monitor groundwater and surface water connections and to assess changes in vertical hydraulic gradient. Numerous monitoring well clusters exist in the monitoring network in all three management areas, particularly in the Fish Slough and Owens Lake areas where the majority of interconnected waters exist within the Basin. By comparing historical and future hydraulic vertical gradients using cluster wells, the monitoring network will detect decreases in upward groundwater flow that could lead to decreases in groundwater discharge to surface waters.

In areas of GDE, evapotranspiration and vegetation cover is related to water table depth and groundwater elevation monitoring (Elmore et al., 2003 & 2006). Monitoring water levels is a sufficient proxy to indicate potential for reductions in groundwater discharge caused by groundwater management.

Monitoring Network and Management Area Considerations: The Tri-Valley Management Area contains the least amount monitoring data to describe the long-term groundwater level declines and consistent pumping stress. As noted in section 3.5.4, the OVGA will attempt to address this monitoring gap using a variety of methods. A 2021 survey sent to Tri-Valley residents has yielded several potential domestic well owners willing to allow OVGA staff to monitor groundwater levels in their wells. OVGA has attempted extensive outreach with Tri-Valley Groundwater Management District agricultural pumpers in an attempt to ascertain annual pumping amounts and is exploring acquiring data from indirect methods to estimate agricultural pumping based on remote sensing. The OVGA is exploring grant opportunities and the potential for cooperative agreements with state and federal agencies with land jurisdiction in the basin to fund additional water level monitoring.

The Owens Valley Management Area contains the greatest density, highest frequency, and longest record of historical monitoring due to LADWP's surface and groundwater extraction activities. The robust monitoring network available for this management area near population centers and near LADWP wellfields in the adjudicated area is evident in the online database and is more than sufficient to assess conditions and trends. The exception to this monitoring density and frequency is in the northwestern corner locally referred to as Round Valley. This area currently has low pumping stress and ample surface water diversions. It currently has little potential for future development or extraction. Based on these circumstances and the observed stable groundwater levels, the more limited monitoring in Round Valley (primarily from Wheeler Crest CSD and LADWP monitoring) is deemed sufficient but could be improved under this GSP (Section 4, Project #3).

Although there is currently little pumping stress in the Owens Lake Management Area, potential projects in development could change conditions. As described in Sections 2.1.2, 2.1.3 and 3.2.3, LADWP is developing a groundwater development program to pump saline groundwater from confined aquifers under the Owens Dry Lake. There are several regulatory programs that could apply to any eventual groundwater development including SGMA though none (except compliance with CEQA) are certain. As part of the planning efforts, LADWP has installed and continues to upgrade an extensive system of surface water, groundwater, extraction, ground surface, meteorological and vegetation monitoring equipment. The OVGA anticipates that additional monitoring locations will be added to the OVGA monitoring network and database as more data becomes available as the project development proceeds.

The robust set of representative monitoring wells selected for the Owens Lake Management Area anticipates potential future pumping under the lakebed. The proposed monitoring network includes wells completed in multiple confined aquifers beneath the lake and cluster wells with differing vertical screen intervals in the unconfined aquifer that supports GDEs along the lake perimeter, in seep and spring areas, and upslope on alluvial fans. LADWP has also installed a subsidence monitoring network (see Appendix 8) and anticipates installing extensometers at two locations in deeper lake-area wells. The monitoring network can be used for baseline/background data and will be used to prevent significant and unreasonable effects caused by deviations from historical groundwater levels if LADWP's project or another unforeseen project is implemented.

3.5.2 Monitoring Protocols for Data Collection and Monitoring (Reg. § 352.2)

This section will briefly review the monitoring protocols necessary to implement the GSP. Detailed descriptions are contained in Appendix 4, Sampling and Analysis Protocol (SAP). The SAP was prepared in accordance with DWR SGMA inspired Best Management Practices (BMP), in particular BMP #1 - M*onitoring Protocols, Standards, and Sites* (DWR, 2016b). Technical guidance documents considered in preparation of the SAP include, but are not limited to, the following documents:

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

Links to complete documents cited in the SAP are included in the References Section and available online.

3.5.3 Representative Monitoring (Reg. § 354.36)

Due to the large size of the basin and varying hydrologic conditions and pumping stresses, the OVGA decided to split the basin into three Management Areas (Section 2.2.4). Within each management area, representative monitoring wells have been selected from the larger, comprehensive monitoring network that reflect the prevailing hydrologic conditions and react to changes in water balance components such as recharge and pumping. This GSP includes 86 representative monitoring sites to monitor conditions and SMC for the relevant sustainability indicators at these locations to periodically evaluate the sustainability of the Basin. The sites include groundwater monitoring wells, surface water flows at Fish Slough springs, and sites for remotely sensed ground elevation measurements. Locations and description of the representative sites are contained in Section 3.5.1 and Appendix 3. Data from wells other than the representative monitoring sites will continue to be acquired for the monitoring network and will be used to evaluate the adequacy of the representative sites when the GSP is updated. Subsidence Monitoring using InSAR measurements at representative locations is described in Section 2.2.2.4 and Appendix 3.

Minimum Thresholds and Measureable Objectives have been established at representative monitoring wells as detailed in Sections 3.2 and 3.3, respectively. The representative wells have an extensive historical data record with semi-annual or more frequent groundwater observations over many years along with well construction information and geologic information. Most wells are part of ongoing monitoring programs from OVGA members and future data availability should not be a limitation. All representative wells are in good physical condition. The wells are spatially dispersed in all management areas, and most are constructed in the uppermost water table aquifer. Some wells are completed in deeper confined or semi-confined aquifers, primarily in Fish Slough and Owens Lake Management Area.

In most portions of the Basin multiple monitoring candidate locations exist, and additional criteria were developed to select the representative wells to ensure the selected wells reflected general water level conditions in the area. Criteria included: proximity to either recharge area or extraction stress (creeks, ditches, reservoirs and actively pumped wells); subsurface characteristics and proximity to any structural heterogeneities (faults, alluvial/volcanic contacts, etc.); proximity to more sensitive resources (domestic wells, GDEs, etc.); upgradient or down-gradient wells for water quality assessment. Hydrographic data and well logs were examined for all nearby wells to select wells that accurately reflected regional groundwater patterns. The prevailing selection strategy was to select wells that were in good hydrologic communication with the surrounding region and that were located near enough to recharge/pumping zones to reflect seasonal and annual changes. Wells unduly influenced by local recharge sources such as temporary water spreading for recharge or consistent surface water seepage or adjacent to larger supply wells that may turn on/off on daily or weekly time frames were not selected.

3.5.4 Assessment and Improvement of Monitoring Network (Reg. § 354.38)

Identification and description of data gaps is described in detail in Appendix 3. As noted in Section 3.5.4 and Appendix 3, during the initial 5-year implementation of the GSP, the OVGA plans to address data gaps in the Basin. The OVGA may add new monitoring points to the current representative monitoring wells if suitable monitoring become available. Additionally, if as a part of ongoing monitoring or if groundwater conditions change or are expected to change, the GSP will be updated to add or alter monitoring locations, methods, or frequency. Management Actions and Projects #1, #2, and #3 described in Section 4 were included in the GSP address high priority data gaps will include annual review and evaluation of the monitoring network as part of the database maintenance.

4. Projects and Management Actions to Achieve Sustainability Goal (Reg. § 354.44)

Groundwater Sustainability Plans must include *"a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin"* (Reg. § 354.44). As established above, the Basin is currently ranked low priority and overall, groundwater conditions are sustainable. The OVGA has chosen to develop this GSP to ensure groundwater conditions in the basin are maintained or improved where applicable. An additional consideration in developing this list of Management Actions and Projects was to not place an undue financial or regulatory burden on local residents recognizing that compliance with SGMA is voluntary for the OVGA (See Fund1 in guiding principles, Section 1.2). Given the sustainable condition and low priority status, the management actions and projects discussed in this section will be implemented at the discretion of the OVGA.

Four proposed Management Actions and Projects are summarized in Table 4-1 and discussed individually below. Design specifics for projects, implementation plans, or OVGA regulations will be prepared as applicable after adoption of this GSP and will be made available for public review and comment before Board decisions to implement an action. As this GSP is implemented, if the management actions or projects cannot be implemented due to lack of funding, the OVGA will determine whether to pursue outside funds or impose fees to implement the project if it is necessary to maintain sustainability of the Basin or GSA viability. Decisions regarding imposition of fees will be consistent with the OVGA Guiding Principles (CEP and Section 1.2)

4.1 Proposed Management Action #1: Well Registration and Reporting Ordinance

The purpose of this proposed management action is to address a data gap regarding well locations and pumping amounts in the Basin. Several water providers or commercial pumpers did not respond to requests to provide data voluntarily to the OVGA to include in the GSP. In some portions of the basin the data gap is considered high priority, for example no pumping information was provided for the Tri-Valley Management Area (Appendix 3). The proposed ordinance will describe methods for measurement of pumping (e.g. flow meters on wells) or procedures for estimation of pumping rates and volumes using power consumption data. In addition, the list of domestic wells in the Basin is probably incomplete. Registration of *de minimis* pumpers is permitted by SGMA, and the ordinance may include a one-time voluntary report to acquire information on well location, well construction characteristics, water levels, and approximate production amounts. This basic information is already required by local and State regulations as part of well permitting and well completion reports. The ordinance will contain procedures, timing, and methods to register a well and submit needed information which will be reviewed for quality control and entered in the OVGA database.

Circumstances under which projects or management actions shall be implemented and criteria that would trigger implementation and termination: The OVGA shall determine the timing of when to consider a Well Registration and Reporting Ordinance following adoption of the GSP; however, this program will be a necessary to complete and maintain a current database of pumping locations and amounts. Termination of this program would be at the discretion of the OVGA. Data relevant to activities and monitoring in the adjudicated portion of the Basin will be exempt from the ordinance, but subject to the data sharing requirements of the LTWA (Section 2).

Permitting and regulatory process: Preparation of a Well Registration and Reporting Ordinance would be exempt from environmental regulations or permitting. The OVGA will follow all public noticing and review requirements when preparing and adopting the ordinance.

Justification and Benefits: SGMA requires GSAs to maintain a database of hydrologic and hydrographic data (§354.40). Substantial effort and state funds have been expended to compile historical data into the OVGA database, yet data gaps remain (Appendix 3). This ordinance is necessary to address multiple data gaps identified as high to low priority (e.g. well location, construction, production). Expected benefits of this management action will be a more accurate and complete database and ready access to groundwater information to all beneficial users in the Basin. If it becomes necessary for the OVGA to regulate pumping amounts or well spacing to prevent well interference or other impacts to private wells, a complete registration of all pumpers is necessary.

Implementation: The OVGA retains discretion whether to implement this management action depending on funding, staffing, and need. If the Well Registration and Reporting Ordinance is adopted, OVGA staff or contractors will establish a contact list of well owners, develop mail and on-line reporting forms and procedures including establishing a location on OVGA.us to submit the required information. Pumpers in the Basin will be given ample opportunity and time to prepare the requested well and pumping information. Initially, well registration and reporting potentially could be required of all well owners, but ongoing reporting of pumping would only be required for agricultural, commercial, or municipal pumpers, and CSD/mutual water companies but not *de minimis* users. Staff will inspect data received and update the OVGA database approximately annually. Specifics regarding timing and level of detail of the reported data will be described in the ordinance.

Legal authority: The OVGA members created a JPA in accordance with California Government Code Section 6509 to jointly exercise their powers as the exclusive GSA for the Basin and for the purpose of preparing this GSP. Descriptions of the powers are contained in Article II, Section 2 of the JPA included in Appendix 1. The JPA will remain in effect until terminated by unanimous consent of active members or when there are fewer than two members remaining in the OVGA.

SGMA grants GSAs the powers and authorities to *"perform any act necessary or proper…"* including adopting *"..rules, regulations, ordinances, and resolutions…"* necessary for SGMA implementation (CWC 10725.2(b)). Registration of groundwater extraction facilities and reporting is permitted by SGMA (CWC 10725.6 and 10725.8). Acquisition of groundwater pumping and well information is necessary to manage groundwater in accordance with SGMA.

Procedures for providing noticing to the public: In addition to applicable noticing and public hearings to adopt an ordinance (reference), the OVGA will post all notices on its website and notify individuals on its interested party contact list before adoption in accordance with CWC 10725.2(c).

Cost: The OVGA will incur staff, administrative, and noticing costs to prepare and adopt the Well Registration and Reporting Ordinance. Costs are estimated to be $14,370. Costs to receive, catalog, enter data, and perform all program functions are estimated to be $360 annually. The low estimated costs reflects the nearly complete extraction dataset for the Basin already obtained by the OVGA.

4.2 Proposed Management Action #2: Well Permit Review Ordinance

The purpose of this proposed management action is to acquire information necessary to maintain an up-to-date database of pumping wells in the Basin. Additionally, the ordinance would allow the OVGA to determine if regulation of new wells under SGMA is applicable and necessary to ensure sustainable conditions are maintained. The proposed ordinance will require well construction permit applications submitted to Inyo or Mono Counties be provided to the OVGA for review. The Ordinance will include criteria the OVGA will apply to determine the need to regulate pumping from a new, reactivated, or replacement well. The scope of the permit review will be tailored as necessary to determine the need for groundwater management based on the potential for a well described in a permit to exceed a minimum threshold, prevent attaining a measureable objective, or to create other significant and unreasonable effects (e.g. well interference, surface water depletion). The Ordinance will describe the conditions the OVGA may place on well construction, location, capacity, or extraction to ensure sustainable groundwater conditions are maintained in the Basin. Small capacity wells for *de minimis* extractors are exempt from most SGMA provisions including regulation of pumping. Permits for such wells will be reviewed primarily to acquire information to update the database and ensure the use and production of the well is correctly cataloged as *de minimis*.

Circumstances under which projects or management actions shall be implemented and criteria that would trigger implementation and termination: The OVGA shall determine the timing of when to consider a Well Permit Review and Ordinance following adoption of the GSP; however, this program will be necessary to maintain a current database of pumping locations and amounts and determine the need for groundwater regulation of new wells. Termination of the program would be at the discretion of the OVGA.

Permitting and regulatory process: Preparation of a Well Permit Review Ordinance would be exempt from environmental regulations or permitting. The OVGA will follow all public noticing and review requirements when preparing and adopting the ordinance.

Justification and Benefits: SGMA requires GSAs to maintain a database of hydrologic and hydrographic data (§354.40). Substantial effort and state funds have been expended to compile historical data into the OVGA database, and this ordinance is necessary to maintain an accurate and up-to-date database and determine the need for groundwater regulation. The database provides to groundwater information to all beneficial users in the Basin in a readily accessible format.

Implementation: The OVGA retains discretion whether to implement this management action depending on funding, staffing, and need. If the project proceeds, the Ordinance will describe the procedure for Inyo and Mono County departments responsible for approving well permits to provide the permits to the OVGA for review. The Ordinance will specify the procedures the OVGA will employ to complete its well permit review, including deadlines to complete and notification of the applicant and surrounding properties. If additional conditions on a well location, construction, or operation are warranted, the Ordinance will contain procedures to modify the permit or to appeal the decision.

Legal authority: The OVGA members created a JPA in accordance with California Government Code Section 6509 to jointly exercise their powers as the exclusive GSA for the Basin and for the purpose of preparing this GSP. Descriptions of the powers are contained in Article II, Section 2 of the JPA included in Appendix 1. The JPA will remain in effect until terminated by unanimous consent of active members or when there are fewer than two members remaining in the OVGA.

SGMA grants GSAs the powers and authorities to *"perform any act necessary or proper…"* including adopting *"…rules, regulations, ordinances, and resolutions…"* necessary for SGMA implementation (CWC 10725.2(b)). Acquisition of groundwater pumping and well information is necessary to manage groundwater in accordance with SGMA. Registration of groundwater extraction facility and reporting is permitted by SGMA (CWC 10725.6 and 10725.8) as is regulation of pumping (CWC 10726.4).

Procedures for providing noticing to the public: In addition to applicable noticing and hearing requirements to adopt an ordinance (reference), the OVGA will post all notices on its website and notify individuals on its interested party contact list before adoption. Procedures for communication and any necessary agreements between County Departments responsible for well permits, permit applicants, and the OVGA will be included in the Ordinance.

Cost: The OVGA will incur staff, administrative, and noticing costs to prepare and adopt the Well Permit Review Ordinance. Hydrology staff or contractors may be retained to complete the permit review. Costs are estimated to be $7,920. Annual costs to receive, review, analyze potential pumping effects are estimated to be $1,740 based on the recent history of well permit applications submitted to Inyo and Mono Counties. The low cost of this of this project reflects the relatively low number of well permit applications in the Basin, approximately 40 each year (many in the adjudicated portion) .

4.3 Proposed Management Action #3: Increase groundwater level monitoring network

The purpose of this proposed management action is to address a data gap regarding the paucity of water level measurements primarily in the Tri-Valley Management Area. The current water level monitoring network in the Benton and Hammil Valleys and to a lesser extent Chalfant Valley is insufficient for detailed mapping of groundwater elevations. Without reasonable estimates of the groundwater elevations across the valleys, a domestic well vulnerability assessment is difficult and reliant on several (though reasonable) assumptions. This data gap added uncertainty in developing SMCs and in the assessment of whether or where groundwater conditions may cause unreasonable effects. The limited data acquired by the

OVGA, show water levels have been slowly but consistently declining in the Tri-Valley area for decades. Filling this data gap is recommended as high priority, and collecting water level data from existing wells is the most expedient and cost-effective solution. In addition, water level data for Round Valley in the Owens Valley Management Area and south of Olancha in the Owens Lake Management Area are sparse and might be expanded by monitoring private wells if volunteer owners are identified. Pumping stress in these parts of the Basin is much lower and thus filling those data gaps is a lower priority. This management action will consist of two components, a voluntary program of monitoring existing privately-owned wells and a potential program to install additional, dedicated monitoring wells.

Circumstances under which projects or management actions shall be implemented and criteria that would trigger implementation and termination: Following adoption of the GSP, the OVGA will determine whether to implement this management action. First, the OVGA must ascertain whether well owners are willing to participate in a voluntary monitoring program. The program will require the OVGA enter into land access agreements with willing well owners. The time required to finalize access agreements or what conditions a well owner may request are not known. Access for the OVGA to conduct monitoring would be voluntary and could be terminated by the well owner at any time. Discontinuing the overall water level monitoring program would be the discretion of the OVGA.

Construction of new dedicated monitoring wells by the OVGA is contingent on acquiring funding and developing land access/lease agreements with landowners at suitable locations in the Basin.

Permitting and regulatory process: Instituting a private well monitoring program would be exempt from environmental regulations or permitting. Fieldwork will be conducted by qualified, and certified staff or contractors and will comply with all applicable regulations, standards, and monitoring protocols to prevent contamination or damage to private property.

Installation of new monitoring wells will comply with CEQA and applicable permitting and regulations pertaining to well installation. Monitoring wells will be constructed in accordance with current State regulations.

Justification and Benefits: Substantial effort and state funds have been expended to compile historical data into the OVGA database, yet data gaps remain (Appendix 3). Expanding monitoring in the Tri-Valley portion of the Basin is necessary to address multiple high priority data gaps for well information (e.g. location, construction) and for characterization of water levels. Similar efforts in other portions of the Basin may be beneficial but are not as high priority. Expected benefits of this management action are a more accurate and complete characterization and description of groundwater conditions and trends. The data will be housed in the OVGA database and readily accessible to all beneficial users in the Basin.

Implementation: Responding to a mailed survey sent by the OVGA to the Tri-Valley Management Area residents, several well owners in the Tri-Valley Management area expressed interest in participating in a water level monitoring program. To increase the number of candidate locations, the OVGA will add a form to its website to allow well owners to volunteer for the program or request monitoring of their well. The OVGA must inspect each well to determine if it is suitable for monitoring and would provide reliable and useful information. Based on that inspection, the OVGA would select which wells to include in the program and begin negotiating access agreements. Monitoring frequency would be a condition in access agreements, but should be at least annually or semi-annually. Monitoring may be conducted by the OVGA or in cooperation with another agency such as the TVGWMD. The program could also include monitoring of existing or new wells owned by state or local agencies under a cooperative arrangement with the OVGA or TVGWMD.

If the private well monitoring program is insufficient to fully address the data gap, the OVGA may seek funding to install wells owned by the Authority. Implementation of this program is contingent on acquiring funding and developing land access/lease agreements with landowners at suitable locations in the Management Area.

Legal authority: The OVGA members created a JPA in accordance with California Government Code Section 6509 to jointly exercise their powers as the exclusive GSA for the Basin and for the purpose of preparing this GSP. Descriptions of the powers are contained in Article II, Section 2 of the JPA included in Appendix 1. The JPA will remain in effect until terminated by unanimous consent of active members or when there are fewer than two members remaining in the OVGA.

SGMA grants GSAs the powers and authorities to *"perform any act necessary or proper…"* including adopting *"…rules, regulations, ordinances, and resolutions…"* necessary for SGMA implementation (CWC 10725.2(b)). The OVGA is permitted to enter into agreements with a private party to assist in or facilitate the implementation of a GSP (CWC 10726.5). Similarly, the

OVGA may acquire by purchase or lease real property and construct improvements (i.e. monitoring wells) to carry out the purposes of the GSP (CWC 10726.2). Expanding the number of groundwater level monitoring locations either by agreement with private parties or construction of monitoring wells is currently considered necessary to manage groundwater in accordance with SGMA.

Procedures for providing noticing to the public: The OVGA will publicize all requests for well owners to volunteer for the monitoring program and modify the website (https://ovga.us/) to facilitate requests to the OVGA for monitoring. The TVGWMD will be notified and kept apprised of the development and implementation of the monitoring program.

Cost: The OVGA will incur staff, administrative, and noticing costs to inspect candidate well and prepare land access agreements. The cost of the inspections and conducting the monitoring depends on the number of wells but has been estimated at $26,730 with ongoing costs of $10,050 assuming approximately 20 additional monitoring locations may be visited semi-annually. The scope of the project and costs will be determined by the OVGA considering available funding. If it determines additional wells dedicated to monitoring are necessary, the OVGA could incur staff costs to procure outside funding and potential lease costs with landowners where new monitoring wells are sited. Costs for well construction are contingent on acquisition of funding.

4.4 Proposed Project #4: Tri-Valley Groundwater Model Development

Water levels in the Tri-Valley Management Area have been steadily declining approximately 0.5-2 ft/year for 20-30 years (depending on location and data record). Spring discharge into Fish Slough, an Area of Critical Environmental Concern, likewise has steadily decreased over the last 30 years. Available geologic and hydraulic evidence suggests there is hydrologic connection between the Tri-Valley and Fish Slough areas, and that the declining water levels in Tri-Valley are associated with reduced spring discharge at Fish slough. If these trends continue, spring discharge is expected to cease completely at some locations within the next few years, which will severely degrade or eliminate a significant portion of remaining habitat for the endangered Owens pupfish and threatened Fish Slough milk-vetch which are dependent on spring flow and water management.

CWC Section 106 states that it is *"the established policy of this State that the use of water for domestic purposes is the highest use of water and that the next highest use is for irrigation."* It is not feasible or reasonable for the residents and agricultural producers in the Tri-Valley communities to make immediate or drastic reductions in pumping without economic and social hardship or without potentially impacting air quality (see Fund 1 guiding principle in Section 1.2). More importantly, insufficient information exists for the OVGA (or another agency) to design a program to manage pumping to ensure the SMC for water levels in the valleys and spring flow are achieved.

Despite the importance of spring discharge in Fish Slough for maintaining habitat and declining discharge rates over multiple decades, its water source is currently inferred indirectly from geologic and hydrologic data. Based on general geochemistry, stable isotopes, and tritium, Zdon et al., (2019) concluded Fish Slough springs were sourced by a combination of water from Tri-Valley to the east, or the shared recharge areas for Adobe Valley and the Volcanic Tablelands to the north and northwest. The geochemistry of source water varied spatially within Fish Slough, suggesting it is located at a convergence of regional groundwater flow paths. The authors did not quantify the proportion each source area contributed to a particular spring or seep discharge.

As part of the development of this GSP, the OVGA has improved the understanding of several of the water balance components for the Tri-Valley management area, in particular developing two land surface models to estimate groundwater recharge (Appendices 10 and 11). The OVGA proposes to build upon these recent advances in knowledge of source area and water balance by developing a regional hydrogeologic groundwater model to simulate groundwater levels, flow and spring discharge within Fish Slough and the Tri-Valley management area. Expected benefits from the model include: 1) compile all relevant hydrogeologic information into a single repository, 2) increase regional geologic understanding by developing a 3D geologic model, 3) quantify the amount of recharge and flow paths from specific areas, and 4) provide an indispensable tool for predicting anticipated effects of proposed management actions to address declining spring flow and water levels in the management area.

<u>*Circumstances under which projects or management actions shall be implemented and criteria that would trigger implementation and termination*</u>: Presently the OVGA, nor its member agencies possess sufficient funding to complete the groundwater model development. The Tri-

Valley area includes a Disadvantaged Community and imposition of fees to fund the project is not preferred. Grant funding is actively being sought through the Inyo-Mono Integrated Regional Management Group (IMIRMG) for a portion of the required budget. Requested funds total $150,000 with up to an additional $150,000 anticipated as matching funds or in-kind contribution to complete the project. Initiation of the project is contingent on obtaining the necessary funding.

Permitting and regulatory process: This is a data compilation and groundwater modeling project. There will be no public noticing requirements, permitting, or regulatory process for this project.

Justification and Benefits: The lack of a numerical groundwater flow model was identified as a high priority data and knowledge gap. The capability to manage groundwater pumping is dependent on an ability to predict the impacts of recharge and pumping on the aquifer system. The GSP has documented the gaps in monitoring network and water balance and contains proposed steps to address them. Many of the datasets required to develop the proposed numerical groundwater flow model have already been compiled and processed as part of this GSP preparation. Increased understanding of the hydrogeologic system, and data collected as part of the modeling effort, could in turn inform subsequent GSP updates. The model could also be used to help determine specific GSP criteria such as sustainable yield, measureable objectives, and minimum thresholds for the Tri-Valley area, which is data poor compared to the rest of the Owens Valley groundwater basin. All measureable objectives for this Management Area are expected to benefit from the project.

Additional data alone will be insufficient to determine how pumping should be managed to stabilize water levels or spring flow above minimum thresholds or to recover water levels to the measurable objectives. Greater understanding of the regional hydrogeologic flow system is vital to determine causality and to develop solutions to arrest or reverse the declines in water levels and spring flow discharge observed within Fish Slough. Numerical groundwater flow models can provide this by integrating the multiple sources of data, information, and knowledge available for the area into a single system. It would be inappropriate and infeasible to impose regulations on pumping that could cause economic and social hardship or degrade the agricultural landscape and air quality based on incomplete knowledge. This project is necessary for the OVGA, Tri-Valley residents, and concerned public to have confidence that potential pumping management measures will accomplish the intended positive effects to the groundwater system and avoid causing other undesirable results.

Implementation: Implementation of the project requires acquisition of outside funds. If funds are acquired, the OVGA will enter into the necessary grant agreements to expend the funds. The work will incur staff time, but a contractor with expertise in groundwater modelling will likely be selected to complete the study.

Legal authority: The OVGA members created a JPA in accordance with California Government Code Section 6509 to jointly exercise their powers as the exclusive GSA for the Basin and for the purpose of preparing this GSP. Descriptions of the powers are contained in Article II, Section 2 of the JPA included in Appendix 1. The JPA will remain in effect until terminated by unanimous consent of active members or when there are fewer than two members remaining in the OVGA.

SGMA grants GSAs the powers and authorities to *"perform any act necessary or proper…"* including adopting *"…rules, regulations, ordinances, and resolutions…"* necessary for SGMA implementation (CWC 10725.2(b)) including groundwater investigations (CWC 10725.4(b)). Developing a groundwater model for the Tri-Valley Management Area is necessary to manage groundwater in accordance with SGMA.

Procedures for providing noticing to the public: This is a data compilation and groundwater modeling project. There will be no public noticing requirements, permitting, or regulatory process for this project. The TVGWMD will be informed of all applications for funds and progress on the project if it proceeds.

4.5 Additional OVGA Activities

4.5.1 Owens Lake Groundwater Development Project

In this GSP the OVGA has designated the southern portion of the basin including Owens Lake as a separate management area. The geology of Owens Lake Management area is distinct from the rest of the Basin, and it has areas of naturally occurring poor water quality due to evaporative concentration at the terminus of the closed basin. The current pumping stress in the Management Area is imperfectly quantified but is known to be relatively low compared to the rest of the Basin. The Well Registration and Reporting Ordinance and database updates should address the recognized data gaps. Water level conditions are stable, and the overall management goal for the Owens Lake Management Area is to maintain current conditions in areas of sensitive vegetation and near existing beneficial uses of groundwater.

LADWP is proceeding with plans to develop saline groundwater from aquifers beneath the lakebed to replace potable water from the Los Angeles aqueduct presently used for dust control (dust control regulation or management is not subject to SGMA or this GSP). The OLGDP has identified the sensitive resources potentially affected by the project, most of which overlap with SGMA sustainability indicators, e.g. water levels, surface water capture (springs), water quality, and subsidence. Details of the potential pumping project including the monitoring methods and locations or management triggers are not yet finalized. A fundamental principal of the OLGDP, however, is to include an adaptive management strategy to evaluate monitoring results, and based on the observations, adjust pumping, monitoring, or management triggers, or take other actions to avoid impacts to sensitive resources. Such a strategy could be accommodated in future GSP updates.

The application of SGMA and this GSP to the OLGDP is uncertain. Lands managed pursuant to the LTWA are exempt from SGMA (CWC §10720.8), but except for some areas on the edge of the lake, most of the OLGDP is not on LADWP-owned lands. There is an outstanding dispute resolution proceeding between Inyo County and LADWP over whether the LTWA applies to Owens Lake with LADWP contending that the LTWA doesn't apply and Inyo County contending that it does. This dispute was not resolved and was put on hold without prejudice while the OLGDP proceeded. Unless managed pursuant to LTWA, Owens Lake pumping might be subject to regulation by this GSP.

The lakebed is owned and managed by the California State Lands Commission (CSLC), and LADWP operations on State Lands are conducted under a CSLC lease. State agencies are required to *"…consider the policies of [SGMA], and any groundwater sustainability plans adopted pursuant to [SGMA], when revising or adopting policies, regulations, or criteria, or when issuing orders or determinations, where pertinent"* (CWC §10720.9). SGMA *"…does not authorize a local agency to impose any requirement on the state or any agency, department, or officer of the state. State agencies and departments shall work cooperatively with a local agency on a voluntary basis."* (CWC §10726.8(d)). The CSLC could make compliance with an adopted GSP part of their future lease requirements. Given the various sources of uncertainty regarding oversight for the OLGDP, this GSP was prepared assuming it could apply to the lakebed.

LADWP established the Owens Lake Groundwater Working Group of stakeholders as part of the OLGDP while the research is conducted on the lake to develop a management plan and associated CEQA analysis for the project. An idea to create a multi-agency entity to oversee adaptive management and provisions of a CEQA monitoring and mitigation plan has been proposed, but the regulatory framework has not been finalized. This GSP proposes that the OVGA actively participate in the working group and coordinate with state and local agencies with land management responsibilities to ensure this management area is managed sustainably to avoid undesirable results. If desired, the OVGA may establish an advisory committee for the Owens Lake Management Area (JPA Article I.5, Appendix 1) to assist the Board.

4.5.2 Provide assistance acquiring state or federal funding

It is anticipated that as the GSP is implemented, the OVGA will require or desire additional grant funding to conduct activities described in the plan. The OVGA is a signatory to the IMRWMG, and staff from the group are experienced and well positioned to identify grant opportunities that may be applicable to the OVGA or its members. The OVGA will support the IMRWMG to provide assistance identifying and acquiring state or federal funding for projects for monitoring, studies, or potential measures to improve groundwater use efficiency or conservation. The Board will consider contracting with the IMRWMG to manage grants awarded to the OVGA. Details regarding specific services that may be provided to the OVGA or compensation have not been determined and will be defined in subsequent agreements between the agencies.

4.5.3 Develop a pumping program to stabilize water levels in Tri-Valley Management Area

Declining water levels in the Tri-Valley Management Area have been documented as discussed above (Section 2 and Appendix 3). For a largely unconfined aquifer system, this suggests overdraft is occurring, but the presence or amount of overdraft is not readily apparent in the water balance (Section 2.2.3). The ambiguity is partially due large data gaps in the management area which should be addressed by Management Actions described above to require additional data reporting and for groundwater model development. If an overdraft condition is confirmed and measures to improve efficiency or land use practices are not effective or not implemented, the OVGA will take steps to develop a pumping plan to ensure sustainable conditions are achieved and undesirable results prevented. GSAs have the authority to control groundwater extractions (CWC §10726.4(a)). This potential management action is dependent on development of a numerical groundwater model to adequately inform OVGA decision makers. Specifics regarding potential management actions that may be implemented are not possible at the time this GSP was prepared and will be included in future GSP updates.

Table 4.1 Summary of Management Actions for each Management Area including timeline and events that initiate the actions. The Management Actions are also organized the applicable sustainability indicator.

Tri-Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
Lowering of Water Levels, Reduction in Storage	Stabilize Declining Water Levels	Set SMC minimum threshold at the anticipated groundwater elevation in 2030 and measurable objective at the level measured in January 2015.	Include in approved GSP	Short	N/A	
		Establish supply well registration and reporting	Well Registration and Reporting Ordinance	Short	GSP adoption	Information is necessary to fill data gap and to maintain the OVGA database
		Review new permits for water supply wells. Regulate production if necessary to ensure water levels remain within SMC	Well Permit Review Ordinance (de minimis excluded)	Short	GSP adoption	Information necessary to maintain OVGA database. Hydrology staff or contractor required.
		Increase groundwater level monitoring network	Land access agreements for monitoring	Short	GSP adoption	Information is necessary to fill data gap. Dependent on

PRELIMINARY DRAFT

Tri-Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
			existing wells or new monitoring well installation			grant funding for new monitoring wells. Hydrology staff or contractor required
		Develop groundwater model for Tri-Valley/Fish Slough management area	Grant agreement	Short or Long	Grant Funding Awarded SMC Minimum Threshold hit	Dependent on grant funding. Necessary to fill data gap
		Provide assistance acquiring state or federal funding for projects to improve groundwater use efficiency or conservation	Resolution	Medium	Grant Funding Opportunity	Conducted by or in cooperation with TVGWMD and Inyo-Mono IRWMP
		If efficiency gains have not addressed the declining water levels, based on the model and monitoring, develop a pumping program to stabilize water levels by 2030 and attain the measurable objective by	GSP amendment	Long	SMC Minimum Threshold hit Completed Groundwater Model	Dependent on groundwater model completion and could require an additional 1-2 years to prepare

PRELIMINARY DRAFT

Tri-Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
		2042				
Surface Water Depletion	Stabilize Fish Slough Spring Discharge	Set SMC minimum threshold at 0.1 cfs and measurable objective at 0.5 cfs for Fish Slough Northeast spring	Include in approved GSP	Short	N/A	
		Cooperate with agencies having jurisdiction in the Fish Slough sub-basin to acquire grant or other funding for studies and projects.	Provide letters of support	Short	Board Direction	Necessary to address data gap.
		Develop groundwater model for Tri-Valley/Fish Slough management area	Grant agreement, letters of support for grant applicants	Short or Long	SMC Minimum Threshold hit Grant Funding Awarded	Dependent on grant funding. Necessary to fill data gap
		If a pumping effect is determined from monitoring or the model, develop a pumping program or other contingency measures (e.g. wells) to stabilize pumping effect on	GSP amendment	Long	Completed groundwater model	

PRELIMINARY DRAFT

Tri-Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
		the spring at the SMC management objective				
		If a pumping effect is determined, seek or support grant opportunities for agricultural water use efficiency or multi-benefit land repurposing	Grant Agreement or letters of support for grant applicants	Long	Board Direction	Conducted by or in cooperation with TVGWMD and IRWMP
		Identify recharge sources supporting GDEs in Tri-Valley and support land management that enhances or maintains recharge	Letters of Support Land Access Agreement for monitoring	Long	Completed groundwater model Expanded water level monitoring	Additional monitoring equipment (e.g. flow gauges or monitoring wells) or imagery would require funding
Subsidence	Prevent subsidence	Set SMC minimum threshold of 0.3 ft and measureable objective based on average water level and 0 ft of subsidence	Include in approved GSP	Short	N/A	
		Monitor water levels. Monitor ground elevation utilizing publicly available	None	Short	Board Direction	Hydrology staff or contractor required to analyze data and report

PRELIMINARY DRAFT

Tri-Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
		remote sensing methods				findings
Water Quality	Track Water Quality	Continue data acquisition from ongoing monitoring programs or studies	None	Short	GSP adoption	Staff time to maintain database

Owens Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
Lowering of Water Levels, Reduction in Storage. Surface Water Depletion	Maintain Water Levels	Set SMC minimum threshold in the GSP at lowest GW elevation during 2012-2016 drought and management objective at the average elevation from 2001-2010	Include in approved GSP	Short	N/A	
		Establish supply well registration and reporting	Well Registration and Reporting Ordinance	Short	GSP adoption	Information is necessary to fill data gap and to maintain database
		Review new permits for water supply wells Regulate production if necessary to ensure water levels remain within SMC	Well Permit Review Ordinance (de minimis excluded).	Short	GSP adoption	Information necessary to maintain database. Hydrology staff or contractor required.
		Acquire or develop groundwater model for the Owens Valley management area	TBD	Medium	Board Direction Grant Funding Awarded	

PRELIMINARY DRAFT

Owens Valley Management Area						
Sustainability Indicator	Goal	Management Action or Project	Required Action	Timeline	Triggers	Notes
		Provide assistance acquiring state or federal funding for projects to improve groundwater use efficiency or conservation	Resolution	Medium	Grant Funding Opportunity	Conducted in cooperation with Inyo-Mono IRWMP
Subsidence	Prevent subsidence	Set SMC minimum threshold of 0.3 ft and measureable objective based on average water level and 0 ft of subsidence	Include in approved GSP	Short	N/A	
		Monitor water levels and for changes in ground elevation utilizing publically available remote sensing methods	None	Short	Board Direction	Hydrology staff or contractor required to analyze data and report findings
Water Quality	Track Water Quality	Continue data acquisition from ongoing monitoring programs or studies	None	Short	GSP adoption	Staff time to maintain database

OWENS VALLEY GROUNDWATER AUTHORITY

Owens Lake Management Area						
Sustainability Indicator	Goal	Management Action	Possible Board Action	Timeline	Triggers	Notes
Lowering Water Levels, Surface Water Depletion	Maintain Water Levels	Set SMC minimum threshold in the GSP at lowest GW elevation during 2012-2016 drought and management objective at the average elevation from 2001-2010.	Include in approved GSP	Short	N/A	
		Establish supply well registration and reporting	Well Registration and Reporting Ordinance	Short	GSP adoption	Information is necessary to fill data gap and to maintain the OVGA database
		Review new permits for water supply wells Regulate production if necessary to ensure water levels remain within SMC	Well Permit Review Ordinance (de minimis excluded).	Short	GSP adoption	Information needed. to maintain OVGA database. Hydrology staff or contractor required.
		Acquire or develop groundwater model for the Owens Lake management area		Medium	Board Direction	
		Participate in the Owens Lake Groundwater	MOU, GSP Amendment to	Short and	Ongoing	Hydrology staff or contractor required.

PRELIMINARY DRAFT

Owens Lake Management Area						
Sustainability Indicator	Goal	Management Action	Possible Board Action	Timeline	Triggers	Notes
		Working Group and the proposed (but not defined) regulatory entity to oversee the Master Project EIR and HMMMP provisions	include SMC for GDE/springs for the Master Project	Long	Master Project implemented	Costs or fees associated with oversight could be negotiated with project proponent
Subsidence	Prevent subsidence	Monitor water levels and changes in ground elevation utilizing publically available remote sensing methods		Short	GSP adoption	For portion of management area outside the lakebed
		Participate in the proposed regulatory entity to oversee the LADWP Master Project EIR and HMMMP provisions	MOU, GSP Amendment to include SMC for subsidence for the Master Project	Long	Master Project implemented	
Water Quality	Track Water Quality	Continue data acquisition from ongoing monitoring programs or studies	None	Short	GSP adoption	Staff time to maintain database
		Participate in the Owens Lake Groundwater	MOU, GSP Amendment to	Short and	Ongoing	Hydrology staff or contractor required.

PRELIMINARY DRAFT

Owens Lake Management Area						
Sustainability Indicator	Goal	Management Action	Possible Board Action	Timeline	Triggers	Notes
		Working Group and the proposed (but not defined) regulatory entity to oversee the Master Project EIR and HMMMP provisions	include SMC for water quality triggers for the Master Project	Long	Master Project implemented	Costs or fees associated with oversight could be negotiated with project proponent

5. Plan Implementation

5.1 Estimate of GSP Implementation Costs (Reg. § 354.6)

Implementation of all or parts of this GSP are at the discretion of the OVGA as long as the Basin remains ranked as low priority. Agencies can request to terminate membership in the OVGA following adoption of the GSP in accordance with the JPA (Article VI section 1.1; Appendix 1). It was not possible to anticipate future OVGA membership or how it may exercise its discretion regarding implementation of projects at the time this GSP was prepared. This budget assumed the OVGA may decide to designate members responsible for each Management Area once the membership questions are settled. To assist the OVGA future decisions cost estimates to implement this GSP were developed for administrative functions as well as for each Project. Costs to implement tasks specific to each Management Area were also developed.

Several assumptions were necessary to estimate GSP implementation costs. The OVGA adopted a budget for FY 2021-2022 in April 2021 (Table 5-1), and that budget will be applicable for the six months after the GSP is submitted in January 2022. Annual administration and other ongoing costs to maintain the OVGA database were estimated. Costs to implement individual Management Actions were assumed to occur in FY 2022-23 (the OVGA may initiate these tasks sooner in which case the annual budget would revised). Staff and contractor hourly rates included in the estimated budget are approximate and will be finalized when the future OVGA staffing model is determined.

The estimated cost to implement the GSP is approximately $436,665. The single largest cost is the development of a groundwater model for the Tri-Valley and Fish Slough portion of the Basin. The model is prerequisite to development of land or pumping management to address groundwater concerns and is contingent on acquisition of grant funding. The initial year of the GSP (FY 2022-23) includes three Management Actions and total costs are estimated to be $81,270. Ongoing annual costs thereafter are estimated to be $44,620. A breakdown of costs to implement this GSP that are applicable to the entire Basin are presented as are costs for specific tasks in each Management area (Table 5-2). Primary costs consist of staff services with smaller added expense for basic equipment purchases (for monitoring). The assistance of contractors is included for some tasks, primarily monitoring in Tri-Valley Management Area. Additional assumptions for administration include two annual meetings of the OVGA Board, preparation of an annual report for the Board and DWR and budget, staff for routine OVGA/SGMA business, website maintenance, and incidental costs to maintain an active GSA (insurance, fiscal services, general operating expenses). Costs for each Management Action or Project are presented in Table 5-3. Costs for projects contingent on completion of modelling or that are expected to be initiated after the 5 year periodic evaluation (Table 4-1) were not estimated.

5.2 Schedule for Implementation

Implementation of the GSP for the low priority basin is discretionary and contingent on final disposition of the Board membership following submission of the GSP or acquisition of grants, neither of which cannot be determined at the time this GSP was prepared. A schedule is not included, however, Management Actions #,1, #,2, #3 (potentially) and other activities to provide assistance acquiring state or federal funding and participation in the OLGDP could be completed in 2022-2023.

5.3 Annual Reporting (Reg. § 356.2)

The OVGA JPA (Article III section 3.1.7) requires the Executive Manager prepare and submit an annual report, including a proposed budget, to the OVGA Board of Directors before April 1 of each year. The report will document groundwater conditions and progress implementing Management Actions in this GSP and will comply with CWC §10728 requirements for annual reporting. The report will include: groundwater elevation data, annual groundwater extraction data, surface water used for groundwater recharge , total water use, and change in groundwater storage. The report may suggest the OVGA consider revisions to the GSP based on groundwater conditions or new information gained through implementation of monitoring or the Management Actions.

5.4 Periodic Evaluations

Every five years after adopting the GSP, the OVGA will evaluate sustainability of the groundwater conditions throughout the Basin. The report will evaluate conditions relative to SMC and interim milestones at representative monitoring sites. The status of the monitoring network will be reviewed and discuss whether previous data gaps have been addressed or new gaps have been identified. A summary of the implementation of GSP projects and management actions, including an updated implementation schedule and summary of the benefits from implementation will be included. Amendments to the GSP will be described as well as any revisions to the monitoring program. Although not anticipated, legal actions arising from the GSP and any enforcement actions will be described. Presentation of the five year evaluation will coincide with the OVGA annual report, and it will be submitted to DWR, if required.

Table 5-1. OVGA FY 2021-22 adopted budget.

Revenues		
Interest from treasury		$4,000
Other Agencies (member contributions)		$0
Grant Funding		
(a) Grant Administration		$18,750
(b) Stakeholder Engagement Plan		$0
(c) GSP Development		$130,792
Total Revenue		**$153,542**
Expenditures		
Fiscal Services		
Insurance	$2,500	
Reserve Fund	$13,290	
Subtotal		**$15,790**
Staff Services		
Agency: Inyo, Executive Manager		
(a) Staff services	$33,970	
(b) Grant Administration	$13,000	
Agency: Inyo, Legal	$18,000	
Agency: Inyo, Fiscal Agent/Financial Services	$4,000	
Agency: Mono, Administrative & Legal	$33,000	
Agency: Bishop, Administrative	$5,500	
Subtotal		**$107,470**
Professional Services		
Website Development	$0	
Outside Audit	$4,850	
DBS&A	$7,500	
Subtotal		**$12,350**
Miscellaneous Expenses		
Internal Copy Charges	$1,500	
Advertising	$3,000	
Office, Space & Site Rental	$1,500	
General Operating	$500	
Subtotal		**$6,500**
Total Expenditures		**$142,110**
Anticipated carry over balance		**$11,432**

PRELIMINARY DRAFT

Table 5-2. OVGA GSP implementation costs for the Basin and for each Management Area.

OVGA Operation	Administration and Basin Wide Projects	Tri-Valley	Owens Valley	Owens Lake	Total
FY 2022-23	$45,260	$20,640	$8,545	$6,825	$81,270
Ongoing annual cost	$25,070	$11,760	$4,645	$3,145	$44,620
Groundwater Model		$310,775			$310,775
Total	$70,330	$343,175	$13,190	$9,970	$436,665

Table 5-3. GSP Management Actions and Project costs.

Management Action	FY 2022-23	Ongoing Annual Cost
Well Registration and Reporting Ordinance	$14,370	$360
Well Permit Review Ordinance	$7,920	$1,740
Increase groundwater level monitoring network	$26,730	$10,050
Groundwater Model	$310,775	$0
Grant Assistance or multi-agency cooperation	$5,840	$5,840
Total	$365,635	$17,990

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