Small Water Suppliers and Rural Communities at Risk of Drought and Water Shortage Vulnerability and Recommendations and Guidance to Address the Planning Needs of these Communities

REPORT PURSUANT TO
SECTION 10609.42 OF THE CALIFORNIA WATER CODE

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Water Use Efficiency Branch

Notes: This report developed pursuant to Section 10609.42 of the California Water Code was informed by documents that provide methodology, assumptions, data, estimates, and other information. These supporting documents are provided as appendices in the back of this report.

Definitions and key concepts used in this report are listed in glossary on page 51. Terms appearing in ***purple*** *refer to* ***key definitions****; those appearing in* ***brown*** *refer to* ***key concepts****.*

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Abbreviations and Acronyms

AB	Assembly Bill
AWWA	American Water Works Association
CAL OES	California Office of Emergency Services
CDAG	County Drought Advisory Group
CDFA	California Department of Food and Agriculture
CEC	California Energy Commission
CPUC	California Public Utilities Commission
CWC	California Water Code
DDW	State Water Resources Control Board Division of Drinking Water
DWR	California Department of Water Resources
GSA	groundwater sustainability agencies
HSC	California Health and Safety Code
IHS	Indian Health Services
LHMP	local hazard mitigation plan
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Governor's Office of Planning and Research
SADWF	Safe and Affordable Drinking Water Fund
SB	Senate Bill
State Water Board	State Water Resources Control Board
WSCP	water storage contingency plan

Executive Summary

This report is submitted pursuant to CWC Section 10609.42 which directs DWR to identify **small water suppliers** and rural communities that may be at risk of **drought** and **water shortage vulnerability** and propose recommendations and information in support of improving the **drought** preparedness of **small water suppliers** and rural communities**.**

Specifically, Section 10609.42 requires:

1. DWR, in consultation with the State Water Resources Control Board (State Water Board) and other relevant State and local agencies and stakeholders, identify **small water suppliers** and areas of households on private supplies (termed "rural communities" in the legislation, and also called "**self-supplied communities** in this report") that may be at **risk** of **drought** and **water shortage**. DWR must then notify counties and groundwater sustainability agencies (GSAs) of suppliers or communities that may be at **risk** within its jurisdiction and may make the information publicly accessible on the website (CWC Section 10609.42[a]).
2. DWR, in consultation with the State Water Board and stakeholders, develop recommendations and guidance relating to the development and implementation of countywide **drought** and **water shortage** contingency plans to address the planning needs of **small water suppliers** and rural communities. The legislation directs DWR to explain how the planning needs of **small water suppliers** and rural communities can be integrated into complementary existing planning processes (CWC Section 10609.42[b]).

To assess **drought** and **water shortage** vulnerability, a methodology for analyzing **risk** was developed and **small water suppliers** and **self-supplied communities** statewide were evaluated for their relative **risk** of **drought** and **water shortage**. Each supplier and community examined received a numeric **risk** score, which is derived from a set of indicators developed from a stakeholder process. Indicators used to estimate **risk** represented three key components: (1) the **exposure** of suppliers and

communities to hazardous conditions and events, (2) the physical and social **vulnerability** of suppliers and communities to the exposure, and (3) recent history of shortage and **drought** impacts. The **risk** scores for individual **small water suppliers** and **self-supplied communities** were calculated separately, using the same methodology but different **risk** indicators.

Importantly, the methodology used for analyzing **risk**, and this report as well, do not define thresholds whereby certain **small water suppliers** and **self-supplied communities** are considered "at **risk**" of **drought** and **water shortage** and others are not. Instead, the methodology inherently recognizes that all communities in California face some **risk** of **drought** and **water shortage** and thus provides a tool to calculate the relative **risk** of these suppliers and communities. Future thresholds may be defined and utilized to determine which suppliers and communities are particularly at **risk** of **drought** and **water shortage**; but for now, DWR believes the State is best served by understanding the relative **risk** of its **small water suppliers** and **self-supplied communities** and, perhaps more importantly, having a common methodology for calculating **risk** that can be applied at different levels of government and in different contexts.

In total, 4,100 **small water suppliers** were examined for their relative **risk** of **drought** and **water shortage**. The results show that a vast majority of the State's counties (52 of the 58 counties) have **small water suppliers** in the top 10th percentile of **risk** scores based on the **risk** scoring method described above. As intimated above, the 10% cut-off is not intended to be viewed as a threshold whereby **small water suppliers** scoring in the top 10% are considered at **risk** of **drought** and **water shortage** and those outside the top 10% are not at **risk**. Instead, the 10% cut off is useful for summarizing results and providing an example of how the scoring methodology can be used. The primary benefit of this scoring exercise is to offer local and regionally-specific information to assist with **drought** and **water shortage** planning. Below, are some statistics among those scoring in the top 10% **risk** that offer a snapshot of patterns notable statewide:

- 68% are in a fractured rock area, and many of these high-**risk** suppliers on fractured rock rely on groundwater
- Over half of the high-**risk** suppliers located in groundwater basins are in high subsidence areas and/or basins identified by DWR in Bulletin 118 as subject to critical conditions of overdraft.

- Over half (58%, 241) of the top at-**risk** suppliers are in high or very high-**risk** zone for wildfire, as defined by CalFire.
- To evaluate rural community **risk** (referred to as *self-supplied community **risk***), 5000 Census Block Groups (the geographical unit used by the United States Census Bureau, typically between 600 and 3,000 people) with record of a domestic well (1970-2019) were examined. The results of the evaluation show that 50 of the 58 counties contain one or more Block Groups that scored within the top 10% at **risk**. Counties with the highest number of Block Groups within the top 10% include:
    - Riverside County (60 Block Groups)
    - Kern County (55 Block Groups)
    - San Diego County (33 Block Groups)
    - Tuolumne County (30 Block Groups)
    - San Luis Obispo County (24 Block Groups)
    - Stanislaus County (24 Block Groups)
    - Lake County (15 Block Groups)
    - Madera County (14 Block Groups)
    - Monterey County (14 Block Groups)
    - Siskiyou County (13 Block Groups)

To develop recommendations and guidance on **drought** planning for small water systems and **self-supplied communities**, DWR utilized a public process involving State agencies, cities, counties, small communities, **small water suppliers** and other stakeholders by forming a stakeholder advisory group, the County Drought Advisory Group (CDAG). The CDAG had many discussions on the best way to improve preparation of small communities for the next **drought**. It offered a venue and process for close collaboration between State agencies and local agencies, as well as input from other key stakeholders.

Throughout the stakeholder process the four-phase model of disaster **risk** management helped to frame the **drought** and **water shortage** planning approach: (1) Mitigation, Preparation, and **Capacity** Building; (2) Forecasting and Monitoring; (3) **Drought** and **Water Shortage** Response; and (4) Recovery and Relief (Wilhite 2000 & 2014).

State agencies and stakeholders alike agreed that additional planning requirements for the suppliers and communities for **drought** preparedness and long-term resiliency should leverage and extend existing processes when possible. The recurring theme in the recommendations in this report is to incorporate **water shortage** contingency plans into existing planning documents for **small water suppliers** serving 1,000 to 3,000 **service connections** and emergency response plans for all **small water suppliers**. Leveraging existing DWR processes to develop and implement **water shortage** contingency planning and State Water Board processes to develop and implement emergency response planning will help minimize costs to both local and State agencies.

Rural communities with water systems serving fewer than 15 **service connections** and self-supplied households are likely to be unable to perform meaningful **water shortage** planning themselves, so integrating planning within existing County plans is more feasible. Counties use a variety of tools to plan for and mitigate against future disasters and hazards; including local hazard mitigation plans, general plan elements, emergency operations plans, climate adaptation plans, Groundwater Sustainability Plans, and others. Providing counties the flexibility to use one or more of these plans is intended to leverage existing processes and organizational capacities in efforts to improve preparation for future **droughts**.

Regional planning solutions that transcend county boundaries were discussed towards the end of the CDAG stakeholder process. Further discussion is necessary to advance a holistic and regional approach for **drought** and **water shortage** planning solutions that include **urban water suppliers**, **small water suppliers** and **self-supplied communities**.

Because Tribes are sovereign governments with data and regulatory systems that are not structured within the State or Counties, their planning systems will be different. This report proposes that Indian Health Services continues to promote the **water shortage** contingency plan they developed during the last **drought**.

Technical assistance for helping approximately 250 small **community water systems,** serving 1,000 to 2,999 **service connections**, develop **water shortage** contingency plans would cost approximately $1 to $2 million. Additional funding would be needed to help small **community water**

systems serving less than 1,000 **service connections** and non**community water systems** that are schools for technical assistance to develop their emergency response plans and comply with minimum resiliency requirements.

The recommendations in this report, as shown in Tables 1 – 4 below, should be considered in the context of other statewide efforts around water including water resiliency, water conservation, safe and affordable drinking water, Human Right to Water, the Sustainable Groundwater Management Act, and biodiversity.

Table 1 Summary of Recommendations for Small Water Suppliers

S1. All small community water systems serving 15 to 2,999 service connections and noncommunity water system that are schools, should be required to develop an Emergency Response Plan and a drought supply evaluation to submit to the State Water Board.
S2. State Water Board should work with small community water systems serving less than 1,000 service connections and noncommunity water systems that are schools to establish minimum resiliency measures.
S3. All small community water systems serving 1,000 to 2,999 service connections should be required to develop a drought and water shortage contingency plan and coordinate with groundwater sustainability agencies where applicable.
S4. The State should provide technical assistance to small water systems on drought and water shortage planning, preparation and response.
S5. In developing a water shortage contingency plan, small water systems should use the proposed annual statewide drought and water shortage risk assessment prepared by the State, unless justifiably better data is available to improve drought and water shortage resiliency.
S6. All water suppliers should be required to provide and maintain accurate water service area boundaries on a designated site to be maintained by the State Water Board.
S7. The State should make funding available to small community water systems and noncommunity water system that are schools to install additional infrastructure to improve drought and water shortage preparedness and response (e.g., backup well, water meters).

Table 2 Summary of Recommendations for Self-supplied Communities

R1. Counties should complete drought and water shortage contingency plans for self-supplied communities, specify drought as a risk in their LHMPs, and have Emergency Operations Plans covering the entire county that include planned response to drought and water shortage conditions.
R2. The County or State should provide technical assistance to self-supplied households to improve reliability of their water supply.
R3. Update statutory requirements and guidelines for General Plans to ensure that drought resilience and water shortage contingency policies or implementation programs are incorporated into the safety element, conservation element, or other appropriate elements.
R4. Counties and regional planning agencies should use the proposed annual statewide drought and water shortage risk assessment prepared by the State to prioritize needs for drought and water shortage contingency planning.
R5. The State should improve its understanding of domestic well locations and well depths.

Table 3 Summary of Recommendations for Tribes

T1. Tribes are encouraged to develop drought and water shortage contingency plans and formally adopt them through a resolution of the Tribal Council or other Tribal authority with jurisdiction.
T2. The State should coordinate with Indian Health Services when preparing the proposed annual statewide drought and water shortage risk assessment to also include tribal water systems.

Table 4 Summary of General Recommendations

G1. The State should conduct an annual statewide drought and water shortage risk assessment and generate risk scores for each small water system, noncommunity water system that is a school, and self-supplied community using best available statewide information.
G2. Drought and water shortage contingency planning and response should be incorporated into implementation of the Safe and Affordable Drinking Water Fund.
G3. Establish a standing interagency drought and water shortage task force to facilitate proactive State planning and coordination, both for pre-drought planning and post-drought emergency response composed of Department of Water Resources, State Water Board, California Public Utilities Commission, California Office of Emergency Services and Governor's Office of Planning and Research.

1.0 Introduction

1.1 Purpose

This report has been prepared pursuant to the requirements of California Water Code Section 10609.42 (Assembly Bill [AB] 1668 [Friedman, 2018]) which states:

> (a) No later than January 1, 2020, the department, in consultation with the board and other relevant state and local agencies and stakeholders, shall use available data to identify **small water suppliers** and rural communities that may be at **risk** of **drought** and **water shortage vulnerability**. The department shall notify counties and groundwater sustainability agencies of those suppliers or communities that may be at **risk** within its jurisdiction, and may make the information publicly accessible on its Internet Web site.
>
> (b) The department shall, in consultation with the board, by January 1, 2020, propose to the Governor and the Legislature recommendations and guidance relating to the development and implementation of countywide **drought** and **water shortage** contingency plans to address the planning needs of **small water suppliers** and rural communities. The department shall recommend how these plans can be included in county local hazard mitigation plans or otherwise integrated with complementary existing planning processes. The guidance from the department shall outline goals of the countywide **drought** and **water shortage** contingency plans and recommend components including, but not limited to, all of the following:
>
> (1) Assessment of **drought vulnerability**.
>
> (2) Actions to reduce **drought vulnerability**.
>
> (3) Response, financing, and local communication and outreach planning efforts that may be implemented in times of **drought**.
>
> (4) Data needs and reporting.

(5) Roles and responsibilities of interested parties and coordination with other relevant water management planning efforts.

Chapter 3 of this report addresses the directives contained in CWC Section 10609.42(a) and Chapter 4 addresses the directives in 10609.42(b).

1.2 Background

In June 2018, Assembly Bill (AB) 1668 and Senate Bill (SB) 606 were passed as part of efforts to make water conservation a California way of life. The legislation tasked the California Department of Water Resources (DWR) and the State Water Resources Control Board (State Water Board) with implementing several directives related to urban and agricultural water use efficiency and **drought** resiliency.

To initiate and coordinate the implementation of the legislation, a five-agency coordination team (Agency Coordination Team) was formed comprising DWR, the State Water Board, the California Department of Food and Agriculture (CDFA), California Public Utilities Commission (CPUC), and California Energy Commission (CEC). In September 2018, listening sessions were held in Sacramento, Fresno, and Los Angeles to solicit public input and stakeholder engagement in implementing the legislation. In November 2018, a County Drought Advisory Group (CDAG) was formed to advise DWR on the implementation of the legislative mandates specific to (i) identifying **small water suppliers** and rural communities at **risk** of **drought** and **water shortage** and (ii) developing recommendations and guidance for countywide **drought** and **water shortage** contingency plans to address the planning needs of those communities.

DWR kept partner State agencies informed about CDAG activities through the Agency Coordination Team. This team was formed to coordinate SB 606- and AB 1668-related projects aimed at long-term improvements in water conservation and **drought** planning. These projects will serve to help California adapt to climate change and the increasingly frequent and more intense **droughts** throughout the State.

Some of these agencies actively participated on the CDAG Project Team and were actively involved in planning and attending advisory group meetings. In addition to legislatively mandated criteria, the State agencies and CDAG advised DWR to also consider the following related directives and policies in developing the **drought** and **water shortage vulnerability** assessment

indicators and the proposed recommendations and guidance for contingency planning:

- Governor Newsom's Executive Order N-10-19 (April 2019), which directs agencies to recommend a suite of priorities and actions to build a climate-resilient water system and ensure healthy waterways.
- Senate Bill 200 (Monning, 2019; Health and Safety Code Section 116686), which establishes the Safe and Affordable Drinking Water Fund in the State Treasury to help water systems provide an adequate and affordable supply of safe drinking water in both the near and long terms and authorized water system administrators to provide an adequate supply of affordable, safe drinking water to disadvantaged communities and to prevent fraud, waste, and abuse.
- SB 862 Budget Act of 2018, which appropriates funding for State Water Board to implement a needs analysis on the state of drinking water in California.
- AB 685 (2012; CWC Section 106.3), which declares that everyone in California has a right to clean, safe, affordable, and accessible water adequate for human consumption and sanitary purposes. The legislation instructed all relevant State agencies, including State Water Board, to consider the human right to water when revising, adopting, or establishing policies, regulations, and grant criteria pertinent to water uses. Recently, the State Water Board enlisted the expertise of the Office of Environmental Health Hazard Assessment (OEHHA) to develop a framework for evaluating the quality, accessibility, and affordability of the State's domestic water supply.

1.3 Agency and Stakeholders Roles

DWR consulted with State agencies (State Water Board, OEHHA, CPUC, Governor's Office of Emergency Services [Cal OES], Governor's Office of Planning and Research [OPR], and CEC), federal agencies (Indian Health Services [IHS] and the US Environmental Protection Agency), and a 32-member stakeholder advisory group (CDAG) acknowledged in this report.

For the duration of this project, DWR worked closely with the State Water Board and OEHHA. Close agency coordination was beneficial as there is significant overlap between this project and the State Water Board Division of Drinking Water Drinking Water Needs Assessment project and the effort led by OEHHA to develop *A Framework and Tool for Evaluating California's Progress in Achieving the Human Right to Water*.

The CDAG 32-member stakeholder advisory group included representatives of counties, cities, water districts, academia, environmental justice and environmental organizations, Tribes, and third-party assistance and associations. Advisory group meetings were open to the public and announcements of public meetings were posted on DWR's website and listservs. The advisory group met approximately bimonthly for the duration of the project, starting in December 2018.

Many CDAG members were involved in the response to the historic **drought** of 2012–2016 and are familiar with the need for better coordination and planning to support families and systems affected by the emergency, and the high cost of **drought**-related impacts (Lund 2018). DWR leveraged that wealth of experience through an inclusive process to integrate lessons learned into recommendations and guidance that affirm a top priority is to proactively plan to avoid some of the most challenging issues from the last **drought**.

In February 2019, a literature review was completed to document findings from previous studies and reports relevant to this project. The literature review is attached as Appendix 1. Stakeholders referred to those findings in CDAG meetings to suggest, develop and prioritize recommendations. The findings and stakeholder viewpoints are used as background information on issues used for framing the recommendations in this report.

Two workgroups were created to focus on the two legislative mandates to identify those at **risk**, and to give recommendations for **water shortage** contingency planning:

- **Risk** Assessment Technical workgroup
- **Water Shortage** Contingency Plan (WSCP) workgroup

Workgroup meetings were planned as needed and participation was solicited from the advisory group. Participation was in person and online and focused on technical details and discussion of options. Information collected from the workgroup meetings was shared with the advisory group through draft documents and presentations at bimonthly meetings.

1.4 Drought Planning Approach: Phase Model of Disaster Risk Management

Throughout the stakeholder process the four-phase model of disaster **risk** management helped to frame the **drought** and **water shortage** planning approach (Wilhite 2000 & 2014):

Phase 1: Mitigation, Preparation, and Capacity Building. This pre-disaster learning phase includes **risk** assessment, **risk** reduction, improving coping **capacity**, and improving emergency and **water shortage** plans.

Phase 2: Forecasting and Monitoring. This pre-disaster phase includes ongoing forecasting and monitoring, improving science, and accounting for precipitation, water supply, and climate changes.

Phase 3: Drought and Water Shortage Response. This phase includes communication, calling for assistance, and implementing any emergency response procedures that are defined during a disaster.

Phase 4: Recovery and Relief. This post-disaster response phase includes impacts assessment, assistance to homes and suppliers, and funds to boundary organizations to distribute assistance.

Figure 1 presents the four phases of disaster **risk** management. The recommendations throughout this report reference the phases because all **drought** and **water shortage** planning, monitoring, response, and mitigation actions fall within one or more of these phases.

Many of the items listed in the four-phase cycle are addressed by existing efforts and State reporting processes.

Figure 1 Disaster Risk Management Framework

2.0 Vulnerable Small Suppliers and Rural Communities: Scoring of Drought and Water Shortage Risk

CWC Section 10609.42(a) requires DWR, in consultation with other agencies and stakeholders, to identify **small water suppliers** and rural communities (areas of households on private supplies, also called "**self-supplied communities** in this report") that may be at **risk** of **drought** and **water shortage**. DWR must then notify counties and groundwater sustainability agencies (GSAs) of suppliers or communities that may be at **risk** within its jurisdiction and may make the information publicly accessible on the website.

Appendix 2 provides the indicators, datasets, and methods used for constructing this deliverable, as well as the tools created during this project that can be used going forward to assess **drought** and **water shortage vulnerability** on an annual or as-needed basis.

The **risk** of **drought** and **water shortage vulnerability** is recognized as a problem derived from a combination of hydrological and sociological factors. The indicators of **risk** and methods adopted into the **drought vulnerability** tools developed as part of this project evolved in close coordination and through an iterative feedback process with the State Water Board, CDAG, and several other State and local agencies and stakeholders. The draft aggregation method to combine these indicators and the overall process taken to develop these is recorded in Appendix 2 in detail.

This effort is the first to systematically and holistically consider **drought** and statewide **water shortage risk** of **small water suppliers** and households. As with any first major effort, it is important to recognize that the indicators and construction of the scoring should be revised as more data becomes readily available and knowledge advances on **droughts** and water resilience. The scoring system should allow for monitoring changes in **risk** over time. At the same time, as the collective understanding of what **risk** of **drought** and **water shortage** evolves, so too should the scoring system. Understanding and perspectives on **drought** may be informed by future **drought** experiences.

This section presents results of calculating initial **risk** scores using existing statewide datasets and the newly developed tools to estimate **risk** of **drought** and **water shortage** for **small water suppliers** and **self-supplied communities**. The **risk** was assessed based on a multi-pronged definition; this offers valuable information beyond helping to prioritize which suppliers and communities need assistance. Further, delivering not only the aggregated **risk** scores, but also the disaggregated measures of **risk** to water suppliers, counties, groundwater sustainability agencies, integrated regional water management programs, the State Water Board, and other stakeholders can be valuable for planning, prioritizing and improving **drought** and **water shortage** resilience.

Risk scores were calculated for the following categories:

1. **Small water suppliers** including community and **noncommunity water systems** and tribal water systems (produced by the federal government [IHS]).
2. **Self-supplied communities**.

Recognizing that the **risk** assessment conducted as part of this project is based on available data and reflects a snapshot of **drought** and **water shortage risk**, it is recommended that this assessment is updated annually. Section 4d discusses this further.

2.1 Small Water Suppliers – Risk Assessment

Urban water suppliers are required to develop a comprehensive urban water management plan, which must include a section on **drought** and **water shortage** contingency planning (CWC Section 10644(b)).

The **risk** assessment developed during this project was done for 4,100 **community** and **noncommunity water systems** which is the terminology used by the State Water Board for regulating **public water systems**. There are approximately 2,300 small **community water systems** in California and 320 schools with their own water systems which are classified as **non-transient noncommunity water systems** under the regulatory jurisdiction of the State Water Board.

Because of data availability constraints, those systems with fewer than 15 **service connections** are classified for this report under the **self-supplied communities** (referred to in legislation as "Rural Communities").

The analysis includes those suppliers that have spatial boundaries of their service areas recorded in the Water Boundary Tool, as of May 23, 2019. It must be noted that the water boundary geospatial layers have not been verified to ensure the accuracy of the location of the small water supplier or that the boundary itself is accurate, but at the time of analysis this was considered the best available data. The State Water Board is currently undertaking this verification process.

2.2 Water Shortage Risk Indicators: Exposure, Vulnerability, and Observed Shortages

To evaluate the relative **risk** of **drought** and **water shortage vulnerability** for small water systems, DWR collaborated with the State Water Board and CDAG to develop a tool that used a common framework with indicators.
A total of 29 indicators, listed in Table 5, were used to analyze **drought** and **water shortage risk** for **small water suppliers**.

Table 5 Risk indicators Used to Analyze Drought and Water Shortage Risk for Small Water Suppliers

COMPONENT 1 – Exposure to Climate Change	Metric	Data Source
SC1a – Projected Temperature Shift	Projected change in temperature by mid-century	Pierce, Cayan Scripps UCSD, DWR
SC1b - Projected Sea Level Rise	Presence of salt into coastal aquifers with projected 1 meter sea level rise	USGS, Befus Univ. Wyoming
SC1c - Projected Wildfire Risk	Projected acres burned from wildfire for each system boundary or community	Westerling UC Merced

COMPONENT 2 – Exposure to Recent Conditions & Events	**Metric**	**Data Source**
SC2a – Current Wildfire Risk	Modelled current risk for each system (based on vegetation)	CalFire
SC2b - Drought Early Warning Forecast Water Year 2019	Annual Risk of Local Drought (precipitation)	PRISM OSU
SC2c - Fractured Rock Area	Fractured rock	DWR
SC2h - Projected population growth	Near term projected population growth rate	DWR
SC2i – Water Quality in Surrounding Basin	Water quality problems in surrounding basin	USGS GAMA
SC2d - Basin- Subsidence	Susceptibility to subsidence	DWR
SC2e - Basin- Salt	Salts documented in basin	DWR
SC2f - Critically Overdrafted	Critically overdrafted basin	DWR
SC2g - Chronic declining water levels	Declining groundwater levels	DWR
SC2j -Surrounding agricultural land use	Presence of irrigated agricultural in basin	DWR

COMPONENT 3 – Infrastructure Vulnerability	**Metric**	**Data Source**
SC3a - Interties	Presence of interties	SDWIS
SC3b – Emergency interties	Presence of emergency interties	SDWIS
SC3c - Baseline monitoring	Level of monitoring reported	eAR
SC3d – Customers metered	% system connections that have meters	eAR
SC3e - # Water Sources	Count of water sources	SDWIS derived
SC3f - # Source Types	Count of water source types	SDWIS derived
SC3i – Distribution Outage Record	Count of distribution problems of water outage	eAR
SC3j – Water Level Status	Levels of water source- recovering, steady, declining, blank	eAR

COMPONENT 4 – Organization Vulnerability	**Metric**	**Data Source**
SC4a – Rate Updated	Year rate structure was last updated	SWRCB
SC4b – Rate Type	Type of rate structured used by supplier. Survey question in eAR 2017 (flat base rate =1; other =0)	SWRCB
SC4d – Drought Preparedness Plan	Have drought plan or WSCP; year written or updated	SWRCB
SC4e - Customer Base Socio-Economics	Multiple population characteristics combined score	Private vendor data
SC3g – Supplier Size	Service connections count	eAR

Demographic and economic variables included in socio-economic customer base indicator.

Variable Names	**Brief description of what variable is**	**Data Source**
PERCAP	Average per capita income for the all Block groups (BG) that intersected with the service areas	ACS 2012-2016
AvgMHI	Average Median Household Income (MHI) for the all BGs that intersected with the service areas	ACS 2012-2016
Q65yr	Percentage of population of 65 and older of all BGs that intersected with the service areas	ACS 2012-2016
Qpov	Percentage of population of living at or under the poverty level of all BGs that intersected with the service areas	ACS 2012-2016
Q5y	Percentage of population of under 5 years age of all BGs that intersected with the service areas	ACS 2012-2016
Qmobile	Percentage of mobile households of all BGs that intersected with the service	ACS 2012-2016

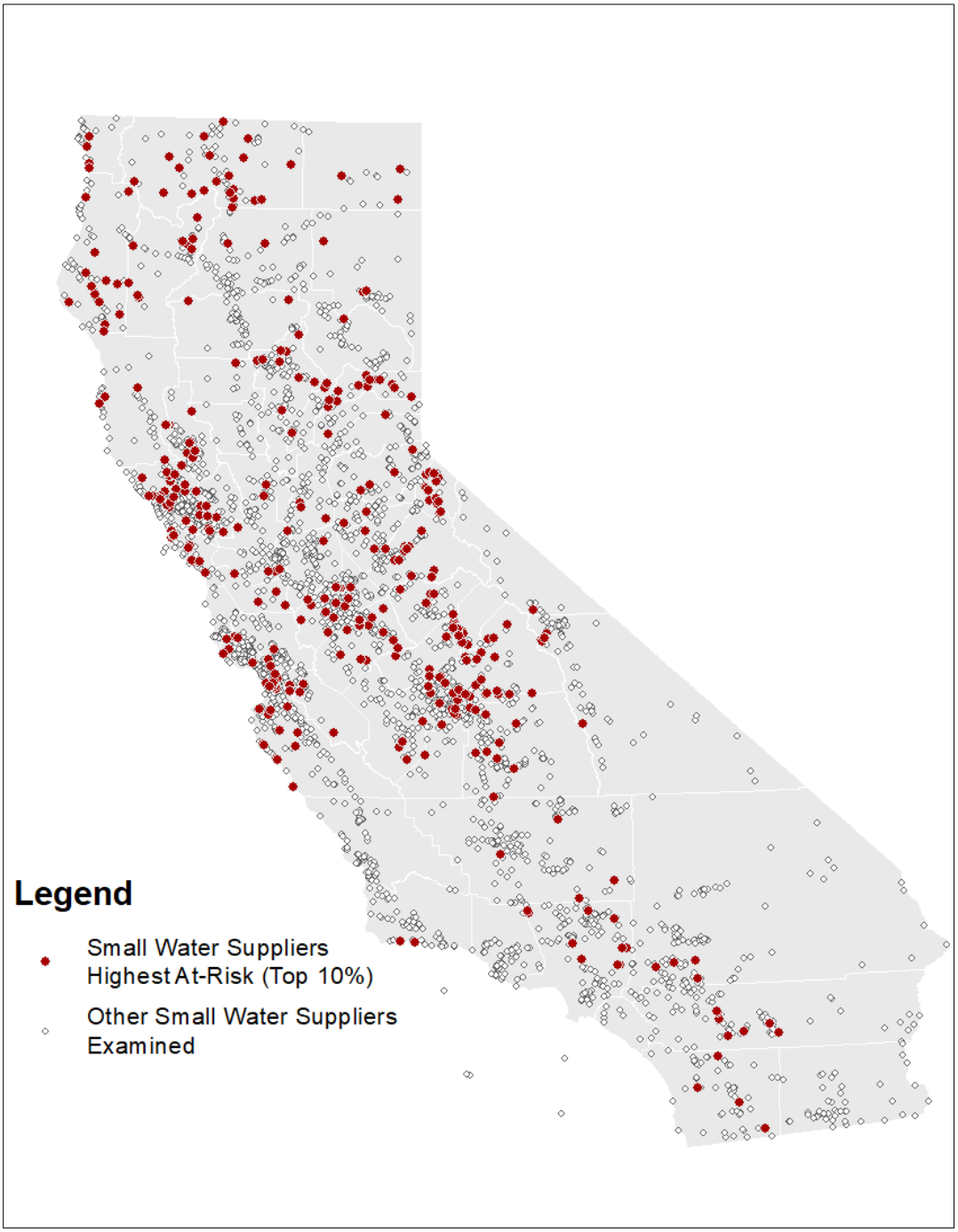
Variable Names	Brief description of what variable is	Data Source
	areas	
NoVeh	Percentage of households with no vehicles of all BGs that intersected with the service areas	ACS 2012-2016
Qedu	Percentage of population over 25 years of age with no high school diploma of all BGs that intersected with the service areas	ACS 2012-2016
Qparent	Percentage of population with single parent with children under 18 of all BGs that intersected with the service areas	ACS 2012-2016
Qunempl	Percentage of population of civilian unemployed of all BGs that intersected with the service areas	ACS 2012-2016
Qgroup	Percentage of all census Block population with Group Quarters (GQ) that intersected with the service areas	Census 2010
Qrenters	Percentage of renter households of all BGs that intersected with the service areas	ACS 2012-2016

COMPONENT 5 – Recent Observed Shortage	Metric	Data Source
SC3h – Shortage: Self-reported projected	Supplier-reported projected shortage	eAR 2011-2018
SC3k – Shortage: Curtailment and Compliance Order	Systems under order of compliance for curtailment (2014) or building moratoriums	SWRCB
SC3L – Shortage: Drought Assistance Record	Systems that received drought assistance on record	SWRCB

2.3 Relative Risk Findings

Based on draft statewide **risk** score results, Figure 2 shows **small water suppliers** in the top 10 percent of those identified to be at **risk** of **drought** and **water shortage** (based on statewide available datasets).

Figure 2 Small water suppliers in the top 10% of draft drought and water shortage vulnerability risk scores



Out of the **small water suppliers** in the top 10 percent of **drought vulnerability risk** scores (411 suppliers) shown in Figure 2, the following statistics are provided:

- 112 are **community water systems**
- 238 are **noncommunity water systems**
- 61 are **noncommunity nontransient** systems (mostly **noncommunity water systems** that are schools)
- 92% have groundwater as primary water supply

52 of the 58 counties have a small water system with a **risk** score in the top 10% of **risk** cores for these types of suppliers. More details are provided in Appendix 3.

2.4 Rural Communities (referred to here as "self-supplied communities") – Risk Assessment

"**Self-supplied communities**" for this analysis are households and other customers that are supplied by systems with fewer than 15 **service connections**. This category is intended to cover what is labeled as the "rural communities" in the legislation, and hereafter referred to as **self-supplied communities.**

Self-supplied communities category also includes households with private or domestic wells or houses supplied by surface water such as rivers, lakes, and the like. Some private wells are located in urban areas; so, the term "rural" is not adequate, and CDAG chose "**self-supplied communities**" as an alternate term for clarity.

This category (**self-supplied communities**) is intended to cover populations that rely on self-supplied groundwater, surface water residential water use, or supply systems with fewer than 15 **service connections**. These communities were identified using U.S. Census Block groups. Block groups that have zero population and those that have no domestic wells recorded between 1970-2019 were excluded from the **self-supplied communities** category. Approximately 5,000 Census Block groups are considered **self-supplied communities** that meet the above criteria.

2.5 Water Shortage Risk Indicators: Exposure, Vulnerability, Observed Shortages, and Domestic Well Reliance

To evaluate the relative **risk** of **drought** and **water shortage vulnerability** for the self-supplied systems, DWR also collaborated with the Water Board and CDAG to develop a tool that used a common framework with indicators. A total of 20 indicators, listed in Table 6, were used to analyze **drought** and **water shortage risk** for **self-supplied communities**.

Table 6 Risk indicators Used to Analyze Drought and Water Shortage Risk for Self-Supplied Communities

Component 1: Climate Change Risk Indicators	Indicator	Indicator Description	Data Source
RC1a - Temperature Shift	Projected change in heat by mid-century	Projected change in max temperatures by mid-century (averaged across models)	DWR
RC1 b -Wildfire risk	Projected severe or high severe risk for each system boundary or community	Projected area burned (averaged across all GCMs) by 2035-2064, RCP8.5; spatial join with Block groups	UC Merced
RC1c -Saline intrusion risk	Susceptibility to seawater intrusion -- 1 meter sea level rise into coastal aquifers	Spatial extent of projected SLR under RCP 8.5 by 2040 (1 m) into coastal aquifers; spatial join with Block groups	University of Wyoming (coordinated with USGS)

Component 2: Exposure to Current Conditions and event Risk Indicators	**Indicator**	**Indicator Description**	**Data Source**
RC2a - Drought Early Warning 2019	Annual Updated Early Drought Risk Warning	Less than 70% of average precipitation by January 31st for that water year = high risk of drought	PRISM OSU
RC2b - Wildfire Risk	Modelled current risk maximum for each Census Block Group	Use CalFire Scoring HAZ_CODE: Moderate (1)= .33; High (2)= .67; Very High (3) =1; no score =0 (no or low risk); Took max for each Census BG with spatial join in ArcGIS	CalFire
RC2c – Fractured Rock Area	Fractured Rock Area	Communities in Fractured Rock Areas (1) or not (0)	DWR
RC2h – Population Growth	Projected population growth	Census data estimates of growth rate between 2016 to 2021, estimated by service area	DWR
RC2i- Water Quality Index	Domestic well water quality risk (includes areas outside of alluvial basins)	Indication of likelihood that groundwater likely accessed by domestic wells may contain concentrations of constituents above regulatory levels.	SWRCB
RC2d – Subsidence Presence	Record of subsidence	Documented Impacts #7.b Subsidence Points; recoded to 0,.5,1 from original points of 0,3,10, then associated to Block groups	DWR
RC2e – Salt Presence (basin)	Record of salts	Documented Impacts #7.c Salt Intrusion Points	DWR
RC2f – Overdrafted basin	Critically overdrafted groundwater basin	Yes (1)/no (0) of whether area is in critical overdraft	DWR

Component 2: Exposure to Current Conditions and event Risk Indicators	**Indicator**	**Indicator Description**	**Data Source**
RC2g - Declining Water Levels	Declining groundwater levels	Documented Impacts #7.a - Declining GW levels Points	DWR
RC2j - Surrounding Irrigated Agriculture	Presence of irrigated agriculture in surrounding basin	Irrigated Acres Priority Points	DWR

Component 3: Physical Vulnerability (aggregated as RC3)	**Indicator**	**Data Source**
RC3a - Well Depth Flag	Well-depth flag – if any portion of the groundwater unit(s) that intersect with the Census BG has relatively domestic wells, marked whole BG as ‘1’ (high risk) (0,1)	OSWCR-DWR
RC3b – Well Depth Proportion	Proportion of Public Land Survey Sections in Block Group where the max depth of domestic wells is shallower than max of public wells (0-1)	OSWCR-DWR

Component 4: Social Vulnerability Risk Indicators (aggregated as RC4)	**Indicator**	**Data Source**
PERCAP	Average per capita income for all block groups (BG). Combined to create RC4a.	ACS 2012-2016
AvgMHI	Average Median Household Income (MHI) for all BGs. Combined to create RC4a.	ACS 2012-2016
Qpoverty	Percentage of population living at or below poverty level. Combined to create RC4a.	ACS 2012-2016
Q65yr	Percentage of population of 65 and older of all BGs. Combined to create RC4b.	ACS 2012-2016
Q17yr	Percentage of population of under 17 years of all BGs. Combined to create RC4b.	ACS 2012-2016
Q5y	Percentage of population of under 5 years age of all BGs. Combined to create RC4b.	ACS 2012-2016
Qmobile	Percentage of mobile households of all BGs. Combined to create RC4c.	ACS 2012-2016
QnoVeh	Percentage of households with no vehicles of all BGs. Combined to create RC4c.	ACS 2012-2016
Qedu	Percentage of population over 25 years old with no high school diploma of all BGs	ACS 2012-2016
Qparent	Percentage of population with single parent with children under 18 years old of all BGs. Combined to create RC4b.	ACS 2012-2016
Qunempl	Percentage of population of civilian unemployed of all BGs. Combined to create RC4b.	ACS 2012-2016
Qlang	Percentage of population who speak English less than well of all BGs. Combined to create RC4b.	ACS 2012-2016
Qgroup	Percentage of all census block group population with Group Quarters (GQ). Combined to create RC4c.	Census 2010
Qrenter	Percentage of households that are renters. Combined to create RC4c.	ACS 2012-2016

Component 5: Water Shortage Record	Indicator	Data Source
RC5a – Reported household outages on domestic well	Presence of one or more households with reported outages in Census Block Group	DWR
RC5b – Reported household outages on private well	Proportion of households with reported outages in Census BG (compared to total households in BG) (0-1 scalar)	DWR

Relative Risk Findings

Figure 3 provides a map of the Census Block Groups with a **risk** score in the top 10%. For these block groups, the following statistics are provided:

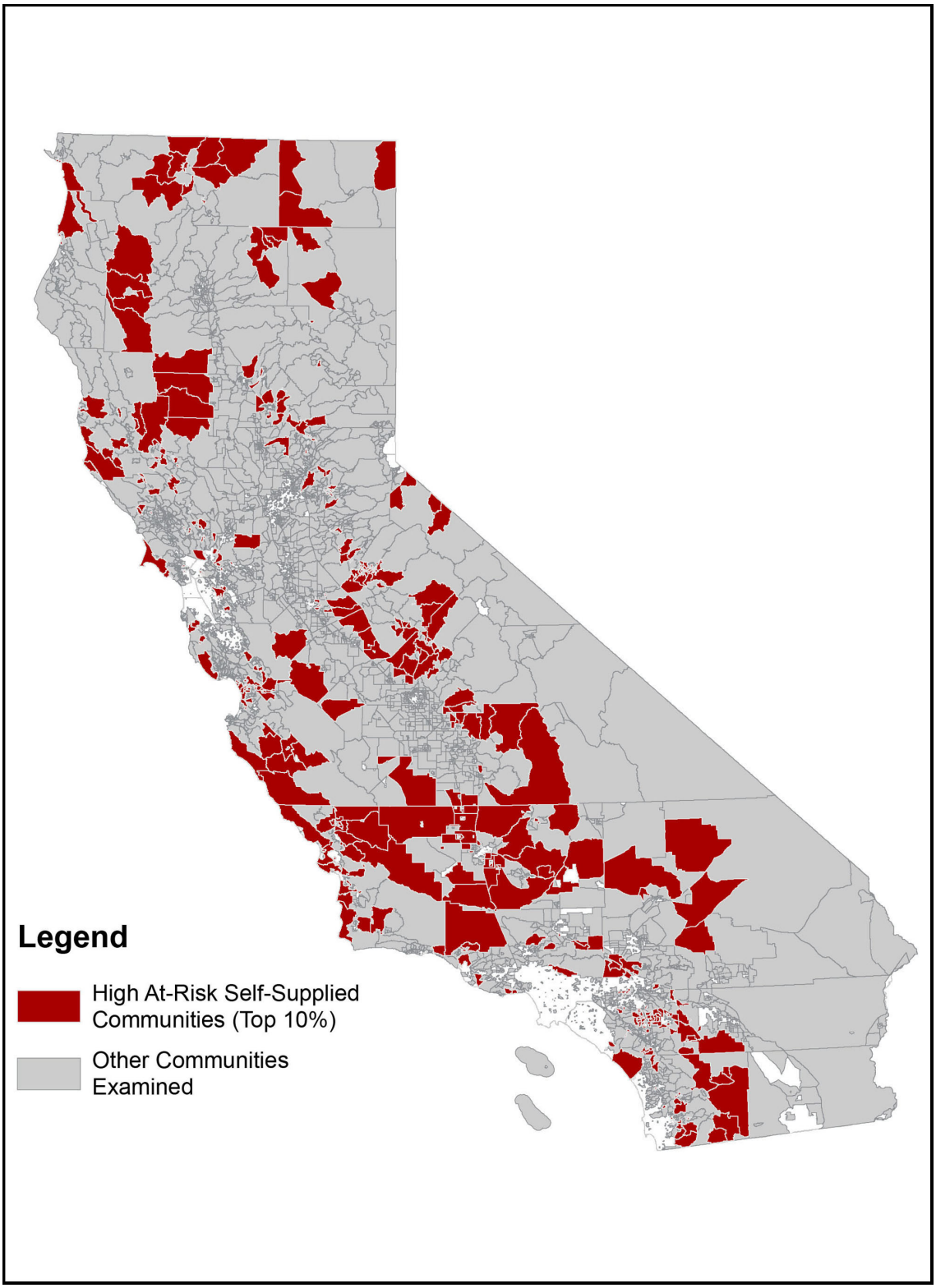
- 501 Block Groups make up the top 10% of the total 4989 examined
- 50 of the 58 counties contain Block Groups that scored within the top 10% at **risk**:
- Counties with the highest number of Block Groups within the top 10% include:

County	Number of Block Groups that are in Top 10% Risk	Total Number of Block Groups Examined in County	Percent of all Block Groups Examined in County that are in Top 10 Percent at Risk
Tuolumne	30	47	64%
Alpine	1	2	50%
Siskiyou	13	30	43%
San Benito	9	21	43%
Mariposa	7	17	41%
San Luis Obispo	24	63	38%
Lake	15	43	35%
Kern	55	173	32%
Trinity	4	13	31%

County	Number of Block Groups that are in Top 10% Risk	Total Number of Block Groups Examined in County	Percent of all Block Groups Examined in County that are in Top 10 Percent at Risk
Modoc	3	11	27%
Madera	14	61	23%

More details are provided in Appendix 4.

Figure 3 Self-supplied communities examined and those noted in red that are in the top 10% of draft drought and water shortage vulnerability risk scores



2.6 Tribal Water Systems – Risk Assessment

IHS is a federal partner that DWR worked closely with during this project. During the recent **drought**, IHS developed a tool to help identify and prioritize vulnerable tribal water suppliers. In previous years, IHS used similar concepts that are consistent with the **risk** and **vulnerability** framing and shared their indicators with CDAG. During the CDAG process, IHS updated their analysis to be consistent with the CDAG methodology because many of the CDAG-identified **risk** factors were not yet included in the IHS methodology. The tribal water system **risk** scores were calculated but, at present, are not included in Appendix 3 for data confidentiality reasons. IHS should be contacted for information on those results.

3.0 Recommendations and Guidance: Drought and Water Shortage Contingency Planning

As required by CWC Section 10609.42(b), this section describes recommendations and guidance relating to the development and implementation of countywide **drought** and **water shortage** contingency plans to address the planning needs of **small water suppliers** and rural communities. DWR is required to explain how the planning needs of **small water suppliers** and rural communities can be integrated into complementary existing planning processes. CDAG placed a high priority on this effort, while finding an approach that is effective and efficient.

To inform the recommendations, the CDAG WSCP workgroup examined several existing tools and reporting mechanisms used during the recent **drought** that could support aspects of **drought** and **water shortage** contingency planning for **small water suppliers**.

During the last major statewide **drought**, the State Water Board issued requirements and recommendations for steps that water suppliers should take for **drought** planning. Many of these requirements (listed in Figure 4) were directed to **urban water suppliers**. However, some were applicable to all water suppliers.

Figure 4 State Water Board DDW key recommendations to Water Suppliers during the 2012–2016 Drought

Education

- Educate customers and employees on emergency regulations, opportunities and incentives to upgrade indoor fixtures and appliances,
- Use education and the tools available through the Save Our Water and DDW website
- Educate and prepare governing boards on the **drought** response actions contained in the emergency regulations

Increase local supplies

- Accelerate the completion of projects that conserve potable water by making use of alternative water supplies;
- Improve leak reporting and response programs;
- Take proactive steps to secure communities' water supplies and educate customers about water conservation and the status of their supply reserves;
- Conduct water loss audits and make leak detection and repair a top priority for the duration of the **drought**

Use the checklist and template available through the DDW website to assess water supply and develop a **water shortage** contingency plan.

IHS also developed a voluntary **water shortage** contingency planning template for Tribes.

Small water system and rural community **drought** preparedness varied widely across the State. The CDAG experiences suggest few improvements in **drought** preparedness have been made since the **drought** ended.

The CDAG WSCP Workgroup suggested the **water shortage** contingency planning steps outlined in the American Water Works Association (AWWA) M60 Manual could be helpful for framing recommendations to build resiliency to future **droughts** and **water shortages** (American Water Works Association 2019). Those steps consist of:

- Step 1. Form a **Water Shortage** Response Team
- Step 2. Forecast Supply in Relation to Demand

- Step 3. Balance Supply and Demand and Assess Mitigation Options
- Step 4. Establish Triggering Levels
- Step 5. Develop a Staged Demand-Reduction Program
- Step 6. Adopt the Plan
- Step 7. Implement the Plan

Recommendations for meeting the **drought** and **water shortage** planning needs of **small water suppliers** and **self-supplied communities** are presented separately below.

3.1 Small Water Supplier Recommendations

CDAG participants shared the knowledge gained from their experiences during the last statewide **drought**. During the **drought**, those represented during this discussion described a lack of pre-planning, few agreements, and a lack of emergency/contingency plans such that many small system stakeholders were not aware of possibilities for assistance during times of acute or chronic shortage. Many small system stakeholders have a significant need for **drought** and **water shortage** contingency training.

CDAG members strongly believe that while planning is necessary, there is no need to start a new planning process especially for smaller water systems serving less than 1,000 **service connections**. Small water systems need to plan and prepare, but generally do not have the managerial, technical, and financial **capacity** to develop a full scale WSCP such as required of **urban water suppliers**. The preferred approach is to leverage complementary existing processes and authority to require **drought** and **water shortage** emergency response planning for all small water systems. However, the State Water Board does not have the regulatory authority to require development and submission of emergency response plans (ERPs) for any **public water system**. ERP development could be done with standardized templates and forms **small water suppliers** and school water systems would fill out with technical assistance and training provided by the State. These templates and forms would be an add-on to existing data reporting requirements. In addition, small water systems serving 1,000 to 2,999 **service connections** should be required to adopt a WSCP. DWR, through its existing **water shortage** contingency planning program, would review the WSCPs and provide guidance and technical assistance on how to develop a WSCP.

Specific recommendations are described below followed by general recommendations that are cross-cutting. For the successful implementation of all the recommendations, the State should provide funding to implement the corresponding proposed new activities.

Drought Planning & Technical Assistance

Recommendation S1. All small community water systems serving 15 to 2,999 service connections and noncommunity water system that are schools, should be required to develop an Emergency Response Plan and a drought supply evaluation to submit to the State Water Board.

The Emergency Response Plan (ERP) should be updated every five years or when significant changes occur and submitted to DDW similar to the Emergency Notification Plans (ENPs). Small water systems should also be required to submit **drought** supply evaluations to the State Water Board (e.g., groundwater levels).

The State Water Board should work with small **community water systems** serving 15 to 2,999 **service connections** and non**community water systems** that are schools to develop an Emergency Response Plan template that would integrate emergency response and **water shortage** planning components including methods to evaluate their supply into existing State Water Board reporting processes and plans.

The State Water Board should determine the appropriate components to be included in an ERP and the most appropriate way to collect this data, which may include, but not be limited to, sanitary surveys or electronic submission.

Two components that CDAG stakeholders wanted to emphasize follow:

- Small **community water systems** and **noncommunity water systems** that are schools should each proactively compile a list of relevant resources that can be used for assistance in the event of a **drought** or **water shortage** emergency, including local community-based organizations that work with vulnerable populations in and around areas served by the **public water system**, contractors for drilling wells, certified water haulers, and emergency shower vendors.
- Small **community water systems** and water systems that are schools should each have a plan for community outreach and informing communities of the resources available in the event of a

drought or **water shortage** emergency, including a list of contacts to notify for assistance requests.

Recommendation S2. The State Water Board should work with small community water systems serving less than 1,000 service connections and noncommunity water systems that are schools to establish minimum resiliency measures.

The State Water Board determined that small water systems with less than 1,000 **service connections** do not have the **capacity** to develop **water shortage** contingency plans. A better alternative for water resiliency improvement consists of working with these water suppliers to establish minimum resiliency measures for infrastructure improvements as part of the State Water Board's Safe and Affordable Drinking Water Program.

Recognizing that vital resiliency improvements will require additional funding; the State should seek to secure additional and expanded capital funding sources. The State Water Board should identify funding needs for implementation of resiliency projects and incorporate those needs into its expenditure plan and intended use plan analysis and prioritization processes for existing, new and expanded funding sources.

Recommendation S3. All small community water systems serving 1,000 to 2,999 service connections should be required to develop an abridged water shortage contingency plan and coordinate with GSAs where applicable.

CDAG referred to this plan as an "abridged WSCP" to differentiate it from the more stringent WSCP requirements that **urban water suppliers** need to comply with as part of their urban water management plans (CWC Section 10632.2). The proposed WSCP for **small water suppliers** is consistent with the AWWA M60 Manual (**Drought** Preparedness and Response). The proposed WSCP is not as extensive as what applies to **urban water suppliers** serving more than 3,000 **service connections**. This recommendation does not modify the definition of an **urban water supplier** nor does it extend the urban water management planning requirements to suppliers below the established 3,000 **service connections** threshold. Appendix 5 contains the basic planning components recommended for **water shortage** contingency planning for **small water suppliers**.

Small **community water systems** serving 1,000 to 2,999 **service connections** would update their WSCPs every five years or when significant changes occur and submit them to DWR. A copy of the ERP must be included as part of the submitted WSCP.

Recommendation S4: The State should provide technical assistance to small water systems on drought and water shortage planning, preparation and response.

The State can provide venues for local coordination and knowledge transfer involving diverse expertise and representation (e.g., community advocates, local system operators, disadvantaged self-supplied or small water system users, and large system operators). Training can include how to complete effective water needs assessments to identify the investments **small water suppliers** need to make. Technical assistance should support increased water resiliency efforts (including support of water resiliency planning) for **small water suppliers**, especially in disadvantaged communities, to ensure equitable implementation of these recommendations. Technical assistance to assist in consolidation projects, and to develop good examples of regionalization and partnerships would ensure these concepts are adopted in California. Resources to advance this new level of technical assistance could be provided using either existing technical assistance providers or through developing new programs.

DWR should develop a guidebook adapted from the AWWA M60 Manual (**Drought** Preparedness and Response) that is tailored to **small water suppliers**' needs in California.

Technical assistance for helping approximately 250 small **community water systems,** serving 1,000 to 2,999 **service connections**, develop **water shortage** contingency plans would be approximately $1 to $2 million. Additional funding would be needed to help small **community water systems** serving less than 1,000 **service connections** and non**community water systems** that are schools for technical assistance to develop their emergency response plans and comply with minimum resiliency requirements.

Monitoring and Assessment

Recommendation S5. In developing a water shortage contingency plan, small water systems should use the proposed annual statewide drought and

water shortage risk assessment prepared by the State, unless justifiably better data is available to improve drought and water shortage resiliency.

Small water suppliers should use the information in the proposed annual statewide **drought** and **water shortage risk** assessment, unless better data is available, to inform planning and prioritizing projects that enhance the water supplier's **drought** and **water shortage** resiliency.

Recommendation S6: All water suppliers should be required to provide and maintain accurate water service area boundaries on a designated site to be maintained by the State Water Board.

Collecting, standardizing, updating, and publishing service areas boundaries for all water suppliers is a critical step toward having the necessary tools to assess **risk** to **drought** and **water shortage** and engage water system consolidations and regional partnerships. Water service area boundaries are also important geospatial datasets for estimating and projecting utility populations and water demand for water supply planning, providing information to the public about their water supplies and drinking water quality, and for emergency response. Although there have been previous efforts to map all approximately 7,400 **public water systems** in California, the existing maps are not complete and are not consistently updated or verified. Likewise, there is a need to develop both the **public water system** service area boundaries and legal boundaries for the purposes of evaluating growth and consolidation potential.

Well depth, well log information and water service area boundaries should also be reconciled with existing DWR and State Water Board well databases that should be linked.

Infrastructure Needs to Improve Drought and Water Shortage Resiliency

Recommendation S7: State should make funding available to small community water systems and noncommunity water system that are schools to install additional infrastructure to improve drought and water shortage preparedness and response (e.g., backup well, water meters).

Currently, drinking water regulations (California Code of Regulations, Section 64554(c)) specify that new **community water systems** using only groundwater must have a minimum of two sources of supply, and that the system must be capable of meeting maximum day demand with the highest-

capacity source offline. The State Water Board is not able to apply this requirement to the many existing **small water suppliers** that rely on a single groundwater well for domestic water. This makes these **small water suppliers** even more vulnerable to **drought** impacts, as noted in the **risk** evaluation outlined in Section 3. Additional infrastructure is needed, such as backup wells, water tanks, and water meters, to improve resiliency. Additional funding would provide incentives that would improve resiliency.

3.2 Self-Supplied Communities Recommendations

During the CDAG process, the varied group of participants shared impacts they encountered during the last **drought** and how State and local responses (or the lack thereof) helped (or exacerbated) challenging **water shortage** conditions in rural regions. Participants urged DWR and other state agencies to apply common sense guidelines to water management in **self-supplied communities** during a **drought**. They stated that State agencies need to better understand the unique nature of water use and dependencies (e.g., groundwater versus surface water) in rural areas before the State codifies and then requires implementation of contingency plans that may have little recognition of these unique challenges. Related to the discussion above is the general lack of knowledge of self-supplied water systems on how to communicate with the State and regional agencies when a problem emerges or happens at the local level. There is a need for communication to continue during non-**drought** years.

This input from CDAG members was invaluable and has helped the State develop the **drought** and **water shortage** planning components proposed in this report.

The consideration for the roles and responsibilities of different entities is crucial, especially when developing regional solutions to support smaller, more vulnerable water systems. CDAG helped to define and plan coordination considering the roles of the different entities that have related authority and expertise to ensure that there is **drought** planning and oversight for all communities in the State. DWR recommends that existing efforts should be leveraged instead of mandating a new plan.

Specific recommendations for self-supplied community **water shortage** contingency planning are discussed below. For the successful implementation of all the recommendations, funding will be necessary to assist in implementing the corresponding proposed new activities.

Drought Planning & Technical Assistance

Recommendation R1: Counties should complete drought and water shortage contingency plans for self-supplied communities and water systems with fewer than 15 service connections, specify drought as a risk in their LHMPs, and have Emergency Operations Plans covering the entire county that include planned response to drought and water shortage conditions.

The county **drought** and **water shortage** contingency plan should follow the steps and include the elements listed in Appendix 6, which starts with the County forming a **water shortage** response team that includes County officials, State Water Board district offices, large and small water systems personnel, among others. Specifically:

1. Counties should use one or more of the following existing processes to incorporate required and recommended components related to **drought** and **water shortage** contingency planning for **self-supplied communities** (listed in Appendix 6): Local Hazard Mitigation Plan (LHMP), General Plan (Safety Element, Conservation Element, or other element), Emergency Operations Plan, Climate Adaptation Plan, Integrated Regional Water Management Plan, Groundwater Sustainability Plan, or other plan.
2. The State should develop a crosswalk online template (cross-reference table) for Counties to report where various **water shortage** contingency plan components are integrated. The completed form should be submitted to the State on an annual basis.
3. Although LHMPs are not currently required, all counties have a LHMP and these should be updated to include **drought**. **Drought** should be identified in the county's LHMP as a **risk** in all areas of the county (including unincorporated areas) not covered by an Urban Water Management Plan WSCP or abridged WSCP for **small water suppliers**. Near- and long-term mitigation projects to address **drought** and **water shortage** vulnerabilities also should be identified because few counties currently include projects to mitigate **drought** impacts in their LHMPs.
4. In the County general plan, available **drought** support/ response services should be added as a required section of a

safety element. Additionally, future water quality and contaminant map information from the State Water Board needs assessment project required by Health and Safety Code Section 116772(a)(1) should also be included in general plans, as these may impact availability of safe water.

5. Emergency operations plans should include planned response to **drought** conditions that cover the entire county, including unincorporated areas.
6. Each County should be required to, as part of existing planning processes, develop a robust plan for community outreach and informing communities of the resources available in the event of a **drought** or **water shortage** emergency. The plan should include a list of contacts to notify for assistance or information requests.
7. Counties at **risk** to future **drought** or **water shortage** should consider establishing a standing County **drought** and **water shortage** task force to ensure consistency within counties and will include representatives from local governments, community-based organizations, local water suppliers and members of the public. The formation of each County task force should be included in each County's general plans or in some other existing County plan.
8. County planning departments should ensure that planning considers future water availability, including climate change impacts. Existing mechanisms, such as the California Environmental Quality Act process, should be used for land use permitting.

DWR, in coordination with other relevant State agencies such as CAL OES and State Water Board, should on a regular basis review County planning documents containing recommended WSCP components to ensure that integration of **drought** and **water shortage** contingency planning is meaningful and targeted to the needs of vulnerable populations most at **risk** of **drought** and **water shortage**. In instances where this integration is lacking or insufficient, DWR, in coordination with other relevant State agencies, such as CAL OES and the State Water Board, could provide suggested changes to incorporate in the planning documents.

Recommendation R2: The Counties or State should provide technical assistance to self-supplied households to improve reliability of their water supply.

Homeowners and renters need help with resiliency planning. Training, such as workshops, can be coordinated by the Counties and State to disseminate educational materials.

Recommendation R3: Update statutory requirements and guidelines for General Plans to ensure that drought resilience and water shortage contingency policies or implementation programs are incorporated into the safety element, conservation element, or other appropriate elements.

Under current law governing general plans in Government Code 65302, general plans must address water resources and various natural hazards that relate to water in the conservation and safety elements. Currently within the safety element of the general plans, "Mitigating Hazards through **Drought** Resiliency Plans" is discussed as a best practice. However, **drought** is not specifically identified as a topic that must be addressed in either element. Legislation adding specific **drought** and **water shortage** contingency planning requirements to one or more of these general plan elements to address the need to mitigate **risk** and **vulnerability** would help improve **drought** and **water shortage** preparedness. OPR would be required to update the General Plan Guidelines to incorporate legislative changes to GC 65302, if proposed legislation were signed into law.

Monitoring and Assessment

Recommendation R4. Counties and regional planning agencies should use the use the proposed annual statewide drought and water shortage risk assessment prepared by the State to prioritize needs for drought and water shortage contingency planning.

Counties should use the proposed State annual statewide **drought** and **water shortage risk** assessment as explained in Recommendation G1 for their county and, to the extent feasible, supplement with additional data including information collected by the Counties to prioritize **drought** and **water shortage** management actions. The Counties **risk** analysis should be documented into one of their plans (e.g., general plan) so that the **risk** of all areas within a county are understood and accounted for in planning.

Recommendation R5: The State should improve its understanding of domestic well locations and well depths.

At present, DWR has compiled an online well completion report database listing the location (within a 1 square mile public lands section) of all domestic wells and when they were permitted. However, the usefulness of the information is hampered by (a) a lack of information on which wells have since been plugged and abandoned, and (b) a lack of precise information on well locations. Many Counties have information on which wells that have been plugged and abandoned. The Counties should share this information with DWR to add to the existing online well completion report database. Going forward, well completion permits issued by Counties should record the latitude and longitude of wells within 100 meters. This information would be redacted from the public version of the database to protect privacy concerns.

The State should also link the DWR well completion report log database with the State Water Board domestic well database.

Understanding of domestic well locations and well depths will help improve future **drought** and **water shortage risk** assessments for **self-supplied communities**.

3.3 Tribal Systems Recommendations

IHS has prepared a **drought** contingency plan template, which Tribes may choose to use to develop their own plan. Tribes are encouraged (but not required) to share their **drought** contingency plans with IHS, so that IHS can assist the Tribe with implementing the plan should **drought** conditions arise. That template is included in Appendix 7.

The following recommendations are specific to Tribes.

Drought Planning & Technical Assistance

Recommendation T1: Tribes are encouraged to develop drought and water shortage contingency plans and formally adopt them through a resolution of the Tribal Council or other Tribal authority with jurisdiction.

Monitoring and Assessment

Recommendation T2: The State should coordinate with Indian Health Services when preparing the proposed annual statewide drought and water shortage risk assessment to also include tribal water systems.

IHS plans to use the same scoring methodology as the State will use for small water system **risk** scoring. The State should continue to share data IHS needs to perform this annual update. IHS will maintain the Tribal list so that confidential information about Tribal water systems will not be disclosed publicly via the State.

3.4 General Recommendations (Cross-Cutting)

The following general recommendations are also suggested:

Conduct annual statewide drought and water shortage risk assessment

Recommendation G1: The State should conduct an annual statewide drought and water shortage risk assessment and generate relative risk scores for each small water system, noncommunity water system that is a school, and self-supplied community using best available statewide information.

Drought risk and **vulnerability** is dynamic and can change with decisions and investments made during a **drought**. **Drought** relief and planning needs continual assessments to consider the changing distribution of **drought risk** given different types of **drought** and new resilience-building efforts.

The benefit of offering an annual statewide **drought** and **water shortage risk** assessment is that Counties, groundwater sustainability agencies (GSAs), and other local groups will be aware of those areas and populations that are at higher **risk** and they can be prioritized for funding for abridged WSCP development or targeted assistance during periods of **water shortage**.

DWR should annually update the statewide **drought** and **water shortage risk** assessment for **small water suppliers** and **self-supplied communities** by April 15th of each year to enable local suppliers to start planning for a dry year prior to summer months. The indicators and construction of the scoring should be revised as more data becomes readily available.

This updated **risk** assessment should be made available annually to Counties, GSAs, integrated regional water management groups, State Water Board water system administrators, and other entities. The data and results of the annual statewide **drought** and **water shortage risk** assessment should be made publicly available in a centralized location similar to the Human Right to Water Portal as is currently on the State Water Board website. Deficits in data quality and availability identified through this process should be addressed through investment in data collection and enhanced monitoring.

The State should build upon the databases and tools developed for this project to compute/update annual **risk** and **vulnerability** assessments.

- Ongoing State funding is necessary to annually update and maintain the annual statewide **drought** and **water shortage risk** assessment tools developed as part of this CDAG process, along with ongoing funding to support continued refinement of existing data and to gather new data, including data on **State small water systems**, local small water systems, and concentrations of domestic wells.
- All data collected by DWR associated with either this CDAG process or implementation of the recommendations should be made publicly available in a centralized online location.

Integrate Drought and Water Shortage Contingency Planning and Response with Safe and Affordable Drinking Water Fund

Recommendation G2: Drought and water shortage contingency planning and response should be incorporated into implementation of the Safe and Affordable Drinking Water Fund.

Drought and **water shortage vulnerability** and **risk** should be:

- included as part of the State Water Board's current Needs Assessment project, as well as part of any similar future projects.
- a consideration for project funding from the Safe and Affordable Drinking Water Fund (SADWF) as part of the annual SADWF Expenditure Plan.

Establish Interagency Drought and Water Shortage Task Force

Recommendation G3: Establish a standing interagency drought and water shortage task force to facilitate proactive State planning and coordination, both for pre-drought planning and post-drought emergency response composed of DWR, State Water Board, CPUC, CAL OES and OPR.

This interagency task force should include a diverse stakeholder group, including experts in land use planning, water resiliency and water infrastructure, to develop strategies to enhance collaboration between the various fields and consider all types of water users.

In addition, after the submittal of this report to the Legislature, CDAG and State agencies should continue to meet to follow up on items that can be incorporated in the near term, such as to support agencies in implementing **water shortage** contingency planning, and other recommendations when required.

4.0 Topics for Further Discussion

During the CDAG meetings and discussions with State agencies, many relevant topics were brought to DWR's attention but need further discussion before recommendations can be made. Some of those topics follow.

4.1 Support Regional Scale Planning

There is a need for planning on a regional scale. There is a need for regional plans to annually assess regional water supply and demand conditions with a focus on communities identified as vulnerable to **drought**/**water shortage** (using the most recent proposed annual statewide **drought** and **water shortage risk** assessment prepared) and considering **urban water suppliers**, **small water suppliers**, other water users, and County WSCPs. Currently, there is no agency to take on those activities using existing authority. The State should develop a map of **urban water suppliers** in the proximity of **small water suppliers** to aid overall planning related to the resiliency of all water suppliers in the area.

4.2 Encourage Policies that Prioritize Sustainable Drinking Water for Rural and Small Water Systems

Throughout the State, regulations and development standards may be insufficient to ensure sustainable drinking water for small water systems and **self-supplied communities**. The consequence of this has led to the proliferation of small water systems that which are vulnerable to system failures caused by **drought** conditions or **water shortage** conditions. Further discussion is needed on the following suggestions to avoid these problems:

- The State could actively encourage collaboration between Counties and other key entities such as GSAs to, for example, support greater coordination between implementation of local groundwater sustainability plans and County implementation of proactive **drought** and **water shortage** planning. The State Water Board and DWR should develop further guidance, proposed recommendations, and data and decision-support tools to support this kind of collaboration.
- The State could work with the California State Association of Counties to identify opportunities to revise entitlement regulations and development standards to ensure that new small water systems are

constructed and permitted with sufficient water supply reliability, redundancy, and **drought**-resiliency measures to enhance the long-term sustainability of these small water systems and **self-supplied communities**.

- There were many discussions on what role the State could have in ensuring long term water supply reliability for **self-supplied communities**, and what is needed, in addition to existing mechanisms, to prevent the proliferation of new unsustainable wells that decrease **drought** resiliency.
- Counties could require additional **drought** and **water shortage** evaluations as part of permit applications for new **public water systems** and wells.
- California Code of Regulations Section 64215 addressing Water Supply Requirements for **State small water systems** could be expanded to (1) ensure adequate supply during **drought** years, and (2) expand the minimum supply requirement to include water systems with one to four connections. Unresolved issues include how to make sure a well is **drought** resilient.

4.3 Integrate Drought Risk and Resiliency into Hazard Mapping Tools

Currently, California Health and Safety Code Section 116772(a) (1) requires the State Water Board to make available maps of information on high-**risk** areas. The State Water Board and DWR should coordinate to integrate hazard mapping tools, and State Water Board efforts should consider extending its examination of communities and suppliers to include mapping of **drought risk** and resiliency.

4.4 Funding and Financing for Contingency Planning

Feedback from CDAG made it clear that funding and financing is key for small water system and self-supplied community **water shortage** contingency planning. Appendix 8 includes several funding ideas for small water systems suggested by members of the CDAG that warrant further consideration. These funding suggestions are not specific to recommendations in this report but are included as suggestions since improving the financial viability of small water systems can improve **drought** and **water shortage** planning and resiliency.

5.0 Glossary

5.1 Key Definitions

"**Community water system**" refers to a **public water system** that serves a minimum of 15 **service connections** used by yearlong residents or regularly serves a minimum of 25 yearlong residents of the area served by the system. Health and Safety Code (HSC) Section 116275(i).

"**Drought**" is defined in various ways depending on the needs (Moreland 1993). Generally, a **drought** is when supply does not meet demand for water, which has been met in the past. **Drought** tends to be associated with lower-than-average precipitation periods, though can be driven by increases in demand and ambient temperatures (which can influence demand and timing of supplies). Dry or warm periods can lead to reduced surface water flows, reduced surface and groundwater storage, and increased water quality challenges (e.g., from harmful and other algal blooms or increased disinfectant biproduct concentrations). Additionally, dry periods can lead to shifts in pollutant blooms in aquifers. These water quality issues are important **drought risks** to consider when planning and preparing for **droughts**, especially as temperatures increase under the changing climate.

"**Local primacy agency**" means a local health officer that has applied for and received primacy delegation pursuant to Section 116330. HSC Section 116275(r).

"**Noncommunity water system**" means a **public water system** that is not a **community water system**. HSC Section 116275(j).

"**Nontransient noncommunity water system**" means a **public water system** that is not a **community water system** and that regularly serves at least 25 of the same persons over six months per year. HSC Section 116275(k).

"**Public water system**" means a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more **service connections** or regularly serves at least 25 individuals daily at least 60 days out of the year. Health & Safety Code (HSC), Section 116275(h).

"**Self-supplied communities**" intends to cover what is regarded as the "rural communities" in the legislation. This is intended to cover those households and others with domestically used water (for dish washing, showering, drinking, and the like) on their own wells and surface water supplies. The **unit of analysis** for these communities is the U.S. Census Block group, omitting those with zero population (according to ACS 2012-2016) and those that have no domestic wells recorded (based on data from the DWR Well Report Database 2019). For the purpose of this **risk** and **vulnerability** assessment, this category also addresses communities served by water suppliers with fewer than 15 **service connections**.

"**Noncommunity water system that is a school**" refers to a school that is a permitted **public water system** because it has its own water supply.

"**Service connection**" means the point of connection between the customer's piping or constructed conveyance, and the water system's meter, service pipe, or constructed conveyance. HSC Section 116275(s).

"**Small water suppliers**" for this analysis are those with fewer than 3,000 **service connections** and serving less than 3,000 acre feet per year. **Urban water suppliers** with 3,000 connections and/or serve over 3,000 acre-feet are required to develop an urban water management plan, which includes a section on **drought** and **water shortage** contingency planning. Those **small water suppliers** that are listed as participating in an urban water management plan were also excluded because they are expected to be covered by their plan.

"**State small water system**" means a system for the provision of piped water to the public for human consumption that serves at least five, but not more than 14, **service connections** and does not regularly serve drinking water to more than an average of 25 individuals daily for more than 60 days out of the year. HSC Section 116275(n).

"**Transient noncommunity water system**" means a **noncommunity water system** that does not regularly serve at least 25 of the same persons over six months per year. HSC Section 116275(o).

"**Urban water supplier**" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually.

"**Water shortage**" is an insufficient quantity of water to meet indoor water uses such as drinking and sanitation, and other critical water needs, which can be caused by chronic conditions, extreme events, or both. This includes the physical lack of supply coming out of the tap, a problem that can be caused by dry wells or surface water, a regulatory restriction on accessing surface water, or some physical obstruction impeding water supply.

5.2 Key Concepts

Capacity (adaptive and coping): The **capacity** to adapt or cope is one of the two core sub-components necessary to understand **vulnerability**. This is the ability or potential of a system (or supplier, household, etc.) to respond successfully to climate variability and change and includes adjustments in both behavior and in resources and technologies. For this analysis, DWR represents **capacity** in Component 4: Organizational **Vulnerability** of the framework, which covers mostly social and economic **vulnerability** indicators.

Exposure to Hazard: **Exposure** in this **risk** framework represents the degree to which a water supplier's service area and a community is exposed to various hazardous environmental conditions and events that could lead to **drought** and/or **water shortage**.

Risk: Consistent with the Intergovernmental Panel on Climate Change 2012 Special Report (Cardona et al. 2012) and its upcoming Sixth Assessment Report, **risk** is the combination of **vulnerability** and the extent of **exposure** to a hazardous event or conditions, including projected future hazards (IPCC 2017). **Vulnerability**, as described below, is the combination of sociological and structure factors that make it more or less likely for people to be harmed when they are exposed to a hazard. The stakeholders in CDAG meetings agreed that **risk** is driven by both **exposure** to environmental events and conditions and social, political and economic factors, which is consistent with scientific literature on **water shortage** and scarcity (Kummu et al. 2016; Mekonnen and Hoekstra 2016) and disaster **risk** management.

Sensitivity: **Sensitivity** is one of the two core sub-components to understand **vulnerability**. This is the susceptibility of harm when exposed to hazardous conditions or an extreme event relating to **drought** and/or **water shortage**. This is often measured using characteristics of a population or a system. For this analysis, DWR represents **sensitivity** in Component 3 of the framework and it covers mostly physical **vulnerability** indicators.

Units of analysis: The final lists required by legislation must be in the form of listing **small water suppliers** and rural communities (referred to here as "**self-supplied communities"**). Because the **risk** factors differ between these groups, an analysis of each was conducted separately and separate lists were constructed. The **unit of analysis** used for **small water suppliers** is the service area boundary polygons available through the water boundary tool, except for the Tribal **small water suppliers**, which were represented by point location. The **unit of analysis** for the self-supplied households is census Block Groups (ACS 2012-2016 Tiger Shapefile). The Census Block Groups do not necessarily represent individual communities, but they do cover areas where population resides. Using this spatial unit for this analysis allows DWR to access demographic information that is otherwise not available.

The analysis includes those suppliers that have spatial boundaries of their service areas recorded in the water boundary tool, as of May 23, 2019 (https://trackingcalifornia.org). Those "**State Small** Systems" (State Water Board) with fewer than 15 **service connections** will be covered under the **self-supplied communities** represented by census Block Groups.

Vulnerability: **Vulnerability** is the propensity or predisposition to be adversely affected. Such predisposition constitutes an internal characteristic of the affected element, whereas **exposure** to a hazard is a condition or event to which the affected element (i.e., supplier or community) is subjected. In the field of disaster **risk** management, this includes the characteristics of a person or group and their situation that influences their **capacity** to anticipate, cope with, resist, and recover from the adverse effects of physical events (Wisner et al., 2004). For further reading on **vulnerability**, see *Key Concepts and Methods in Social **Vulnerability** and Adaptive **Capacity*** (https://www.fs.fed.us/rm/pubs/rmrs_gtr328.pdf) and Chapter 1 in IPCC Special Report on Extreme Events (Lavell et al. 2012). **Vulnerability** is typically estimated by combining **sensitivity** and **capacity** of the supplier or community or other grouping of population or assets.

6.0 References

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List of Appendices

The appendices to this report are in separate documents and are available on request from DWR.

Appendix 1 Literature Review

Appendix 2 Drought and Water Shortage Risk Scoring – California's Small Water Supplier and Self-Supplied Communities

Appendix 3 Small Water System Draft Water Shortage Risk Results

Appendix 4 Rural Community Draft Water Shortage Risk Results

Appendix 5 Proposed Draft Water Shortage Contingency Plan Components for Small Water System

Appendix 6 Proposed Draft Umbrella Water Shortage Contingency Plan Components

Appendix 7 IHS Template for a Drought Contingency Plan for a Tribal Public Water system

Appendix 8 General Funding and Financing Issues