

7 Water Supply Reliability and Drought Risk Assessment

CWC 10635(a)

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

Under the Act, all UWMPs must include an assessment of the reliability of their water supplies. The water supply and demand assessment must compare the total projected water use with the projected water supply, in 5-year increments, through the next 20 years. This section presents a comparison of the water demands and supplies within the VWD's service area, and assesses supply versus demand during normal years, single dry water years, and multiple dry water years. This section also provides a DRA that enables VWD to evaluate its risk under a severe drought lasting for the next five consecutive years.

7.1 Constraints on Water Sources

Though VWD is guided by its 2018 Water, Wastewater, and Recycled Water Master Plan to ensure future reliable water supplies, it is dependent on the water supply abilities of its wholesaler, the SDCWA. According to the SDCWA's 2020 UWMP, the SDCWA anticipates meeting all future demands of its member agencies in normal and single dry-year scenarios. However, some level of shortage could potentially be experienced during the multiple dry-year scenarios. Strategies to address these deficiencies, including SDCWA's Carryover Storage Program and Dry-Year Transfer Program, are discussed in Section 11.2.4 of SDCWA's 2015 UWMP.

The purchase of 1,140 MG per year of contracted desalinated seawater supply through the San Diego County Water Authority from the Claude "Bud" Lewis Carlsbad Desalination Plant helps VWD alleviate potential multiple dry-year water shortages. Other methods, including increased implementation of demand management measures and use of recycled water, are discussed in Section 7.3.

7.1.1 SDCWA Supplies

VWD currently purchases 100 percent of its potable water supply from SDCWA. SDCWA's supplies include imported water from the State Water Project (SWP) and the Colorado River, water available from a transfer agreement and canal lining projects, and desalinated seawater.

SWP water is imported from the Sacramento-San Joaquin Bay Delta, which is an increasing reliability concern due to effects of climate change, competing demands, and other environmental constraints. Recent legal decisions regarding Colorado river supplies and the Delta Plan, as discussed below, may restrict imported SWP water during times of drought or certain times of the year to maintain minimum flows for environmental needs or other legal agreements. During recent years, SWP supplies have faced allocations due to drought conditions; the risk of allocation is projected to continue in the next few years. As part of the 2020 UWMP update, the SDCWA evaluated the reliability of these supplies and stated that the delivery estimates are anticipated to be 51 percent of maximum potential allotment amounts on a long-term average condition, and 12 percent under a single dry-year condition.

Colorado River supplies are subject to the Quantification Settlement Agreement (QSA), which may change due to legal decisions. The 2003 QSA and related agreements, executed in October 2003, resolved longstanding disputes regarding Colorado River water use among agencies, and established a baseline water use for Imperial Irrigation District, Coachella Valley Water District, and Metropolitan. This permitted implementation of a variety of water conservation and transfer agreements, including the Water Authority's transfer agreement with Imperial Irrigation District. The 2003 QSA also provides that the Coachella Valley Water District and Metropolitan put aside, for the term of the agreement, a dispute over beneficial use of water by Imperial Irrigation District; and that Metropolitan would forbear consumptive use of water to permit the Secretary of Interior to satisfy the uses of the non-encompassed water delivered to holders of present perfected rights. Additionally, the Colorado River Basin has been experiencing a multi-year drought, which has diminished supply storage by 50 percent with respect to total capacity. Continued drought conditions and climate change effects may potentially affect Colorado River water supplies. Even with potential changes to the Quantification Settlement Agreement and climate change impacts, Colorado River supplies are considered substantially more secure than SWP supplies. As a part of the 2020 UWMP update, the SDCWA evaluated the reliability of these supplies and stated that, based on information from Metropolitan, Colorado River supply availability for an average normal year, single dry year, and multiple dry year is 1.25 million AF, which is the maximum Colorado River Aqueduct delivery capacity. This estimate includes water management programs, including the SDCWA's transfers and canal lining projects.

The SDCWA has been implementing plans to diversify its water supply with alternative sources to increase supply reliability. Through these diversification efforts, there is an increased chance the reduced availability of any one supply source would be buffered, because the region would not be reliant on a single supply source. These efforts include implementation of the Claude "Bud" Lewis Carlsbad Desalination Plant, which is a drought-proof supply that is anticipated to be reliable in normal, single dry-year, and multiple dry-year hydrologic scenarios.

Delta Plan Policy WR P1 is one of fourteen regulatory policies in the Delta Plan. The Delta Plan is a comprehensive, long-term, legally enforceable plan guiding how federal, state, and local agencies manage the Delta's water and environmental resources. The Delta Plan was adopted in 2013 by the Delta Stewardship Council. Delta Plan Policy WR P1 identifies UWMP as the tool to demonstrate consistency with the state policy that suppliers that carry out or take part in covered actions must reduce their reliance on the Delta.



VWD’s documentation on reduced reliance on the Delta, through SDCWA supplies and local projects, is documented in Appendix F.

Expanded discussion on the reliability and consistency of the SDCWA supply is in the SDCWA 2020 UWMP and Metropolitan Water District’s 2020 UWMP.

7.2 Reliability by Type of Year

Table 7-1 shows the basis of water year assessment for single-dry and multiple-dry year supplies expected to be available compared to those supplies in an average year. “Average Year” hydrology, as used in this UWMP plan, was taken as the average between the years 1986 and 2018. This base year information matches the SDCWA 2020 UWMP.

Table 7-1. Basis of Water Year Data (Reliability Assessment)

Year Type	Base Year*	Available Supplies if Year Type Repeats	
		Volume Available	% of Average Supply
Average Year	1986-2018		100
Single-Dry Year	2015		100
Consecutive Dry Years 1st Year	2011		100
Consecutive Dry Years 2nd Year	2012		100
Consecutive Dry Years 3rd Year	2013		100
Consecutive Dry Years 4th Year	2014		100
Consecutive Dry Years 5th Year	2015		100

Note:

Water years are in calendar years.

Normal year demand projections for VWD over the next 20 years were calculated in Table 4-3. In its 2020 UWMP, the SDCWA has developed long-range supply forecasts for normal year water reliability assessment for each of its member agencies. These supply forecasts are shown in Table 6-8, along with projected VWD storage and recycled water supplies over the next 20 years.

As shown in Table 7-2, based on actual data of local water supplies and the methodology used by SDCWA for imported supplies, 100 percent of supplies are available in a single dry year and in multiple dry years.

Reliability is anticipated to vary by supply; local supplies, including desalinated water, are assumed to remain consistent and reliable, even in drought conditions. The SDCWA 2020 UWMP was consulted for anticipated supply reliability of imported supplies. SDCWA assumes no reduction in their availability of water from water transfers, canal lining

projects, or regional desalination and projects full availability of these supplies due to the drought resilience of these supplies.

7.3 Supply and Demand Assessment

To assess water service reliability during drought events, the UWMP Act requires each urban water supplier to prepare single and multiple dry-year demand and supply projections and comparisons in 5-year increments.

The SDCWA reports that if Metropolitan, SDCWA, and member agency supplies are developed as planned, along with achievement of the SB7 water conservation targets, adequate water supply is anticipated within the SDCWA's service area for normal and single dry years, as well as multiple dry year periods, through 2045. If supply limitations arise in multiple dry-year scenarios, they will be addressed through implementation of extraordinary water conservation measures.

7.4 Projected Normal Year Supply and Demand

Normal year demand projections for VWD were estimated in coordination with SDCWA UWMP projections for its member agencies and the SDCWA long-range supply forecasts for normal-year water reliability assessment. Table 7-2 shows the forecasted normal water year projections for the VWD service area.

Table 7-2. Normal Year Supply and Demand Comparison

	Volume of Water (MG)				
	2025	2030	2035	2040	2045 (Opt)
Supply totals	6,165	6,439	6,653	7,373	8,072
Demand totals	6,818	7,064	7,317	8,097	8,826
Difference	(653)	(625)	(664)	(724)	(754)
Active and Passive Conservation	653	625	664	724	754
Surplus/(Shortage)	5	4	2	8	9

Notes:

SDCWA supplies assume member agency demands on SDCWA are inclusive of conservation. District demand projections do not include conservation. The District will incorporate active and passive conservation savings to mitigate potential supply shortages.

SDCWA anticipates sufficient supplies to deliver all the regional, supplemental water needed by its member agencies above normal year demand projections, if needed.

The projections show that VWD anticipates a slight shortfall in projected water supplies to meet demands (without conservation) through 2045. However, to mitigate for these projected water supply shortfalls, VWD can implement demand-reduction actions and conservation measures, as discussed in Sections 8 and 9.



7.5 Single Dry Year Supply and Demand

For the single dry-year scenario, supplies were calculated based on evaluating the availability of each supply. For desalinated water, it is assumed that supplies would be reliable and available at normal levels in a single dry year. Per information from the SDCWA 2020 UWMP, it is anticipated that purchased water would be available to meet demands in a single dry year. SDCWA assumes it will be able to deliver all the regional, supplemental water needed by its member agencies during this single-year drought.

Based on modeling performed by SDCWA, demands would increase by 7 percent in a single dry year; therefore, VWD would purchase additional supplies from SDCWA to meet increased demands. Table 7-3 shows VWD’s single dry-year assessment in 5-year increments through the year 2035. In a single dry water year, supplies and demands would be equal with no surplus or deficit.

Table 7-3. Single Dry Year Supply and Demand Comparison

	Volume of Water (MG)				
	2025	2030	2035	2040	2045 (Opt)
Supply totals	7,296	7,558	7,828	8,663	9,444
Demand totals	7,296	7,558	7,828	8,663	9,444
Difference	0	0	0	0	0

Notes:

Based on modeling performed by SDCWA, demands would increase by 7 percent in a single dry year; therefore, VWD would purchase additional supplies from SDCWA to meet increased demands.

Per information from the SDCWA 2020 UWMP, it is anticipated that purchased water would be available to meet demands in a single dry year.

SDCWA assumes it will be able to deliver all the regional, supplemental water needed by its member agencies during this single-year drought.

7.6 Multiple Dry Year Supply and Demand

For the multiple dry-year scenario, supplies were also calculated by evaluating the anticipated availability of each supply. For desalinated water, it is assumed that supplies would be reliable and available at normal levels in a single dry year. Based on modeling data from SDCWA, demands would increase to 107 percent of normal in the first year, 108 percent of normal in the second and third years, and 109 percent of normal in the fourth and fifth years of a multiple dry-year period.

The demand and supply assessment assumes that VWD would purchase additional supplies from SDCWA to meet demands. SDCWA does not show a deficit of supplies or a need to utilize carryover storage supplies during an extended drought but does assume SDCWA and member agencies would implement demand management and conservation measures in response to extended drought conditions. Therefore, as shown in Table 7-4, in all years of a multiple dry-year scenario, supplies and demands would be equal with no surplus or deficit.

Table 7-4. Multiple Dry Years Supply and Demand Comparison

		Volume of Water (MG)				
		2025	2030	2035	2040	2045 (Opt)
First Year	Supply totals	7,296	7,558	7,828	8,663	9,444
	Demand totals	7,296	7,558	7,828	8,663	9,444
	Difference	0	0	0	0	0
Second Year	Supply totals	7,364	7,628	7,901	8,744	9,532
	Demand totals	7,364	7,628	7,901	8,744	9,532
	Difference	0	0	0	0	0
Third Year	Supply totals	7,364	7,628	7,901	8,744	9,532
	Demand totals	7,364	7,628	7,901	8,744	9,532
	Difference	0	0	0	0	0
Fourth Year	Supply totals	7,432	7,699	7,975	8,825	9,620
	Demand totals	7,432	7,699	7,975	8,825	9,620
	Difference	0	0	0	0	0
Fifth Year	Supply totals	7,432	7,699	7,975	8,825	9,620
	Demand totals	7,432	7,699	7,975	8,825	9,620
	Difference	0	0	0	0	0

Notes:

Based on modeling data from SDCWA, demands would increase to 107 percent of normal in the first year, 108 percent of normal in the second and third years, and 109 percent of normal in the fourth and fifth years of a multiple dry-year period; therefore, VWD would purchase additional supplies from SDCWA to meet increased demands.

Per information from the SDCWA 2020 UWMP, it is anticipated that purchased water would be available to meet demands during an extended drought.

SDCWA assumes it will be able to deliver all the regional, supplemental water needed by its member agencies during an extended drought, assume SDCWA and member agencies would implement demand management and conservation measures

VWD continues to work closely with the SDCWA for future water supply planning. Based on the information provided by the SDCWA, the water supply available to VWD is considered reliable.

7.7 Drought Risk Assessment

CWC 10635(b)

The drought risk assessment shall include...a determination of the reliability of each source of supply under a variety of water shortage conditions. This may include a determination that a particular source of water supply is fully reliable under most, if not all, conditions.

CWC 10634

The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Near-term drought reliability of the sources of supply utilized by VWD depends on the drought impact and stress on each supply. VWD's DRA assesses a projected drought over the next five-year period from 2021 – 2025. The historical period used in the analysis to represent the SDCWA's driest consecutive five-year period are years 2014 – 2018. Those years represent the five-year period with the lowest local water supply production from surface water and groundwater, the two local water supplies that are most susceptible to variation due to weather. The data used to calculate VWD's supply capabilities under the scenario of five consecutive dry years includes a comparison between available water supplies and water demands. For SDCWA (and, inherently, VWD) supplies, which consist of the Imperial Irrigation District water transfer, canal lining projects, and regional seawater desalination, no reduction in the availability over the five-year period is assumed due to the drought resilience of these supplies. Surface water supplies may be impacted by variations in weather and drought conditions and are considered to be available similar to usage during the 2014-2018 period.

The DRA demands for 2021 – 2025 were projected by taking 2020 demands escalating them annually for five years based on the multipliers developed by SDCWA, which were based on a weather index developed to assess the impact of dry/hot weather on water demands. The demand projection multipliers are as follows:

- 2021 – 108%
- 2022 – 112%
- 2023 – 116%
- 2024 – 120%
- 2025 – 125%

The SDCWA 2020 UWMP shows a surplus of water supplies for all demand conditions and has determined that actions under the WSCP would not be necessary. Demand projection multipliers for each of the risk assessment years are modeled after the multipliers used in the SDCWA 2020 UWMP and use 2020 demands as the baseline demand year. VWD's DRA is presented in Table 7-5.

Table 7-5. Five-Year Drought Risk Assessment Tables to address CWC Section 10635(b)

Year	Description	Total (MG)	
2021	Gross Water Use	5,222	
	Total Supplies	5,222	
	Surplus/Shortfall w/o WSCP Action	0	
	<i>Planned WSCP Actions (use reduction and supply augmentation)</i>		
	WSCP - supply augmentation benefit		
	WSCP - use reduction savings benefit		
	Revised Surplus/(shortfall)	0	
2022	Gross Water Use [Use Worksheet]	5,416	
	Total Supplies [Supply Worksheet]	5,416	
	Surplus/Shortfall w/o WSCP Action	0	
	<i>Planned WSCP Actions (use reduction and supply augmentation)</i>		
	WSCP - supply augmentation benefit		
	WSCP - use reduction savings benefit		
	Revised Surplus/(shortfall)	0	
	Resulting % Use Reduction from WSCP action		
2023	Gross Water Use	5,609	
	Total Supplies	5,609	
	Surplus/Shortfall w/o WSCP Action	0	
	<i>Planned WSCP Actions (use reduction and supply augmentation)</i>		
	WSCP - supply augmentation benefit		
	WSCP - use reduction savings benefit		
	Revised Surplus/(shortfall)	0	
	Resulting % Use Reduction from WSCP action		
2024	Gross Water Use	5,803	
	Total Supplies	5,803	
	Surplus/Shortfall w/o WSCP Action	0	
	<i>Planned WSCP Actions (use reduction and supply augmentation)</i>		
	WSCP - supply augmentation benefit		
	WSCP - use reduction savings benefit		
	Revised Surplus/(shortfall)	0	
	Resulting % Use Reduction from WSCP action		

Table 7-5. Five-Year Drought Risk Assessment Tables to address CWC Section 10635(b)

Year	Description	Total (MG)	
2025	Gross Water Use	6,044	
	Total Supplies	6,044	
	Surplus/Shortfall w/o WSCP Action	0	
	<i>Planned WSCP Actions (use reduction and supply augmentation)</i>		
	WSCP - supply augmentation benefit		
	WSCP - use reduction savings benefit		
	Revised Surplus/(shortfall)	0	
	Resulting % Use Reduction from WSCP action		

Notes:

During an extended drought, VWD would purchase additional supplies from SDCWA to meet increased demands. The SDCWA 2020 UWMP shows a surplus of water supplies for all demand conditions and has determined that actions under the WSCP would not be necessary.

7.8 Seismic Risk Assessment

CWC 10632.5(a)

Beginning January 1, 2020, the plan shall include a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities.

Seismic impacts to VWD’s water supplies are evaluated on a regional scale, as seismic events along the San Andreas and San Jacinto fault systems could limit imported supplies.

VWD’s actions in response to a seismic event reflect actions included in the SDCWA Emergency Storage Project and the San Diego County Multi-Jurisdictional Hazard Mitigation Plan.

7.8.1 San Diego County Water Authority

The 2013 SDCWA Master Plan Update summarized the potential degree of damage to its pipelines and the amount of time required to restore services after a natural disaster. A 1993 report evaluated system vulnerabilities to the most probable seismic event (MPE) and maximum credible seismic event (MCE). The MPE is defined as the largest event with a 10 percent chance of occurrence over the next 50 years, while the MCE is the largest event judged to be possible given geologic criteria such as relationships between fault length, fault displacement, and slip rate.

Impacts to VWD would be greatest with a major seismic event on the Elsinore Fault Zone: all five SDCWA pipelines cross the Elsinore Fault zone and a major event on the Second Aqueduct (Pipelines 3, 4, and 5) has the potential to cut off treated and/or untreated water

from MWD to VWD for 1 to 3 months. The predicted failure from the MPE (magnitude [M] 7.0) and MCE (M7.5) on the Elsinore Fault lead to estimated repair times that range from:

- Pipeline 3: 50 to 54 days
- Pipeline 4: 38 to 40 days
- Pipeline 5: 78 to 86 days

SDCWA is currently in the process of updating its vulnerability assessment.

Damage from a regional earthquake to imported supply is mitigated by major investments in emergency storage made by SDCWA. SDCWA's Emergency Storage Project includes emergency surface water storage (90,100 AF) and new distribution facilities to allow continued water service to its member agencies during a prolonged regional interruption. The Emergency Storage Project facilities can be used to deliver emergency water supply during 2- and 6-month imported water supply interruptions, or any other emergency situation where SDCWA has insufficient water available to supply at least 75 percent of the total demand of its service area or any portion of the service area.

The Carlsbad Desalination Project (CDP) would also help mitigate SDCWA water shortages if deliveries from MWD are reduced. However, the plant may also be susceptible to a seismic event. Studies estimated that partial flows could be restored in 1 week to 1 month, and full capacity would require up to 6 months of repairs if CDP sustained damage from the MCE on the Rose Canyon Fault. Conveyance and distribution damage caused by seismic activity would take 1 week to 3 months to repair. The CDP has the capacity to produce 56,000 AFY (50,000 AFY of this total supply is owned by SDCWA and the remaining 6,000 AFY is owned by the City of San Diego). An outage at the CDP due to major ($M > 7$) seismic activity would result in no supply being available from the CDP.