MEETING FUTURE DEMANDS

THIS CHAPTER ADDRESSES HOW SNWA PLANS TO RELIABLY MEET PROJECTED WATER DEMANDS UNDER A RANGE OF SUPPLY AND DEMAND CONDITIONS.

INTRODUCTION

As described in the preceding chapters, water supply conditions and demands can be influenced by several factors that can change in unpredictable ways, including changes associated with economic conditions, water conservation progress and climate variability. As the SNWA prepared its 2021 Plan, the organization considered two overriding issues related to water supply and demands:

- The potential impact of continued drought and climate change on water resource availability, particularly for Colorado River supplies; and
- The potential impact of economic conditions, climate change and water use patterns on long-term water demands.

To address these uncertainties, the SNWA developed a series of planning scenarios that represent Southern Nevada's future water resource needs under variable supply and demand conditions. This approach helps inform water resource planning and development efforts and demonstrates how the SNWA plans to meet future needs, even if conditions change significantly over time.

Water demands and resource volumes are presented in consumptive use terms, consistent with the water resource descriptions in Chapter 3 and illustrating the supply-related impacts of SNWA shortage reductions and DCP contributions. As described in the following sections, all of the planning scenarios presented in this chapter demonstrate the SNWA's ability to meet the community's long-term projected water needs with additional conservation and adaptive use of its Water Resource Portfolio.

SUPPLY AND DEMAND

Water resource planning is based on two key factors: supply and demand. Supply refers to the amount of water available or expected to be available for use. Demand refers to the amount of water expected to be needed in a given year.

Water demand projections are based on population forecasts and include assumptions about future water use, such as expected achievements toward water conservation goals. Precise accuracy from year to year rarely occurs in projecting demands, particularly during periods of significant social and economic change. While making assumptions is a necessary part of the planning process, assumptions are unlikely to materialize exactly as projected. Likewise, climate variations, policy changes and/or the implementation of new regulations can also influence water resource availability over time.

The scenarios presented in this chapter address these uncertainties by considering a wide range of supply and demand possibilities. Rather than considering a single forecast, the scenarios bracket the range of reasonable conditions that may be experienced over the 50-year planning horizon. Key factors evaluated include possible reductions of Colorado River supplies, as well as variation in future demands. This is a conservative approach that reflects the uncertainties presented in the current planning environment.

The following describes the water supply conditions and demand projections considered as part of scenario development.

Water Supply

Figure 4.1 summarizes the water resources planned for development and use as part of the SNWA's Water Resource Portfolio. As previously described, some permanent and temporary resources are subject to restrictions for use based on Lake Mead water levels (when Lake Mead is at an elevation of 1,090 feet or lower). Other resources are subject to future agreements or will require the development of facilities for use.

Ultimately, the timing and need for resources will depend significantly on how supply and demand conditions materialize over the long-term planning horizon.

	SUPPLY	CONSUMPTIVE USE	AVAILABLE IN SHORTAGE
PERMANENT	Colorado River (SNWA and Nellis Air Force Base) [1]	276,205 AFY	Yes. Subject to shortage reductions
	Nevada Unused Colorado River (Non-SNWA)	13,938 (2021) to 0 AFY in 2031	Yes. Subject to availability
	Tributary Conservation ICS	30,690-36,000 AFY	Yes
	Las Vegas Valley Groundwater Rights	46,961 AFY	Yes
TEMPORARY	Southern Nevada Groundwater Bank	345,206 AF (20,000 AFY max.)	Yes
	Interstate Bank (Arizona)	613,846 AF (40,000 AFY max.)	Yes
	Interstate Bank (California)	330,225 AF (30,000 AFY max.)	Yes
	Intentionally Created Surplus (storage in Lake Mead)	865,741 AF (300,000 AFY max.)	Yes, varies by Lake Mead elevation
FUTURE	Colorado River Transfers/Exchanges Permanent Future Supply (Desalination and Colorado River Partnerships)	20,000-40,000 AFY	Yes
	Colorado River Transfers/Exchanges Virgin River/Colorado River Augmentation	Up to 108,000 AFY	To be determined
	Garnet and Hidden Valleys Groundwater	2,200 AFY	Yes
	Tikaboo and Three Lakes Valley North and South Groundwater	10,605 AFY	Yes

FIGURE 4.1 **SNWA Water Resource Portfolio**

Water Demand Projections

The planning scenarios developed as part of this Plan include three water demand projections (Figure 4.2 and Figure 4.3). These include an upper and lower water demand projection that assumes expected conservation and an upper demand projection that assumes lower levels of conservation achievement. The lower water demand projection was derived from a population forecast and expected conservation achievements. The Clark County population forecast was obtained from the University of Nevada Las Vegas Center for Business and Economic Research (CBER).

YEAR	2021	2045	2072
LOWER DEMAND 86 GPCD IN 2035	291,000	301,000	324,000
UPPER DEMAND 86 GPCD IN 2035	294,000	353,000	405,000
UPPER DEMAND 98 GPCD IN 2035	296,000	389,000	434,000

FIGURE 4.2
SNWA Demand Projection, (AFY)

The CBER forecast is also used in local planning, including transportation planning by the Regional Transportation Commission. The forecast is based on CBER's working knowledge of the economy and the nationally recognized Regional Economic Model Incorporated (REMI).

The lower water demand projection was derived using the 2021 CBER population forecast through 2060 and trending through 2072. The historical share of Clark County population attributable to the SNWA service area was multiplied by 2020 water-use levels and reduced over time to represent expected achievement of the community's water conservation goal of 86 GPCD by 2035.

The upper demand projection was developed for planning purposes to reflect increased uncertainties related to possible changes in demands associated with the economy, climate, population and water use variability. It also reflects expected achievement of the community's water conservation goal of 86 GPCD by 2035.

The upper demand projection represents an approximate 15 percent increase over the lower projection at the midpoint of the planning horizon (2041), increasing to 25 percent in the latter part of the planning horizon (2072). The SNWA also considered one variant of the upper demand projection to illustrate how falling short of the current conservation goal will impact the anticipated timing and need for permanent, temporary and future resources. The projection assumes the community only reduces demands to 98 GPCD by 2035 and 92 GPCD by 2055.

Water Supply Conditions

The SNWA also made assumptions about future water supply conditions as part of its long-range

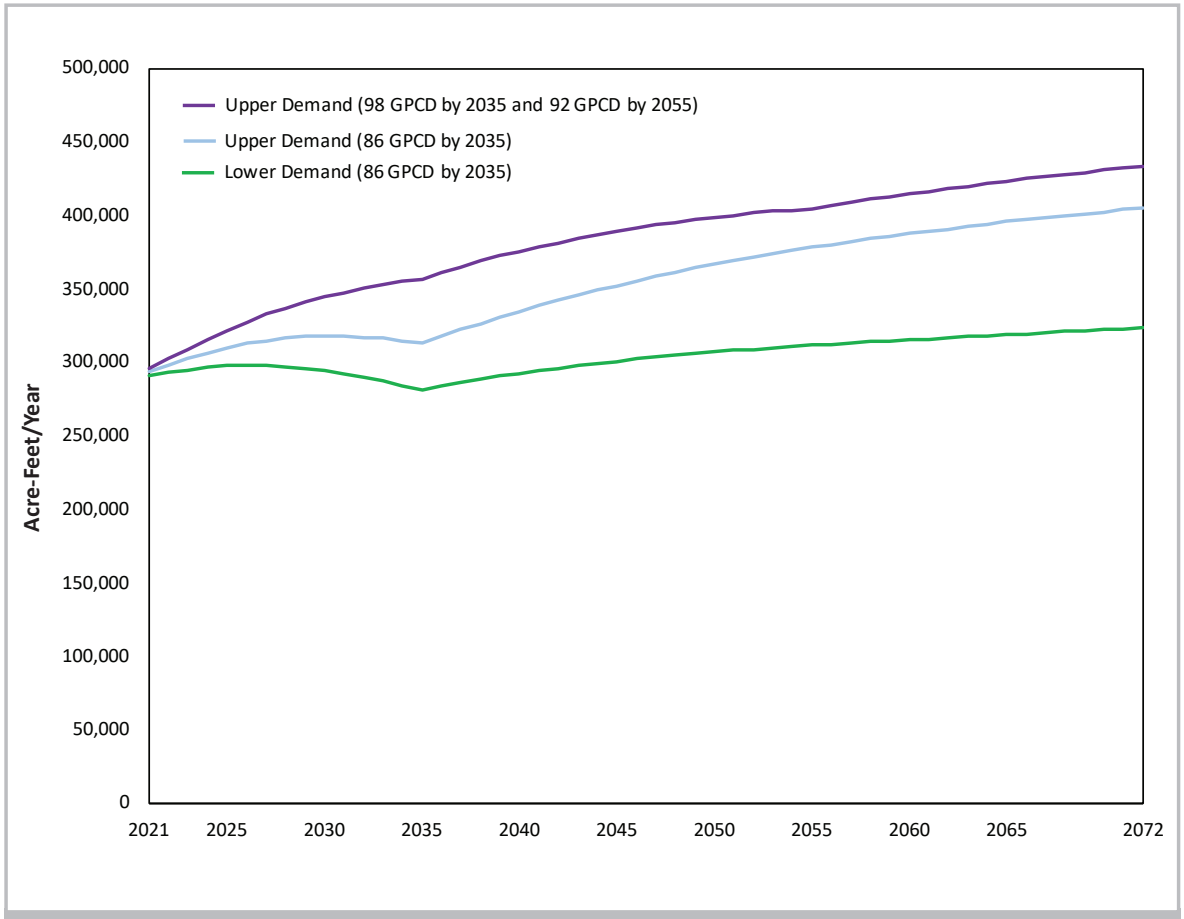


FIGURE 4.3 **SNWA Projected Water Demand**

planning efforts. As detailed in Figure 4.4 and Figure 4.5, the SNWA evaluated three water supply conditions based on historic Colorado River inflows since 1906 (when record-keeping began) to 2021. While one of the planning scenarios presented in this Plan considers historical average flows for Colorado River supplies (14.7 MAFY inflow), drier hydrology is expected based on current trends and forecasted conditions (see Chapter 2).[1] As a result, the two lower inflow volumes as shown on right provide a more prudent range for planning purposes, with inflows ranging from 12.9 to 11.0 million acre-feet per year (MAFY).

As noted earlier in this Plan, Colorado River inflows are highly variable, with occasional and extended periods of extremely wet and extremely dry inflows. By incorporating historical water supply conditions into long-term planning efforts, the SNWA can make better-informed decisions about future Lake Mead water levels and associated restrictions on Colorado River supplies, as well as the timing and volume of resources needed to meet future demands.

The Interim Guidelines define shortage volumes for Lake Mead elevations between 1,075 and 1,025 feet. Likewise, the DCP defines Lower Basin contributions when Lake Mead is at or below 1,090 feet. Both agreements expire in 2026. While some provisions extend further, operational certainty decreases with time.

WATER SUPPLY CONDITION	SUMMARY
14.7 MAFY INFLOW	This inflow is representative of the Colorado River's historical long-term average of 14.7 MAFY and is based on a 50-year sequence of inflows using the period of 1977 to 2019 and 1906 to 1912. This hydrology is more optimistic than current conditions. Over the most recent 22-year period, there were five years with inflows at or above 14.7 MAF.
12.9 MAFY INFLOW	This inflow is based on Colorado River inflows for the 25-year period from 1953 to 1977 that averaged 12.9 MAFY. The sequence was repeated twice to form the basis for the 50-year water supply condition. This hydrology is slightly more optimistic than current conditions. Over the most recent 22-year period, inflows average approximately 12.3 MAF.
11.0 MAFY INFLOW	This inflow is based on Colorado River inflows for the 50-year period from 1931 to 1980, adjusted to an average flow of 11.0 MAFY. This hydrology is less optimistic than current conditions but reflects the potential for significant hydrological change. Over the most recent 22-year period, there were nine years with inflows at or below 11.0 MAF.

FIGURE 4.4 **Water Supply Conditions Summary**

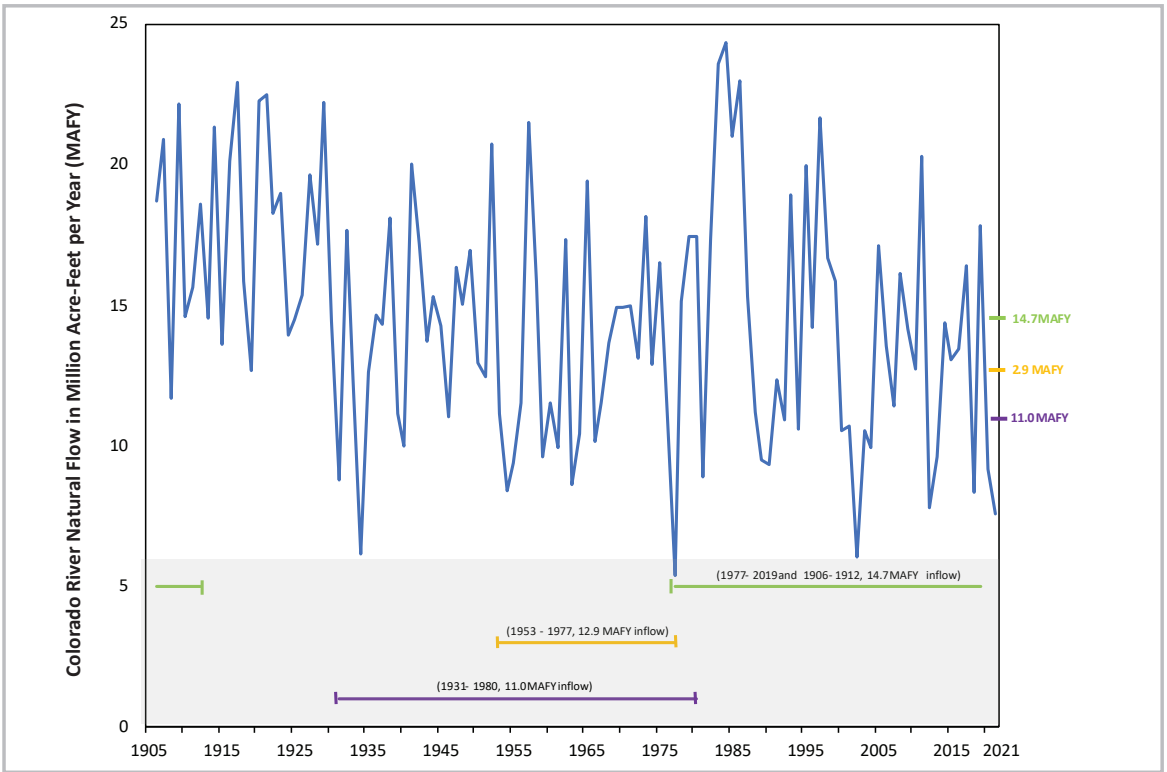


FIGURE 4.5 **Water Supply Conditions Evaluated in Planning Scenarios 1906 - 2020**

Hoover Dam

The Interim Guidelines and Lower Basin DCP work to reduce the decline of Lake Mead water levels and protect Colorado River operations. If modeling projects Lake Mead to be at or below 1,030 feet, the U.S. Secretary of the Interior will work with Lower Basin states to determine what additional actions may be needed to avoid and protect against the potential for Lake Mead to decline below 1,020 feet.

If Lake Mead is projected to be at or below 1,030 feet, the U.S. Secretary of the Interior and the Lower Basin stakeholders will consult to determine what additional measures are needed to protect against the potential for Lake Mead to decline to below 1,020 feet. In 2021, the U.S. Bureau of Reclamation's August 24-month study projected Lake Mead's minimum probable elevation to decline below 1,030 feet. In accordance with the DCP, the Secretary of the Interior and the Lower Basin States are actively engaged in consultation to establish additional plans and actions to protect against Lake Mead declining below an elevation of 1,020 in the next two years and for the remainder of the interim period. Nevada may be required to assume reductions and contributions greater than 30,000 AFY or take reductions sooner than currently called for. This Plan assumes a maximum reduction of 40,000 AFY.

Colorado River modeling performed by the U.S. Bureau of Reclamation in August 2021 projected Lake Mead to fall below an elevation of 1,075 feet by January 1, 2022, resulting in the first-ever shortage declaration by the Secretary of the Interior for 2022. The risk of shortage remains high in subsequent years. Modeling indicates an approximate 91 to 100 percent probability of shortage through 2029 and an 84 to 100 percent probability in the subsequent 10-year period.

SUPPLY AND DEMAND SCENARIOS

Water supply conditions and demand projections are combined into a series of planning scenarios (Figure 4.6 through Figure 4.19) that depict the volume and type of resources planned for use to meet the range of possible future supply and demand conditions discussed in this chapter.[3] Each set of planning scenarios is accompanied by a more detailed description of water supply conditions and assumptions about resource availability and use.

The 2021 Plan assumes the Interim Guidelines and DCP continue through the planning horizon. Resource volumes may vary within scenario groupings based on assumptions for how SNWA DCP commitments are met. The SNWA can meet this obligation by reducing the use of Colorado River supplies, utilizing other resources, or converting eligible forms of ICS to meet DCP contributions.

All planning scenarios consider combinations of permanent, temporary and future resources as described in Chapter 3. Having a portfolio of resource options provides the SNWA with the flexibility to adjust the use of some resources if the development of other resources is delayed or revised or if changes in demands occur. If other options become available sooner, the priority and use of resources may change.

14.7 MAFY NATURAL FLOW PLANNING SCENARIOS

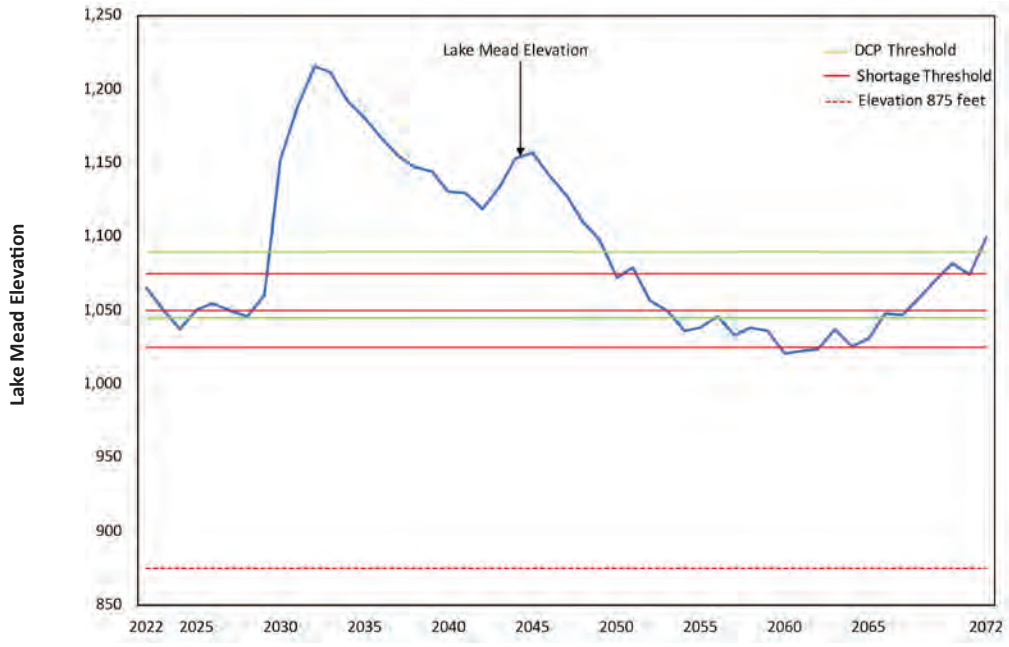


FIGURE 4.6 **Lake Mead Elevation, 14.7 MAFY Natural Flow**

Figure 4.6 depicts the projected Lake Mead elevation with average inflows of 14.7 MAFY. This hydrology is based on a 50-year sequence of inflows using the period of 1977 to 2019 and 1906 to 1912.

This forecast assumes Lake Mead will decline intermittently over the long-term planning horizon, triggering shortage reductions and DCP contributions from 2022 through 2029. This is followed by a return to normal water supply conditions and recurring shortage after 2049.

Figures 4.7 - 4.9 reflect water resources available to meet projected demands with average inflows of 14.7 MAFY.

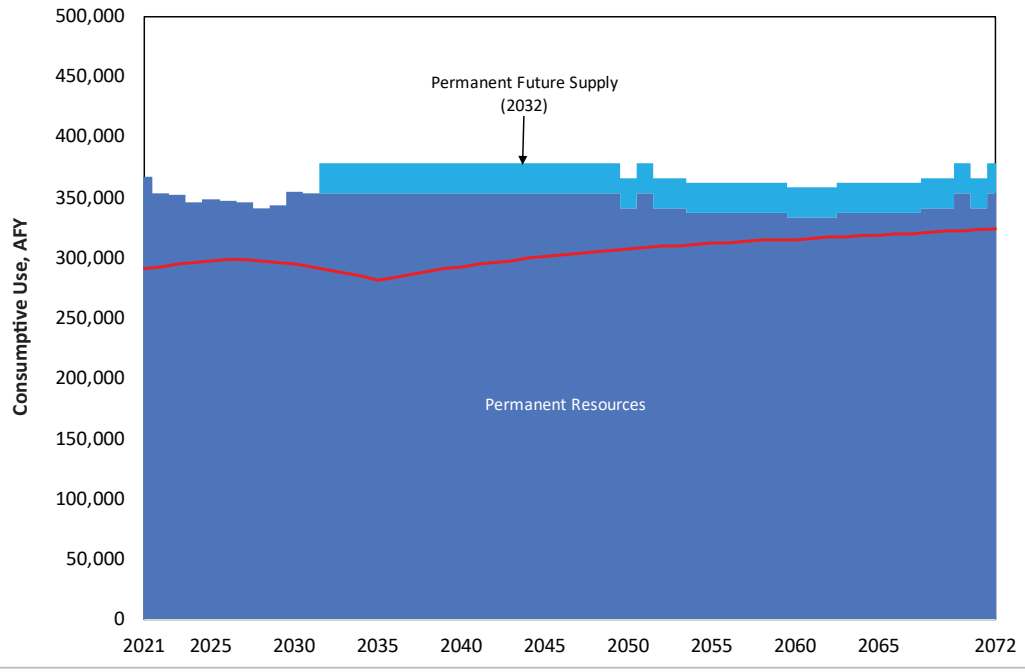


FIGURE 4.7 **14.7 MAFY Natural Flow, Lower Demand (86 GPCD)**

As shown in Figure 4.7, permanent resources are sufficient to meet demands through 2072. Permanent future supplies (25,000 AFY) are available in 2032 but not needed under this scenario.

Temporary, permanent future supply and other future resources are not anticipated for use during the planning horizon.

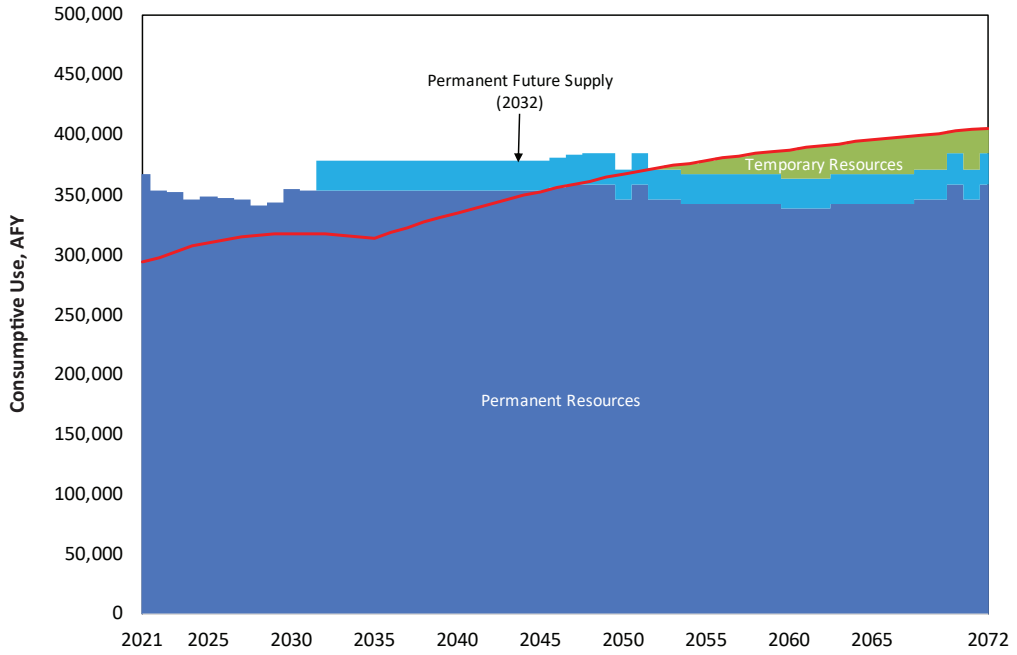


FIGURE 4.8 **14.7 MAFY Natural Flow, Upper Demand (86 GPCD)**

As shown in Figure 4.8, permanent, temporary and future resources are needed to meet demands through 2072. Under this scenario, permanent future supply (25,000 AFY) is available in 2032, with deliveries beginning in 2048. Temporary resources are needed in 2052. Other future resources are not anticipated for use during the planning horizon.

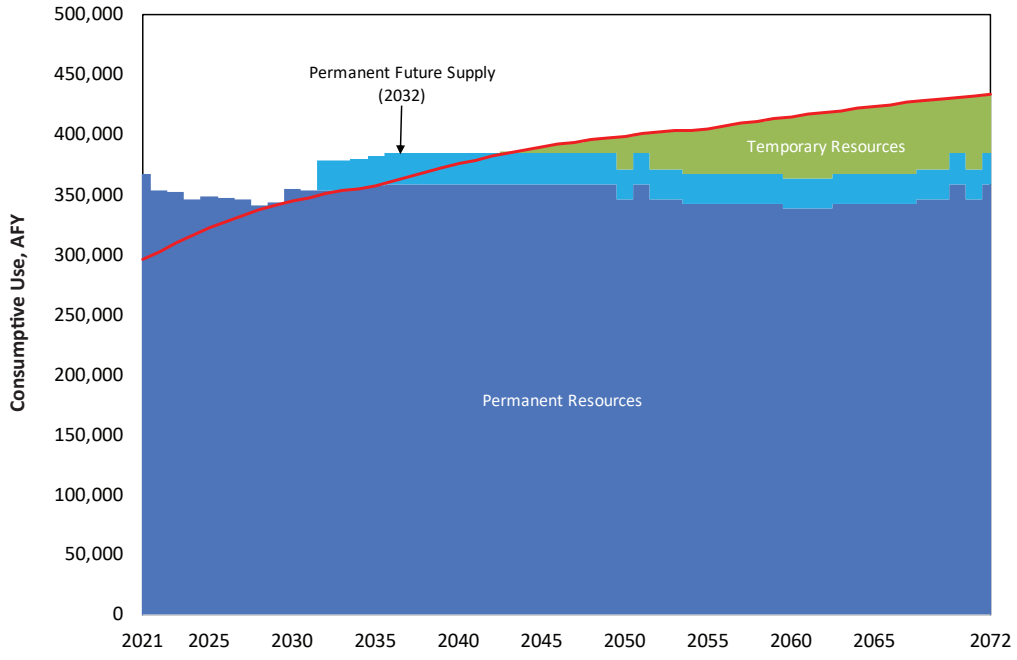


FIGURE 4.9 **14.7 MAFY Natural Flow, Upper Demand (98 GPCD by 2035 and 92 GPCD by 2055)**

Figure 4.9 illustrates how falling short of the conservation goal impacts the timing and need for temporary and future resources. This scenario assumes upper demands at 98 GPCD by 2035 and 92 GPCD by 2055. Permanent, temporary and future resources are needed to meet water demands through 2072. Permanent future supply (25,000 AFY) is available in 2032, with deliveries beginning in 2036. Temporary resources are needed in 2043. Other future resources are not anticipated for use during the planning horizon.

12.9 MAFY NATURAL FLOW PLANNING SCENARIOS

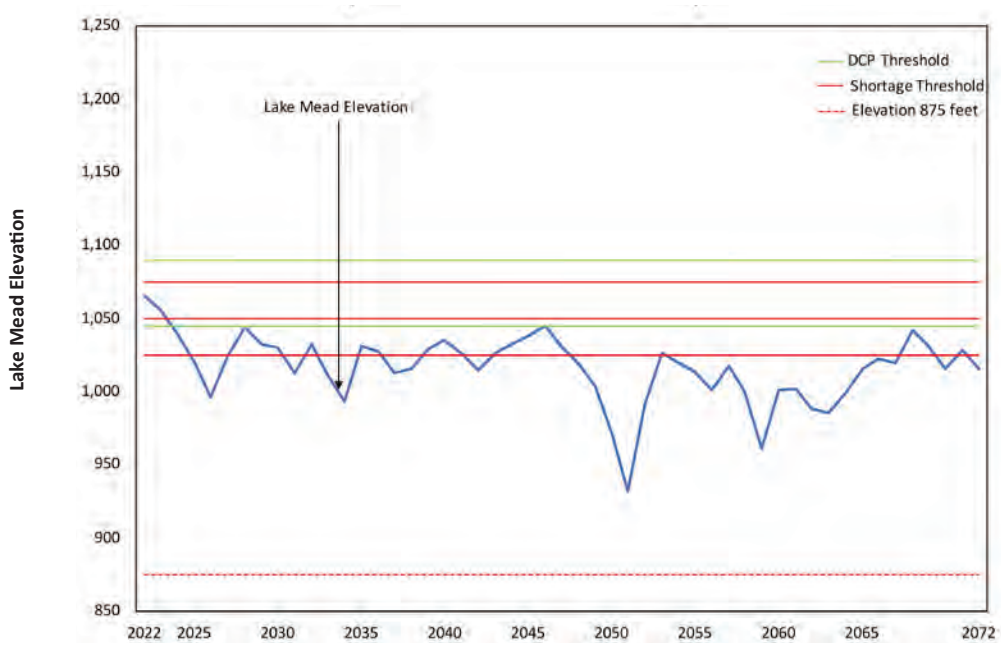


FIGURE 4.10 **Lake Mead Elevation, 12.9 MAFY Natural Flow**

Figure 4.10 illustrates the projected elevation of Lake Mead with average inflows of 12.9 MAFY. This hydrology was derived from a 25-year period from 1953 to 1977 and repeated twice to form the basis for the 50-year water supply condition.

Under this scenario, Lake Mead consistently falls below 1,050 feet (reaching a low elevation of 931 feet) with intermittent elevations above and below 1,025 feet.

Shortage reductions and DCP contributions are assumed throughout the planning horizon. Increased reductions up to 40,000 AFY are assumed based on demands and when Lake Mead water levels are below 1,020 feet.

Figures 4.11 – 4.13 reflect water resources available to meet demands with average inflows of 12.9 MAFY.

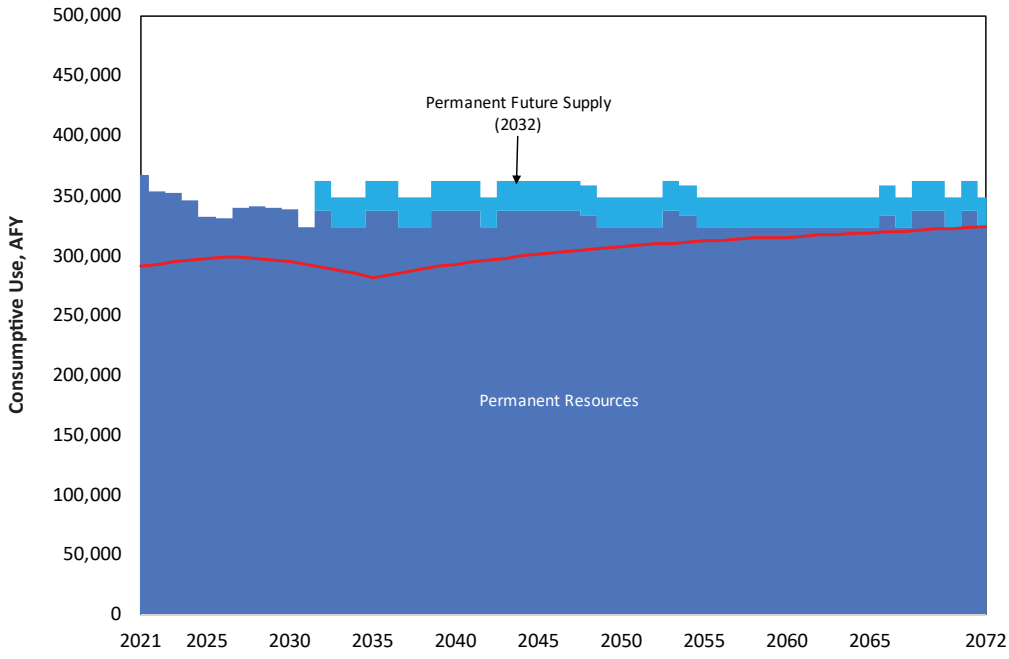


FIGURE 4.11 **E12.9 MAFY Natural Flow, Lower Demand (86 GPCD)**

As shown in Figure 4.11, permanent resources are sufficient to meet demands through 2072. Permanent future supplies (25,000 AFY) are available in 2032 but not needed under this scenario.

Temporary, permanent future supply and other future resources are not anticipated for use during the planning horizon.

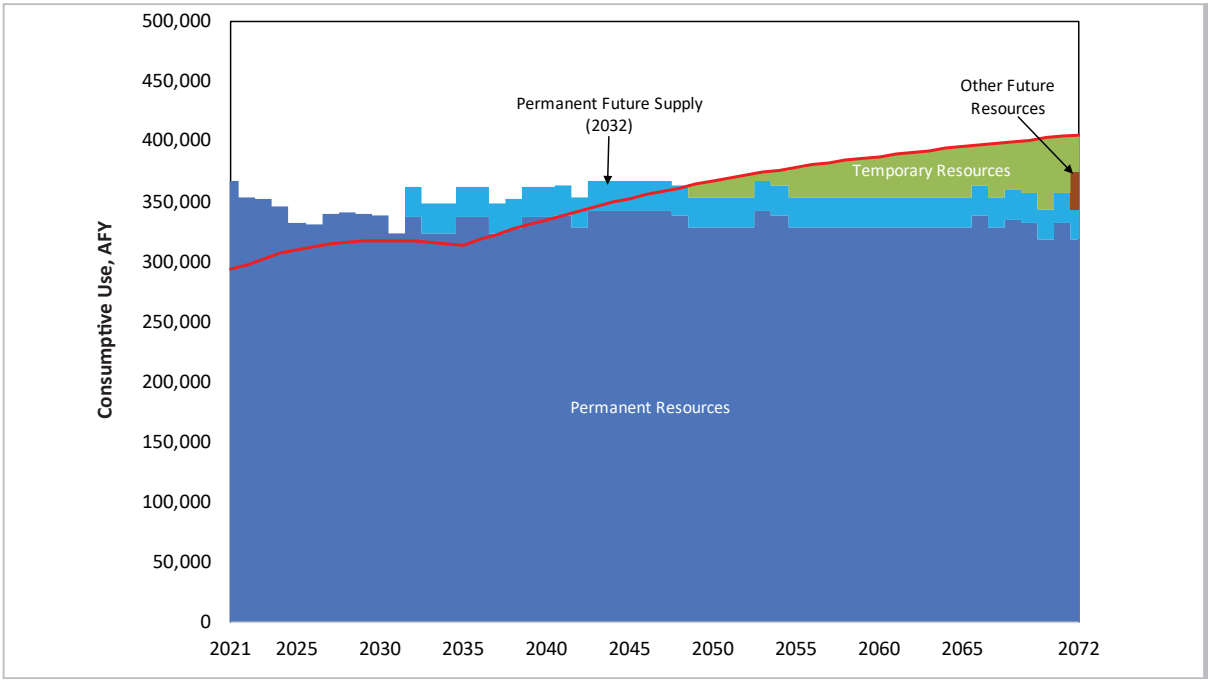


FIGURE 4.12 **12.9 MAFY Natural Flow, Upper Demand (86 GPCD)**

As shown in Figure 4.12, permanent, temporary and future resources are needed to meet demands through 2072. Permanent future supply (25,000 AFY) is available in 2032, with deliveries beginning in 2042. Temporary resources are needed in 2049. Other future resources are needed prior to 2072 (31,000 AFY in 2072).

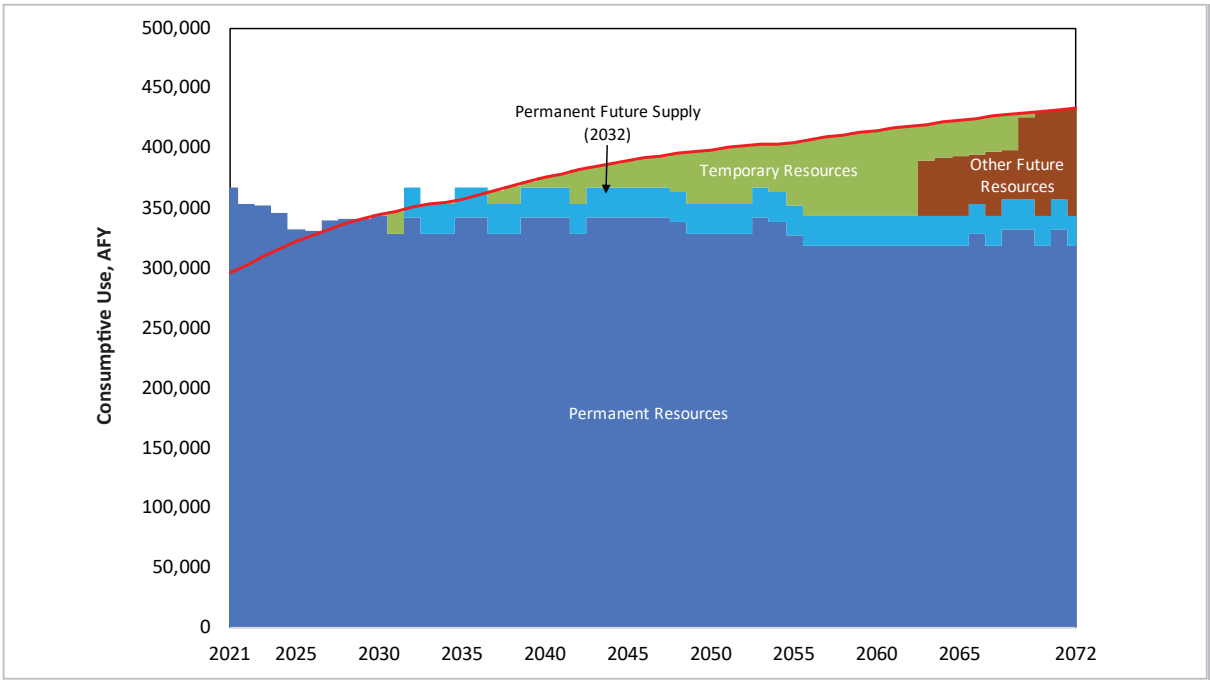


FIGURE 4.13 **12.9 MAFY Natural Flow, Upper Demand (98 GPCD by 2035 and 92 GPCD by 2055)**

Figure 4.13 illustrates how falling short of the conservation goal impacts the timing and need for temporary and future resources. This scenario assumes future water use at 98 GPCD by 2035 and 92 GPCD by 2055. Permanent, temporary and future resources are needed to meet water demands through 2072. Temporary resources are first needed in 2030, prior to permanent future supply, which is available and needed in 2032. Other future resources are needed prior to 2063 (89,000 AFY in 2072).

11.0 MAFY NATURAL FLOW PLANNING SCENARIOS

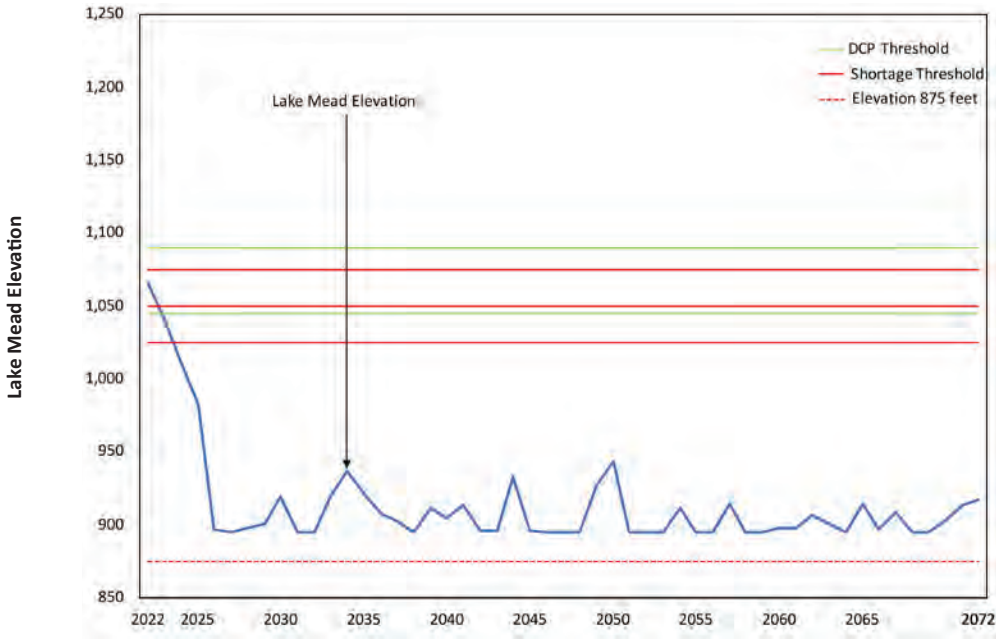


FIGURE 4.14 **Lake Mead Elevation, 11.0 MAFY Natural Flow**

Figure 4.14 illustrates the projected elevation of Lake Mead with average inflows of 11.0 MAFY. This hydrology is based on inflows between 1931 and 1980 adjusted to 11.0 MAFY. Under this scenario, Lake Mead falls below elevation 1,050 feet in 2023 and rapidly declines below 1,000 feet in 2025. Lake Mead periodically reaches elevation 895 feet thereafter.

Shortage reductions and DCP contributions are assumed throughout the planning horizon. Increased reductions up to 40,000 AFY are assumed based on demands, and when Lake Mead water levels are below 1,020 feet.

Figures 4.15 – 4.17 reflect the water resources available to meet water demand projections with average inflows of 11.0 MAFY.

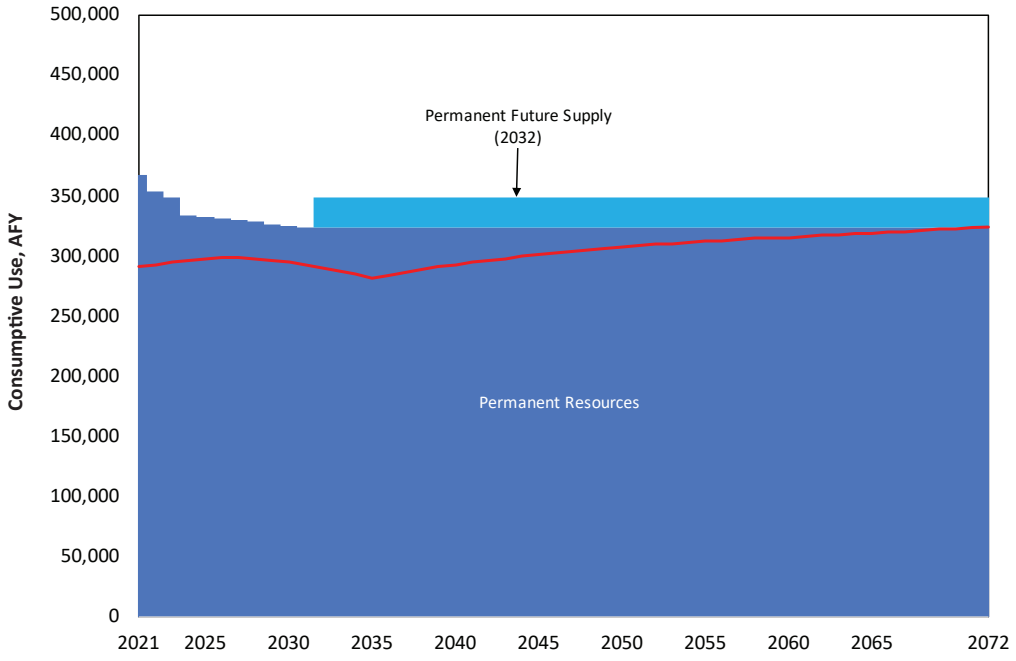


FIGURE 4.15 **11.0 MAFY Natural Flow, Lower Demand (86 GPCD)**

As shown in Figure 4.15, permanent resources are sufficient to meet demands through 2072. Permanent future supplies (25,000 AFY) are available in 2032 but not needed under this scenario. Temporary and future resources are not anticipated for use during the planning horizon.

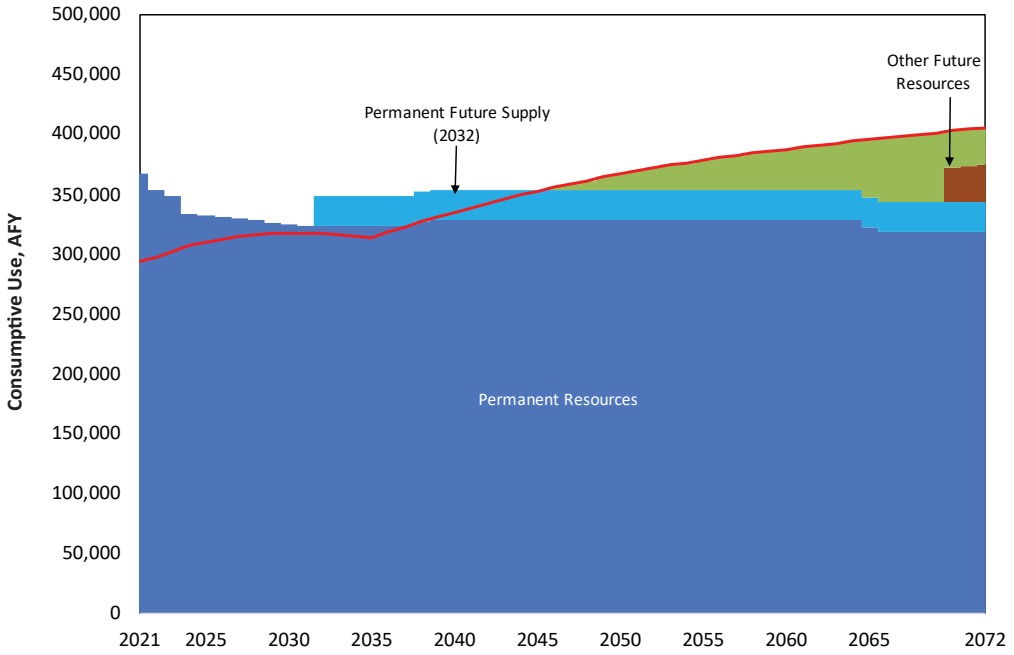


FIGURE 4.16 **11.0 MAFY Natural Flow, 2032 Upper Demand (86 GPCD)**

As shown in Figure 4.16, permanent, temporary and future resources are needed to meet demands through 2072. This scenario assumes permanent future supply (25,000 AFY) is available in 2032 and needed in 2039. Temporary resources are needed in 2046. Other future resources are needed prior to 2070 (31,000 AFY in 2072).

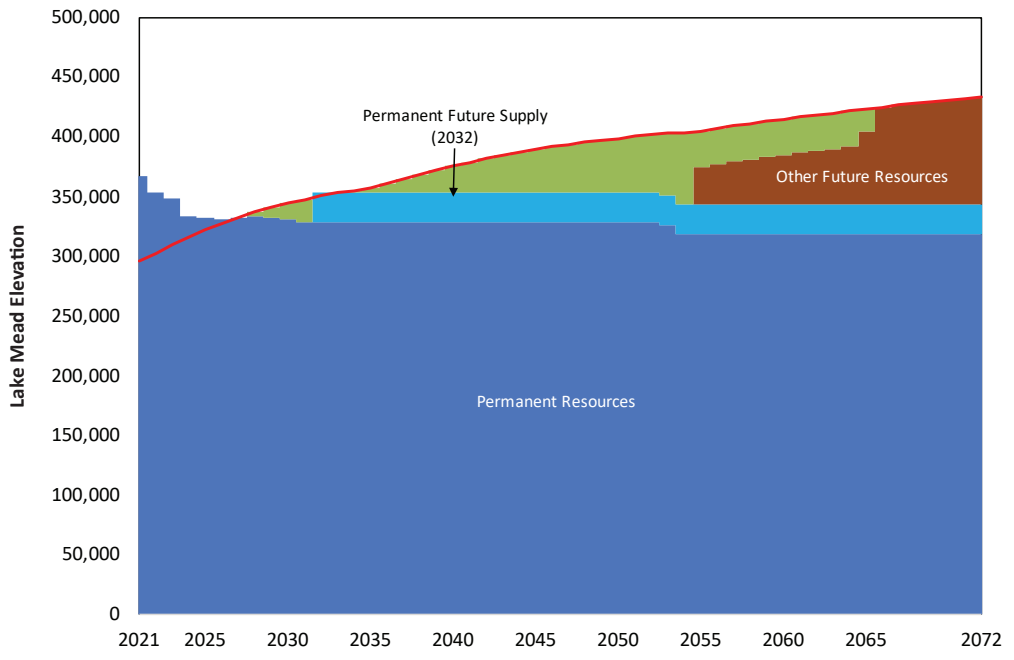


FIGURE 4.17 **11.0 MAFY Natural Flow, 2032 Upper Demand (98 GPCD by 2035 and 92 GPCD by 2055)**

Figure 4.17 illustrates how falling short of the conservation goal impacts the timing and need for temporary and future resources. This scenario assumes future water use at 98 GPCD by 2035 and 92 GPCD by 2055. Permanent, temporary and future resources are needed to meet water demands through 2072. Temporary resources are first needed in 2028, prior to permanent future supply (25,000 AFY), which is available and needed in 2032. Other future resources are needed prior to 2055 (89,000 AFY in 2072).

Figures 4.18 and 4.19 illustrate how the availability of future permanent supply impacts the timing and need for temporary resources and other future resources.

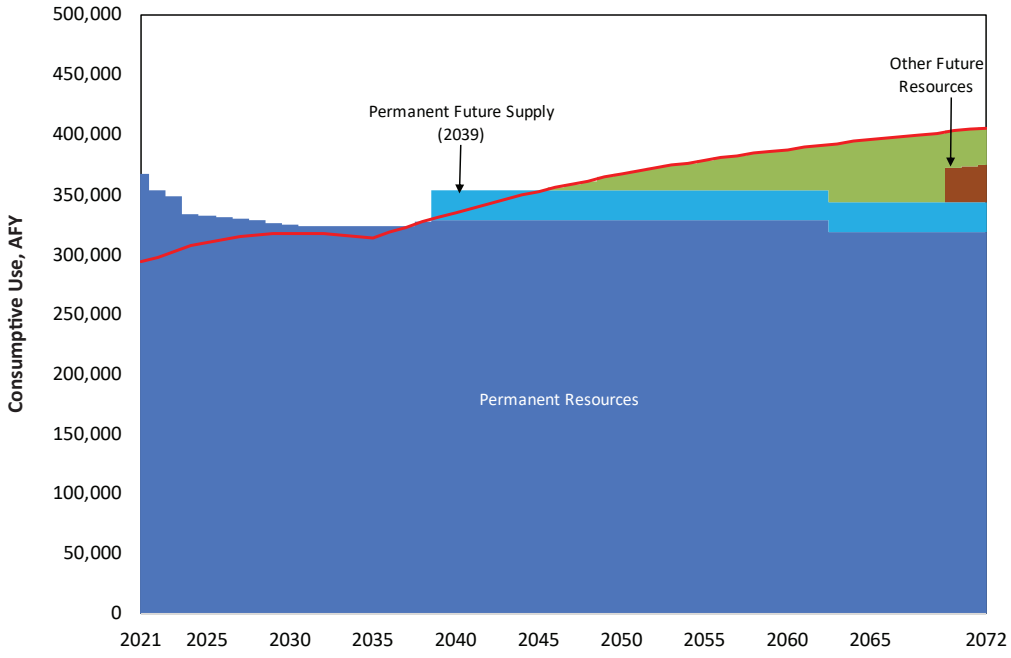


FIGURE 4.18 **11.0 MAFY Natural Flow, 2039 Upper Demand (86 GPCD)**

As shown in Figure 4.18, permanent, temporary and future resources are needed to meet demands through 2072. This planning scenario considers delayed timing for permanent future supply (25,000 AFY), which is available and needed in 2039.

Temporary resources are needed in 2046. Other future resources are needed prior to 2070 (31,000 AFY in 2072).

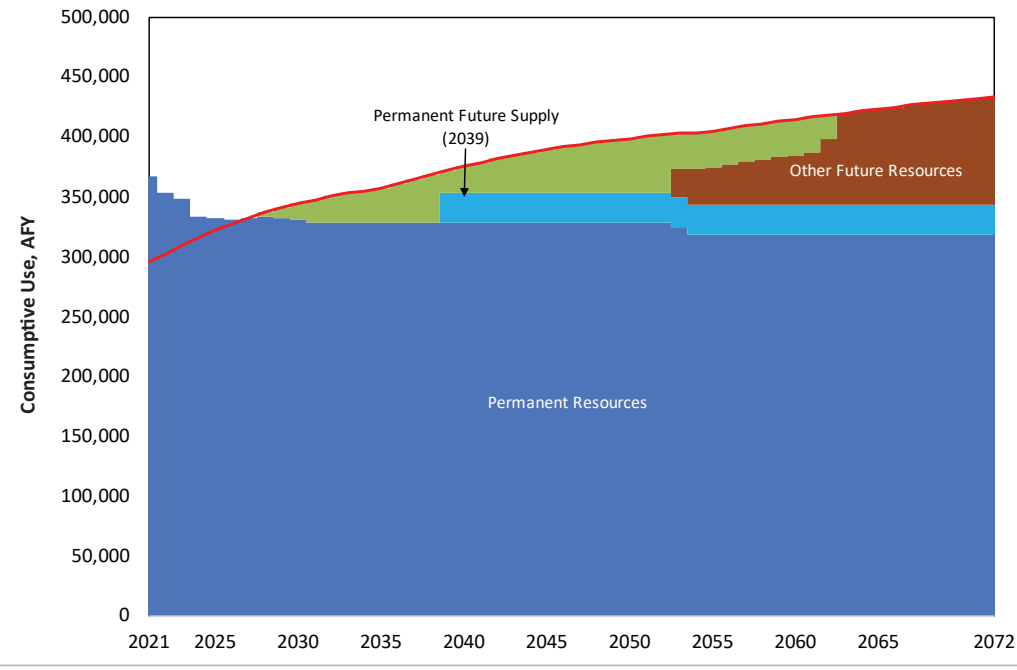


FIGURE 4.19 **11.0 MAFY Natural Flow, 2039 Upper Demand (98 GPCD by 2035 and 92 GPCD by 2055)**

Figure 4.19 illustrates how falling short of the conservation goal impacts the timing and need of temporary and future resources. This scenario assumes future water use at 98 GPCD by 2035 and 92 GPCD by 2055. It also assumes temporary resources are needed in 2028 as a bridge until future permanent supply (25,000 AFY) is available in 2039. Other future resources are needed prior to 2053 (89,000 AFY in 2072).

CHAPTER SUMMARY

Water supply and demand conditions are influenced by several of factors, including economic conditions, water use patterns, conservation progress and climate variability. To account for these variables, the SNWA's 2021 Plan considers three water supply and demand scenarios that bracket the range of plausible conditions to be experienced over the 50-year planning horizon.

The scenarios assume that Southern Nevada will continue to make progress towards its new water conservation goal of 86 GPCD. They also demonstrate how falling short of the goal could impact water resource timing and need over the planning horizon. Likewise, the scenarios assume that conserved Nevada Colorado River water will continue to be stored for future use when available and that this and other temporary resources will be used to meet demands until future resources are needed and developed. Meanwhile, the SNWA continues to work with its Colorado River partners to explore emerging resource development opportunities, including participation in desalination projects in the U.S. and Mexico, and/or conservation and reuse projects in the state of California.

Colorado River modeling performed by the U.S. Bureau of Reclamation in 2021 projected that Lake Mead will reach an elevation of 1,075 or lower in 2022, triggering the first federal shortage declaration. The risk of shortage remains high in subsequent years. Modeling indicates an approximate 91 to 100 percent probability of shortage through 2029 and an 84 to 100 percent probability in the subsequent 10-year period. Under the Interim Guidelines and DCP, the maximum supply reduction prescribed to Nevada is 30,000 AFY; however, this amount could potentially increase.

The 2021 modeling effort also projected Lake Mead's minimum probable elevation to decline below 1,030 feet during 2023. In accordance with the DCP, the Secretary of the Interior and the Lower Basin States are actively engaged in consultation to establish additional plans and actions to protect against lake level decline below elevation 1,020 in the next two years and through the remainder of the interim period.

The SNWA is not currently using its full Colorado River allocation, and near-term shortage declarations are not anticipated to impact current customer use. However, a return to normal or near-normal hydrology is unlikely to occur during the long-term planning horizon, and the probability of shortage is high. Meanwhile, local water demands are projected to increase.

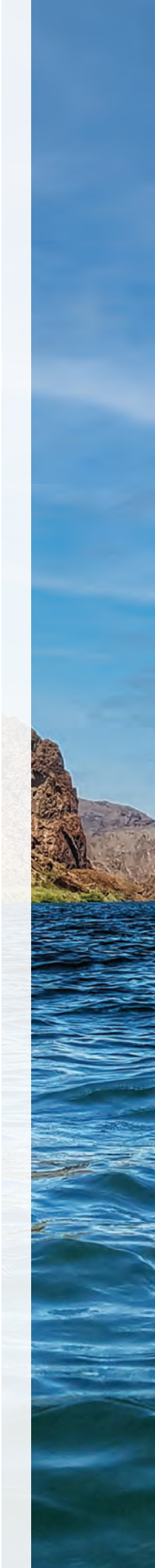
Meeting long-term projected demands will require the SNWA to make significant and sustained progress toward its conservation goal. As demonstrated in the planning scenarios, lower levels of conservation achievement will impact the timing and need of temporary and future resources.

The 2021 Plan demonstrates the importance of conservation in extending the availability of Colorado River resources, minimizing the use of temporary resources, and delaying the timing and need for future resources. With ongoing community support and through adaptive use of its Water Resource Portfolio, the SNWA is prepared to meet the range of projected demands and water supply conditions presented in this plan.

Subject to necessary authorizations and ongoing conservation progress, the amount of resources available for use as described in the SNWA Water Resource Portfolio is sufficient to meet the range of projected demands through the planning horizon. Maintaining this portfolio provides flexibility and enables the SNWA to use an appropriate mix of resources as needed to meet demands. Through this and other adaptive management strategies, the SNWA is better prepared to address factors that can influence resource availability over time, such as permitting, policy changes, climate variability and/or new regulations.

As part of its long-term water planning efforts, the SNWA will:

- Continue to assess factors influencing water demands and the outlook for future demands;
- Continue to evaluate conservation progress and take steps necessary to achieve established conservation goals;
- Maintain a diverse water resource portfolio to ensure future resources are available to meet projected long-term demands and to replace temporary supplies such as banked resources;



- Continue to assess its overall water resource options and make informed decisions on which resources to use when needed;
- Consider the factors of availability, accessibility, cost and need when determining priority of resources for use;
- Support ongoing efforts to increase the elevation of Lake Mead and preserve system operations; and
- Work proactively with other Colorado River water users to explore emerging future resource options of mutual benefit.

ENDNOTES

1 The U.S. Bureau of Reclamation developed the Colorado River simulation System (CRSS), a long-term planning and operations model. The probabilities of shortage correspond with August 2021 CRSS results, applying historical Colorado River flows, provided by U.S. Bureau of Reclamation to Southern Nevada Water Authority, August, 2021.

2 The water supply operating condition for 2021 applied the observed Lake Mead elevation for December 31, 2020. The water operating condition for 2022 corresponds with the projected Lake Mead elevation from the August 2021 24-Month Study for December 31, 2021.