

Climate Adaptation Master Plan for Water (CAMP4W)

WORKING MEMORANDUM 8

REFINING SIGNPOSTS AND TIME-BOUND TARGETS

January 2025

1 Introduction

Extreme weather conditions in recent years have presented Southern Californians with an unsettling preview of the challenges ahead. In addition to the highly variable year-to-year hydrologic conditions inherent in the western United States, climate change has fueled extreme water events further challenging water management in California. The State abruptly swings from periods of severe and extended drought to record-setting wet seasons. This is putting mounting pressure on the management of the region's available and potential water resources. The Climate Adaptation Master Plan for Water (CAMP4W) ensures Metropolitan's commitment to assess and respond to the climate risks to water supplies, water quality, infrastructure, operations, workforce, public health, and financial sustainability.

CAMP4W is an adaptive management approach to integrated resource planning, and it provides a roadmap to guide future capital investments while considering the risks and impacts of climate change. The 2024 Climate Adaptation Master Plan for Water (CAMP4W) Year One Progress Report presents the Climate Decision-Making Framework (**Figure 1**). The framework is intended to define a consistent, stepwise process to help the Board make project and program investment decisions based on the best available information. It is critical that investments are driven by informed, educated, and intentional decisions. Metropolitan's priorities, as defined through the CAMP4W planning process, emphasize the need to remain reliable and resilient into the future, while considering financial sustainability, affordability, and equity. Metropolitan must balance the need to be prepared for the future with the need to balance costs and not over-build or create stranded assets.

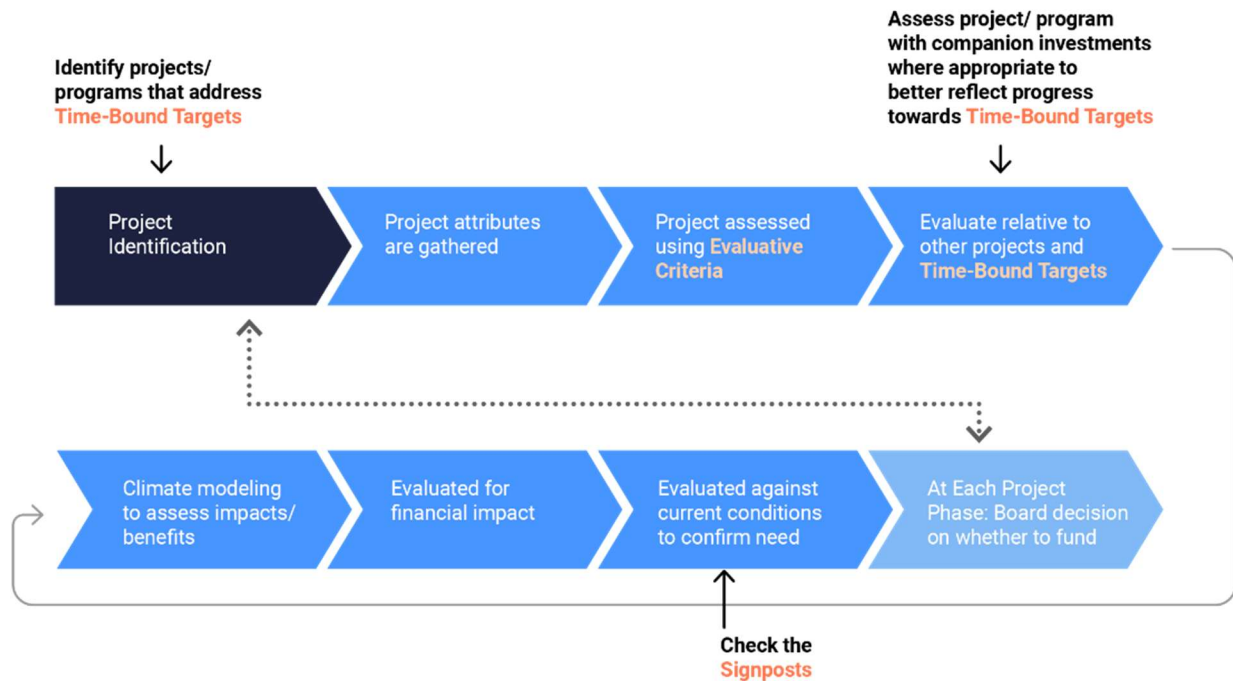


Figure 1. Climate Decision-Making Framework

Interplay between Time-Bound Targets and Signposts. Time-Bound Targets and Signposts will work hand in hand to support the Board’s deliberation process and investment decisions. While Evaluative Criteria facilitate the assessment of projects and programs based on their merits, Time-Bound Targets identify the resource- and policy-based objectives that guide project development and investments to be reliable and resilient into the future. Through near-, mid- and long-term Time-Bound Targets, Metropolitan will measure progress towards CAMP4W objectives and specific priorities set by the Board. Tracking and updating Signposts will provide regular reporting of key real-world metrics that, over the long-term planning horizon and driven by trends rather than short-term fluctuations, may suggest the need to update the Time-Bound Targets.

Working Memorandum 8 Content. Three key elements critical to the Climate Decision-Making Framework, which include Evaluative Criteria, Time-Bound Targets, and Signposts, are defined in **Figure 2**. The CAMP4W Year One Progress report stated that each of the key elements would be updated throughout 2024. **This Working Memorandum 8 provides an update on the progress made in refining the Signposts and Time-Bound Targets** and presents the next steps. Evaluative Criteria are being developed simultaneously and will be presented to the Task Force separately.

Glossary of Terms. This Working Memorandum utilizes additional terms that are defined in **Figure 3** for reference.

As Metropolitan prepares for the future through **planning under deep uncertainty**, it is as important as ever that we make informed, educated, and intentional decisions on where and how we invest. We must balance the need to be prepared for the future, with the need to balance costs and not over build or create stranded assets. As an agency responsible for supplying water to our 26 Member Agencies, who serve the 19-million person service area across 5,200 square miles, the impacts of our decisions are far reaching.

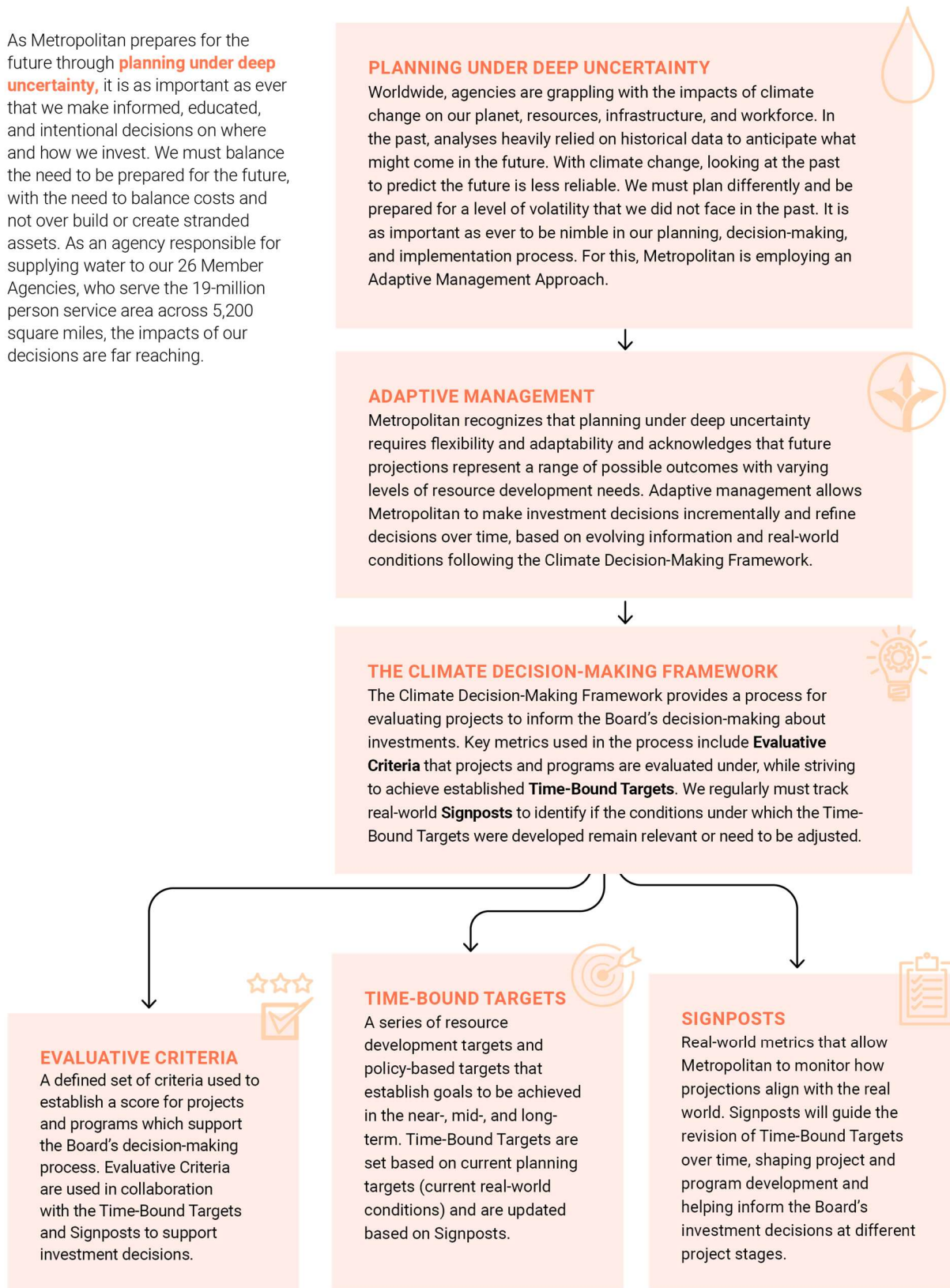


Figure 2. Adaptive Management Process defined in the CAMP4W Year One Progress Report

Drivers of change

- Specific factors whose future values and outcomes are uncertain but significantly impact future water supply reliability and system resilience

Scenario

- A singular view of the future under specific assumptions and outcomes

Supply/Demand Gap

- An analysis performed for each scenario to determine the frequency, timing, and geography of net shortage conditions

Time-Bound Targets

- Resource development and policy goals set by the Board to address future reliability needs identified by the supply/demand gap analysis and other objectives to help Metropolitan best meet its mission

Signposts

- Measurable indicators of the direction and trends of identified drivers of change

Figure 3. Glossary of Terms

2 Signposts

The CAMP4W Year One Progress Report provides a list of proposed Signposts across four categories, which include Demand, Supply, Infrastructure, and Financial Signposts (**Figure 4**). **This Working Memorandum 8 focuses on refinements to the Signposts that have been made since the issuing of the Year One Progress Report.**

DEMAND	SUPPLY	INFRASTRUCTURE	FINANCIAL
Population	Climate Change Indicators	Unexpected Shutdowns	O&M Trends
Economy	Regulations	Infrastructure Loss	Capital Cost Trends
Local Agency Supply	Storage	Emergency Response	Emergency Response Costs
Demand Management	Water Quality	Power Interruptions	
Regulations		Connectivity and Robustness	
Figure 6-2 Proposed Signpost Metrics		Infrastructure Capability	

Figure 4. Initial Signposts Proposed in the 2024 CAMP4W Year One Progress Report

2.1 Understanding Signposts

As the scenario planning approach helps account for a range of supply gaps and uncertainties, Signposts contribute to an updated understanding of how the drivers of change may be shaping actual conditions relative to potential scenarios. Signposts serve as measurable indicators of the direction and trends of the identified drivers of change over time. Tracking signposts will involve collecting data over time and analyzing the data to identify patterns, shifts or movements that impact water supply and demand conditions, track impacts to infrastructure, and inform our assumptions about possible future conditions. Although signposts do not eliminate uncertainty, they offer a data-driven understanding of patterns, helping to contextualize trends over time and enhance decision-making.

2.1.1 Integrated Water Resources Plan Needs Assessment

Metropolitan’s [Integrated Water Resources Plan \(IRP\)](#) is a key planning effort towards establishing a long-term, comprehensive water resources strategy.

The IRP is adaptive and as regional water resource issues evolve, so does the IRP. Since the inaugural IRP in 1996, Metropolitan routinely monitors conditions and measures progress in achieving the plan’s objectives. As such, the IRP has been periodically updated to expand Metropolitan’s strategy to address changing conditions that affect water resource reliability.

The 2020 IRP planning process featured a regional needs assessment that evaluated the impacts of uncertainties including climate change on water resource reliability. This effort resulted in a comprehensive list of findings to help guide actions to address those uncertainties. The 2020 IRP Needs Assessment is summarized in [Working Memorandum #3](#).

Role of Scenarios and Signposts

Scenarios are not intended to control, select or predict the likelihood of uncertainties or predict the future but rather to allow Metropolitan to exercise awareness of potential future challenges and ensure Metropolitan remains prepared.

Signposts support tracking and quantifying trends over time. Tracking them is not intended to eliminate uncertainty but rather to inform assumptions about possible future conditions and support decision-making with the most up-to-date information available.

2.1.2 Drivers of Change and IRP Scenarios

The supply and demand Signposts outlined below and referred to as Water Supply Reliability Signposts, are derived from the comprehensive IRP analysis that identified drivers of change. Drivers such as climate change, regulatory requirements, and growth, have uncertain but potentially significant effects on both water supply and demands in Southern California (**Figure 5**). The IRP Needs Assessment quantified these uncertainties and their potential effects on future supply and demand. Metropolitan then developed separate sets of assumptions for the drivers of change. These sets of assumptions became the basis for the IRP scenarios (A, B, C, and D) which are shown in **Figure 6**. These scenarios serve to represent the range of potential future outcomes and allow for investigations of the major sources of uncertainty and the impacts of those uncertainties on supply and demand.

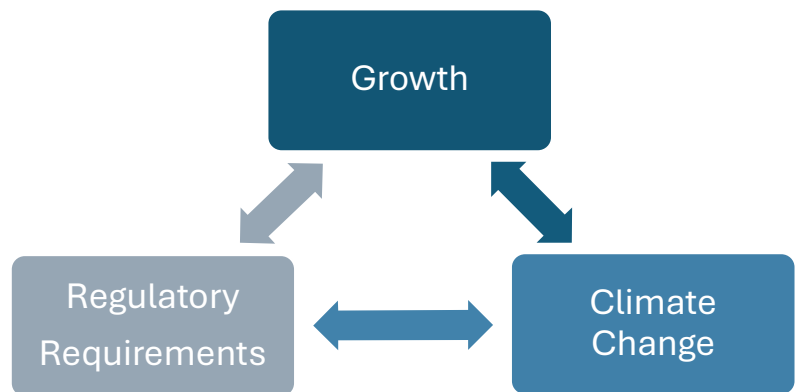


Figure 5. Drivers of Change for Water Supply Reliability

Drivers of change for infrastructure and financial Signposts outlined in this memorandum focus on evaluating the trends in impacts to Metropolitan’s infrastructure over time from climate related conditions and events.

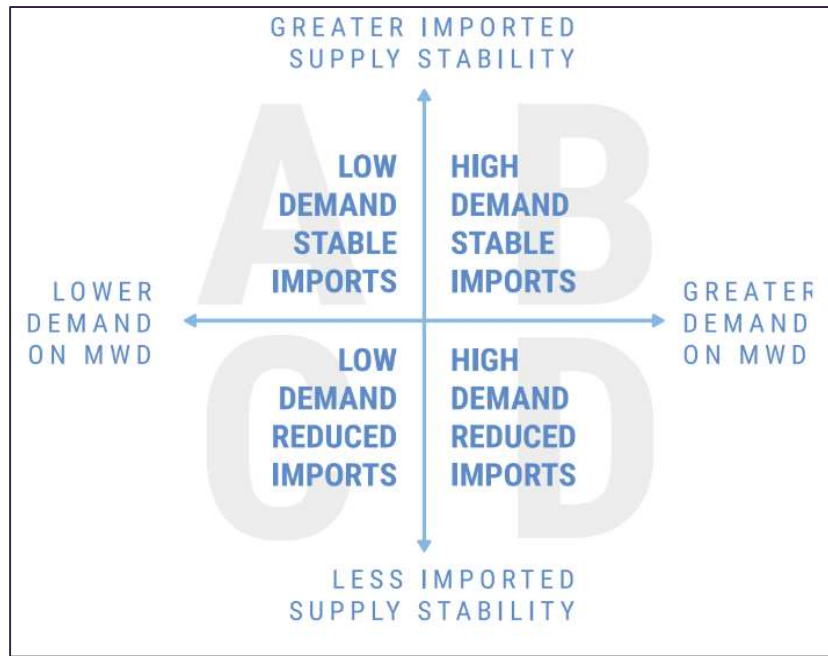


Figure 6. IRP Needs Assessment Planning Scenarios A, B, C and D

2.1.3 Need for Signposts

Signposts are a tool in the CAMP4W process, employed to track and quantify trends and changes in drivers over time. They provide context for decision-making by monitoring trends across multiple years and provide visibility of these trends to the Board through regular updates. Tracking Signposts ensures that Board decisions are informed by the current information. While not all data can be updated with the same frequency—especially data tracked by external entities—Signposts provide insight to long-term shifts which have more significance than short-term variations.

Signposts do not eliminate uncertainty, but they support a structured and evidence-based decision-making process. It is important to note that the trends tracked by Signposts take time to develop, and require analysis and context.

2.1.4 Signposts Inform the Long-Term Strategic Planning Cycle

Combining IRP Scenario planning and Signposts tracking creates a disciplined planning methodology. Although IRP updates are intended to occur generally every five years, the tracking of Signposts will be reported on an annual basis and certain conditions might necessitate earlier reviews. A few of these conditions may include:

- A structural or systemic change in the underlying uncertainties (e.g., rule and regulation changes to the Colorado River)
- New data or insights that indicate the cause-and-effect relationship made for underlying drivers of change are different than originally assumed

- Certain factors become more certain/known than originally evaluated, which may impact the range of future conditions (e.g., climate change impacts on groundwater basins and replenishment; extreme heat events increase the frequency of infrastructure failures)

IRP updates, which will be presented for Board approval roughly every five years, will include revising assumptions, planning model inputs, updating the reliability analysis, and updating the needs assessment. While updating the Time-Bound Targets will be at the discretion of the Board, it would be practical to include revisiting them as part of the five-year process when supply and demand gaps are updated. Metropolitan’s long-term strategic planning cycle is presented in **Figure 7**. Key components that are considered annually include:

- Assessments of Signpost data and evaluation of information to inform the CAMP4W Annual Report
- Local Agency Supply surveys to track assumptions made in scenarios
- Report out on storage conditions (which are tracked more frequently as well)
- Scenario check-in to confirm assumptions align with current information and observations

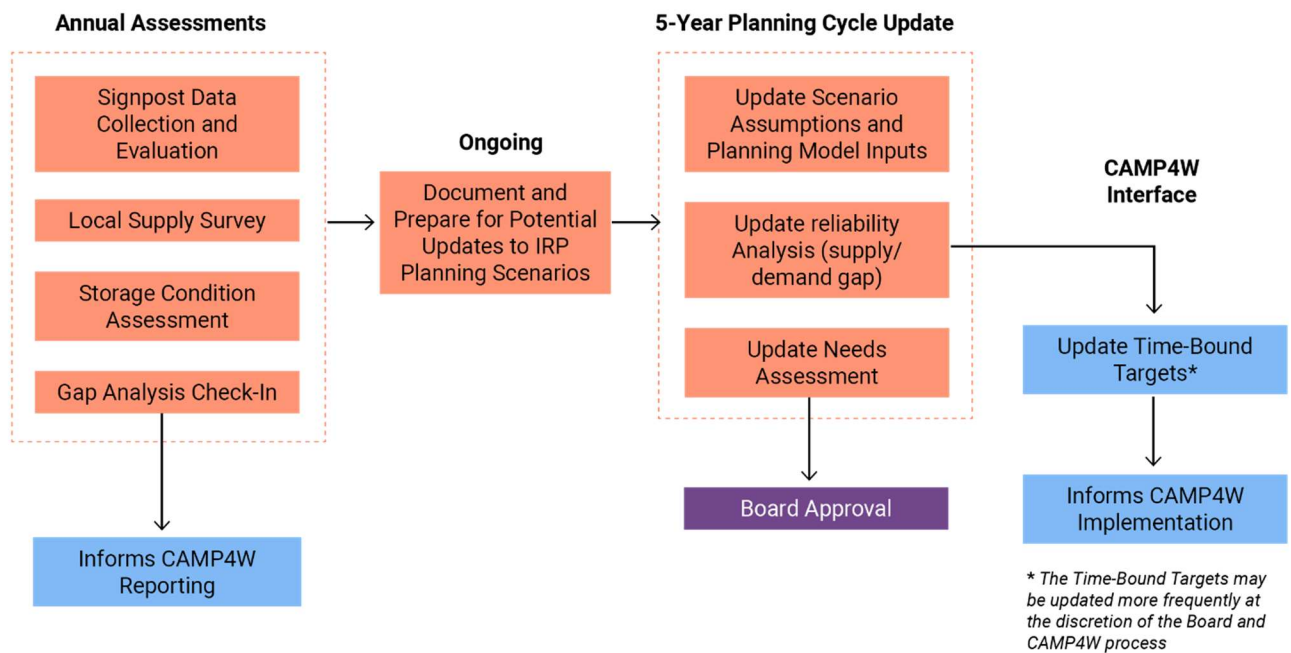


Figure 7. Metropolitan’s Long-Term Strategic Planning Cycle

2.2 Identifying and Interpreting Signposts

Signposts should be effective, meaningful, and not overly complex to avoid potentially delaying any decision-making processes. It is also important that they be based on objective factors that are verifiable and transparent. The following section describes the process used to identify Signposts.

2.2.1 Approach for Identifying and Interpreting Water Supply Reliability Signposts

Signpost data necessarily involves the establishment and analysis of trends over time to ascertain relevance and insights for Time-Bound Targets and Metropolitan’s investment decisions. **Signposts do not trigger actions.** Actions will be triggered by Board direction and policy decisions, where Signposts are one tool used to ensure decision-making is based on the best available information.

To identify the appropriate Water Supply Reliability Signposts, a set of screening parameters are reflected in the following questions:

- **Is it measurable?**
- **Does it have an impact on supply or demand?**
- **Can it be reflected in a modeling approach?**
- **Is the impact of the Signpost persistent and not transitory (i.e., systemic)?**
- **Is it reflected indirectly in other signposts?**

Using these screening parameters, the Water Supply Reliability Signposts were refined to include those described in Table 1.

Table 1. Summary of Proposed Water Supply Reliability Signposts

	Data and Sources	Importance	Limitations
Demographic Signpost	Population and Household: <i>Department of Finance, Census, SCAG, SANDAG</i> Employment: <i>CA Employment Development Department</i>	Key inputs in modeling retail demand Systemic changes can affect demand/supply gaps (e.g. low birthrate and migration)	Annual data are estimates by governmental agencies and are subject to revision Signs of systemic change can take a long time (Census)
Climate Change Signpost	GHG emissions Annual California Hydroclimate Report Intergovernmental Panel on Climate Change National Oceanic and Atmospheric Administration	Emission trends are an indicator of how climate change risk is developing RCPs are reflected in MWDs modeling CALSIM III includes RCP modeling	Difficulty in downscaling impacts to local areas The impacts of climate change take years to be established Climate models incorporate the latest thinking, but

	Data and Sources	Importance	Limitations
	CALSIM III (DWR's modeling tool) CRSS (USBR's modeling tool)	Estimated climate impacts associated with RCPs are applied to the CRSS inputs	climate science continues to evolve
Local Agency Supply Signpost	Member agency coordination/ Local Supply Survey Groundwater basin reports	Key inputs in modeling Metropolitan's demand Systemic changes can affect demand/supply gaps (e.g. impaired groundwater basins)	Local Supply is also dependent on weather variation Data is not available in real-time (year plus delay) Data is provisional and subject to reconciliation and revisions
Imported Supply Signpost	DWR's Delivery Capability Report (CALSIM III) SWP BiOps USBR 24-Month Study Reporting CRA Post-2026 Operating Guidelines Source Water Constituents of Concerns Title 22 Primary and Secondary Drinking Water Regulations	Regulations may have significant impacts on Metropolitan's core supplies and demands Regulatory parameters are reflected in Metropolitan's modeling	Implementation and effectiveness of regulations may be uncertain May be subject to legal challenges and negotiations
Metropolitan Storage Signpost	Metropolitan's storage accounting <ul style="list-style-type: none"> • Put/take capacity • Accessible storage by region • End-of-year storage balances 	Stored water is a core supply needed to balance demand and supply.	Storage balances can fluctuate from year-to-year

2.2.2 Approach for Identifying and Interpreting Infrastructure and Financial Signposts

Metropolitan performs regular rehabilitation and repair to its infrastructure as a normal course of business. Climate change puts additional stress on Metropolitan's facilities and causes additional replacement and repair projects to maintain the system during and after extreme events. Understanding the increased frequency and extent of infrastructure repair and replacement projects due to climate change is a critical factor in understanding how climate change is impacting Metropolitan as well as the needed investments. Metropolitan will also strive to track the financial impacts related to infrastructure investments needed to address climate impacts and projections. **Tracking these trends over time will provide valuable data to support investment decisions.**

Infrastructure and financial Signposts provide Metropolitan with data that shows how climate is

impacting infrastructure in terms of losses, interruptions, and useful life, as well as the corresponding financial impacts. To track the information needed to report on these Signposts, Metropolitan will need to implement additional tracking and reporting procedures. The development of appropriate Signposts must therefore be based on the potential availability of data and other factors, discussed below.

At the individual asset level, there are benefits to tracking trends. As an example, tracking the impact of heat on electrical assets in the desert can inform the best timing for investing in repair or eventually replacement, if needed. In this case, the increased frequency of occurrence would be an infrastructure metric that could indicate this particular asset is in need of a more permanent solution. The financial signpost that corresponds to this example would include tracking the capital and O&M expenditures for these repairs. When trends indicate the increased frequency of this repair as well as the magnitude of damages, expressed as time spent or the equivalent costs, this could validate the increased expense to more permanently address this climate impact.

In addition to the direct relationship between the example at the asset level and the decision to fund an infrastructure project to mitigate the impacts of climate change on that asset, tracking this kind of information would provide Metropolitan with a method of evaluating system-wide climate impacts. Over time, data collected could inform design standards and repair and replacement schedules, and foster opportunities for infrastructure and operational innovation.

Implementing these kinds of Signposts would be done by expanding Metropolitan’s asset management program to track additional climate related impacts. Currently, Metropolitan operations staff perform regularly scheduled and unexpected repairs and replacements based on work orders and tracking within Metropolitan’s digital system. The proposed pathway to tracking the impacts of climate change would require additional metrics to link observations and actions to climate conditions, where applicable. Additionally, tracking the cost would provide detailed information on how these efforts impact Metropolitan financially.

To identify the appropriate Infrastructure and Financial Signposts, a similar set of screening parameters to those identified for Water Supply Reliability Signposts are reflected in the following questions:

- **Is it measurable?**
- **Does it have an impact on infrastructure or the cost to maintain infrastructure?**
- **Is the impact of the Signpost persistent and not transitory (i.e., systemic)?**
- **Is it reflected indirectly in other Signposts?**

The CAMP4W Task Force and staff identified potential infrastructure and financial Signposts to track and help facilitate decision-making. These were included in the CAMP4W Year One Progress Report and are listed below:

Initial Draft Infrastructure Signposts:	Initial Draft Financial Signposts:
<ul style="list-style-type: none"> ● Infrastructure Loss ● Power Interruptions ● Connectivity and Robustness ● Infrastructure Capability ● Unexpected Shutdowns ● Emergency Response 	<ul style="list-style-type: none"> ● O&M Trends ● Capital Cost Trends ● Emergency Response Costs

A refined set of Infrastructure and Financial Signposts are presented in Table **Table 2. Infrastructure and Financial Signposts**, including the addition of a potential affordability Signpost.

Table 2. Infrastructure and Financial Signposts

Signpost	Infrastructure Metrics	Financial Metrics
Infrastructure Loss	Frequency of infrastructure loss or failure (R&R) related to climate impacts: tracking of work hours, time	Capital and O&M cost to repair or replace
Infrastructure Capability	Frequency and duration of a service area receiving inadequate water supplies due to climate impacts and/or infrastructure limitations, tracking of time and allocated supply	Capital and O&M costs to secure and deliver emergency water supplies; costs and impacts to implement emergency conservation programs and communications
Power Interruptions	Frequency and duration of interruptions due to climate impacts; tracking of work hours, time	Capital and O&M cost to provide alternative power supply or financial impact of not having power
Unexpected Shutdowns	Frequency of loss of use related to climate impacts: tracking of work hours, time	Capital and O&M cost to repair or replace
Emergency Response	Frequency and duration of emergency response; tracking of work hours, time	Capital and O&M cost to associated with emergency response
Affordability	Trends in affordability of rates throughout service area (Further recommendations TBD)	

In addition to tracking how climate change is impacting assets, Metropolitan is interested in methodologies for tracking affordability metrics. To understand the feasibility of tracking this metric as a Signpost, staff will look to industry standards and practices, including experiences and input from Member Agencies, and return to the Board with options in 2025.

3 Time-Bound Targets

3.1 Understanding Time-Bound Targets

Time-Bound Targets are policy and resource management goals which are established by the Board to guide project and program development and support the evaluation of proposed investments in pursuit of climate adaptation and the CAMP4W objectives. As discussed in Section 0, Time-Bound Targets work in collaboration with Signposts and Evaluative Criteria to form the basis of the Adaptive Management process (see **Figure 2**).

Time-Bound Targets are informed by the findings of resource planning in the IRP process and other data analysis. Similar to criteria used in the General Manager's Business Plans, Metropolitan seeks Time-Bound Targets that are specific, measurable, and achievable. The Time-Bound Targets proposed herein are based on these criteria and have been drafted to reflect Board indicated priorities.

The Board establishes Time-Bound Targets and may update them at its discretion. Because many of the Time-Bound Targets are based on the IRP planning process, updating and refining them at a similar interval to the IRP updates may be practical. Regardless, long-term trends rather than short-term variation in real-world conditions, as reflected by Signposts, IRP planning, and other holistic analyses, should form the basis for updating the Time-Bound Targets.

3.2 Identifying Time-Bound Targets

The Time-Bound Targets outlined in the CAMP4W Year One Progress Report were developed to reflect Board priorities as discussed in the Task Force meetings. **Figure 8** presents the Time-Bound Targets defined in the CAMP4W Year One Progress Report.



	CATEGORY	NEAR TERM	MID TERM	LONG TERM
 Resource-Based Targets Numbers reflect additional supplies unless indicated otherwise	Core Supply ¹	N/A	Identify 300 TAF for potential implementation by 2035. Alternatively, 250 TAF of new storage will reduce core supply need to 200 TAF	Identify 650 TAF for potential implementation by 2045. Alternatively, 250 TAF of new storage will reduce core supply need to 550 TAF or, 500 TAF of new storage will reduce core supply need to 500 TAF
	Storage	Identify up to 500 TAF for potential implementation by 2035		
	Flex Supply (Dry Year Equivalent)	Acquire capability for up to 100 TAFY		
 Policy-Based Targets	Equitable Supply Reliability	Add 160 CFS capacity to the SWPDA by 2026	Implement additional 130 CFS capacity to SWPDA by 2032	Implement capacity, conveyance, supply, and programs for SWPDA by 2045
	Local Agency Supply ²	Maintain 2.09 to 2.32 MAF (under average year conditions)	2.12 to 2.37 MAF (under average year conditions)	2.14 to 2.40 MAF (under average year conditions)
	Demand Management ³	Implement structural conservation programs to achieve 300 TAF by 2045		
	Regional Water Use Efficiency	Assist Retail Agencies to achieve, or exceed, compliance with SWRCB Water Use Efficiency Standards ⁴		
		GPCD target for 2030 ⁵	GPCD target for 2035	GPCD target for 2045
	Greenhouse Gas Reduction	N/A	40% below 1990 emission levels by 2030	Carbon Neutral by 2045
	Surplus Water Management	Develop capability to manage up to 500 TAFY of additional wet year surplus above Metropolitan's Storage Portfolio and WSDM action		

Figure 8. Time-Bound Targets as defined in the CAMP4W Year One Progress Report

In addition, the Year One Progress Report identified six categories of additional Time-Bound Targets for future consideration:

- **Community Equity:** Focus on investing in underserved communities, affordability measures and providing meaningful community engagement.
- **New Local Supply:** Targets around local and Member Agency supply and/or program development.
- **Water Quality:** Invest in necessary research and innovation to address emerging contaminants of concern and new regulatory requirements.
- **Infrastructure Resilience:** Investments necessary for existing and future infrastructure to be able to meet growing climate-driven vulnerabilities during and after disruptions.
- **Imported Water Source Resilience:** Investment in protecting source watersheds and existing infrastructure to reduce risks presented by accelerated climate change.
- **Ecosystem Health:** Invest in natural systems that provide measurable improvements and value, in the areas of resilience, and regulatory benefits to water supplies.

Potential targets for Community Equity, Water Quality, and Imported Water Source Resilience were presented at the July 24, 2024 Task Force meeting. **Table 3** presents the draft Time-Bound Targets for

those categories that were presented to the Task Force, with revisions based on the discussion at the meeting and subsequent feedback.

Further data collection and analyses will continue to set new or refine existing Time-Bound Targets as conditions change, progress is made, Signposts are reviewed, the IRP is updated, and Board direction is provided.

Table 3. Draft Time-Bound Targets for Community Equity, Water Quality, and Improved Water Source Resilience

Category	Near Term	Mid Term	Long Term
Community Equity <i>Focus on investing in underserved communities, affordability measures and providing meaningful community engagement to address the impacts of climate change.</i>	Develop and promote water conservation programs, rebates, and incentives for low-income and disadvantaged communities (DAC), as defined in Water Code 79505.5, to increase program participation and regional water conservation.		
	Work with member agencies and legislative sponsors for continuous state and federal funding for low-income rate assistance programs (LIRA). Gather regional information about impacts of water rates on DACs to support member agencies.	Develop equity metrics and conduct community equity analyses on Metropolitan infrastructure investments, operations, and conservation programs. Develop a Water Affordability & Environmental Justice Policy to inform community investment associated Metropolitan projects and programs.	
Water Quality <i>Invest in necessary research and innovation, to address emerging contaminants of concern and new regulatory requirements.</i>	Develop research, mitigation, and response plans and management tools to address highest priority climate-induced water quality impacts such as: <ul style="list-style-type: none"> • Increased Salinity • Elevated Turbidity and Pollutant Concentrations • Increased Nutrient Pollution • More Frequent Reservoir Anoxia • Increased Chlorine Demand and Microbial Activity 		
	Update nitrification action plan and response indicators by end of 2025	Implement new tools and infrastructure modifications to minimize climate impacts on water quality	
Imported Water Source Resilience <i>Investment in protecting source watersheds and existing infrastructure to reduce risks presented by accelerated climate change.</i>	Participate in pilot projects to assess climate adaptation strategies that build watershed resilience and their benefits to protection of water supply	Develop and implement a program for supporting the protection of source watersheds from climate change-drive risks to water supply	

3.3 Use of Time-Bound Targets

Time-Bound Targets will be used to guide project and program development and support the evaluation of proposed investments. They will establish a timeframe for when projects or programs need to be

planned and implemented to provide readiness for future scenario conditions and identify emphases to pursue potential co-benefits along with water supply reliability and system resilience.

When considering which projects and programs will be assessed through the CAMP4W decision-making framework, staff will consider their relevance toward Time-Bound Targets among the screening questions.

4 Conclusion and Next Steps

Signposts and Time-Bound Targets are important components of an adaptive management approach to resource planning and investment, which enhances flexibility and responsiveness amid the dynamic conditions and uncertainties of climate change. They support the Board's decision making about investments, using the best available information and emphasizing Board established priorities. Signposts and Time-Bound Targets are intended to be adaptive as well, and staff will continue to revise them, and any changes will be presented for Board consideration.

The refined set of Water Supply Reliability Signposts have been included in the Draft 2024 CAMP4W Annual Report, and future Annual Reports will include the infrastructure and financial signposts discussed, as well as any new ones identified. The initial set of Time-Bound Targets will be incorporated into the CAMP4W Implementation Strategy with next steps on the additional, future Time-Bound Targets, at the discretion of the CAMP4W Task Force and Board.