Climate Adaptation Master Plan for Water – Joint Task Force

CAMP4W
Climate Adaptation
Master Plan for Water

Table of Contents

CAMP4W
Climate Adaptation
Master Plan for Water

Climate Adaptation Master Plan for Water
– Joint Task Force

Joint Task Force on the Climate Adaptation Master Plan for Water
Established November 21, 2023

CHARTER

Given the realities of the climate crisis and its impact on hydrology, infrastructure and the availability of water supplies, the Metropolitan Water District Board of Directors established a Long-Term Regional Planning Subcommittee through its Finance, Audit, Insurance and Real Property Committee to develop a Climate Adaptation Master Plan for Water (CAMP4W).

Subsequently, a Joint Task Force of Board Members and Member Agencies has been chartered to produce a regional plan (aka, CAMP4W Plan, or Plan) that will develop and establish a master plan that includes:

- **Climate and Growth Scenarios**: Develop climate scenarios—based on RCP 8.5 as set by the board and regularly updated to reflect real-world conditions and climate risks—to assess and set ranges of variability of water supplies from the State Water Project, the Colorado River, and regional hydrology as well as correlated regional growth scenarios that indicate demands of different member agencies;
- **Time-bound Targets**: Set targets to achieve by 2030, 2035, and 2045 for efficiency, conservation (including GPCD across the entire service area), system interconnection, water supply, equity and affordability, and other targets as needed and identified;
- **Framework for Climate Decision-Making and Reporting:** Establish a *Climate Decision-Making Framework* for the Board of Directors to align Metropolitan's project-level investments with a set of evaluative criteria developed to match the values and priorities of the Board while complementing Member Agencies' individual plans and investments. The framework is part of an adaptive management approach and provides a platform for regular reporting—at least annually—on progress toward the targets and other indicators established by the master plan;
- **Policies, Initiatives, and Partnerships:** Identify policies, initiatives, and regional partnerships that will achieve the conservation and supply targets in order to address the range of potential regional supply gaps among member agencies; and
- **Business Models and Funding Strategies**: Assess and recommend business model options and rate enhancements--as well as strategies to secure funding at the State and federal levels--that help achieve the targets while ensuring long term financial sustainability, equity, and affordability.

Individual components will be developed and reviewed by the Task Force over the next 12 months, with the overall final draft Plan to be reviewed and approved by the board by Q4 of 2024.

Climate Adaptation Master Plan for Water (CAMP4W)

WORKING MEMORANDUM #1

SUMMARY OF CAMP4W PROCESS

August 2023

Metropolitan staff developed this Working Memorandum #1 as a supplement to the discussion provided during the Climate Adaptation Master Plan for Water (CAMP4W) Board retreat (Workshop #1) held in February 2023 and subsequent meetings. This memorandum summarizes the CAMP4W process and identifies work completed to date and the next steps in the process.

This Memorandum is divided into the following sections:

- Section 1: Background
- Section 2: Overall CAMP4W Process
- Section 3: CAMP4W Year 1
- Section 4: CAMP4W Year 2 and Beyond

The current schedule for the development of the CAMP4W is illustrated in Figure 1. As shown, the schedule provides for regular engagement with Board members and Member Agencies, as well as the public. To capture the values of the communities served, public engagement will include listening sessions, community-led sessions, technical charettes, and sector-specific meetings.

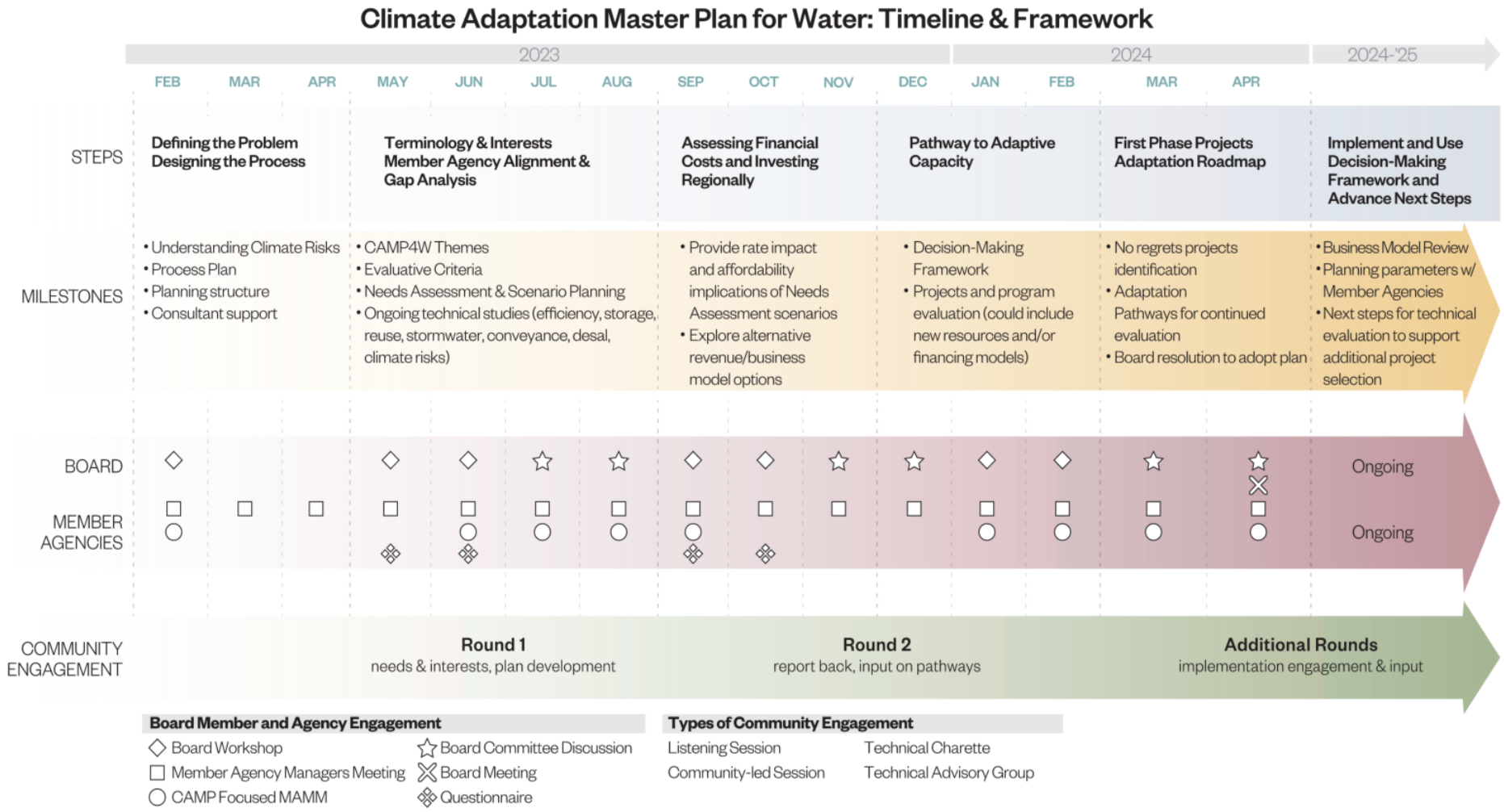


Figure 1. CAMP4W Timeline and Framework

Section 1: Background

In 2022, Metropolitan adopted an updated Integrated Water Resources Plan (IRP) Needs Assessment that examined the water supply implications of a range of water resource conditions and demand projections. Since the IRP update process started in 2020, many unprecedented events have occurred including both a record drought and record snow and rain in California, record drought conditions in the Colorado River system, and economic volatility caused by the pandemic. These events have made evident the need to plan for risks and opportunities on a grand scale. The increasing climatic variability and water supply uncertainty have prompted Metropolitan's Board of Directors (Board) to pursue the integration of climate and water resource planning with its financial plans.

The Board charged the leadership and staff of Metropolitan to expand the focus of water resource and financial planning to include climate adaptation strategies and to develop a Climate Adaptation Master Plan for Water (CAMP4W). The effort focuses on strengthening the resilience and reliability of Metropolitan, and its Member Agencies individually, in the face of a changing climate and the associated risks to our economic and environmental stability. As such, the information developed in the IRP Needs Assessment will be a key input to the CAMP4W as will the ongoing Vulnerability Assessment and Drought Mitigation Action Portfolios. The outcome of this process will be a holistic decision-making framework for setting investment plans to ensure the continued ability to fulfill Metropolitan's mission. This forward-looking and integrated approach allows Metropolitan to adaptively manage its resources so that investments remain appropriate to current conditions and additional insight about the future.

CAMP4W Problem Statement

Extreme weather conditions in recent years have presented Southern Californians with the stark reality of the challenges ahead – weather whiplash is abruptly swinging the state from periods of severe and extended drought to record-setting wet seasons, putting mounting pressure on the year-to-year management of all our available water resources. There is no question that climate change is here and is driving the need to strengthen and better integrate our existing infrastructure while building new water infrastructure designed for this century's climate. For example, in 2022, three consecutive dry years exposed extreme vulnerability in the State Water Project Dependent Areas inspiring Board action to pursue equitable water supply reliability through an interconnected and robust system of supplies, storage and programs and, in many ways, catalyzing this comprehensive planning process. To ensure the continued water supply reliability and resilience for all the communities we serve, Metropolitan is developing a Climate Adaptation Master Plan for Water that will determine near-term capital investments, inform adaptive management strategies, and guide the evolution of Metropolitan's business model as we confront our new climate reality in the years and decades ahead.

Considering the impacts of climate change and other hazards and the need to reduce these associated risks, CAMP4W will provide the basis for Metropolitan's policy and investment decisions in the near term to best serve its Member Agencies in the long term. This involves a multi-year iterative process in which various aspects of the process build upon one another. Preliminary objectives (that will be refined through the process) include to:

- Increase the resiliency and reliability of Southern California's water supplies,
- Build greater equity into our regional water storage and delivery systems, so that Metropolitan may have access to reliable water supplies, even in severe drought periods, for all our 26 Member Agencies.
- Pursue collaborative cost-sharing partnerships and promote affordability initiatives as we make the necessary investments to adapt Southern California's water infrastructure to the demands of the 21st century,
- Clearly understand the Metropolitan Member Agency network of water resource supplies and infrastructure to determine opportunities to provide additional connectivity,
- Understand the climate risks and vulnerabilities the network is facing,
- Identify adaptation strategies that strengthen the network and reduce vulnerabilities,
- Identify opportunities to expand water resources,
- Identify opportunities for strategic sharing of resources and infrastructure across member agencies to maximize all potential local supply options,
- Develop a financial strategy to fund capital investments and equitably share both water supplies and costs among Member Agencies, and
- Develop a business model that supports Metropolitan's role into the future.

Section 2: Overall CAMP4W Process

Development of the CAMP4W requires a series of tasks that will extend over multiple years. Figure 2 presents an overview of the components that are underway and how they will be integrated into the process. Section 3 provides details on the tasks to be completed during Year 1, which extends through the first quarter of 2024. The work completed in Year 1 will culminate in a CAMP4W Part 1 Report. Section 4 discusses Year 2 and beyond, which will result in a completed IRP Phase 2: CAMP4W Report (Part 1 and Part 2 combined). As a living document, the implementation of the plan will evolve beyond the completion of the Report, and it will be updated as time progresses and conditions change.

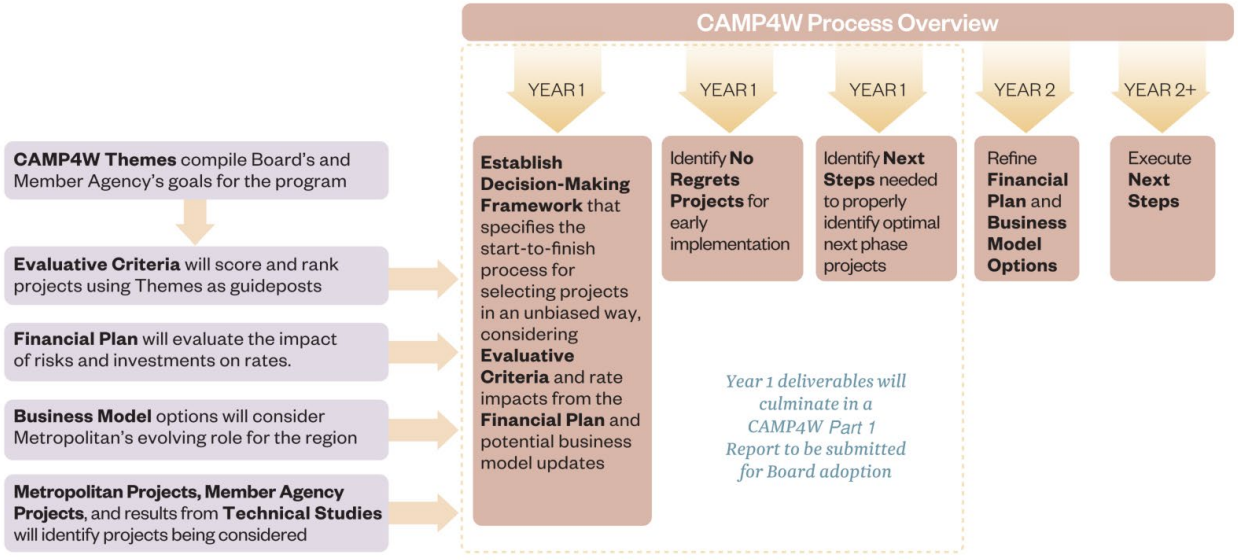


Figure 2. CAMP4W Process Overview

Section 3: CAMP4W Year 1

Year 1 of the CAMP4W process, extending through the first quarter of 2024, involves the development of the CAMP4W Part 1 Report. The pathway to completing this report involves a series of workshops with the Board to ensure the CAMP4W process and outcome aligns with its goals. Working memoranda (WM) will be developed to capture workshop outcomes, as applicable, or to serve as draft sections of the CAMP4W Part 1 Report. These would be working documents to facilitate ongoing discussion with the Board ahead of delivery of the final report.

Figure 3 presents a summary of the deliverables that will be provided to the Board as part of Year 1 (through quarter 1 of 2024). Each of these deliverables is further discussed below.

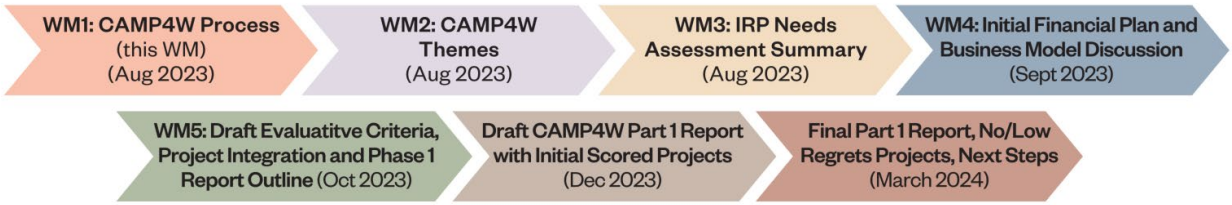


Figure 3. CAMP4W Year 1 Deliverables

WM2: CAMP4W Themes

Developed early in the CAMP4W process, Themes are intended to capture the Board and Member Agencies' preferences for what concepts and priorities should be incorporated throughout the CAMP4W development process. Initial ideas were captured at the Board retreat in February 2023 and the workshop held in May 2023 under the categories of reliability, resilience, financial sustainability, affordability, and equity (added following workshops). Subsequent discussions and a request for comments sent to Member Agencies in July 2023 led to the refinement of the Themes. The revised Themes are being presented to the Board in WM2.

As shown in Figure 2, the Themes will be used to inform the development of evaluative criteria, which will in turn inform the process for selecting projects. In this manner, the Board and Member Agencies' preferences and priorities will be carried through the CAMP4W process. The Themes are intended to be adaptable and flexible throughout the multi-year process and can be revised to allow continued alignment between the next steps and Board and Member Agencies' preferences.

WM3: IRP Phase 1: Needs Assessment Summary

The Integrated Resources Plan (IRP) Phase 1: Needs Assessment was completed by Metropolitan in 2020 and adopted by the Board in 2022. This effort involved comprehensive modeling to identify the storage and supply needs for the region across multiple planning scenarios. The planning scenarios were developed based on both population and demand forecasts, as well as the impacts of climate change. Member agencies were involved throughout the process, and they provided input on the modeling parameters, such as population, demand, and local supply forecasts.[1]

The June 2023 Board workshop included a presentation summarizing the Needs Assessment. WM3 summarizes this discussion and includes an overview of how it will be used in the CAMP4W process.

WM4: Initial Financial Plan and Business Model Discussion

A key part of the CAMP4W process involves integrating resource and climate planning with Metropolitan's ongoing financial plan and business model considerations. This will ensure Metropolitan's planning reflects the project and program costs needed to continue to provide a reliable and resilient system in the face of a changing climate.

Metropolitan is currently developing a financial plan that assesses the economic feasibility of proposed projects and the rate impact of developing projects to meet the volumes of water supply and storage identified in the Needs Assessment. In addition, as Metropolitan's role in the region resource planning evolves, such as through the implementation of the Pure Water program, updated business model options will be considered. WM4 will provide an overview of these elements, which will be discussed during subsequent Board workshops as presented in the timeline in Figure 1.

As the CAMP4W process progresses, the financial plan will be refined to consider specific projects needed to meet the storage and supply volumes identified in the Needs Assessment as well as additional infrastructure needed to be resilient and reliable across multiple climate risks (e.g., drought, stronger storms, flooding, wildfires, extreme heat, and sea level rise) and other hazards (e.g., earthquakes). Additional discussion on this process is provided in the next section.

WM5: Draft Evaluative Criteria and Integration of Additional Projects

Evaluative Criteria: The Evaluative Criteria will provide a method of scoring and ranking projects and programs based on criteria important to the Board and Member Agencies, as reflected in the Themes. Evaluative Criteria can be used to compare proposed projects and differentiate them from one another. Weighting factors will be applied to each Evaluative Criteria, where weighting factors increase or decrease their relative importance. These weighting factors will be based on the Themes, thereby incorporating the Board and Member Agency priorities into the evaluation process. For example, assigning a higher weight to providing connectivity within the network would reflect the Board's policy to address shortages in the Stade Water Project Dependent Areas. The initial evaluation of projects will be further evaluated on costs so that projects with the highest cost-benefit ratio can be identified.

[1] https://www.mwdh2o.com/how-we-plan/integrated-resource-plan?keywords=IRP

Integration of Additional Projects: Output from the IRP Needs Assessment is a key input in the CAMP4W evaluation process. The Needs Assessment: 1) addresses the climate impacts of increased incidence of drought and changing precipitation patterns from a water supply standpoint, and 2) identifies general volumes of storage and supply needs based on population and demand forecasts. The CAMP4W process will identify specific projects to meet those needs, which will be scored as discussed above.

In addition to storage and supply needs, other key inputs to the CAMP4W include potential climate change impacts beyond changing drought and precipitation patterns (e.g., wildfire, sea level rise, extreme heat and more) as well as other hazards (e.g., earthquakes) and an assessment of the additional projects needed to increase resilience to these impacts. Ongoing Vulnerability Assessments and Hazard Mitigation Plans will identify these additional vulnerabilities (including employee safety and customer resilience) within the system and may identify capital projects needed to harden and strengthen existing infrastructure or to add additional conveyance.

To illustrate how these parallel efforts integrate, Figure 4 displays the following:

1. Inputs used in the selection of potential low/no regrets projects (e.g., preliminary list of projects to fulfill the water volume requirements identified in the Needs Assessment ***plus*** projects to increase overall climate resilience of Metropolitan's infrastructure and operations identified during vulnerability assessments and hazard mitigation planning),

2. Identification of which data are informing the initial financial plan (discussed in WM4, and including only Needs Assessment volumes), and

3. How the CAMP4W process will progress to integrate both the **volume of additional storage and supply needed** with the **infrastructure and operations needs** to create a comprehensive process for selecting projects. This will result in an updated economic evaluation from the initial evaluation that accounts for storage and supply needs alone.

WM5 will provide a summary of the draft evaluative criteria and weighting factors, summarize how infrastructure projects are being incorporated, and will include an outline for the CAMP4W Part 1 Report. These elements will be discussed during subsequent Board workshops as presented in the timeline in Figure 1.

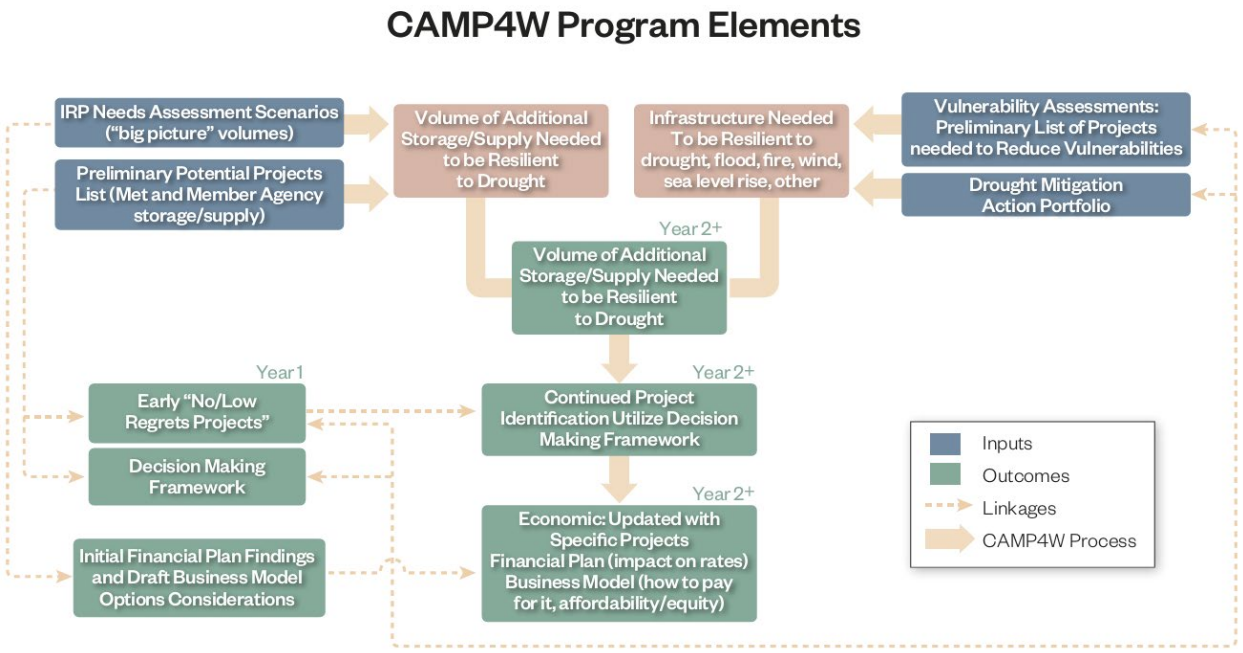


Figure 4. CAMP4W Inputs and Process

Draft and Final CAMP4W Part 1 Report

The CAMP4W Part 1 Report will summarize the work completed during Year 1 of the CAMP4W process. Part 2 will be developed in Year 2 and combined into a final CAMP4W Report.

The Draft Part 1 Report will incorporate the documentation provided in WMs 1-4 and will include a comprehensive decision-making framework that will compile all parts of the process into a stepwise approach for evaluating projects for implementation. This will include:

- Tools for scoring and ranking projects (Evaluative Criteria, WM5),
- Cost effectiveness assessment of scored and ranked projects,
- Methodology for compiling individual projects into portfolios of multiple projects (e.g., combining projects that address the State Water Project Dependent Areas), and
- Assessment of the impacts to rates and affordability based on implementing various portfolios of projects (Alternatives Analysis) using the financial plan currently being developed.

The Draft Part 1 Report will provide a list of projects scored using the evaluative criteria presented in WM5. Following submittal of the draft, Board discussions and input from Member Agencies will result in revisions to the document, to be incorporated into the Final Part 1 Report. In addition, the Final Part 1 Report will take the list of scored storage, supply, and infrastructure projects and identify low/no regrets projects based on assessments of cost effectiveness, economic feasibility/affordability, and impacts to rates. By identifying these projects early on, Metropolitan and its Member Agencies can begin their implementation in a timely manner.

These low/no projects will be presented to and discussed with the Board and Member Agencies at Member Agency Manager's Meetings and Board workshops (see timeline in Figure 1) prior to inclusion in the final report so that identified projects are properly vetted and selected. Identified projects can include both storage and supply projects or programs as well as infrastructure projects (such as those needed to harden existing infrastructure vulnerable to climate conditions).

In addition to the development of a Decision-Making Framework and a list of low/no regrets projects, the final report will include a detailed understanding of next steps that must be implemented moving into year two (beginning quarter 2 of 2024) and beyond.

The final report will be submitted to the Board for adoption (see timeline in Figure 1).

Section 4: CAMP4W Year 2 and Beyond

The CAMP4W process will continue directly into Year 2 (beginning quarter 2 of 2024), where the recommendations identified and adopted by the Board will be implemented and additional projects beyond the low/no regrets projects will be evaluated. Based on discussions to date, this may involve developing a methodology for identifying opportunities for Member Agencies to further collaborate, and a pathway for Metropolitan to facilitate this collaboration. Additional projects will become part of Metropolitan's Adaptive Management Process.

Figure 3 presents an illustration of adaptive management. As shown in the figure, real-world conditions will inform the process and selection of projects. Because projects often take years to plan and implement, there will be ample time for Metropolitan to reassess decisions based on both global and local assumptions which will serve to either:

1. Reduce the potential of stranded assets due to overdevelopment by having the ability to not construct a project that was preliminarily planned for but not needed, and
2. Reduce the potential of under preparedness if conditions require more infrastructure in the future by having planning phases underway early on to position Metropolitan to implement those projects if they are needed.

This adaptive management process provides optimal flexibility, which is critical in the face of a changing climate.

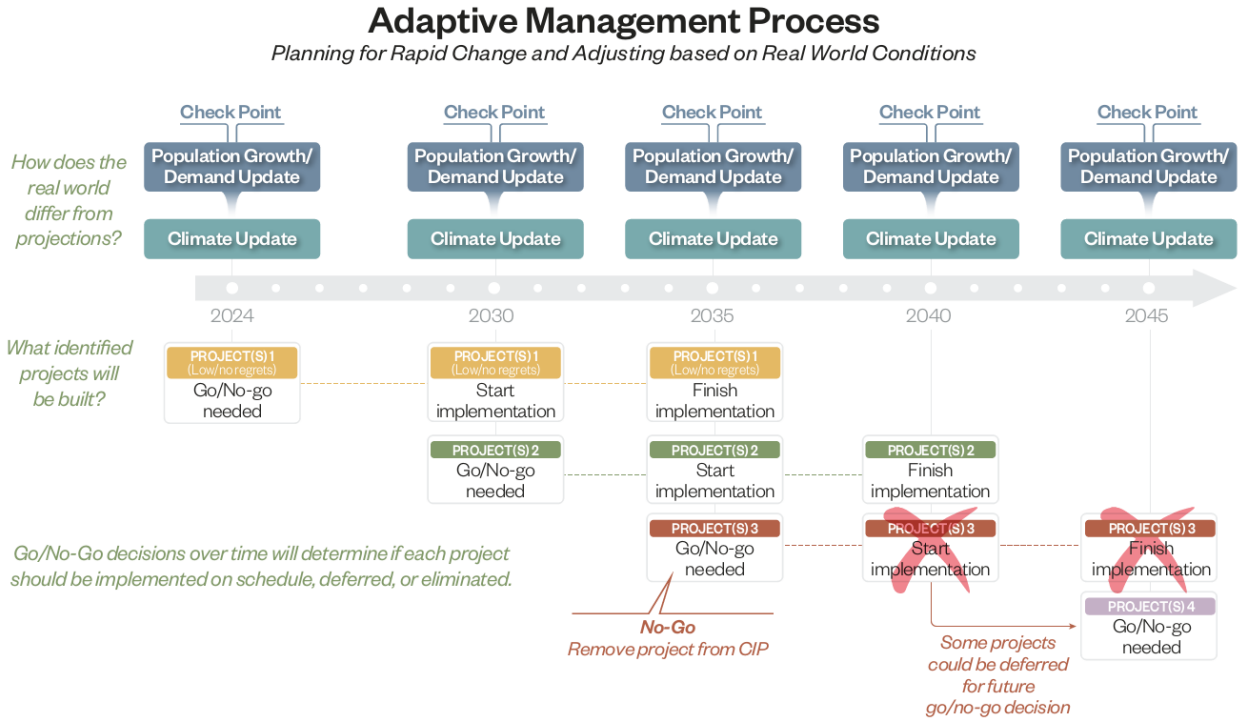


Figure 5. Adaptive Management Process

Climate Adaptation Master Plan for Water (CAMP4W)

WORKING MEMORANDUM #2

CAMP4W THEMES

August 2023

Stronger together. Metropolitan is developing a long-term Climate Adaptation Master Plan for Water (CAMP4W) to prepare Metropolitan and its Member Agencies for an uncertain future by developing a reliable and resilient supply of water and network of facilities. Founded on financial sustainability and equitable affordability, the plan will guide the region with collaboration and interconnectivity through a "stronger together" approach.

The CAMP4W Themes were developed based on discussions among the Board and Member Agencies regarding what concepts should be considered as the CAMP4W planning process progresses across ***reliability, resilience, financial sustainability, and affordability***. The ideas captured during those discussions were compiled into thematic statements that will serve as guideposts during the next steps, including the development of evaluative criteria. An additional category, ***equity***, was added following the discussions as it was identified as an important theme among participants.

The following presents the CAMP4W Themes. Though there is overlap, the themes are categorized as either overarching themes or themes most aligned with reliability, resilience, financial sustainability, affordability, or equity.

OVERARCHING THEMES

Overarching Themes that span all categories.

- Develop a path forward that prepares our region to mitigate, adapt and thrive in a changing climate.
- Recognize that reliability and resiliency, as well as affordability and equity, varies across member agencies and we must work as a single region to create equity.
- Develop a coordinated engagement strategy across Member Agencies and Metropolitan that builds relationships and trust in the communities we serve, provides meaningful information and solicits input throughout the process.
- Comprehensively evaluate alternatives utilizing available data, an understanding of Metropolitan and member agencies facilities, and opportunities for collaboration to make informed decisions on investments.
- Develop a Decision-Making Framework that is flexible and adaptable to varying climate scenarios and human behaviors and achieves multiple benefits.
- Create reliability and resilience by determining:
    - **"Will-build"** projects benefiting multiple planning scenarios (i.e., Low/No Regrets projects)
    - **"Can-build"** projects to be built depending upon further investigation
    - **"May-build"** projects to be built on the conditional occurrence of "trigger" conditions
- Develop portfolios of alternatives and an adaptive management framework designed to support the identified needs of Metropolitain's system considering benefits, costs, prior Board actions, and implementability in achieving resiliency and reliability.

RELIABILITY

Ability to always meet water demands.

- Develop regional and collaborative solutions that address various climate scenarios and consider:
    - Providing multi-benefits across member agencies,
    - Increasing our water reserves,
    - Serving both current and future customers,
    - Maintaining water quality,
    - Considering system and environmental improvements for imported water assets,
    - Diversifying our portfolio, and
    - Establishing system interconnectivity.
- Identify projects that reduce our regional dependence on imported water and that address areas in our system that rely on a single source of supply.
- Improve the reliability of the State Water Project Dependent Areas by upgrading infrastructure connectivity and access to water supply and storage assets.
- Recognize increased water use efficiency as a critical aspect of reliability regardless of varying climate scenarios and identify implementation methodologies.
- Ensure regional connectivity so that all agencies are able to directly access the region's resources and share equally in the regional benefits as well as the regional risks.

RESILIENCE

Ability to withstand and recover from disruptions.

- Identify infrastructure at risk of failure or vulnerable to climate impacts and other hazards and establish a methodology to continuously re-evaluate gaps to manage risks and proactively identify risks.
- Identify investments and partnership opportunities that facilitate collaboration among Metropolitan and Member Agencies.
- Improve the resiliency of the State Water Project Dependent Areas, and those areas with little or no redundancy for access to Metropolitan supplies, by upgrading infrastructure connectivity and access to water supply and storage assets.
- Develop opportunities for integration across water supply, infrastructure, workforce, ecosystems, power supply, and other areas.
- Create a cooperative approach to ensure system flexibility during disaster response and recovery.

FINANCIAL SUSTAINABILITY

Revenues sufficient to cover expenses over the short- and long-term.

- Consider business models that enable Metropolitan to fulfill its regional role and maintain a sufficient income stream to fund necessary projects and programs in partnership with its member agencies.
- Develop a financial plan that assesses rate impacts of various adaptation pathways.
    - Maintain sufficient reserves for liquidity and resilience to various climate scenarios impacting declining revenues, increasing costs, emergency conditions, and member agency demand patterns.
    - Develop a plan that includes managing risk exposure due to climate change to maintain credit worthiness for access to capital markets and debt financing.
    - Explore opportunities to increase non-rate revenues and credit worthiness across climate scenarios.
- Recognize the need to fund ongoing or increasing rehabilitation and repair project costs to maintain resiliency and reliability.
- Evaluate mechanisms that facilitate shared resources among member agencies, reduce individual agency exposure, and support member agencies in completing projects.

AFFORDABILITY

Relative cost burden and elastic ability to access (pay for) service and support member agency efforts to provide affordable supply to their customers.

- Evaluate revenue and rate alternatives that align with an updated business model.
- Consider each Member Agency's distinct financial profile based on their size, level of establishment (growing vs. established), rate capacity, reliance on Metropolitan's supplies, and their retail customer's capacity to pay.
- Explore options in program funding to address access and affordability for the most vulnerable customer segments in alignment with Metropolitan's policies and state law.
- Conduct regular evaluation on affordability factors to understand the discrepancy in affordability across member agencies.
- Evaluate mechanisms to streamline processes and increase efficiencies with innovative ideas for cost-savings.
- Identify opportunities for Metropolitan to actively participate in programs that would support affordability (e.g., programs at the State or Federal level).
- Practice fiscal care and responsibility to ensure MWD's component of the member agencies' water costs are as economical as possible.
- Evaluate projects based on the whole life-cycle costs (capital plus operation and maintenance) to assess long-term economic feasibility and cumulative impacts on affordability.

EQUITY

Fair, just and inclusive.

- Metropolitan will promote regional equity among all member agencies by understanding varying individual member agency needs related to:
    - Access to a reliable water supply that achieves an equivalent level of reliability and resiliency experienced across the region.
    - Access to funding options for projects necessary to achieve the standard of reliability and resiliency afforded to the rest of the region.
    - Access to an inventory of assets sufficient to store and convey water to achieve the same level of reliability and resiliency experienced across the region.
- Metropolitan will support member agencies' equity goals by:
    - Supporting member agencies in pursuing the Human Right to Water through affordability and access to water supplies.
    - Evaluating conservation and use efficiency programs for disadvantaged communities (such as access to rebates, direct install, and other programs).
    - Exploring legislative options to prioritize state and federal investments in disadvantaged communities.
    - Supporting member agencies conservation and water use efficiency programs including communication, funding, and program execution.

Climate Adaptation Master Plan for Water (CAMP4W)

WORKING MEMORANDUM #3

IRP 2020 REGIONAL NEEDS ASSESSMENT SUMMARY

August 2023

Summary

The 2020 Integrated Water Resources Plan (IRP) was organized into a Regional Needs Assessment (Phase 1) and an implementation phase (Phase 2). The Needs Assessment (**Attachment A**) was adopted by the Board in 2022 and established a tool for ensuring regional water reliability through 2045 and incorporated scenario planning to address wide-ranging uncertainties. Building upon this strong foundation of the IRP Needs Assessment, the implementation phase of the IRP will be coordinated through the Climate Adaptation Master Plan for Water (CAMP4W) process.

In collaboration with the Member Agencies, the Board of Directors, and other interested parties, the 2020 IRP Needs Assessment broadened Metropolitan's perspectives compared to past IRPs by constructing and modeling four plausible future scenarios. These scenarios explored uncertainties related to future climate conditions, population growth, regulatory requirements, and the economy. These scenarios represent divergent outcomes of imported supply stability and demands on Metropolitan and are illustrated in Figure ES-1 (see also page 17 of **Attachment A**).

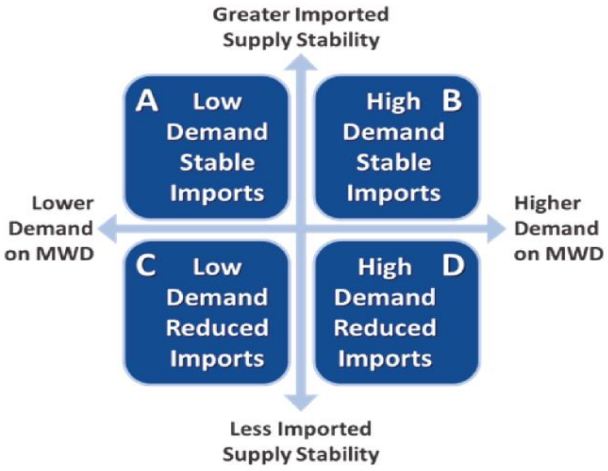


Figure ES-1. IRP Planning Scenarios

The scenario analyses revealed conceivable reliability outcomes through 2045. The potential annual net shortage ranged from none under Scenario A to as high as 1.2 million acre-feet (MAF) under Scenario D.

The IRP Needs Assessment identified three categories of supply:

Core Supply: A supply that is generally available and used every year to meet demands under normal conditions and may include savings from efficiency gains through structural conservation.

Flexible Supply: A supply that is implemented on an as-needed basis and may or may not be available for use each year and may include savings from focused, deliberate efforts to change water use behavior.

Storage: The capability to save water supply to meet demands at a later time. Converts core supply into flexible supply and evens out variability in supply and demand.

In order to address the gaps identified within each scenario, Metropolitan conducted a portfolio analysis to quantify the effect of various combinations of supply categories (core supply, flexible supply, or storage). Initial modeling utilized a single category analysis (core supply, flexible supply, or storage) to test how the supply-demand gap in each scenario could be met. After the portfolio categories were modeled in isolation, a mix of all three categories was modeled for each scenario. The analysis concluded that rather than relying on any single category of portfolio actions, it is more practical in every scenario to pursue a more balanced and diversified mix. For example, the analysis found that under rapid climate change Metropolitan and its Member Agencies would need to develop between 50 thousand acre-feet (TAF) and 650 TAF of new core supply to continue to meet the needs of the region assuming no additional storage is developed and a maximum of 100 TAF of flexible supply is developed. However, by expanding existing storage or by developing new storage programs and investments in Metropolitan's distribution system, the need for new core supply can be reduced.

The Needs Assessment further evaluated the impact of system distribution constraints on system reliability to establish the extent to which water supply shortages can be mitigated by removing those constraints. The analysis found that if distribution constraints were removed entirely, shortages decrease or are eliminated in years prior to 2040. However, in year 2040 and beyond, under Scenarios C and D, frequent shortages and fewer surplus conditions indicate that storage and conveyance capacity alone will not solve the reliability problem without supply improvements.

The Needs Assessment involved extensive modeling across multiple established platforms to conduct a reliability assessment to quantify potential gaps within each scenario. The Needs Assessment resulted in findings across the following five focus areas:

- Demand Management
- Storage Needs
- Imported Supplies
- Local Supplies
- Identification of Gaps by Major Load Area: Modeling by demand load area (the State Water Project (SWP) Dependent Area, the Colorado River Dependent Area, and the Blended Area). This led to findings related to the SWP Dependent Area as an area specifically impacted by future conditions (see page 26 of **Attachment A** for a figure showing the demand load areas).

Metropolitan acknowledges that CAMP4W will require continued close collaboration with Member Agencies to integrate local needs, projects, and priorities. CAMP4W is designed to provide an adaptive decision-making framework to facilitate the selection of projects and the sequencing and timing of each phase of implementation. Scenario planning developed in the IRP Needs Assessment provides a sound foundation for adaptive management. This will allow for flexibility and the opportunity to refine decisions over time so Metropolitan can continue to meet its mission to provide the entire service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way.

Section 1: Needs Assessment Framework and Scenarios

For nearly thirty years, Metropolitan has embraced integrated resources planning for developing a long-term strategy to provide the region with a reliable, high-quality, and affordable water supply. Between 1996 and 2015, Metropolitan recalibrated its IRP on several occasions, based on a single set of assumptions related to changing conditions and forecasts. Beginning with the 2020 IRP update, Metropolitan integrated scenario planning, which instead focuses on a range of assumptions. This important adjustment to the 2020 IRP allows Metropolitan to consider a wide range of uncertainty, based on several key assumptions, including future climate conditions, population growth, regulatory requirements, and the economy (see page 14 of **Attachment A**). To develop the scenarios used in the 2020 IRP Needs Assessment, there was extensive coordination and consultation with Member Agencies, and Board input was integrated throughout the process.

Recent severe drought in California followed by record rainfall provides a real-world example of the challenges facing the region and emphasizes the need to consider future climate change projections in the IRP process. The climate change assumptions were developed in consultation with an expert panel and based on IPCC Assessment Reports (and corresponding global climate models) using the most recent projections available at the time the IRP was developed.

Following is a list of key assumptions included in the IRP Needs Assessment. **Attachment B** provides a comprehensive summary of assumptions for each scenario.

- Assumptions related to future climate conditions:
    - RCP 4.5 represents moderate climate change (reflected in Scenarios A and B)
    - RCP 8.5 represents more pronounced climate change (reflected in Scenarios C and D)
- Assumptions related to population growth and water demands:
    - Low demands (represented in Scenarios A and C)
        - Aggressive conservation practices
        - Low economic growth and population growth
    - High demands (represented in Scenarios B and D)
        - Moderate conservation effectiveness
        - High economic growth which accelerates population growth
- Assumptions related to regulatory impacts:
    - Low regulatory impacts (less restrictive) (Scenarios A and B)
    - High regulatory impacts (more restrictive) (Scenarios C and D)
- Assumptions related to local supplies:
    - Higher local supplies
        - (Scenarios A and C assume higher local supplies relative to Scenarios B and D)
    - Diminishing local supplies
        - (Scenarios B and D assume lower local supplies relative to Scenarios A and C)

Uncertainty and the Establishment of Assumptions

There is **inherent uncertainty** whenever an assumption is made, and in the IRP Needs Assessment, each scenario is defined by numerous assumptions. **Scenario planning and adaptive management capture that uncertainty** in the space between each scenario – the spectrum along which real-world conditions are likely to unfold. Each scenario presents a data point along that spectrum, where any number of variables could shift the outcome in one direction or another.

By adapting and modifying investment decisions over time, **Metropolitan will align implementation with real-world conditions** to reduce the risk of over or under developing resources.

Utilizing these primary assumptions, Metropolitan developed four scenarios that represent potential futures, as shown in Figure 1.

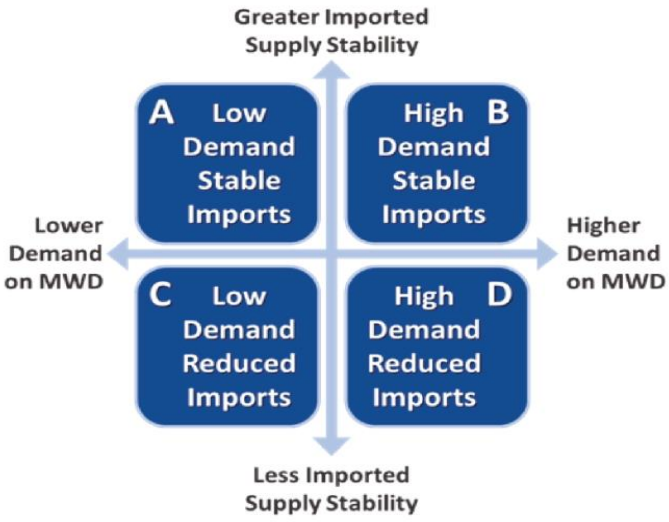


Figure 1. IRP Planning Scenarios

Section 2: 2020 IRP Regional Needs Assessment Evaluation Process

A key goal for Metropolitan is to provide all its Member Agencies with 100 percent water supply reliability through a combination of Metropolitan supplies, local supplies, and increased conservation. Scenario planning allows Metropolitan to consider multiple, plausible future scenarios with a corresponding range of possible shortcomings.

To establish and evaluate each of the four scenarios, the IRP Needs Assessment utilized several prominent modeling platforms to thoroughly analyze the impacts of each set of assumptions. Figure 2 presents a summary of the complex modeling process conducted during the Needs Assessment, followed by a summary of each input (see page 19 of **Attachment A**).

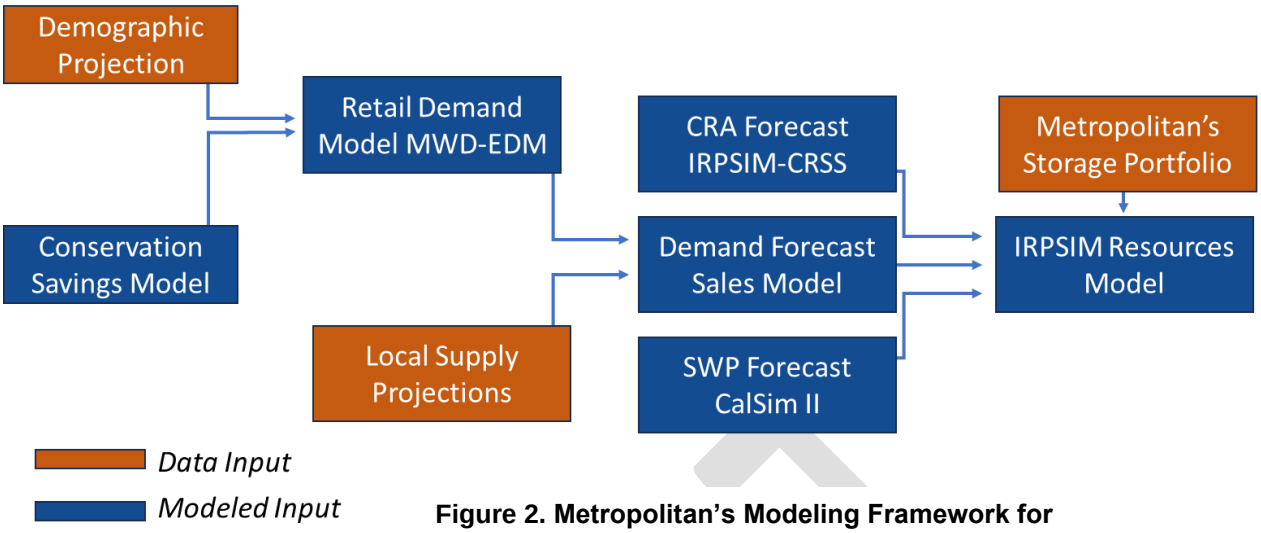


Figure 2. Metropolitan's Modeling Framework for Quantifying Uncertainties

MWD-EDM:

- Demographic growth projections were developed with support from the Center for Continuing Study of the California Economy (CCSCE), which utilizes studies published by the U.S. Census Bureau.
- Drivers for change were evaluated such as smaller lot sizes for future homes, future conservation, water use ethic and rebound behavior (where complete rebound assumed a 10 percent higher forecast compared to a forecast without rebound).
- Conservation savings (structural and behavioral conservation) were established using Metropolitan's Conservation Savings Model based on plumbing code compliance, Metropolitan and Member Agency conservation programs, and price-effect conservation.
- Demands from retail agricultural, seawater barrier, and replenishment were established considering climate change impacts within each scenario (e.g., additional seawater barrier needed when seawater levels increase, and additional supply is needed to combat increased hydraulic pressure).

Local supply projections:

- Includes groundwater, surface water, the Los Angeles Aqueduct, recycled water, groundwater recovery, and seawater desalination. Values were established based on Metropolitan's annual local supply surveys, coordination with local agency staff, and local Urban Water Management Plans.
    - Focused workshops were held with Member Agencies and groundwater management agency staff to gain valuable insights into challenges and reliability impacts of local supplies based on climate change, economic conditions, and regulatory restrictions.

Demand Forecast Sales Model:

- Model calculates the demands on Metropolitan by Member Agencies where local supplies are insufficient to meet retail demand.
- Model accounts for weather-related variations in demands and local supplies, resulting in a range of forecasted demands on Metropolitan.
- Climate expert consultants were engaged to develop techniques and ranges for incorporating climate change impacts into the local precipitation and temperature assumptions.

CRA Forecast IRPSIM-CRSS

- Model provides a base supply from the Colorado River Aqueduct (CRA) utilizing hydrological inputs provided by the United States Bureau of Reclamation, utilizing Metropolitan's generated surplus and shortage characterization of the Colorado River system.
- Based on consultation with climate experts and previous research, climate change is incorporated into CRA supplies by adjusting the Lake Powell and Lake Mead inflow hydrology and evaporation rates.
- Stability of Colorado River supplies were considered based on potential impacts of existing agreements related to operation of the Colorado River and cooperation between the lower basin states and Mexico, with some agreements expiring in 2026. Scenarios A and B assume extension of these agreements (stable imported supply), while Scenarios C and D assume some agreements expire (unstable imported supply) (see page 29 of **Attachment A**).

SWP Forecast-CalSim II

- Model produced by the Department of Water Resources and published in their 2019 Delivery Capability Report (DCR), which provides SWP supply estimates for 1) an existing condition that does not consider climate changes, and 2) an early long-term condition that does incorporate a fixed condition of climate change.
- IRP Needs Assessment utilized the 2019 DCR as a basis for incorporating guidance from climate experts to reflect the regulatory and climate change impacts used in the IRP scenarios to establish the supply estimates from the SWP.

IRPSIM Resources Model:

- IRPSIM is a water supply and demand mass balance simulation model, which analyzes the supply-demand gaps. It integrates inputs from the models described above, including:
    - CRA Forecast (using the IRPSIM-CRSS model)
    - SWP Forecast (using the CalSim II model)
    - Metropolitan's storage portfolio, where IRPSIM considers operational constraints, put and take capacities, contractual arrangements, and other operational considerations.

- Demand Forecast Sales Model which provides the input for demands on Metropolitan, which uses retail demand (demographic projections and conservation considerations) and local supply projections.

- The IRPSIM model considers the availability and accessibility of its imported water supply sources, including storage, where forecasted demands were allocated to portions of Metropolitan's regional distribution system, referred to as demand load areas. Based on this, the model identified spatially where across the system gaps exist for each scenario modeled.
    - Three main demand load areas were identified including: SWP Dependent Areas, Colorado River Dependent Areas, and Blended Areas which are areas able to receive supply from both sources including their respective storage programs (see page 26 in **Attachment A** for a map of each demand load area).
    - During surplus years, excess SWP supply can be stored in SWP storage facilities and/or in blended areas, allowing Metropolitan to store imported supply within Colorado River storage facilities.
- To test reliability, IRPSIM utilizes 96 years of historical hydrology (1922-2017) to establish the probabilities of surpluses and shortages (defined in the model as insufficient supply to satisfy a demand or inaccessible supply). The scenario-based climate impacts were overlaid onto the sequential hydrology data within IRPSIM.

Section 3: 2020 IRP Regional Needs Assessment Findings

The modeling conducted first utilized a single category analysis (core supply, flexible supply, or storage), then category-specific tests were performed to understand the impact of utilizing multiple supply categories in a given portfolio. The analysis concluded that rather than relying on any single category of portfolio actions, it is more practical in every scenario to pursue a more balanced and diversified mix. For example, the analysis found that under rapid climate change Metropolitan and its Member Agencies would need to develop between 50 TAF and 650 TAF of new core supply to continue to meet the needs of the region, assuming no additional storage and a maximum of 100 TAF of flexible supply. However, by expanding existing or developing new storage programs and investments in Metropolitan's distribution system, the need for new core supply can be reduced.

The Needs Assessment further evaluated the impact of system distribution constraints on system reliability to establish the extent to which water supply shortages can be mitigated by removing those constraints. The analysis found that if distribution constraints were removed entirely, shortages decrease or are eliminated in years prior to 2040. However, in year 2040 and beyond, under Scenarios C and D, frequent shortages and fewer surplus conditions indicate that storage and conveyance capacity alone will not solve the reliability problem without supply improvements (see page 32 **Attachment A**).

A comprehensive discussion on findings is included in Attachment A (beginning on page 30), and below is a brief summary of findings across five key focus areas.

State Water Project Dependent Areas

- Vulnerabilities in the SWP Dependent Areas are more severe given reduced reliability of SWP supplies and Metropolitan distribution system constraints. Actions identified in the implementation phase must prioritize addressing the SWP Dependent Area's reliability challenge.
- New core supplies must be accessible to the SWP Dependent Areas. Greater access to existing core supplies can also increase SWP Dependent Area reliability.
- Enhanced accessibility to core supplies and storage, both existing and new, will improve SWP Dependent Area and overall reliability. This includes improvements to Metropolitan's distribution system and capacity to deliver non-SWP supply and storage.
- New storage must be accessible to the SWP Dependent Areas.

Storage

- Storage capacity, put/take capabilities, and accessibility are critical considerations in maintaining reliability under the region's current and future conditions, especially for SWP Dependent Areas.
- Maintaining Metropolitan's existing storage portfolio is critical, including the consideration of re-negotiating contracts when they expire.
- Expanding existing or developing new storage programs and investments in Metropolitan's distribution system can reduce the need for new core supply development to meet potential future shortages and adapt to climate change.
- When evaluating storage options, put/take capabilities are essential; even storage programs with modest put/take capabilities help reduce the need for flexible supply.

Retail Demand / Demand Management

- Metropolitan's future supply reliability may fluctuate based on demand increases and decreases.
- Variability in retail demand largely comes from changes in outdoor water use. Outdoor water use behavior is complex, influenced by weather and climate and by awareness of water scarcity and other conservation measures.
- It is important to pay attention to demand rebound, demand growth, and demand reductions, and take appropriate regional measures as necessary.
- Managing long-term demands through the efficient use of water reduces dependency on supplies, helps preserve storage, and helps reduce the need for extraordinary conservation measures.

Metropolitan Imported Supplies

- Existing imported supplies are at risk from various drivers of uncertainty.
- Maintaining existing imported supply reliability reduces the need for new core supply development and leverages years of investments.
- SWP supplies are highly susceptible to varying hydrologic conditions, climate change, and regulatory restrictions.
- Variability and capacity in SWP supplies provide opportunities to store water during wet periods for use in dry years, including Colorado River storage. Metropolitan's ability to distribute or store SWP supplies when they materialize will enhance the region's reliability, particularly the SWP Dependent Areas. The Colorado River system and Colorado River Aqueduct capacity do not offer the same opportunities concerning SWP storage.

- Shortages on the Colorado River will limit the reliability of Colorado River Aqueduct deliveries as a core supply in the future.

Local Supply

- Maintaining existing and developing new local supplies is critical in helping manage demands on Metropolitan.
- Impacts to reliability occur if local supply assumptions are not achieved; therefore, it is important to track the progress of local supply development as one of the signposts in the One Water Implementation phase.
- Additional actions may be needed should existing and future local supply levels deviate from IRP assumptions.

Section 4: Next Steps

Metropolitan's approach to reliability and resilience brings together Southern California's interests in managing finite water resources for both community and ecosystem needs. It goes beyond identifying the region's future water portfolio and embraces collaboration, diverse communities, and a unified approach to problem solving.

The IRP Regional Needs Assessment identified significant threats facing Southern California's water supply reliability through successive qualitative and quantitative analysis steps. The assessment sizes up the scope of reliability challenges and the management solutions that could be in store for the region by the year 2045 under a wide range of conditions, and it serves as a guide to the deeply uncertain future of Southern California's water supply.

The adoption of the Regional Needs Assessment is an essential precursor, and significantly informs, the CAMP4W implementation phase. This phase will involve the continuation of extensive collaboration among Metropolitan's Board, Member Agencies, and other interested parties to develop an adaptive management strategy and decision-making framework. CAMP4W will also establish a process for monitoring key reliability indicators and find joint approaches to the regional problems and resource needs identified in this assessment.

Climate Adaptation Master Plan for Water (CAMP4W)

WORKING MEMORANDUM #4

IRP 2020 INITIAL FINANCIAL PLAN AND BUSINESS MODEL DISCUSSION

September 2023

Section 1 Overview

In 2022 Metropolitan's Board adopted the 2020 Integrated Water Resources Plan (IRP), which assessed regional water reliability needs through 2045 and incorporated scenario planning to address wide-ranging uncertainties. The IRP was organized into a Regional Needs Assessment (Phase 1) and an implementation phase (Phase 2). Phase 2 is coordinated through the Climate Adaptation Master Plan for Water (CAMP4W) process currently underway.

The CAMP4W process serves to better integrate the resource planning of the IRP with financial planning toward the aims of reliability, resiliency, financial sustainability, affordability, and equity. This planning also integrates the need to respond to challenges presented by climate change. On September 12, 2023, the Board approved the use of climate information and modeling under Representative Concentration Pathway (RCP) 8.5 as a basis for planning purposes in CAMP4W. This action further recognizes the need to adaptively plan towards generally accepted outcomes of a more severe climate change future.

The CAMP4W process is adhering to a streamlined schedule to facilitate the development of a completed CAMP4W Part 1 Report by the first quarter of 2024. To this end, Working Memoranda are being developed to coincide with key topics being discussed with and presented to the Board and Member Agencies. These Working Memoranda will ultimately be compiled to form key chapters of the CAMP4W Part 1 Report. Gathering valuable input from the Board and Member Agencies on these memoranda at set intervals along the way is allowing Metropolitan to maintain the streamlined schedule.

Due to this process, two separate topics have been combined into Working Memorandum 4. One summarizes the Long-Range Financial Plan Needs Assessment (LRFP-NA), which has undergone a lengthy development process that began in 2022. The second portion of Working Memorandum 4 discusses updated business model alternatives. Unlike the LRFP-NA, the business model discussion is in the early conceptual stage. While these two components are on different timelines and are at different levels of development, they are combined herein to facilitate progress and consolidate deliverables to the Board and Member Agencies. It is important to consider this distinction as the document is reviewed.

This Working Memorandum focuses on financial planning and business model discussions, including:

Long-Range Financial Plan (LRFP): To address the reliability gaps identified in the IRP Needs Assessment, Metropolitan has begun the multi-phased, multi-year Long-Range Financial Plan (LRFP) development process. The initial LRFP Needs Assessment (LRFP-NA) (Phase 1) currently underway builds upon the IRP Needs Assessment and is consistent with the goals and objectives of the CAMP4W process pertaining to resiliency, reliability, financial sustainability, affordability, and equity.

Phase 2 of the LRFP will integrate specific capital projects and outline funding and financing strategies based on Board input on policy goals and objectives and the outputs from the CAMP4W planning process. Phase 2 will be developed as the CAMP4W process progresses past the development of the decision-making framework and into the identification of specific proposed capital projects needed to fill the water supply gap as well as infrastructure projects to address vulnerabilities associated with climate change and other hazards and the refurbishment and replacement of Metropolitan's existing facilities and conveyance system. The refinement of the LFRP will be done through an iterative process, where the CAMP4W outcomes are revised based on findings from the LRFP, and the LRFP is adjusted based on the CAMP4W recommendations until a balanced outcome is achieved.

Business Model: The CAMP4W process will also facilitate discussions about Metropolitan's Business Model, which presents an opportunity to deploy shared resources in order to remain ***stronger together***. The Business Model considerations include Metropolitan's expanding role within the region and potential revenue alternatives.

The following sections of this Working Memorandum provide an overview of the LRFP-NA (**Section 2**) and an introduction of possible components of the Business Model that will be further developed in the coming months (**Section 3**).

Section 2 Long Range Financial Plan Needs Assessment Summary

2.1 Background

Understanding the financial impacts associated with bridging the supply gap identified in the IRP Needs Assessment will facilitate the iterative and adaptive methodology that is the cornerstone of the CAMP4W process. The LRFP-NA is designed as a Phase 1 document that provides high-level guidance on the rate impacts and funding opportunities Metropolitan will need to consider to be resilient and reliable in the future. Phase 2 will see an updated LRFP based on CAMP4W findings, which will include specific projects and additional project types to be pursued. Identifying these specific components may impact the categories of projects needed (supply, storage, conveyance, increased system flexibility, etc.), with the goal of identifying the most cost-effective decisions to meet the region's needs and risk tolerance. Phase 2 of the LRFP will therefore present a refined total cost and associated rate and tax implication analysis.

The LRFP-NA is designed to:

- Provide high-level financial analysis of rate and tax impacts under various resource development scenarios presented in the IRP Needs Assessment and summarized in **Figure 1** (see also **CAMP4W Working Memorandum 3** for a detailed discussion on the IRP Needs Assessment).
- Discuss the primary capital financing and funding methods Metropolitan has at its disposal.
- Introduce potential financial tools that could become components of a tailored financial strategy.
- Catalogue Metropolitan's key policies related to the capital markets.

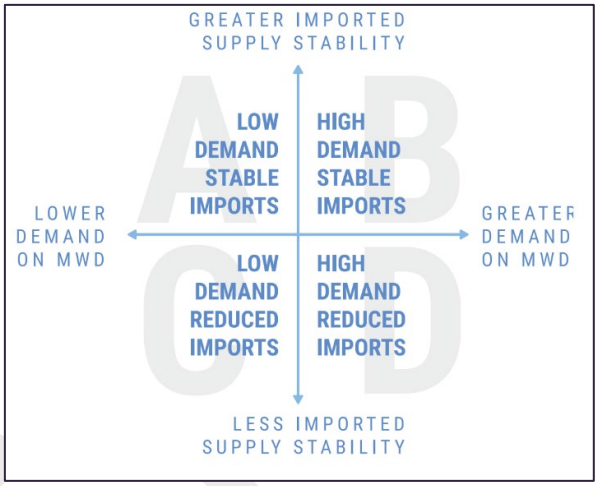


Figure 1. IRP Needs Assessment Planning Scenarios A, B, C and D

The LRFP-NA considers the four planning scenarios identified in the IRP Needs Assessment, which summarized the core supply, flexible supply, and storage needed under each scenario. Only Scenario A avoids shortages without additional water supply and system reliability investments. The remaining scenarios identified potential gaps in core supply and storage for each scenario (acre-feet (AF) needed for each year from 2025 to 2045). It defined high-level actions needed to achieve reliability in each scenario.

The baseline financial forecast was created by taking the 2022/23 and 2023/24 Adopted Budget and 10-Year Financial Forecast and removing the assumed Pure Water Southern California project costs. The baseline, therefore, does not include significant additional resource development but does include ongoing funding for conservation, local resource projects, capital refurbishment and replacement, and various operating assumptions pertaining to cost inflation rates, interest rates, and power and treatment unit costs. Per the 10-Year Financial Forecast, $300 million of annual capital improvement plan (CIP) funding is included in the base cost assumptions for all LRFP-NA scenarios, escalating at 3% annually over the forecast period. The CIP funding largely reflects the deferral of facility expansion projects and focuses instead on necessary refurbishment and replacement of aging infrastructure and compliance with regulatory requirements. The resource development costs presented in the LRFP-NA analysis are in addition to the baseline CIP funding from the 10-Year Financial Forecast. Additionally, the baseline cost includes $30.5 million of annual funding for residential, commercial, and outdoor conservation programs, and conservation messaging. The conservation development scenario included in the LRFP-NA and presented in subsequent sections of this Working Memorandum would add funding in addition to the baseline amount of $30.5 million. Financial plans typically do not project beyond a 10-year period. The LRFP-NA forecasts the average annual rate increases needed to meet the resource development requirements of each scenario over a 10-year period, through 2032, which would include projects to be completed by 2035. Scenario D (**Figure 1**) requires the most significant resource development to reliably meet projected Member Agency demands 100 percent of the time. This scenario shows that core supply would need to increase by as much as 300 thousand acre-feet (TAF) by 2032 beyond Metropolitan's existing resource portfolio of supplies.

2.2 Key Considerations

The LRFP-NA developed key questions that framed the outline of the document and helped guide the analysis. These questions include:

- What are the rate impacts and how much does it cost to provide 100 percent reliability (i.e., meet Member Agency water resource demands fully) under a heavily stressed climate and demand scenario, while considering Member Agencies' potential changes in demands and local conditions?
- Can Metropolitan address the core supply needs in Scenario D solely through conservation?
- What bond financing options are available and what is Metropolitan's debt capacity to finance the projected capital investments?
- How much outside funding from federal and/or state grants should Metropolitan target?
- What other financing tools or structures can Metropolitan explore to address Scenario D capital investments while balancing the varying needs of its member agencies?

2.3 Rate Impacts for Various Scenarios

To establish a comparative cost metric, the average annual rate[1] increase needed to meet the resource development requirements of each Scenario were developed. Cost assumptions were developed based on estimated unit cost per acre-foot of either core supply or storage. Unit rates were developed as follows (see **Figure 2** for definitions):

- Core supply unit cost: $3,000/AF (2023$). The sources used to develop the unit cost for core supply are based on three Southern California desalination and recycling projects. These unit costs are representative of a new core supply that is developed in-region, which operates continuously, and reflects the higher marginal price associated with investing in new conveyance and advanced treatment facilities.
- Storage unit cost: $300/AF of storage capacity (2023$). The sources used to develop the unit cost for storage are based on Metropolitan's cost for construction of Diamond Valley Lake and preliminary results of an in-region storage study. The storage unit cost is based on built capacity, not a calculation of anticipated yield. As such, $300/AF can be interpreted as the annual financing and O&M cost per acre foot of built capacity of new storage.

The IRP Needs Assessment identified three categories of supply:

Core Supply: A supply that is generally available and used every year to meet demands under normal conditions and may include savings from efficiency gains through structural conservation.

Flexible Supply: A supply that is implemented on an as-needed basis and may or may not be available for use each year and may include savings from focused, deliberate efforts to change water use behavior.

Storage: The capability to save water supply to meet demands at a later time. Converts core supply into flexible supply and evens out variability in supply and demand.

Figure 2. Definitions of Core Supply, Flexible Supply and Storage

[1] Average Annual Rate refers to the aggregate rate for full-service treated water.

- Flex supply unit cost: $600/AF. The sources used to develop the unit cost for flex supply are Metropolitan's current supply programs and recent transfer transactions. Minimal quantities of flex supplies are required on average for each of the IRP scenarios. As such flex supplies do not significantly impact the modeling results.

Figure 3 and **Figure 4** present the net shortages identified in the IRP Needs Assessment, through 2032, based on the projected demands from the IRP Needs Assessment (**Figure 5**). The LRFP-NA modeled multiple scenarios, summarized in **Figure 6**. The LRFP-NA identified multiple findings, including the following:

- Estimated rate increases assuming only core supply for each IRP Needs Assessment Scenario A through D (**Figure 7**).
- Estimated rate increases for Scenario D assuming both core supply and storage is developed (sensitivity of shortage) (**Figure 8**).
- Estimated Capital Investment for IRP D Scenario assuming 200 TAF of core supply is developed and 250 TAF of storage (**Figure 9**).
- Summary of estimated overall annual rate increases from 2025-2032 (**Figure 10**).
- Sensitivity analysis assuming low demands are experienced when Scenario D is built (**Figure 11**).

Figure 3. Project Net Shortages Under Different Supply and Demand Conditions through 2032

Core Supply Needs in 2032			
	No Storage	250 TAF Storage (182 TAF storage in 2032)	500 TAF Storage (364 TAF storage in 2032)
IRP A	0 TAF	0 TAF	0 TAF
IRP B	50 TAF	30 TAF	30 TAF
IRP C	15 TAF	15 TAF	15 TAF
IRP D	300 TAF	200 TAF	200 TAF

Figure 4. Core Supply Needs in 2023

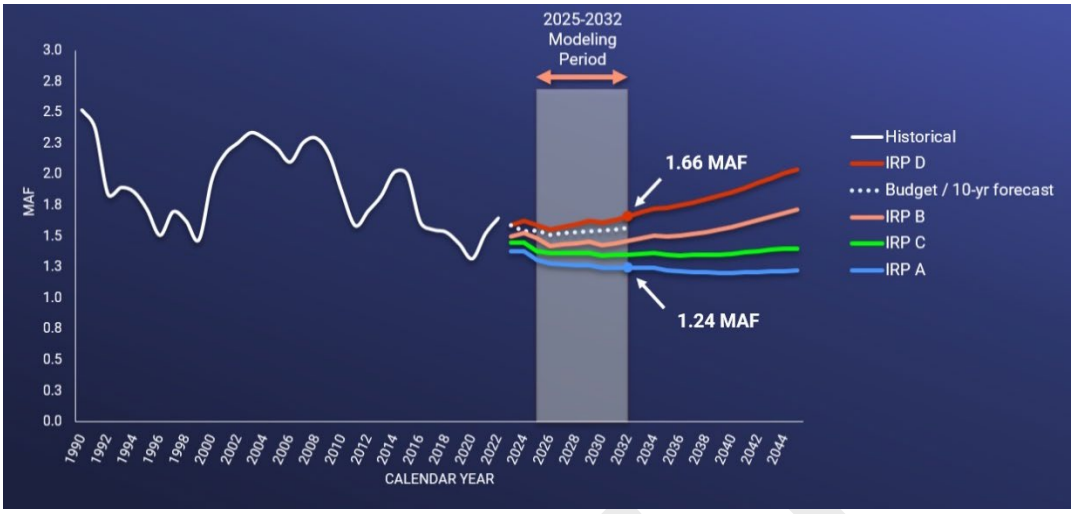


Figure 5. Projected Water Demands for IRP Scenarios

#	Scenario Short Descriptions	IRP Scenario	Import Reliability	Demands	2035 Core Supply Target (AF)	2045 Storage Target (AF)	2032 Storage Target (AF)
1	IRP A, No Storage	A	High	Low (1.24 MAF[11])	N/A	N/A	N/A
2	IRP B, No Storage	B	High	High (1.46 MAF)	50,000	-	-
3	IRP C, No Storage	C	Low	Low (1.35 MAF)	15,000	-	-
4	IRP D, No Storage	D	Low	High (1.66 MAF)	300,000	-	-
5	IRP D, 250 TAF Storage	D	Low	High (1.66 MAF)	200,000	250,000	181,818
6	IRP D, 500 TAF Storage	D	Low	High (1.66 MAF)	200,000	500,000	363,636
7	IRP D w/ IRP A Demand	D	Low	Low (1.24 MAF)	200,000	250,000	181,818

Note: Footnote 11 in the LRFP-NA states:
MAF=Million acre feet

Figure 6. Comparison of Modeled Scenarios (Figure 13 in LRFP-NA)

To achieve 100 percent reliability in 2032 under Scenario D projections, developing a combination of core supply and storage provides the lowest rate increase for that scenario. As summarized in **Figure 10,** at 7.1 percent, this increase is higher than the lowest value of 5.6 percent, but lower than the highest value of 8.4 percent. This configuration was used to calculate a scale of estimated capital investment using the unit rates presented above to estimate capital and O&M costs. Taking the derived capital financing unit rate and multiplying by a resource development target results in an annual financing cost, which was then worked into an estimated total project cost.

To be 100 percent reliable by 2032 under the IRP D scenario with the lowest average annual rate increases (7.1 percent), Metropolitan's preliminary estimate is that $5.5 billion to $6.0 billion of capital investment (in 2023 dollars) could be needed to achieve that objective (**Figure 9**). However, this should be considered a **high-level estimate, as numerous factors can affect the overall cost of a project**. Additional distribution infrastructure, economies of scale, inflation, environmental and regulatory compliance, and treatment technology will impact the ultimate cost of a project.

IRP Scenario	IRP A	IRP B	IRP C	IRP D
Core Supply Development	0 TAF	50 TAF	15 TAF	300 TAF
Average Annual Rate Increase through 2032	6.2%	5.6%	5.6%	8.4%

Figure 7. Estimated Rate Increase Under IRP Scenarios for Core Supply Only (Figure 1 in LRFP-NA)

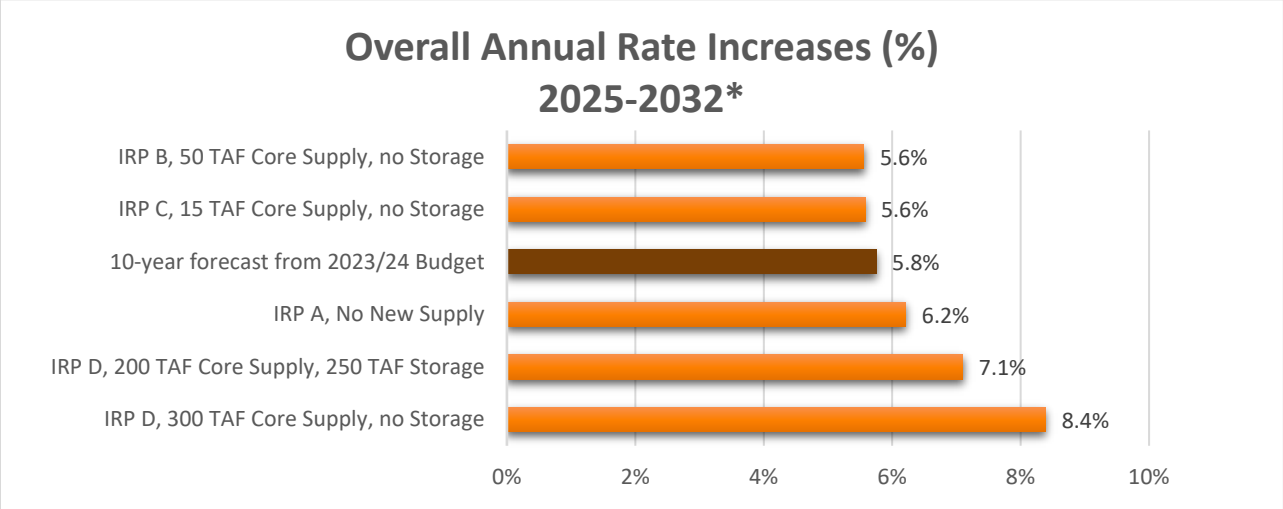
IRP D	300 TAF Core Supply	200 TAF Core Supply	200 TAF Core Supply
	0 TAF Storage	250 TAF by 2035	500 TAF by 2035
Average Annual Rate Increase through 2032	8.4%	7.1%	7.4%

Figure 8. IRP Scenario D Annual Rate Increase Sensitivity of Shortage (Figure 2 in LRFP-NA)

Resource Development		Estimated Capital Investment (billions in 2023$)
Core Supply (TAF)	Storage Capacity (TAF)	
200	250[4]	$5.5 - $6.0

Note: Footnote 4 LRFP-NA): Refer to Figure 10 for supply and storage development requirements by year.

Figure 9. Estimated Capital Investment for IRP D Scenario (Figure 3 in LRFP-NA)



**Increases in different rate elements may vary as a result of the Cost of Service allocation and cost recovery approach for each project. Impacts on a member agency will depend on how and when they take water. For example, the more a project is allocated to supply then the full-service water rate will increase higher than the price for SDCWA exchange agreement deliveries.*

Figure 10. Projected Water Demands for IRP Scenarios

**Member agency rate impacts might be substantially higher than the overall rate increase as a result of the Cost of Service allocation and cost recovery approach taken for each project. For example, if a project only impacts the supply function, then the rate increase for full-service water would increase more and the price increase on the SDCWA exchange deliveries would be less.*

Figure 11. Sensitivity Analysis – Low Demands for IRP D Scenario – Average Annual Overall Rate Increases (2025-2032) (Figure 2 in LRFP-NA)

2.4 Managing Risk with Development and Conservation Assumptions

As development decisions are made, inherent risks and tradeoffs must be considered. On one hand, if Metropolitan develops resources to meet Scenario D projections, and invests in capital projects equivalent to 200 TAF of core supply and 250 TAF of storage, but future demands are significantly lower, such as projected under Scenario A, Metropolitan would need to raise rates an additional 3.8 percentage points (from 7.1 percent up to 10.9 percent) due to the reduced revenues that would be seen under the current Business Model. On the other hand, if Metropolitan were to develop limited supply by only assuming Scenario A projections, but Scenario D conditions were to occur instead, by 2032 the region could see shortages of up to 300 TAF from 10 to 23 percent of the time. Establishing what risk tolerance the Board is willing to face will be an ongoing decision point as the adaptive process continues into the future.

Another factor to consider is the impact of focusing more heavily on conservation as a potential path towards achieving a balanced water portfolio by reducing demands, rather than developing new core supplies. While conservation programs do have the potential to be significantly beneficial, there is insufficient data on the availability and price of the marginal effectiveness of expanding conservation programs. Further study is needed to identify the available capacity and price elasticity of conservation. Conservation programs require front-loaded expenditures for future water savings realized over the lifetime of the investment. Based on the approach analyzed in the LRFP-NA, implementing a robust conservation program able to reduce demands by 300 TAF by 2032 would require expenditures of more than $1.1 billion per year. While conservation can be an effective tool to manage demand, it should be evaluated as a part of a multi-pronged approach to solving projected gaps between available supplies and Member Agency demands. Other conservation options will be further considered through the CAMP4W process as conservation provides multiple benefits such as a reduced risk of stranded assets.

2.5 Initial Considerations for Metropolitan's Ability to Fund the Program

Historically, Metropolitan has developed its capital infrastructure predominantly through its own revenues and financing tools. Metropolitan has maintained a highly rated and successful bond program over its history to meet its capital financing needs.

Given the significant investment required to address the impacts of climate change on top of the existing requirements to maintain Metropolitan's existing system infrastructure, Metropolitan may explore additional options. The following discussion addresses Metropolitan's bond program debt capacity and opportunities for funding from federal and state grant and loan programs. A summary of the funding options discussed further in the LRFP-NA is included in **Figure 12**.

2.5.1 Metropolitan's Bond Program Debt Capacity

To maintain its highly rated bond program, Metropolitan has:

- Adopted prudent debt policies and comprehensive financial best practices.
- Issued a variety of debt instruments to lower its cost of capital.
- Balanced the prioritization of key financial metrics consistently in each biennial budget.
- Managed its relationship proactively with the rating agencies and bond investors.

Types of Financing Tools Available to Metropolitan:

- General Obligation Bonds
- Revenue Bonds
- Certificates of Participation
- Long-Term Tax-Exempt Bonds
- Short-Term Notes and Certificates
- Taxable/Tax-Credit Bonds
- Fixed Rate Loans
- Variable Rates Loans
- Subsidized Loans
- Federal/State Grants (such as Bureau of Reclamation, FEMA, or State Department of Water Resources grant options)
- Federal/State Legislative Budget Appropriations
- Federal/State Loans (WIFIA, SRF, CA IEDB) or debt issued through other entities
- Revenue sources such as rates, fixed charges (Readiness-to-Serve charge and Capacity Charge), property taxes, and lease or other contractual Payments and Appropriations
- Floating Rate Notes
- Variable Rate Demand Bonds (VRDBs)
- Commercial Paper
- Bank Line of Credit
- Other options such as: Tax credit bond (TCB) Financing, New Property Tax Secured Bonds, Tax rate increases

Refer to Section 9 of the LRFP-NA for additional information.

Figure 12. Funding Options

It is estimated that Metropolitan has a range of revenue bond debt capacity between $3.6 billion and $5.1 billion (assuming debt service target does not fall below 1.50x and other requirements are met).

This analysis indicates that based on previously discussed assumptions, there is ***barely sufficient revenue bond debt capacity to accommodate this new projected capital financing need***. In addition, costs may be higher than the preliminarily estimated $5.5 billion to $6.0 billion in capital needs because of the following:

- While $300 million annual costs for CIP projects (mostly refurbishment and replacement of Metropolitan's existing facilities and conveyance system) are assumed in the rate impact analysis, funding of costs associated with increased refurbishment and replacement need to be considered carefully in the context of debt capacity.
- Projected costs for supply and storage projects are preliminary in nature, based on unit costs, which could be higher when specific projects are identified.
- There may be risk associated with assumptions related to Member Agency demands, if water sales do not occur as projected. This would negatively impact net operating revenues and potentially debt service coverage.
- Impacts beyond 2032 have not been established to address the 2045 projections presented in the IRP Needs Assessment, which include significantly more core supply and storage.

Based on these findings, although Metropolitan may be able to finance these capital needs by maximizing its revenue bond capacity, this may not be the only or most advisable approach.

2.5.2 Exploring Federal and State Funding Opportunities

Metropolitan's new Centralized Grants Management team in the Sustainability, Resilience and Innovation (SRI) office will provide a coordinated approach to analyzing, helping secure and complying with grant funding requirements.

Government grants and other legislative support could include:

- Existing federal legislation to address climate change impacts on various capital infrastructure including water-related projects.
- State priorities focused on climate change impacts.
- Water Infrastructure Finance and Innovation Act (WIFIA) loan managed by the U.S. Environmental Protection Agency (EPA).
    - WIFIA can provide loan funding up to 49 percent of Eligible Project Costs at competitively low rates, currently around 4 percent.
    - Potential for Master Loan Agreement with EPA to fund qualifying expenditures for a combination of eligible projects, in addition to funding for specific projects.
    - Would have the potential to provide approximately $3 billion in loan authorization, depending upon the project(s) submitted and qualifying eligibility (based on the maximum estimate of capital infrastructure needs in IRP D scenario of $6.0 billion).
- New approaches and/or opportunities to advocate for new tools that could enable Metropolitan to save on the cost of its infrastructure investments.
- Actions that mandate increased water efficiency can reduce Metropolitan costs for incentive-based conservation.

2.6 Metropolitan's Board Direction

Based on the results of the LRFP-NA, Metropolitan staff seek Board feedback on three important questions critical to the undertaking of Phase 2:

- What is an acceptable average annual rate increase on full-service water sales through 2032 to fund water portfolio projects and/or conservation to address expected impacts of climate change as analyzed within the 2020 IRP Needs Assessment?
- What is the desired estimated allocation between core supplies (which includes conservation), flex supplies, and storage in the optimal portfolio mix developed within the acceptable average annual rate increases identified by the Board?
- What alternative financing approaches interest the Board either singularly or in combination to address funding of future capital investments?

The findings of the LRFP-NA financial analysis are dependent on the assumed unit costs for each resource. Although Metropolitan exercised care in selecting appropriate references on which to base the

unit costs, it is anticipated that when Phase 2 of the LRFP concludes, there will be differences between project-specific unit costs and those modeled here in LRFP-NA. During the second phase of the LRFP, staff will provide a refined financial forecast that considers the Board's approved resource development portfolio that emerges from the CAMP4W process.

In addition, the Board will be evaluating Business Model alternatives, which are discussed in **Section 3**. Since each part of the CAMP4W process is interconnected, the iterative and adaptive approach employed by Metropolitan throughout this process will allow for informed decision and refinement. While the Business Model discussion is preliminary, it is important to consider its potential impact on the LRFP and vice versa.

Section 3 Business Model Considerations

While the exact nature of the hazards a utility faces can vary based on geographic location across the United States, one fact that remains constant is that climate change is having a profound impact on water utilities nationwide. Utilities in the water industry are having to reevaluate their strategies for managing available water supplies, often establishing multiple approaches to adapt as conditions evolve over time.

The Board requested during a recent CAMP4W workshop that additional discussion on the Business Model occur early in the CAMP4W process. Therefore, the CAMP4W process will discuss Metropolitan's current Business Model and facilitate discussions and establish recommendations pertaining to updates to the Business Model.

Framework: The CAMP4W process will consider Metropolitan's evolving function within the region and seek to establish how Metropolitan can best serve the region in facilitating reliability and resiliency in the face of a changing climate, while maintaining financial sustainability.

This section provides a discussion of the following components of the Business Model alternatives:

- Metropolitan's core business and potential for an expanded function within the region
- Alternative revenue structures
- Integration of Business Model development into the CAMP4W process

The Board's February 2023 CAMP4W retreat included discussion on the need to consider possible updates to the business model to build resilience, something that has been raised in past evaluations as well. The CAMP4W process will facilitate progressing discussions related to these topics and options that could strengthen Metropolitan's capacity to invest in necessary resource projects and programs.

3.1 Metropolitan's Historical Role as Importer and Potential Evolving Role to Meet the Needs within the Region

Metropolitan's core business is structured around the sale of treated and untreated water through the importation of water. To conduct this core business, Metropolitan must develop and maintain a network of supportive facilities, which includes conveyance facilities, storage facilities, treatment facilities, and other infrastructure. Metropolitan must also undertake additional efforts such as regional planning, design, water quality monitoring, maintenance, permitting, and other tasks associated with providing a reliable supply of treated and untreated water. All these functions have centered around importing water to ensure delivery of wholesale water service.

The Board and Member Agencies have expressed an interest in potentially revising Metropolitan's functions in the region due to an increasing focus on developing local supply options to address the reduced reliability of imported supplies. Considering the need for Metropolitan to continue to serve Member Agencies, an updated Business Model presents an opportunity to deploy shared resources in order to remain ***stronger together***.

Metropolitan will be exploring multiple components that could be included in the updated Business Model. These options may include but are not limited to:

- Metropolitan developing its own local supplies.

- Metropolitan facilitating financial or other mechanisms to enable the sharing of water resources between Member Agencies (e.g., Metropolitan developing and owning infrastructure that transfers supplies from one or more Member Agencies to storage owned by another Member Agency, or for direct use by other Member Agencies).
- Metropolitan expanding local capacity and regional benefits through co-investing in local resource development.
- Metropolitan providing support to Member Agencies to develop affordability strategies for their customers across the region, including but not limited to technical or policy guidance, advocacy for state action or funding, and fiscal capacity to facilitate external grants or other funding.

The CAMP4W process can enable discussion and creativity about how Metropolitan can best support the region's future through engagement of the Board and Member Agencies in a collaborative and transparent manner. Section 3.3 provides a discussion on how this process corresponds to the other CAMP4W efforts.

3.2 Alternative Revenue Structures

Across the nation utilities are faced with the challenge of evaluating their ability to maintain financial sustainability in the face of an uncertain climate, increased operational and capital costs, aging infrastructure, and expectations of greater equity, such as the need to invest disproportionally in areas that historically have experienced under investment. Metropolitan also faces similar challenges, but at a wholesale level. As a voluntary cooperative without consistent purchase commitments, Metropolitan may also see reduced water demands due to conservation and/or increased local supply that can impact rates, as discussed in Section 2. These challenges could support a revision to Metropolitan's existing revenue structure or the consideration of new revenue structures to support Metropolitan's continued agility and financial sustainability.

At the October Finance, Audit, Insurance and Real Property Committee, staff will bring forward an analysis of alternative cost recovery options for Pure Water Southern California. This discussion of Pure Water cost recovery options may serve as a foundation for future Board discussion on Metropolitan's Business Model. In addition to the cost recovery options for Pure Water Southern California, other cost recovery alternatives may merit further consideration for revisions to Metropolitan's revenue structure while continuing to ensure fairness across the Member Agencies. These may include, but not be limited to:

- Volumetric model
- Volumetric model with demand commitments
- Tax-based revenue model
- Non-volumetric
- Creating different services with different rates
- Increased fees for new annexations

A key component in the CAMP4W process involves open collaboration with the Board and Member Agencies. Exploring all potential options so that the Board and Member Agencies have the opportunity to consider the pros and cons of each will be critical as Metropolitan makes decisions about future investments. In addition to the financial analysis of each option, other benefits may be weighed, such as an alternative's ability to elicit collaboration and shared goals among Member Agencies and objectives of fairness and equity.

3.3 Integration of Business Model Development into the CAMP4W Process

As is the case with the CAMP4W process in general, the development of a Business Model for Metropolitan that will serve the region in the future is best done through an iterative process. Decisions on the Business Model structure will evolve as the process considers: 1) Member Agency interests in increasing collaboration and maximizing local resources, 2) the establishment of a decision-making framework to allow the selection of specific projects to fill gaps and increase reliability and resiliency, 3) updates to the LRFP based on selected projects, and 4) the establishment of how equity and affordability pertain to Metropolitan as an agency. Since these aspects all inform one another, establishing a framework that is adaptable, flexible, and iterative will allow Metropolitan to establish the most beneficial Business Model heading into the future.

Figure 13 presents the major touch points where the updated Business Model, as well as the LRFP, will be drafted through the CAMP4W process. Beyond these high-level input points, Metropolitan will be discussing the components that go into the Business Model with the Board and Member Agencies throughout the process. This will allow Metropolitan to adjust based on preferences, findings, and opportunities discovered along the way. As a two-directional process, some Business Model decisions will impact other CAMP4W components at the same time as those components will impact the Business Model decisions.

Some key questions that will be presented through the process include the following:

- To what extent should individual Member Agencies' potential for developing local resources be considered in the context of greater regional needs, such that Metropolitan could facilitate that regional benefit?
- How much should Metropolitan be developing its own local resources, such that it evolves from a service dependent upon imported supplies to one with more supply resource diversity?
- What cost recovery alternatives should Metropolitan incorporate?
- What options does Metropolitan have in terms of facilitating affordability programs for retail customers of Metropolitan's Member Agencies, including practical, legal and ethical considerations?

As the CAMP4W process unfolds, Metropolitan will engage in many discussions with the Board and Member Agencies as Metropolitan strives to establish the best path forward for continued long-term sustainability. Metropolitan may also look to engage with other agencies across the nation to gain insight into what options are being implemented and to gain perspective on lessons learned regarding what does and does not achieve the intended goals.

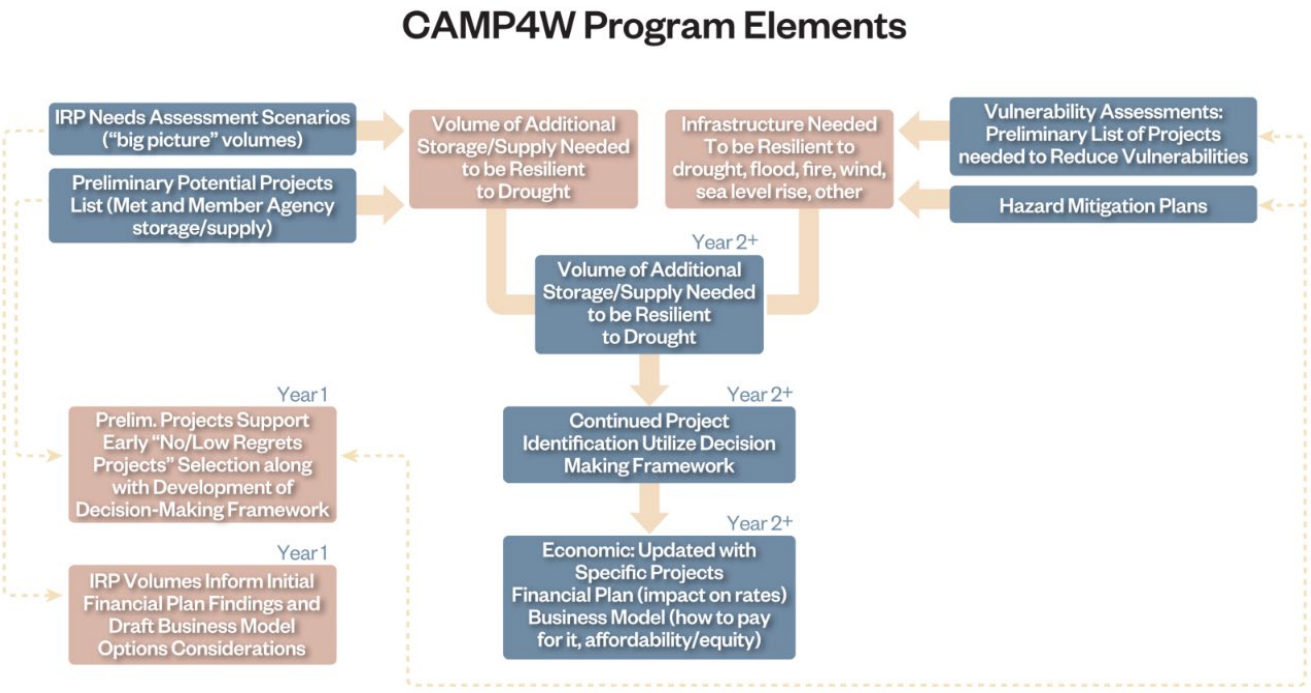


Figure 13. CAMP4W Program Elements

IRP Needs Assessment Table

DRAFT Refined Analysis Assumptions used to Model Retail Demands for Scenarios A, B, C, & D

Data Link: ***Refined Data June 2021***

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
↓	*This scenario is characterized by lower retail water demands and stable regional and local supplies. Demands are impacted by lower economic and demographic growth and a continuing water use ethic across the region. Both regional and local supplies show more stable production due to less severe climate change and less restrictive regulatory constraints on existing water supply projects, and a relatively robust implementation of new water supply projects at the local level.*	*This scenario is characterized by higher retail demands, stable regional and local supplies. Demand are impacted by higher economic and demographic growth and a rebound of water use ethic. Both regional and local supplies show more stable production due to less severe climate change and less restrictive regulatory constraints on existing water supply projects, and a relatively robust implementation of new water supply projects at the local level.*	*This scenario is characterized by lower retail water demands and less stable imported supplies. Demands are impacted by lower economic growth, demographic growth and with successful efforts among member agencies to manage water use behavior and drought-proof their local supplies. It couples a struggling economy with the rapid onset of climate change impacts that have affected imported supplies more drastically than less-vulnerable local supplies.*	*This scenario is characterized by higher retail demands, unstable imported and diminishing local supplies. Demand are impacted by higher economic and demographic growth and a rebound of water use ethic. In this scenario severe climate change impacts both imported and local supplies. Demands on Metropolitan are increasing due to rapidly increasing demands and diminishing yield from local supplies. Efforts to develop new local supplies to mitigate losses of underperforming projects. Losses of regional imported supplies are equally dramatic.*
Retail Demand - Demographics The level of demographic (population, households, housing types, employment) growth is an important driver to water demand	• Lower demographic growth ▪ Utilized Center for Continuing Study of the California Economy's (CCSCE's) low growth forecast developed for the 2020 IRP	• Higher demographic growth ▪ Utilized CCSCE's high growth forecast developed for the 2020 IRP	• Same as Scenario A	• Same as Scenario B
Retail Demand - Immigration Immigration is the most important factor for national population growth, California share of national growth stays consistent across scenarios, not impacted by climate change issues.	• CCSCE's forecast considers climate change impacts on international immigration and migration to California ▪ No basis to change population forecast or regional share growth due to climate impacts at this time	• Same across all scenarios	• Same across all scenarios	• Same across all scenarios
Retail Demand - Households New households are modeled separately from existing households to reflect increasing	• This scenario projects a total of **903,000** additional new households. • Assumes a median lot size of 5,000 sq. ft. for new housing units (approximately 30%	• This scenario projects a total of **2.6 million** additional new households. • Same median lot size assumption as Scenario A	• This scenario projects a total of **907,000** new households • Same median lot size assumption as Scenario A	• This scenario projects a total of **2.8 million** new households. • Same median lot size assumption as Scenario A

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
efficiency and smaller sizes of new homes and lots. These new households include single family, multi family, and Accessory Dwelling Units (ADUs).	reduction compared to the existing median lot size) to reflect smaller lot sizes and more efficient outdoor use. Reduced lot size equates to less irrigable area.			
Retail Demand - Overcrowding In addition to normal housing growth to accommodate population growth, one-time additional housing units a "catch-up" factor is projected to reduce overcrowding, minimize cost burdened households, and bring vacancy rate back to normal level.	• This scenario assumes the lowest success rate, **340,000** additional households, as the "catch-up" factor. • CCSCE's total housing growth "catch-up" factor reflects a struggling economy and low population growth	• This scenario assumes a moderate success rate, **516,000** additional households, as the "catch-up" factor. • CCSCE's total housing growth "catch-up" factor reflects a strong economy and population growth	• This scenario assumes a low success rate, **344,000** additional households, as the "catch-up" factor. • CCSCE's total housing growth "catch-up" factor reflects a weak economy and slow population growth	• This scenario assumes the highest success rate, **696,000** additional households, as the "catch-up" factor. • CCSCE's total housing growth "catch-up" factor reflects a strong economy and population growth
Retail Demand – Behavioral Retention The lower retail demands observed since the last drought are driven by a structural and behavioral water use component, of which behavior is more reversible or at risk to rebound. Retail demands reflect both use per person and the number of people. Total demand can increase even without a degradation in efficient water use behavior.	• Efficient water use behavior is retained at a high level • Behavioral component: **90% retention** of the behavioral component of the observed reduced demand is retained reflecting continued strong water use ethic. • Structural Component: This permanent reduction in demand is accounted for based on demographic assumptions including a shift from single family homes toward multifamily construction with smaller lot sizes, ADUs, less irrigable area, and increased adoption of device-based conservation	• Efficient water use behavior is retained at a moderate level • Behavioral component: **50% retention** of the behavioral component of the observed reduced demand is retained reflecting a plausible rebound in water use ethic. • Structural Component: This permanent reduction in demand is accounted for based on demographic assumptions including a shift from single family homes toward multifamily construction with smaller lot sizes, ADUs, less irrigable area, and increased adoption of device-based conservation	• Same as Scenario A	• Same as Scenario B

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
Retail Demand - Agricultural Demand A hotter and drier climate will impact irrigation needs	• Consistent with member agencies' 2020 UWMP and reflects discussions with member agencies ▪ No additional adjustments assumed	• Same as Scenario A	• Hotter and drier conditions coupled with increased regulatory constraints result in higher operation costs and ag land coming out of production. ▪ 20% decrease in demand by 2045 due to fewer farming operations ▪ 10% increase in irrigation requirements for remaining farms by 2045 due to hotter and drier conditions	• Same as Scenario C
Retail Demand - Seawater Barrier Demand Mitigating overdraft challenges will lead to higher demands on Metropolitan	• No modifications based on member agency discussions	• Same as Scenario A	• Climate change stresses will increase demand • Increased by 10% by 2045. The increase in demand is tempered by lower overall demands in this scenario and less overdraft challenges	• Climate change stresses will increase demand • Increased by 20% by 2045. The increase in demand reflects higher overall demands in this scenario and significant overdraft challenges
Imported Replenishment Demand Changes in natural recharge volume and patterns along with recycled water availability will impact demands on Metropolitan	• Replenishment water purchases from MWD is based on past discussions with member agencies and groundwater basin managers to meet their imported replenishment needs to supplement their natural recharge • Reflects scenario-based climate change impacts on natural recharge • Also reflects recycled water availability for replenishment demands (see recycled water assumption) • Though assumptions are the same across all scenarios, values used vary per scenario			

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
Local Supply - Precipitation Precipitation is a major driver on future water supply. Metropolitan's modeling methodology requires use of annual weather variations over time (1922-2017). Adjustments were made to the historic record to reflect climate expert feedback on potential future impacts.	• Historical variation in precipitation from 1922-2017 will continue through 2045	• Same as Scenario A	• Modified 1922 – 2017 precipitation to reflect more extreme conditions. This will impact surface water reservoir and groundwater supply ▪ Increased the frequency and intensity of dry years ▪ Decreased the frequency and increased the intensity of wet years ▪ Kept 1922-2017 average similar	• Same as Scenario C
Desalination – Existing Local Projects	• Claude "Bud" Lewis (Carlsbad Desalination Plant) ▪ Assumed facility to operate at ~85% of capacity in normal and wet years, and full capacity during dry years. ▪ Normal, wet, and dry years vary by scenario	• Same across all scenarios	• Same across all scenarios	• Same across all scenarios
Desalination – Future Local Projects	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • No planned projects incorporated in this scenario	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • Includes Doheny Ocean Desalination Project, Huntington Beach Seawater Desalination Project, and West Basin Seawater Desalination Project • Operation assumed to be **85% of yield** in normal and wet years, full ultimate yield in dry years • Wet, normal, and dry years vary by scenario	• Same as Scenario A	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate foreach scenario • Includes Doheny Ocean Desalination Project, Huntington Beach Seawater Desalination Project, and West Basin Seawater Desalination Project • **Reduced yield by 20%** to approximate impacts from severe climate change and regulatory constraints • Operation assumed to be **85% of yield (after 20% reduction)** in normal and wet years, full ultimate yield in dry years • Wet, normal, and dry years vary by scenario

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
Groundwater Recovery - Existing Local Projects	• Engaged with member agencies to confirm yield of projects currently in operation • No modifications to yield in this scenario	• Same as Scenario A	• Engaged with member agencies to confirm yield of projects currently in operation • **Decreased yield by 20%** to approximate increased regulatory requirements and severe climate change impacts to groundwater basins	• Same as Scenario C
Groundwater Recovery – Future Local Projects	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 30%** in this scenario to reflect lower need to develop additional projects due to low demands.	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 10%** in this scenario in recognition of strong project implementation	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 20%** in this scenario to approximate the impact of regulatory requirements, but an increase in local project need due to reduced imports	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 20%** in this scenario to approximate the impact of regulatory requirements, but an increase in local project need due to reduced imports • Though assumptions are the same for Scenario C and D, values used vary per scenario based on member agency feedback
Recycled Water - Existing Local Projects	• Engaged with member agencies to confirm yield of projects currently in operation • **Reduced yield by 20%** to approximate impact of decreased wastewater availability from low demands	• Engaged with member agencies to confirm yield of projects currently in operation • **No change to yield**	• Same as Scenario A	• Same as Scenario B

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
Recycled Water - Future Local Projects	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 30%** to approximate the impact of decreased wastewater availability from low demands and less need to develop projects due to stable imports ▪ 30% is based on observed local project development within the service area	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 10%** in this scenario in recognition of strong project implementation	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate for each scenario • **Reduced yield by 30%** to approximate the impact of decreased wastewater availability from low demands and less need to develop projects due to stable imports ▪ 30% is based on observed local project development within the service area • Though assumptions are the same for Scenario A and C, values used vary per scenario based on member agency feedback	• Engaged with member agencies to identify the potential timing and implementation of planned projects appropriate foreach scenario • **Reduced yield by 20%** in this scenario to approximate the impact of regulatory requirements, but an increase in local project need due to reduced imports
LA Aqueduct Supply	• Estimates based on single trace LAA Forecast provided by LADWP in 2020 ▪ Reduced modeled output for each hydrology by 13,000 acre-feet to adjust for approximated bias from what was provided in 2020 and what LADWP used in their UWMP ▪ Note: MWD uses a 96-year hydrology as opposed to LA's 30-year hydrology for modeling methodology purposes	• Same as Scenario A	• Estimates based on single trace LAA Forecast provided by LADWP in 2020 ▪ Reduced modeled output for each hydrology by 13,000 acre-feet to adjust for approximated bias from what was provided in 2020 and what LADWP used in their UWMP ▪ Note: MWD uses a 96-year hydrology as opposed to LA's 30-year hydrology for modeling methodology purposes • Applied annual climate change factor of 0.1652% to reduce LAA supplies per LADWP UWMP	• Same as Scenario D
Surface Water Supply	• Used San Diego Surface Model to approximate annual variance around their UWMP long-term average (43,928 AFY) ▪ Based on 1922-2017 precipitation (see precipitation for local supply assumption) • For all other member agencies used provided scenario specific projections • Though assumptions are the same across all scenarios, values used vary per scenario			

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)
Groundwater Supply	• For Main San Gabriel Basin developed preliminary model: ▪ Calculates production based on consumptive demand ▪ Estimated passive and active recharge using local precipitation ▪ Tracks estimated key well level ▪ Cuts production by 30% if key well level falls below 160 ft MSL • OC Basin ▪ Assumed long-term Basin Production Percentage (BPP) goal of 85% ▪ PFAS impacts 2020-2024 • All other basins ▪ Used 2010-2019 Production Average or UWMP production data when available	• For Main San Gabriel Basin developed preliminary model: ▪ Calculates production based on consumptive demand ▪ Estimated passive and active recharge using local precipitation ▪ Tracks estimated key well level ▪ Cuts production by 30% if key well level falls below 160 ft MSL • OC Basin ▪ Assumed Basin Production Percentage (BPP) of 85% to 2030; reduced by 5% every 5 years afterwards to adjust for growing demands ▪ PFAS impacts 2020-2024 • All other basins ▪ Used 2010-2019 Production Average or UWMP production data when available	• For Main San Gabriel Basin developed preliminary model: ▪ Calculates production based on consumptive demand ▪ Estimated passive and active recharge using local precipitation ▪ Tracks estimated key well level ▪ Cuts production by 30% if key well level falls below 160 ft MSL • OC Basin ▪ Assumed long-term Basin Production Percentage (BPP) goal of 85% ▪ PFAS impacts 2020-2024 • All other basins ▪ Used 2015-2019 Production Average or UWMP production data when available	• For Main San Gabriel Basin developed preliminary model: ▪ Calculates production based on consumptive demand ▪ Estimated passive and active recharge using local precipitation ▪ Tracks estimated key well level ▪ Cuts production by 30% if key well level falls below 160 ft MSL • OC Basin ▪ Assumed Basin Production Percentage (BPP) of 85% to 2030; reduced by 5% every 5 years afterwards to adjust for growing demands ▪ PFAS impacts 2020-2024 • All other basins ▪ Used 2015-2019 Production Average or UWMP production data when available
State Water Project Supply Used DWR's Delivery Capability Report (DCR) projected SWP deliveries as basis for the scenario analysis. The DCR Existing Condition modeling result reflects SWP deliveries without climate impacts. The DCR Future Condition modeling result reflects SWP deliveries with climate impacts by using the Representative Concentration Pathway (RCP) 8.5 with 1.5 ft of sea level rise.	• Used a hybrid of the DCR Existing Condition (no climate impacts) and Future Condition (climate impacts) modeling results to project "moderate" climate change impacts to SWP deliveries ▪ Used 50% of the difference between Existing Condition and Future Condition deliveries	• Same as Scenario A	• Used a hybrid of the DCR Existing Condition (no climate impacts) and Future Condition (climate impacts) modeling results to project "severe" climate change impacts to SWP deliveries ▪ Move from Existing Condition deliveries to Future Condition deliveries linearly to 2035 • Additional degradation factor by 25% by 2035 to represent future regulations/unknowns/low cooperation	• Same as Scenario C

THEMES (Input from Expert Panel, MAs and MWD Staff)	**Scenario A** (Low Demands, Stable Imports)	**Scenario B** (High Demands, Stable Imports)	**Scenario C** (Low Demands, Reduced Imports)	**Scenario D** (High Demands, Reduced Imports)

Colorado River Supply
 	
Utilized expert input to identify evaporative losses, a range of temperature increases (Lukas and Payton, 2020) and a range of runoff decreases to reflect moderate to severe climate impacts (Milley and Dune, 2020)
	• Moderate climate change impacts using Representative Concentration Pathway (RCP)4.5
	  ▪ Linear increase in temp to 2.1 °C by 2045
	  ▪ 15.6% decrease in runoff by 2045 (Powell and Mead inflows)
	  ▪ 4.5% increase in Lake Mead and Lake Powell evaporation by 2045
	• High cooperation-Drought Contingency Plan (DCP) continues after 2026, interim guidelines extended
		• Same as Scenario A	• Severe climate change impacts using Representative Concentration Pathway (RCP) 8.5
			  ▪ Linear increase in temp to 2.75 °C by 2045
			  ▪ 25.6% decrease in runoff (Powell and Mead inflows)
			  ▪ 4.5% increase in Lake Mead and Lake Powell evaporation by 2045
			• Low cooperation- Drought Contingency Plan (DCP) ends after 2026, interim guidelines extended
				• Same as Scenario C

- **Board of Directors**
  Integrated Resources Plan Special Committee

4/12/2022 Board Meeting

7-1

Subject

Adopt the 2020 Integrated Water Resources Plan Needs Assessment; the General Manager has determined that the proposed action is exempt or otherwise not subject to CEQA

Executive Summary

The 2020 Integrated Water Resources Plan (IRP) establishes a strategy for ensuring regional water reliability through 2045. The 2020 IRP incorporated scenario planning to address wide-ranging uncertainties rather than focusing on a single set of assumptions as in the past. In collaboration with the Member Agencies, the Board of Directors, and other interested parties, Metropolitan broadened its perspectives by constructing and modeling four plausible scenarios. Staff organized the 2020 IRP into a Regional Needs Assessment (Phase 1) and a One Water Implementation phase (Phase 2). The Regional Needs Assessment is now complete.

This letter recommends adoption of the 2020 IRP Regional Needs Assessment (**Attachment 1**), which includes findings in five broad categories (State Water Project Dependent Areas, Storage, Demand Management, Imported Supplies, and Local Supplies), quantifies supply/demand gaps, and examines the effectiveness of generalized portfolio categories. Adopting the Regional Needs Assessment allows the analysis and findings to serve as both a foundation and as guardrails for the next implementation phase.

Details

Background

The IRP serves as Metropolitan's long-term, comprehensive water resources strategy to provide the region with a reliable and affordable water supply. After its first adoption in 1996, the IRP was updated in 2004, 2010, and 2015 to adapt to changing conditions that affected water resource reliability. With each update, Metropolitan recalibrated to current conditions and incorporated the best information available to update its forecasts. These plans focused on a single set of assumptions about the future.

The 2020 IRP sought a new analytical framework to:

- Define and account for uncertainties affecting water reliability
- Develop a method to assess and communicate the impacts of those uncertainties
- Explain the uncertainties and their relevance in a clear and transparent way
- Allow integration with an adaptive management strategy that will provide ongoing decision support, information generation, and reporting as essential components

The 2020 IRP explicitly plans for a wide range of uncertainties through scenario planning and by embracing a One Water approach to planning and implementation.

2020 IRP – A Phased Approach for One Water Implementation

Although initially envisioned as a single assessment and planning effort, scenario planning required close coordination with the member agencies. Scenario planning departed from the prior single-scenario methods and needed extra time to help member agencies become comfortable with the approach. Additionally, staff valued

member agency input and refined the scenarios and analysis through multiple iterative steps. The Covid-19 pandemic also forced changes in outreach methods, dynamics of interacting with member agencies, and the work environment of staff conducting the analyses.

Concurrent with developing and analyzing the scenarios, California again slipped into a severe drought. Several scenarios under development showed that the State Water Project (SWP) dependent areas could experience shortages more quickly and deeply as the SWP imported supply became constrained. Eventually, it became clear that the Regional Needs Assessment could serve as a stand-alone guide to the deeply uncertain future of Southern California's water supply without completion of the implementation phase. Thus, the complete IRP was divided into two phases, and the needs assessment was completed.

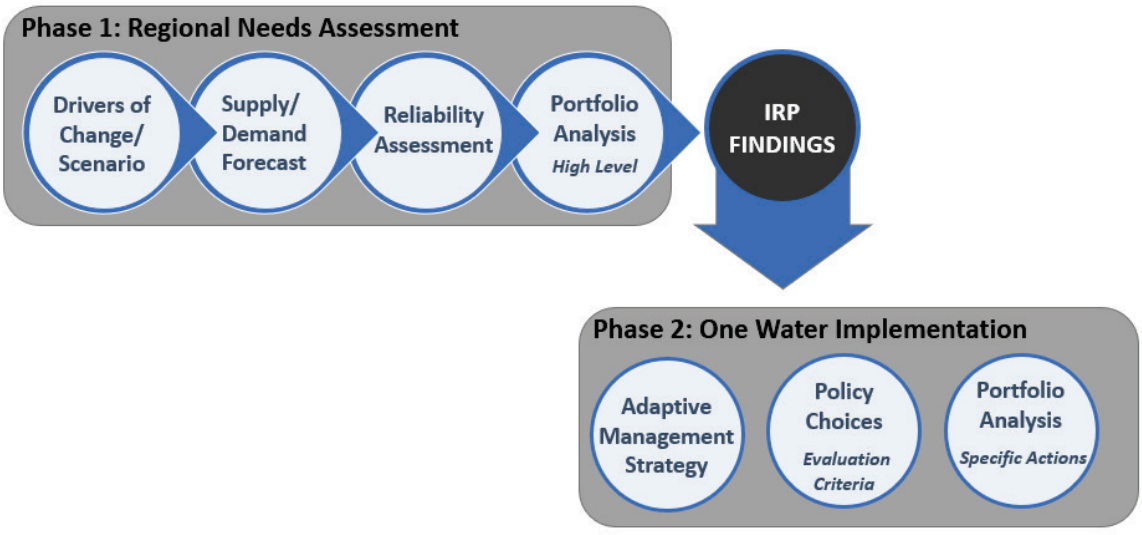
Figure 1 shows the two phases:

- Phase 1: Regional Needs Assessment
- Phase 2: One Water Implementation

The two-phase IRP allows Metropolitan to transition towards a new One Water approach to water reliability and resilience in Phase 2. The One Water approach will focus on balancing Southern California's broad interests in managing finite water resources for both community and ecosystem needs. It will embrace the region's diverse communities through a collaborative approach to addressing water challenges. Establishing a common understanding of the scope of potential water needs of Southern California over the next 25 years is key to the approach in Phase 2. By first defining and identifying a potential range of the region's problems, the IRP Regional Needs Assessment provides the technical foundation to enable the work of identifying specific actions in Phase 2.

Attachment 1 contains the final draft report of the IRP Regional Needs Assessment. It documents the scenario development and subsequent modeling efforts. It then offers a set of findings to inform deliberations and decision-making in Phase 2. In Phase 2, portfolios will be advanced by identifying policies, programs, and projects to address the findings. A comprehensive, adaptive management strategy will be developed in Phase 2 to guide these specific actions.

Figure 1: Process Diagram for Phases 1 and 2 of the 2020 IRP



Recommendation to Adopt Findings of the Phase 1 2020 IRP Regional Needs Assessment

The 2020 IRP Regional Needs Assessment outcomes can be summarized through a set of findings grounded in the scenario reliability analysis. These findings provide the foundation and guardrails for Phase 2. Grouped by topic, the following findings are offered for consideration by the Board:

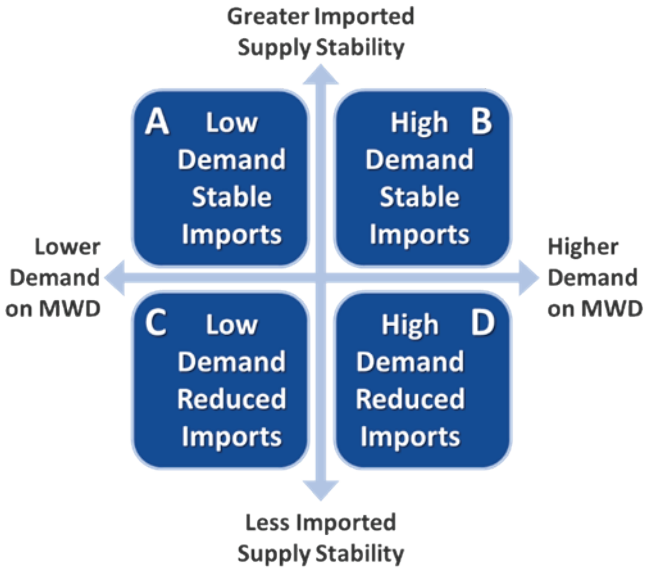
SWP Dependent Areas
• Vulnerabilities in the SWP Dependent Areas are more severe given reduced reliability of SWP supplies and Metropolitan distribution system constraints. Actions identified in the implementation phase must prioritize addressing the SWP Dependent Area's reliability challenge. • New core supplies must be accessible to the SWP Dependent Areas. Greater access to existing core supplies can also increase SWP Dependent Area reliability. • Enhanced accessibility to core supplies and storage, both existing and new, will improve SWP Dependent Area and overall reliability. This includes improvements to Metropolitan's distribution system and capacity to deliver non-SWP supply and storage. • Storage capacity, put/take capabilities, and accessibility are critical considerations for the SWP Dependent Area. New storage capacity and put/take capabilities should be consistent with the portfolio analysis. New storage must be accessible to the SWP Dependent Areas.
Storage
• Storage capacity, put/take capabilities, and accessibility are critical considerations in maintaining reliability under the region's current and future conditions, especially for SWP Dependent Areas. • Maintaining Metropolitan's existing storage portfolio is critical, including the consideration of re-negotiating contracts when they expire. • Expanding existing or developing new storage programs and investments in Metropolitan's distribution system can reduce the need for new core supply development to meet potential future shortages and adapt to climate change. • When evaluating storage options, put/take capabilities are essential; even storage programs with modest put/take capabilities help reduce the need for flexible supply.
Retail Demand/Demand Management
• Metropolitan's future supply reliability may fluctuate based on demand increases and decreases. • Variability in retail demand largely comes from changes in outdoor water use. Outdoor water use behavior is complex, influenced by weather and climate and by awareness of water scarcity and other conservation measures. • It is important to pay attention to demand rebound, demand growth, and demand reductions, and take appropriate regional measures as necessary. • Managing long-term demands through the efficient use of water reduces dependency on supplies, helps preserve storage, and helps reduce the need for extraordinary conservation measures.

Metropolitan Imported Supplies
• Existing imported supplies are at risk from various drivers of uncertainty. • Maintaining existing imported supply reliability reduces the need for new core supply development and leverages years of investments. • SWP supplies are highly susceptible to varying hydrologic conditions, climate change, and regulatory restrictions. • Variability and capacity in SWP supplies provide opportunities to store water during wet periods for use in dry years, including Colorado River storage. Metropolitan's ability to distribute or store SWP supplies when they materialize will enhance the region's reliability, particularly the SWP Dependent Areas. The Colorado River system and Colorado River Aqueduct capacity do not offer the same opportunities concerning SWP storage. • Shortages on the Colorado River will limit the reliability of Colorado River Aqueduct deliveries as a core supply in the future.
Local Supply
• Maintaining existing and developing new local supplies is critical in helping manage demands on Metropolitan. • Impacts to reliability occur if local supply assumptions are not achieved; therefore, it is important to track the progress of local supply development as one of the signposts in the One Water Implementation phase. • Additional actions may be needed should existing and future local supply levels deviate from IRP assumptions.

IRP Scenario Framework

Figure 2 shows the four scenarios used to characterize different outcomes of imported supply stability and demand on Metropolitan. Key drivers of change such as climate, regulatory requirements, and the economy are uncertain and may exert significant effects on both water supply and demands. These and other drivers of change were identified through a collaborative process involving member agencies, expert consultants, research by staff, and the input of other interested parties. The impacts of these drivers within each scenario were quantified using in-house models.

Figure 2. Four Scenarios Used in the IRP



Interaction with Other Planning Efforts

Metropolitan's 2020 Urban Water Management Plan was developed in coordination with the 2020 IRP. When both phases of the IRP are complete, the planning process will serve as Metropolitan's blueprint for long-term water reliability, including key supply development, infrastructure improvements, and water use efficiency goals.

Together, the IRP and the UWMP serve as the reliability roadmap for the region. The UWMP relied on demographic and climate inputs provided by other agencies such as the Southern California Association of Governments, San Diego Association of Governments, California Department of Water Resources, and the U.S. Bureau of Reclamation. The

IRP Regional Needs Assessment extended the planning horizon beyond the single scenario outcomes shown in the UWMP. But importantly, the factors and assumptions used to create the UWMP scenario fall within the bounds of this work.

The IRP Regional Needs Assessment informs other planning efforts and serves as boundary conditions to consider in other planning venues. For example, the IRP Implementation Phase will need to consider the performance of any portfolio under the four scenarios identified in this work.

The General Manager's priorities for the next biennium emphasize action to address findings of the IRP Regional Needs Assessment. For example, substantial effort is underway to provide each member agency access to an equivalent level of water supply reliability and to resolve the constraints of the SWP dependent areas.

Likewise, the portfolio selection will also need to consider Metropolitan's proposed emissions reduction goal in the draft Climate Action Plan to ultimately achieve carbon neutrality by 2045. Finally, the planned rate structure review will also need to ensure the business model can adapt to changing needs of the member agencies and support sustainable local and imported supplies under the same scenarios.

Next Steps

Adoption of the findings and analysis represents a critical juncture; however, the 2020 IRP is far from over. No specific actions are recommended or have been determined from the IRP Regional Needs Assessment. Following adoption of the IRP Regional Needs Assessment, Metropolitan will transition to implementation in Phase 2.

The One Water Implementation phase will take the results and findings of Phase 1 into a collaborative process to identify integrated regional solutions. Using a One Water approach, the implementation phase will translate the high-level portfolio analysis from Phase 1 into specific policies, programs, and projects to address the findings and mitigate the potential shortages. A comprehensive, adaptive management strategy and evaluation criteria will be developed to guide these specific actions. The adaptive management strategy will also establish a process for monitoring key reliability indicators to support decision-making.

Appendices for the 2020 IRP Regional Needs Assessment will be posted to Metropolitan's website at www.mwdh2o.com/IRP. These appendices serve as living documentation for the IRP Regional Needs Assessment, and they will be supplemented and refreshed with updated materials as they become available.

Policy

By Minute Item 14727, dated December 16, 1952, board adoption of a statement of policy with regard to the plans being proposed for the importation or development of large, additional water supplies for the area coming within the scope of this District.

By Minute Item 39412, dated January 14, 1992, board adoption of the revised mission statement of the Metropolitan Water District of Southern California.

By Minute Item 41734, dated January 9, 1996, board adoption of the Integrated Water Resources Plan.

By Minute Item 43810, dated December 14, 1999, board adoption of the Strategic Plan Policy Principles.

By Minute Item 45841, dated July 13, 2004, the Board approved the Integrated Water Resources Plan Update report and the regular interval of IRP Implementation Reports and IRP updates.

By Minute Item 48449, dated October 12, 2010, board adoption of the 2010 Integrated Resources Plan Update.

By Minute Item 50358, dated January 12, 2016, the Board adopted the 2015 Integrated Water Resources Plan Update.

Metropolitan Water District Administrative Code Section 11104: Delegation of Responsibilities.

California Environmental Quality Act (CEQA)

CEQA determination for Option #1:

The proposed action is not defined as a project under CEQA (Public Resources Code Section 21065, State CEQA Guidelines Section 15378(b)(2) and 15378(b)(5)) because it involves organizational or administrative activities and general policy and procedure making that would not result in a direct or indirect physical change to the environment.

CEQA determination for Option #2:

None required

Board Options

Option #1

Authorize the General Manager to adopt the 2020 Integrated Water Resources Plan Regional Needs Assessment.

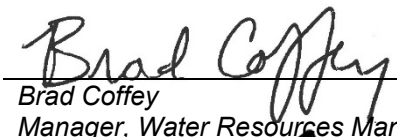
Fiscal Impact: No immediate impact; Metropolitan's long-term costs will depend upon individual project approvals following a forthcoming One Water Implementation Plan.
Business Analysis: Metropolitan's mission is to provide a reliable supply of water to its service area. The 2020 IRP Needs Assessment findings provide guidance on how Metropolitan may accomplish this mission for the next 25 years

Option #2

Do not adopt the 2020 Integrated Water Resources Plan Regional Needs Assessment.
Fiscal Impact: None
Business Analysis: This option reduces the ability of Metropolitan to consider and plan for major changes in the region's water resources.

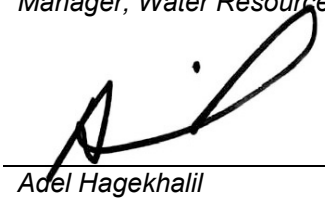
Staff Recommendation

Option #1



3/16/2022

Brad Coffey *Date*
Manager, Water Resources Management



3/17/2022

Adel Hagekhalil *Date*
General Manager

Attachment 1 – 2020 IRP Regional Needs Assessment

Ref# wrm12685000