Climate Action Plan Workshop

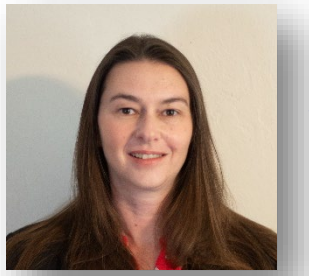
Board of Directors

January 23, 2024

Today's Speakers

David Briggs
Director of Operations and Maintenance

Elizabeth Bialek
Engineering Manager



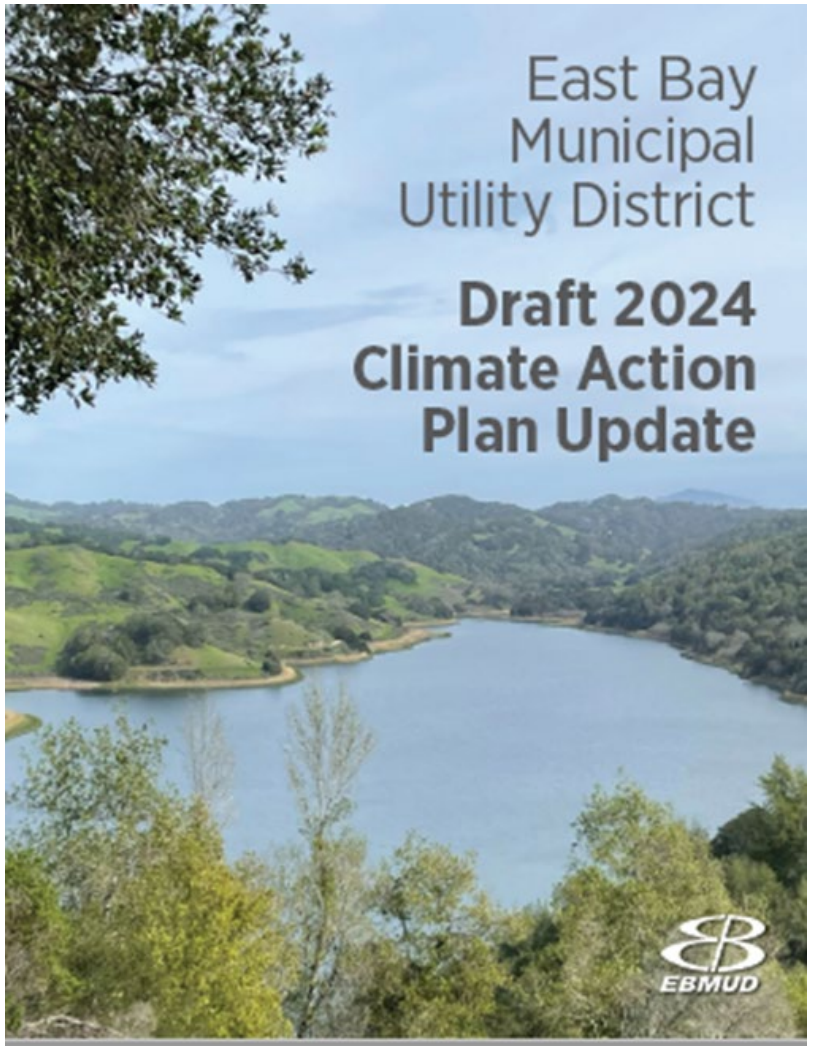
Alice Towey
Environmental Affairs Officer

Amit Mutsuddy
Director of Wastewater

State of Policy & Science

2024 Climate Action Plan Update

- Review the ***science*** on how climate change may affect the District's operations and customers
- Identify ***mitigation*** actions to meet greenhouse gas reduction goals
- Describe ***adaptation*** plans to ensure ***resilience*** of District services over time



State and Federal Policies/Regulations

Mitigation

- AB 1279 (2022): carbon neutrality target, reduce by 85% by 2045
- SB 905 (2022): carbon capture removal, utilization and storage
- SB 100 (2018): 100% renewable energy and zero-carbon resources for electric retail sales by 2045.
- Advanced Clean Fleets Rule (2023)
- Scoping Plan for Achieving Carbon Neutrality (2022)
- National Task Force program funding (EV charging, renewable energy, etc.), emission reduction goal setting

Adaptation

- Stability of electrical grid and energy supply
- Worker safety (protection from heat events)
- Forestry management
- California Water Supply Strategy
- AB 617: environmental justice to reduce air pollution exposure in communities

AB = Assembly Bill
SB = Senate Bill

State Implementation

State will invest billions of dollars to meet California goals

- Electrical generation needs to double to 450,000 GW hrs
- Wind/solar capacity needs to quadruple to 270,000 MW
- Battery storage needs seven-fold increase in 5 years to 6,600 MW

State allowing Diablo Canyon Nuclear Power Plant to remain online through 2030

Qualifying large hydroelectric and nuclear allowable as "zero-carbon" resources

Progress with ZEVs: 5% in 2018, 19% in 2022 (new car sales)

Progress on zero-carbon energy: 41% (2013), 59% (2020), 60% (2023) – goal of 100% (2045)

ZEV = Zero Emissions Vehicles
KW = Kilowatt (1 KW = 1000 watts)
MW = Megawatt (1,000 KW)
GW = Gigawatt (1,000 MW)

District Policies

Policy 7.05 Sustainability & Resilience - Ensures planning and implementation of services achieve long term economic, environmental and human resource benefits with equitable outcomes for communities

- Includes environmental justice commitment

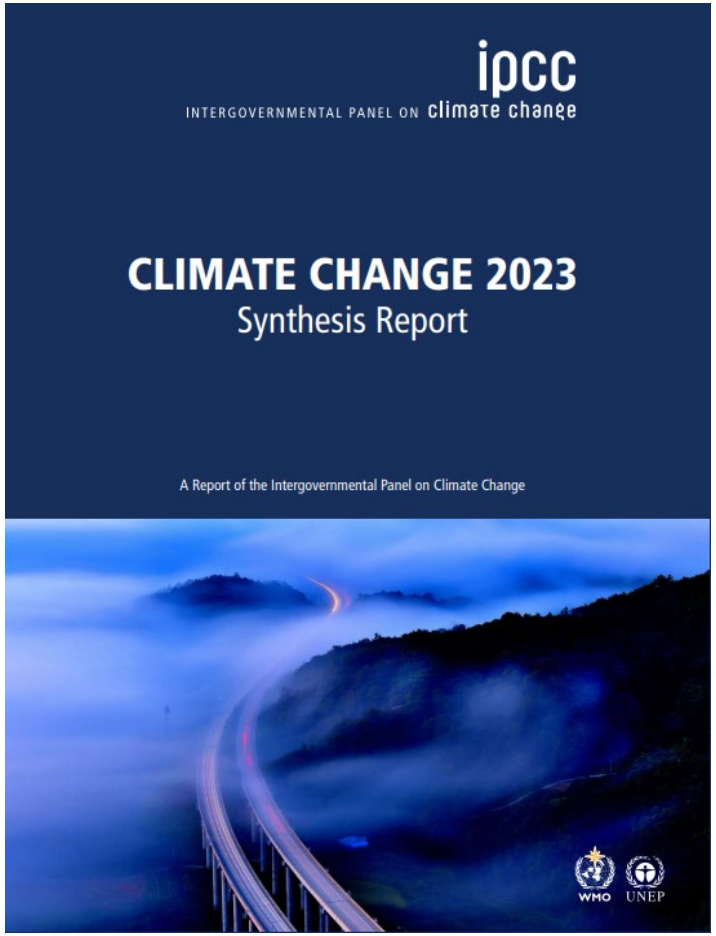
Policy 7.07 Energy - Promotes energy efficiency and minimizes use, and contains District's Greenhouse Gas (GHG) goals

Policy 7.15 Climate Action - Mitigate and adapt to climate change impacts through sustainable activities

DEI Strategic Plan – includes components to improve community engagement and capital project delivery

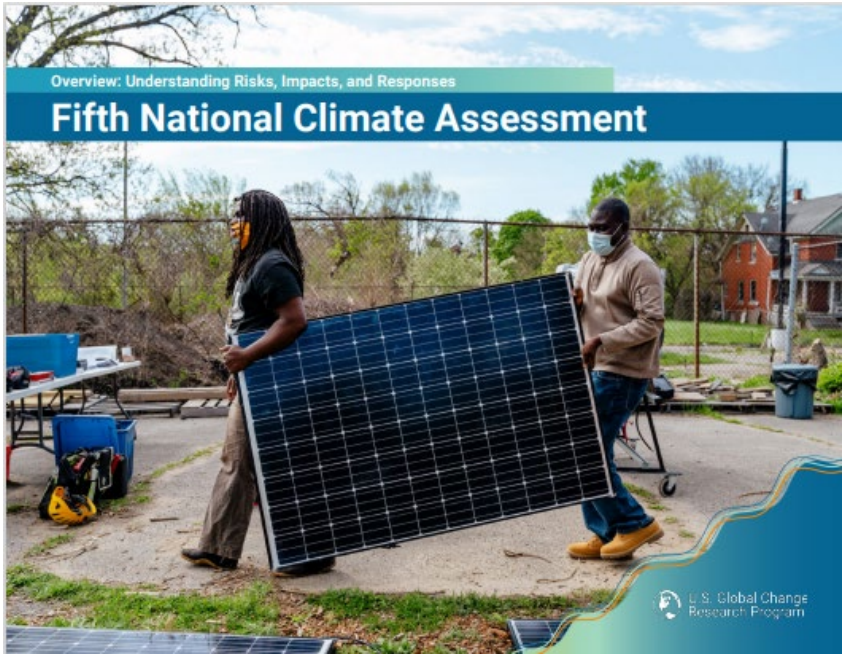
State of Science – Intergovernmental Panel on Climate Change Sixth Assessment (AR6)

- Human activities have "unequivocally" caused global warming
- 2011-2020 global surface temperatures were 1.1°C above 1850-1900 levels
- Likely to reach 1.5°C in the near term
- 2020 GHG emissions make it "likely that warming will exceed 1.5°C during the 21st century and make it harder to limit warming below 2°C "
  - Net Zero CO_2 emissions required to limit global warming



US Fifth National Climate Assessment (NCA5)

- Doubling of atmospheric CO_2 would lead to warming of 2.5°C to 4°C
- More detail on quantification of health benefits of reducing CO_2
- Greater focus on societal impacts of climate change
  - Disproportionate impact on disadvantaged communities
  - Emerging social sciences focus on how people *experience* climate change

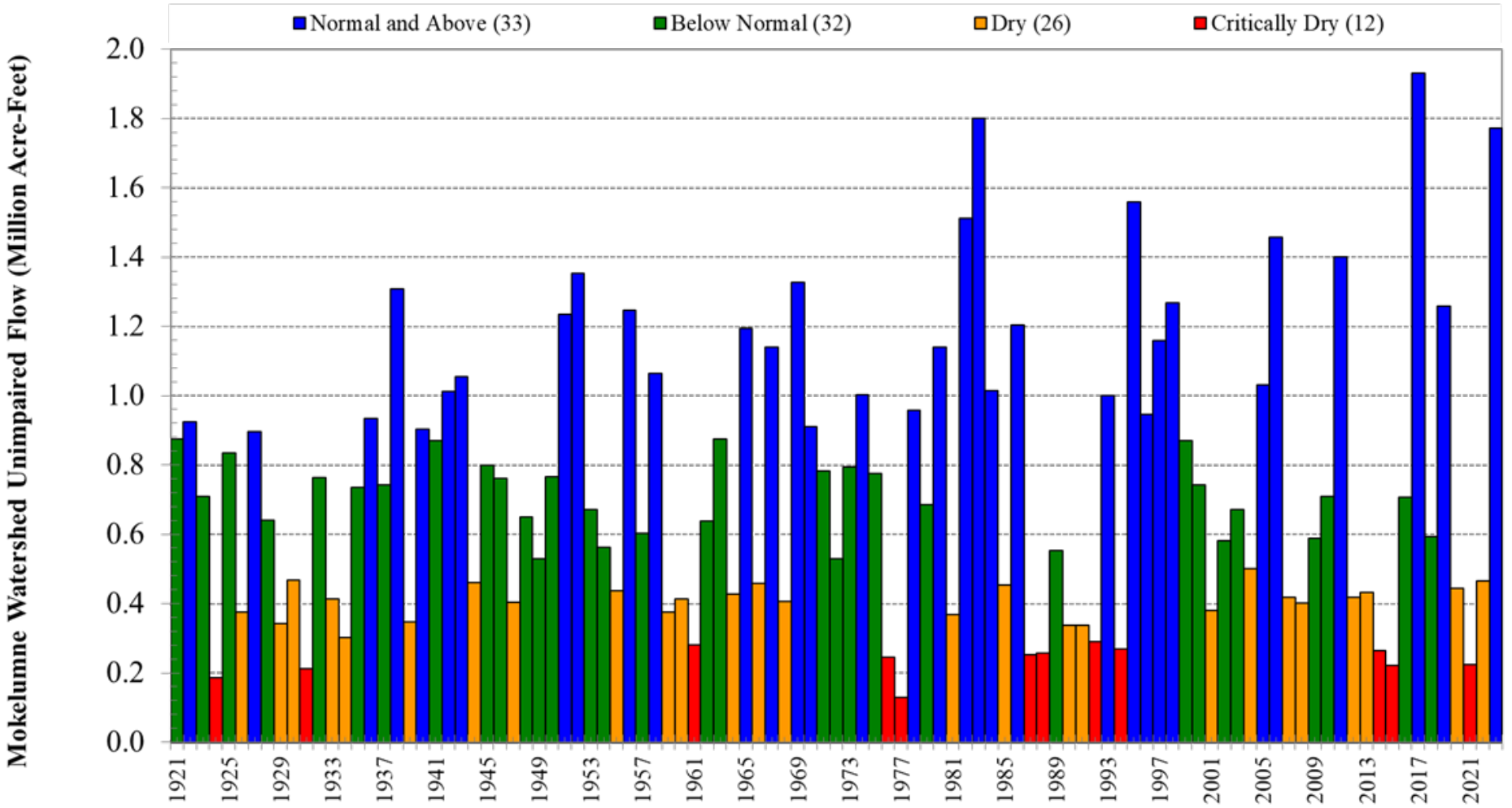


Predicted Impacts of Climate Change

- Increased variability in precipitation
  - More frequent and severe droughts
  - More extreme wet weather events
- Warmer, drier conditions
  - Increased wildfire risk
  - More high heat events
  - Formation of harmful algal blooms (HABs)
  - Impacts to vulnerable species
  - Potential increase in water consumption
- Sea level rise
  - Threat to infrastructure
- Impacts to people and the community

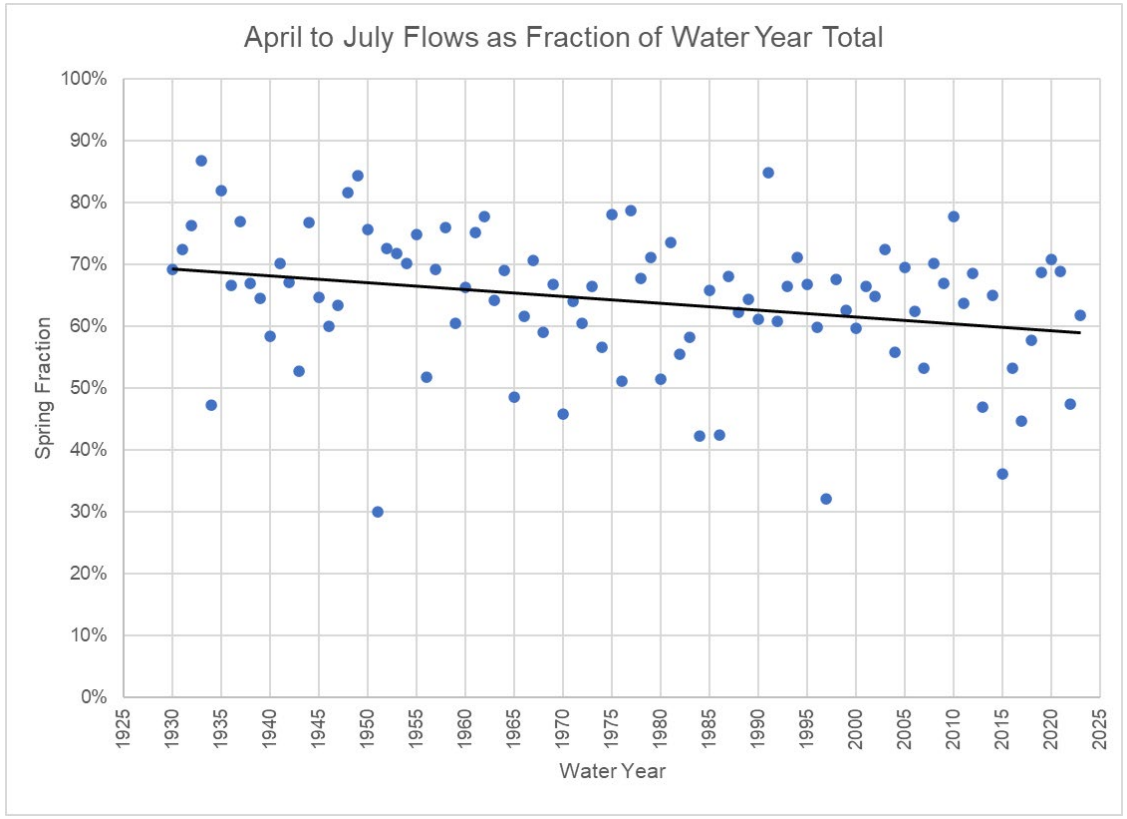
Pardee Reservoir during drought

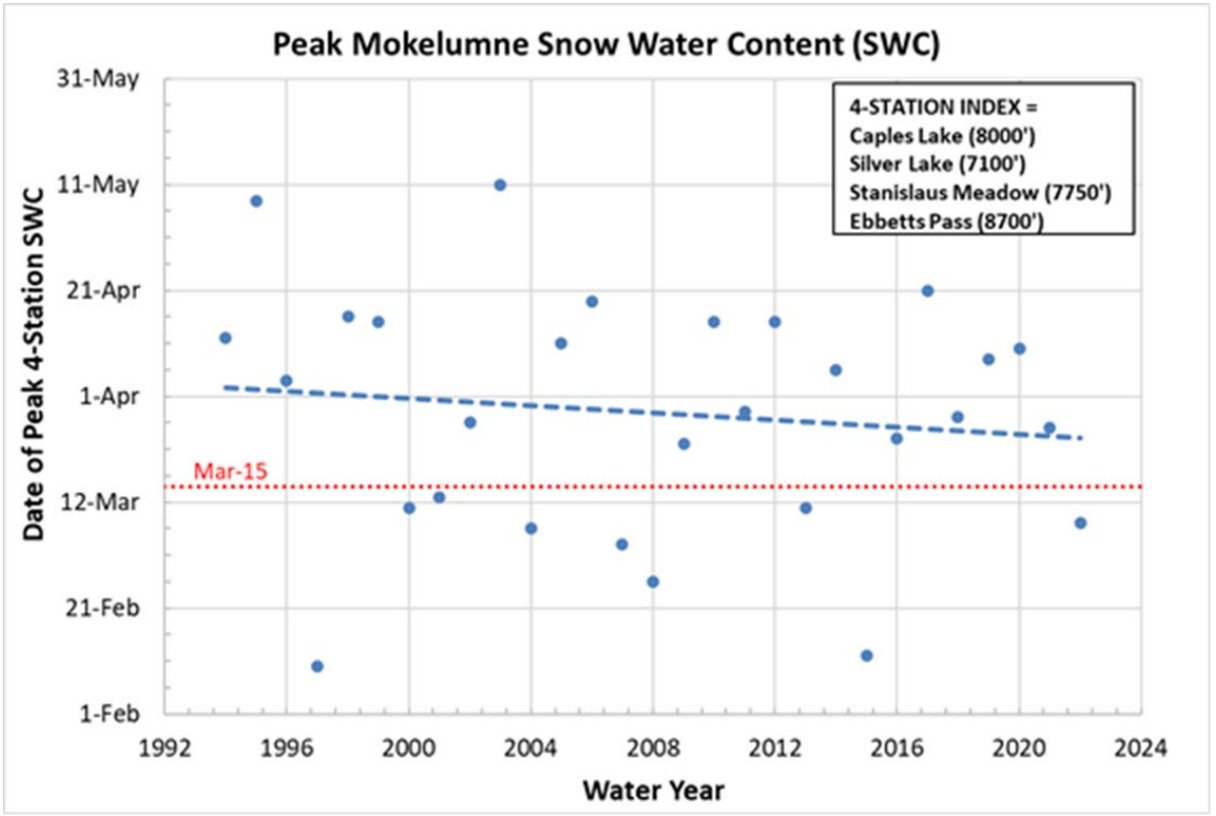
Observed Impacts at District Level: Water Supply Variability



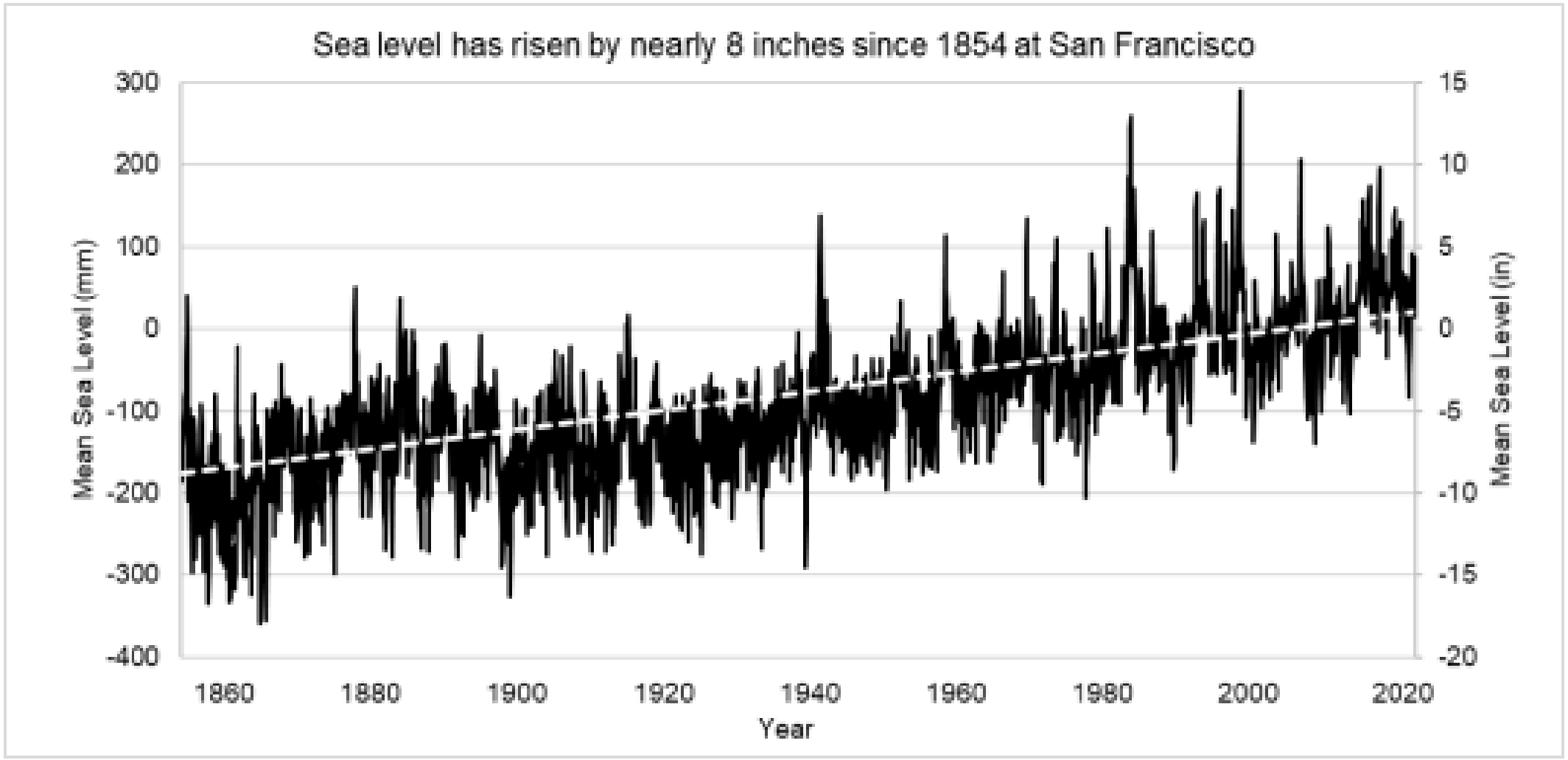
Water Years 1921-2023
provisional data for WYs 2022-23

Observed Impacts at District Level: Shifting Runoff Pattern





Observed Impacts at District Level: Sea Level Rise



EBMUD Mitigation and Adaptation

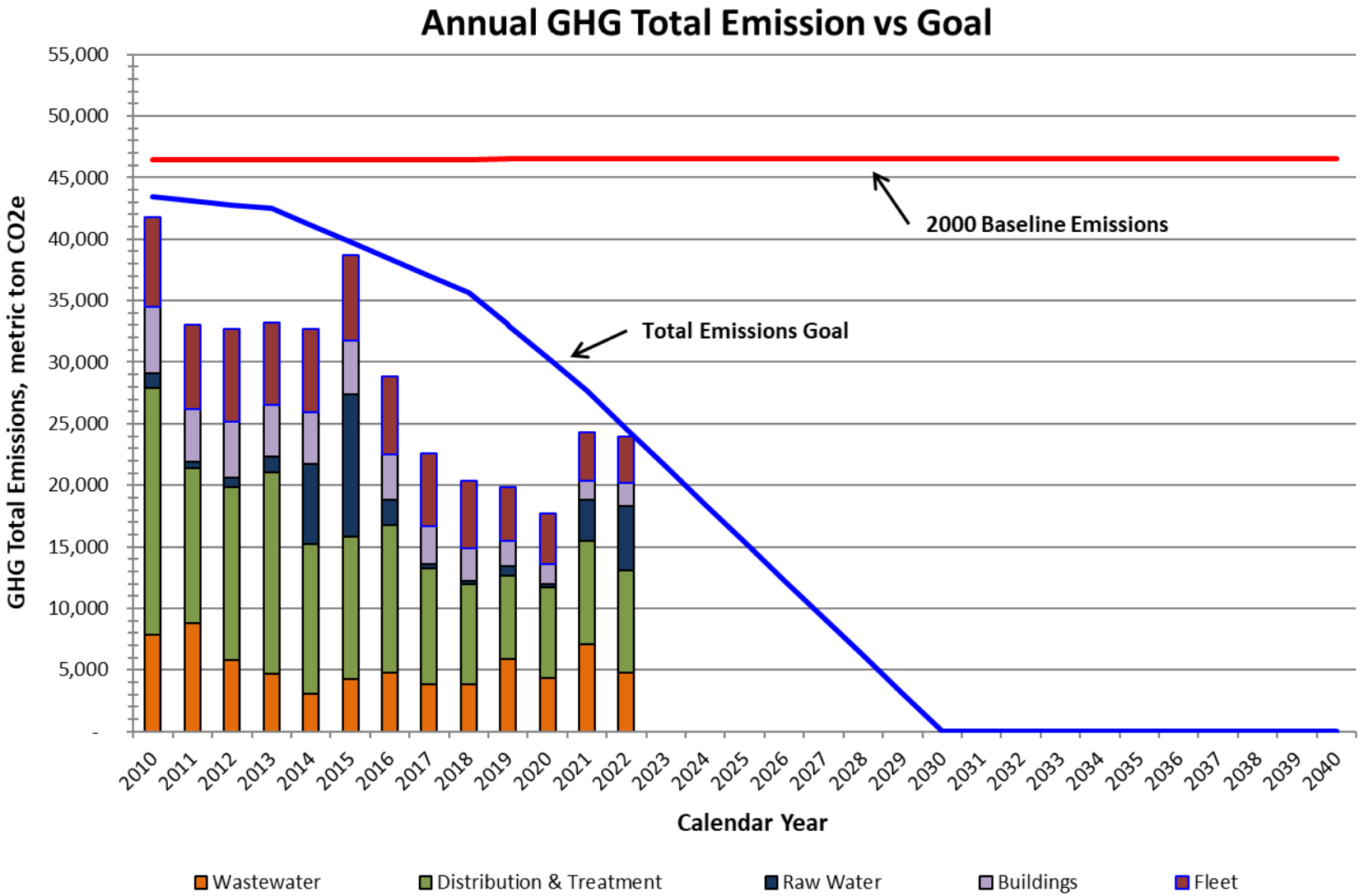
- State policy supports EBMUD mitigation goals
  - "Greening" the grid
  - Advanced Clean Fleet regulations
  - Funding for specific projects
- Science drives EBMUD adaptation planning
  - Study effects of climate change → identify likely impacts to EBMUD → develop adaptation plans

Mitigation Highlights

GHG Reduction and Carbon Neutrality

- District goal is to be carbon neutral by 2030
- Wastewater process emissions and raw water reservoir emissions are not included in goal, staff will track science
- Even with progress on carbon-free electrical energy and fleet conversion, District will need to purchase credits and/or invest in sequestration/re-capture to mitigate residual emissions

District GHG Emissions



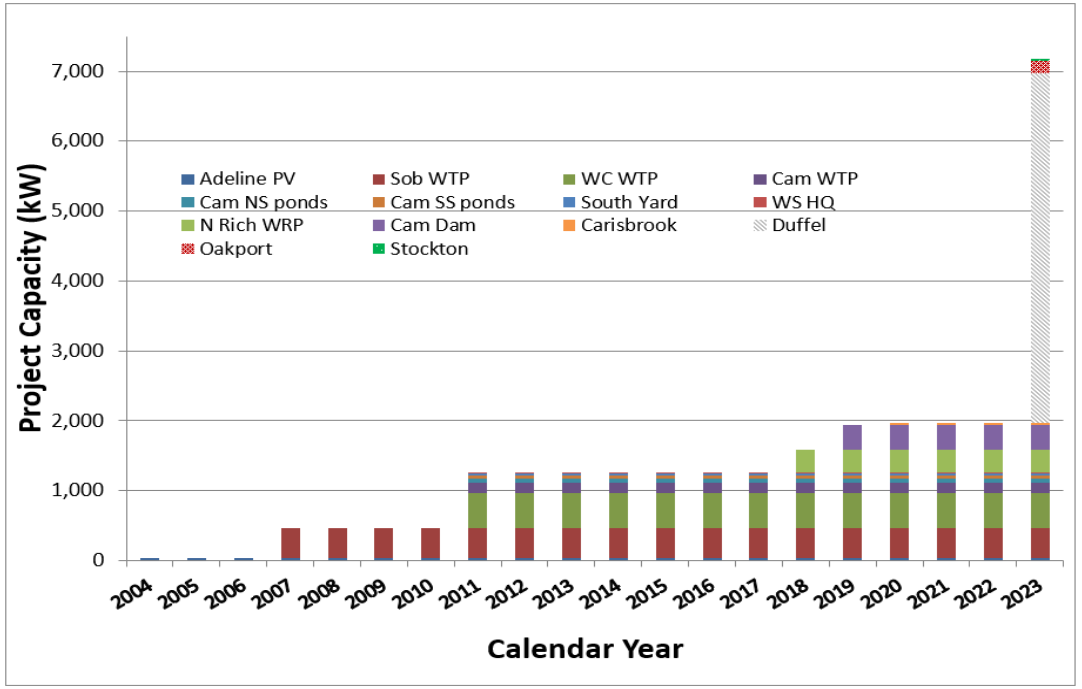
2022 Emissions	2022 Goal
23,968 MT CO2e	24,611 MT CO2e

MT CO2e = Metric Tons of Carbon Dioxide equivalent

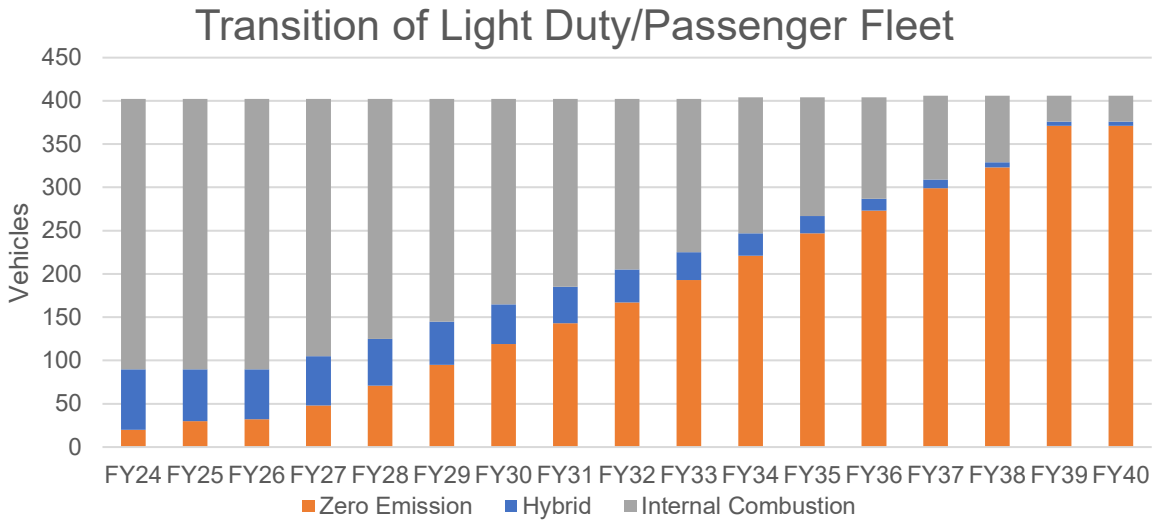
Mitigation Actions and Projects

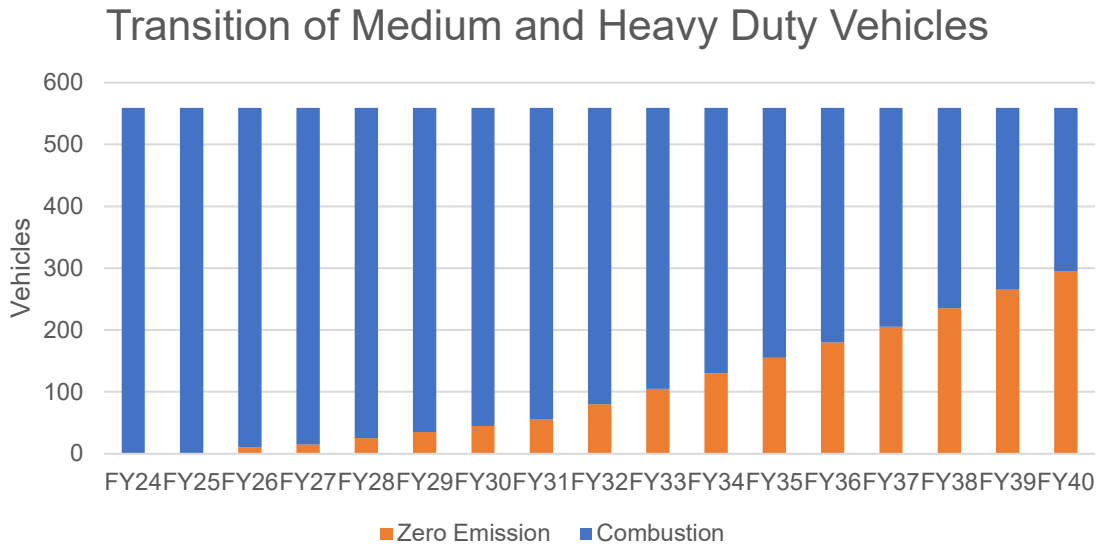
- Purchase low or emissions-free energy
- Minimize energy use
- Develop renewable energy projects
- Transition to renewable diesel
- Convert fleet to ZEVs

Duffel PV project in Orinda / San Pablo Watershed (fall 2023)



Transition of Fleet





Light-duty/passenger vehicles (sedans, pickups, SUVs)

Increase purchases from 35% ZEV by 2026 to 100% in 2035.

Annual replacement cycle: 10 years
Average cost: $40,000 - $50,000

Medium/Heavy duty (8,500 lbs gross vehicle weight)

50% of purchases above 8,500 GVW need to be ZEV in 2024 (100% by 2027)

Limited commercial availability

Annual replacement cycle: 15-25 years
Average cost: $100,000 - $250,000

Zero Emission Vehicle - Market Status

- Currently 14 ZEVs in service (Chevy Bolts)
- Nine ZEVs on order (Ford Pick-ups and Vans)
  - Expected delivery first half of 2024
- Front End Loader pilot successful
  - State CORE grant funding utilized
- Additional medium/heavy duty pilot opportunities in 2024
  - Freightliner eCascadia Tractor
  - Hyzon Hydrogen Fuel Cell Tractor
  - Volvo Full Size Front-end Loaders (if released)

Staff continuously reviewing market and vendors for new products.

Piloted Front End Loader

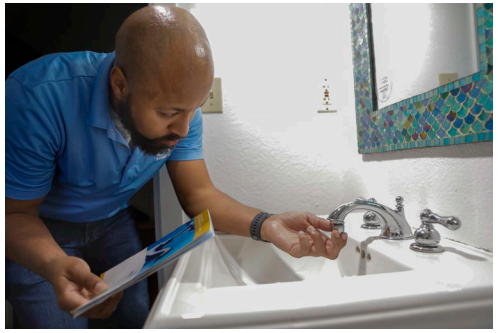
Fleet Management – Challenges and Impacts

- Availability of medium and heavy-duty vehicles may be limited
- Service yard upgrades to accommodate multiple fueling types will increase costs
- Early adoption could increase operating costs and reliability
- Emergency response – electrical or hydrogen supply availability after a major regional disaster is unknown
- Federal support may affect availability of ZEVs and ability of California to set independent emission standards
- Maintaining zero-emission vehicles will require new equipment, training and service contracts

Adaptation Highlights

Diverse Water Supply Development

- Greater water supply variability, more frequent droughts
- Water Supply Management Program (WSMP) 2040 Strategy – diversified water supply portfolio
  - Timing of WSMP Update uncertain, dependent on significant milestones
- Key Activities
  - Recycled Water Strategic Plan Update (Board workshop in February)
  - Implementation of “Making Conservation a California Way of Life” framework
  - Additional water supply options – Los Vaqueros Expansion and Demonstration Recharge Extraction and Aquifer Enhancement (DREAM) Project
  - Water rights protection
  - Bay Delta Water Quality Control Plan (WQCP) process



Installing a faucet aerator

East Bayshore Water Recycling Plant

DREAM Project

Advancement in Forecasting and Reservoir Operations

Most research organized under state, federal, and academic groups – includes Forecast-Informed Reservoir Operation (FIRO), Advanced Quantitative Precipitation Information (AQPI), and Center for Western Weather and Water Extremes (CW3E)

Key activities:

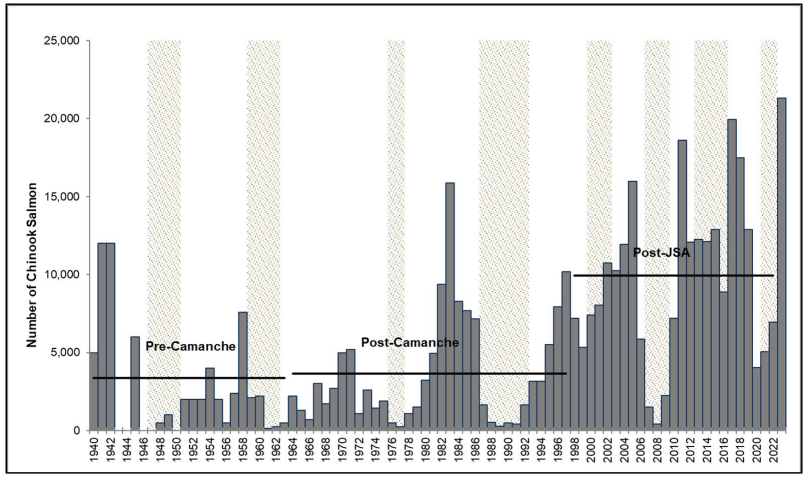
- Funding and technical assistance with AQPI
- High-definition radar installed on Rocky Ridge (east bay hills) to cover service area
- Evaluating ways to optimize flood control operations at Pardee/Camanche Reservoirs
- Improve predictions of intensity and runoff from individual Atmospheric Rivers (ARs) to support daily operations
- Improve predictions of seasonal runoff from snowpack and rainfall to support water supply planning

Pardee Spillway

Natural Resources: Wildlife Protection

- Changes in precipitation and warming can affect aquatic and terrestrial species
- Identification of priority habitats and species in District watershed
- Success of Mokelumne Fishery
- Key Activities
  - Adaptive management
  - Habitat restoration
  - Temperature management on the Lower Mokelumne River

Gravel enhancement for spawning habitat on the Lower Mokelumne River.



Chinook Salmon returns on the Mokelumne River.

Natural Resources: Wildfire and Fuel Management

- Fire Management Plans for East Bay and Mokelumne watersheds
- Key Activities
  - East Bay vegetation management and fuel reduction
    - Tunnel East Bay Hills Fuel Break
    - San Pablo Pine Forest
    - Grizzly Peak Fuel Break
    - Hills Emergency Forums
  - UMRWA Forest Projects Plan
    - 2016 Master Stewardship Agreement with USFS
    - Phase 1: 26,000 acres over eight-year timeframe
    - Phase 2: 225,000 acres (still in planning)

UMRWA forest remediation site, Pioneer, 2023

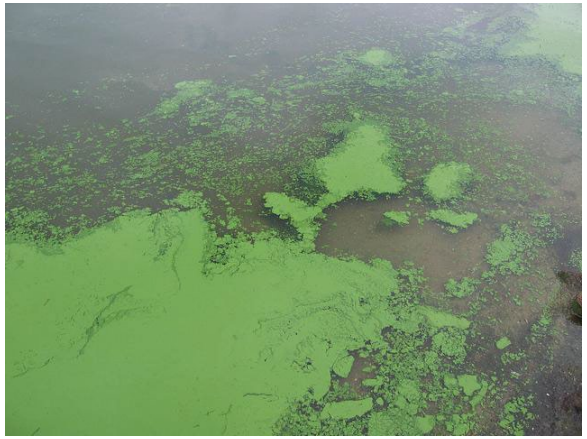
UMRWA = Upper Mokelumne River Watershed Authority
USFS = United States Forest Service

Climate Change – Water Quality Impacts

- Increased potential for wildfires that could lead to higher levels of sediment, metals, nutrients
- Warmer conditions support formation of Harmful Algal Blooms (HAB)
- Extreme precipitation events (ARs) could increase sediment loading

Caldor Fire (2021)

Watershed post wildfire



Algal blooms

Pardee post AR Event 2017

[1] The Caldor Fire Rapidly Grows Near Lake Tahoe : NPR

Capital Investments

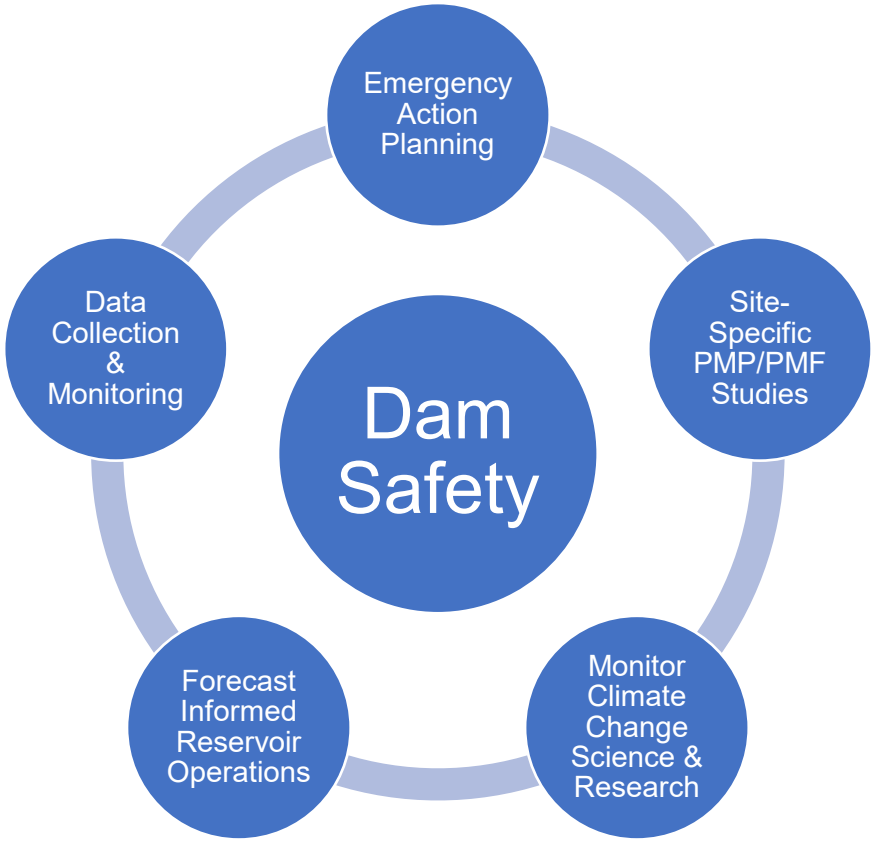
- 5-year CIP includes about $613M for projects or portions of projects that directly help District adapt to climate change
- Watershed projects
  - San Pablo Reservoir Hypolimnetic System
  - Briones Reservoir Water Quality Study
- Water Treatment Plant Projects
  - Orinda Disinfection Improvements
  - Lafayette Interim Improvements
  - Sobrante Reliability and Capacity Improvements
  - USL Maintenance and Reliability Improvements
  - Walnut Creek Pretreatment
- Right-sizing distribution reservoirs

Orinda Water Treatment Plant UV Project

USL Water Treatment Plant.

Dam and Spillway Safety

- Dams and Spillways are considered safe to operate
- District is analyzing new probable maximum flood (PMF) conditions to assess capacity of spillways
  - Current Precipitation estimates rely on historic hydrology and past events
  - District is following research and regulations on how to incorporate climate change in future analyses, and actively discussing with Division of Safety and Dams (DSOD) and other agencies and regulators
- Adaptation strategies include Emergency Action Planning, Monitoring climate change science, data collection, on-going studies, and Forecast-Informed Reservoir Operations (FIRO)

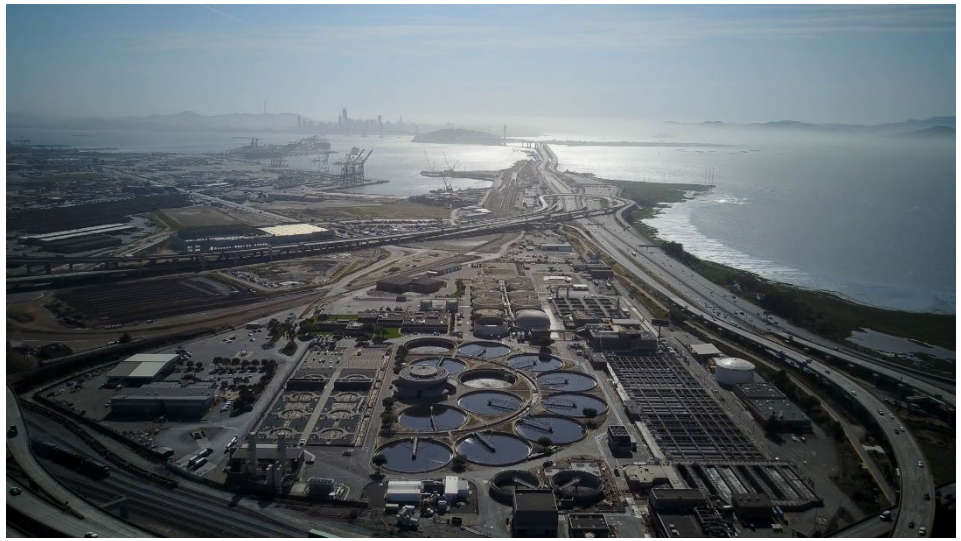


USL Reservoir Spillway

Pardee Spillway

Wastewater Adaptation

- Sea level rise effects on wastewater infrastructure
- Reducing Inflow/Infiltration – (Atmospheric River events)
- Electrical Reliability - (PG&E Public Safety Power Shutoffs)
- Reducing nutrient discharges in SF Bay



Main Wastewater Treatment Plant, Oakland

Confronting Sea Level Rise – Impacts on District Infrastructure

- Increased groundwater salinity leads to greater potential for pipe corrosion
- Sea level rise, combined with extreme precipitation events, increases risk of Delta levee failure
- Potential for flooding of wastewater facilities
  - Assumptions for mean sea level rise: 12 inches by 2050, 36 inches by 2100

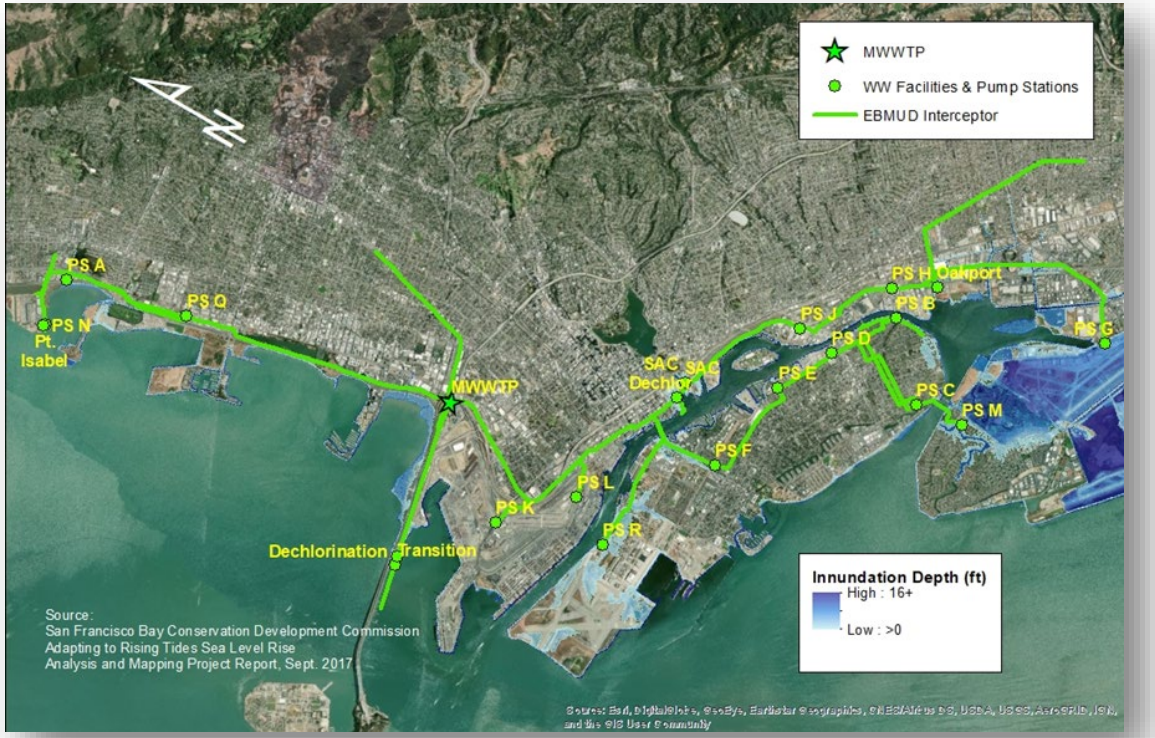
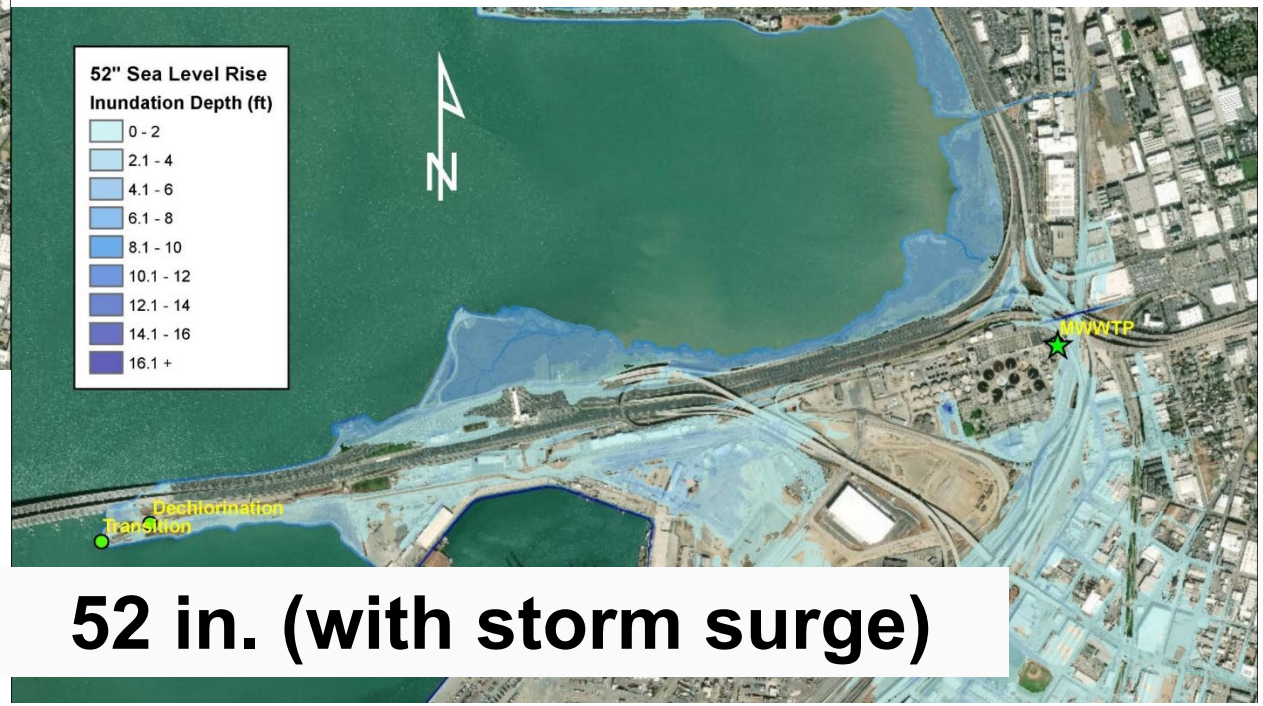


Figure: Locations of various pump stations, interceptors, de-chlorination facility, and main wastewater treatment plant

Source: San Francisco Bay Conservation Development Commission,
Adapting to Rising Tides Sea Level Rise Analysis and Mapping Project Report, Sept. 2017

Sea Level Rise at MWWTP

36 in.



52 in. (with storm surge)

Source: San Francisco Bay Conservation Development Commission,
Adapting to Rising Tides Sea Level Rise Analysis and Mapping Project Report, Sept. 2017

Sea Level Rise + Storm Surge

Dechlorination Facility Improvements

- Upgraded injectors, backup chemical feed system (completed)
- Elevated platform for backup generator and electrical equipment (completed)
- Chemical tanks and piping replacements (future)
- Effluent pumps upgrade (future)
- Seismic Improvements (future)

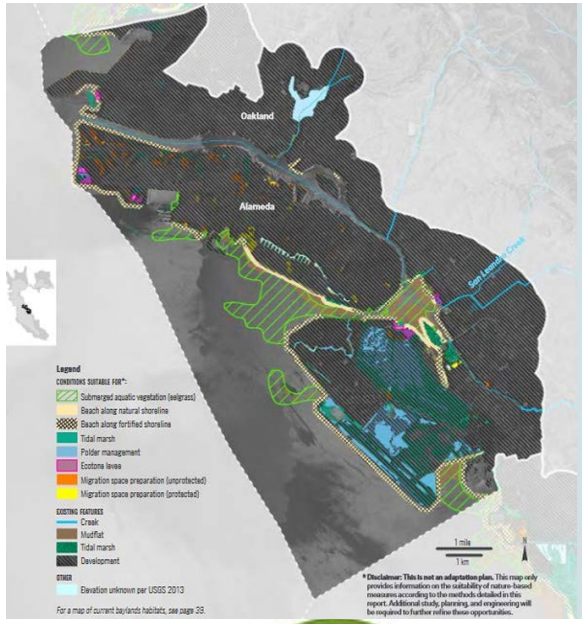
Source: San Francisco Bay Conservation Development Commission, Adapting to Rising Tides Sea Level Rise Analysis and Mapping Project Report, Sept. 2017

Confronting Sea Level Rise

How is EBMUD addressing Sea Level Rise?

- Updated Planning and Design Guidelines
- CIP projects
  - Dechlorination area improvements
  - Pump station M upgrades
  - Final effluent pump station upgrades
- Involvement with local climate change networks
  - BayCan: regional collaboration group
  - Oakland-Alameda Adaptation Working Group

San Leandro Bay
Oakland-Alameda Estuary
Adaptation Working Group



BayCAN
BAY AREA CLIMATE ADAPTATION NETWORK

CIP = Capital Improvement Plan

Inflow/Infiltration Reduction Efforts

EBMUD Work

- Capital Projects
- Regional Technical Support Program (RTSP)
- PSL Program

Satellite Work

- Prescribed Rehab

Status

- Constructed and operational
- Identified over 550 sources total 33 MGD of peak flow
- On-going with over 45% properties compliant
- On-going. 46% complete of required work

Innovative Technologies for Finding Inflow/Infiltration (I&I)

Ongoing Projects

1. Distributed Temperature Sensing
2. Flow Isolation Studies
3. Smoke Testing with Closed-Circuit Television Inspection

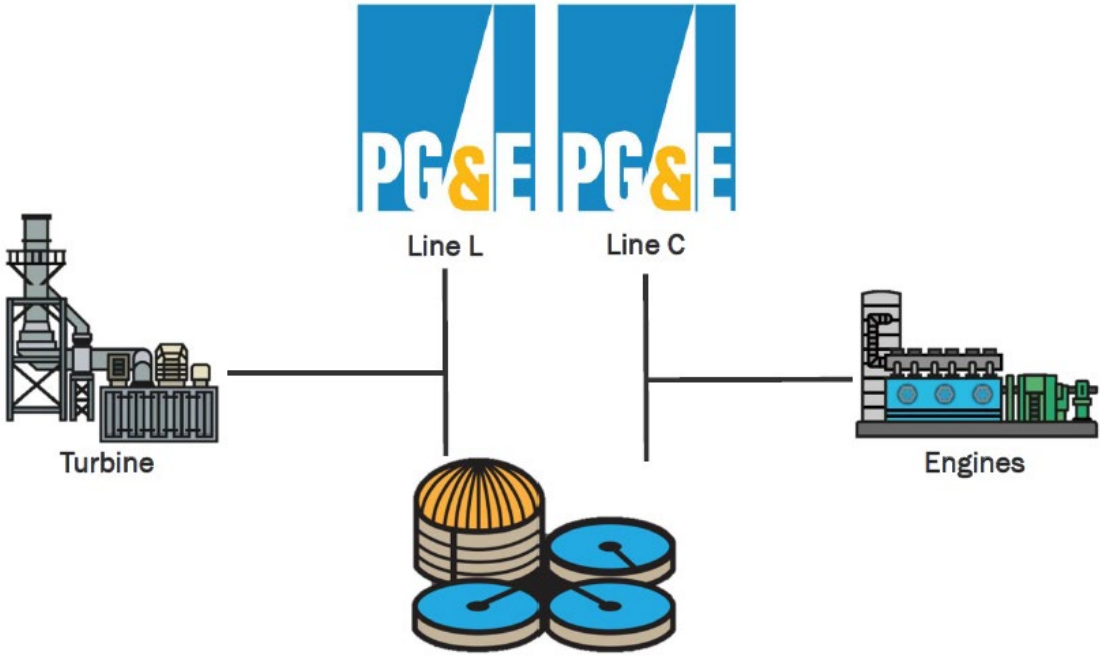
Upcoming Pilot Projects

1. Acoustic Testing of Sewer Systems (2/24-6/24)
2. Smart ball with GoPro cameras (2/24-6/24)

Reliable Power Supply

- Additional and upgraded diesel generators
- Additional connections to PG&E
- Participation in load demand response programs (load shedding)
- Exploring investment in battery storage

Mobile Generator



Schematic of Main Wastewater Treatment Plant

Protecting the Bay: Addressing Nutrient Concerns

- **What are Nutrients:** Nitrogen and phosphorus
- **What are the sources:**
  - Wastewater treatment plants effluents (66%);
  - The rest (33%) come from Sacramento River Delta and stormwater runoff
- **What is EBMUD doing about it**
  - Right-sized resource recovery program
  - Modify secondary process during summer
- **Results:** 50% reduction in Nutrient Loading to the bay from EBMUD

Green Bond Guidance & Investments Policy

- Green Bond Guidance
  - Board approved in 2015 and updated in 2022
  - Four Water System green bond issuances and one for Wastewater since 2015
  - Upcoming green bond issuance for both systems
- Investments Policy (4.07)
  - *"It is the intent of the District to align its investment decisions with its policies, mission, and values."*
  - Safety, liquidity, yield and diversification are the primary investment objectives.
  - Environmental, Social and Governance (ESG) factors considered in District investments (and Employee Retirement System)

Pardee Reservoir

Summary/Call to Action

Research and Innovation

- EBMUD and PG&E working with Desert Research Institute on soil moisture, snowmelt matrix study
- Assessing value of AQPI (forecast tools and high-definition radar)
- Expanding traditional water conservation measures
- Ability to adapt and quantity the risk of climate change
- Ability to prioritize adaptation measures to respond to climate change (performance of assets, carbon inventory, quantifying resilience)
- Wastewater initiatives
- Water treatment studies
- Forestry management

Pipe testing at Center for Smart Infrastructure

Center for Smart Infrastructure

Summary of Mitigation Activities

Completed

- Annual emissions reporting based on the WEN protocol
- Completion of ten photovoltaic (PV) projects since 2003
- Purchase of zero and low emission electricity
- MWWTP is a net generator of electricity
- Purchase of hybrid vehicles

In Progress

- Purchase of ZEVs
- Reduction of emissions to reach 2030 carbon neutrality goal
- Completion of PV projects in Orinda (Duffel project), Stockton, and Oakport (Oakland)
- Additional in-conduit hydrogeneration, where feasible
- Pilot ZEV commercial trucks and construction equipment
- Transition to renewable diesel

Planned

- Develop a carbon offset and renewable energy credit (REC) purchase program to guide purchases
- Transition fleet to ZEVs including service yard modifications

Summary of Adaptation Activities

Completed

- Construction of Freeport
- Water transfers
- Public Safety Power Shutoff Response
- Achieved 46 MGD of water conservation savings
- Recycled water program with capacity to deliver 9 MGD of recycled water
- DREAM pilot project successfully stores and extracts groundwater
- 2023 record setting salmon returns on the Mokelumne

In Progress

- Recycled water strategic plan (Board workshop Feb. 27)
- Bay Delta Water Quality Control Plan
- Coordination with UMRWA on Forest Projects Plan
- Capital upgrades at water treatment plants
- Upgrades to pipes
- I/I reduction
- Distribution reservoir upgrades

Planned

- Compliance with "Making Conservation a California Way of Life" framework
- Increase Biological Nutrient Removal (BNR) to higher flows at the MWWTP
- Complete Electrical Resilience Master Plan at the MWWTP

In closing…

- Staff will continue to monitor the science of climate change
- Uncertainty around timing of impacts
- District has plans for mitigation and adaptation, but much work remains
- Next budget cycle will highlight additional costs that may need to be budgeted

Questions/Comments/ Feedback

FLOWING INTO THE FUTURE

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