AGENDA
IRVINE RANCH WATER DISTRICT
ENGINEERING AND OPERATIONS COMMITTEE MEETING
TUESDAY, NOVEMBER 17, 2026

This meeting will be held in-person at the District's headquarters located at 15600 Sand Canyon Avenue, Irvine, California. The meeting will also be broadcasted via Webex for those wanting to observe the meeting virtually.

To observe this meeting virtually, please join online using the link and information below:

Via Web: https://irwd.webex.com/irwd/j.php?MTID=m63242cd253ee3a181c680d5f5eacf501
Meeting Number (Access Code): 2492 213 2953
Meeting password: h5eSQz25Cew

PLEASE NOTE: Webex observers of the meeting will be placed into the Webex lobby when the Board enters closed session. Participants who remain in the "lobby" will automatically be returned to the open session of the Board once the closed session has concluded. Observers joining the meeting while the Board is in closed session will receive a notice that the meeting has been locked. They will be able to observe the meeting once the closed session has concluded.

CALL TO ORDER 1:30 p.m.

ATTENDANCE
Committee Chair: Doug Reinhart _____
Committee Member: Dan Ferons _____
Alt. Committee Member: Cindy Miller _____

ALSO PRESENT

Paul Cook	___	Kevin Burton	___	Wendy Chambers	___
Paul Weghorst	___	Steve Choi	___	Jim Colston	___
Jason Manning	___	Jose Zepeda	___	Eric Akiyoshi	___
Belisario Rios	___	Jacob Moeder	___	Brian Waite	___
Lori Rigby	___	Scott Giatpaiboon	___	_____	___
_____	___	_____	___	_____	___
_____	___	_____	___	_____	___
_____	___	_____	___	_____	___
_____	___	_____	___	_____	___
_____	___	_____	___	_____	___

PUBLIC COMMENT NOTICE

If you wish to address the Committee orally on any item, you may attend the meeting in person and submit a "speaker slip" to the Committee Chair. Forms are provided at the front of the Committee Room. Public comments are limited to three minutes per speaker on each subject. If you wish to submit written comments to the Committee, please submit your public comment in advance of the meeting by emailing comments@irwd.com before 8:30 a.m. on Tuesday, November 17, 2026, and your remarks will be added to the record at the meeting.

COMMUNICATIONS

1. Notes: Burton
2. Public Comments
3. Determine the need to discuss and/or take action on item(s) introduced that came to the attention of the District subsequent to the agenda being posted and determine which items may be approved without discussion.

INFORMATION

4. ENGINEERING PROJECT STATUS REPORT – AKIYOSHI / MOEDER / RIOS / WAITE / BURTON

   Recommendation: Receive and file.

5. IRWD RESEARCH BUSINESS PLAN – COLSTON / BURTON

   Recommendation: Receive and file.

6. FINDINGS OF 2026 CLIMATE ADAPTATION PLAN – HUANG / NYE / WEGHORST

   Recommendation: Receive and file.

7. MICHELSON WATER RECYCLING PLANT 2025 FLOWS AND LOADS UPDATE – ALVAREZ / WAITE / BURTON

   Recommendation: Receive and file

ACTION

8. SYPHON RESERVOIR IMPROVEMENT PROJECT CONSULTANT SELECTION FOR SYSTEM INTEGRATOR SERVICES– RADVAR / MOEDER / BURTON

   Recommendation: That the Board authorize the General Manager to execute a Professional Services Agreement with Prime Systems Industrial Automation, Inc. in the not-to-exceed amount of $415,840 for system integrator services for the Syphon Reservoir Improvement Project.

OTHER BUSINESS

9. Directors' Comments

10. Adjournment

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Availability of agenda materials: Agenda exhibits and other writings that are disclosable public records distributed to all or a majority of the members of the above-named Committee in connection with a matter subject to discussion or consideration at an open meeting of the Committee are available for public inspection in the District's office, 15600 Sand Canyon Avenue, Irvine, California ("District Office"). If such writings are distributed to members of the Committee less than 72 hours prior to the meeting, they will be available from the District Secretary of the District Office at the same time as they are distributed to Committee Members, except that if such writings are distributed one hour prior to, or during, the meeting, they will be available electronically via the Webex meeting noted. Upon request, the District will provide for written agenda materials in appropriate alternative formats, and reasonable disability-related modification or accommodation to enable individuals with disabilities to participate in and provide comments at public meetings. Please submit a request, including your name, phone number and/or email address, and a description of the modification, accommodation, or alternative format requested at least two days before the meeting. Requests should be emailed to comments@irwd.com. Requests made by mail must be received at least two days before the meeting. Requests will be granted whenever possible and resolved in favor of accessibility.

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November 17, 2026
Prepared by: E. Akiyoshi / J. Moeder / B. Rios / B. Waite
Submitted by: K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

ENGINEERING PROJECT STATUS REPORT

SUMMARY:

A status report of IRWD's Engineering Projects is presented to the Committee for information.

BACKGROUND:

The information, which is provided as Exhibit "A", is a status report submitted quarterly to the Committee for review.

FISCAL IMPACTS:

Not applicable.

ENVIRONMENTAL COMPLIANCE:

Not applicable.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

Exhibit "A" – Engineering Project Status Report

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Exhibit "A"

ENGINEERING PROJECT STATUS REPORT

	Project Name	Engineering Team	Planning/Study Phase		Design Phase						Construction Phase				General Project Info
		Group	Status	Completion	Status	Consultant	PDR / 30%	60%	90%	100%	Status	Contractor	In Service	Final Acceptance	Project Requested By
1	MWRP Tertiary Filter Rehabilitation	Treatment & Conveyance	Completed	Completed	Completed	HDR	Completed	Completed	Completed	Completed	In-Process	ICS	Aug-27	Oct-27	Operations
2	MWRP Fueling Facilities	Treatment & Conveyance	Completed	Completed	Completed	AECOM	Completed	Completed	Completed	Completed	In-Process	ICS	Feb-27	Feb-27	Facilities
3	Coastal Zones B&D and Coastal Zone OC-63 to Zone 4 Pump Stations Rehabilitation	Treatment & Conveyance	Completed	Completed	In-Process	Carollo	Completed	Jan-27	Apr-27	Jul-27	Nov-27	-	-	Feb-29	Infrastructure Planning
4	MWRP 2025 Flows and Loads Update (Phase III Expansion)	Treatment & Conveyance	In-Process	Dec-26	N/A	HDR	-	-	-	-	N/A	-	-	N/A	Infrastructure Planning
5	MWRP Handrail Safety Improvements	Treatment & Conveyance	Completed	Completed	In-Process	CDA	Completed	Completed	Completed	Dec-26	Feb-27	-	-	Aug-27	Safety & Security
6	Fleming Tank and Pump Station Improvements	Treatment & Conveyance	Completed	Completed	Completed	Tetra Tech	Completed	Completed	Completed	Completed	In-Process	Pacific Hydrotech	Completed	Jan-27	Infrastructure Planning
7	HWTP Interconnection Pipeline	Treatment & Conveyance	Completed	Completed	In-Process	West Yost	Completed	Completed	Completed	Jan-27	Mar-27	-	-	Feb-28	Infrastructure Planning
8	HWTP Pump Station Improvements	Treatment & Conveyance	Completed	Completed	In-Process	Adurra	Completed	Jan-27	Apr-27	Jun-27	Aug-27	-	-	Oct-28	Infrastructure Planning
9	Manning Pump Station Replacement	Treatment & Conveyance	Completed	Completed	Completed	Lee & Ro	Completed	Completed	Completed	Completed	In-Process	GSE Construction	May-27	Jun-27	Infrastructure Planning
10	Sand Canyon Headquarters and Operations Center HVAC Upgrades	Treatment & Conveyance	Completed	Completed	Completed	Eng Resource Mech	Completed	Completed	Completed	Completed	In-Process	tbd	Aug-28	Sep-28	Facilities
11	Silverado Canyon Bridge 174 Domestic Water Pipeline Improvements	Treatment & Conveyance	Completed	Completed	Completed	Mark Thomas	Completed	Completed	Completed	Completed	In-Process	Ferreira	Jan-28	Feb-28	OCPW
12	Silverado Canyon Bridge 175 Domestic Water Pipeline Improvements	Treatment & Conveyance	Completed	Completed	In-Process	Mark Thomas	Completed	Completed	Completed	Feb-27	Apr-27	tbd	Jun-28	Jul-28	OCPW
13	Silverado Canyon Bridge 177 Domestic Water Pipeline Improvements	Treatment & Conveyance	Completed	Completed	Completed	MBF Consulting	Completed	Completed	Completed	Completed	In-Process	Ferreira	Feb-28	Mar-28	OCPW
14	Operations Center Warehouse and Water Quality Storage Building	Treatment & Conveyance	Completed	Completed	Completed	Stantec	Completed	Completed	Completed	Completed	In-Process	KPRS	Mar-27	Apr-27	Purchasing
15	Rehabilitation of Dyer Road Wellfield Well No. 7	Treatment & Conveyance	Completed	Completed	Completed	Richard Slade	Completed	Completed	Completed	Completed	In-Process	Best Drilling	Jan-27	Feb-27	Operations
16	DRWF Well 2 and IDP Well 107R Rehabilitation	Treatment & Conveyance	Completed	Completed	In-Process	Richard Slade	Completed	Dec-26	Dec-26	Feb-27	May-27	-	-	Jan-28	Operations
17	MWRP Biosolids Lift Station and Sewer Pipeline	Treatment & Conveyance	Completed	Completed	Completed	Tetra Tech	Completed	Completed	Completed	Completed	In-Process	Paulus Engineering	Aug-27	Oct-27	Regulatory Compliance
18	MWRP Biosolids Handling Improvements	Treatment & Conveyance	Completed	Completed	In-Process	Carollo	Completed	Completed	Completed	Nov-26	Mar-27	-	-	Mar-29	Operations
19	Lake Forest Woods Sewer Improvements	Treatment & Conveyance	Completed	Completed	Completed	Woodard & Curran	Completed	Completed	Completed	Completed	In-Process	GCI	Dec-26	Jan-27	Collections
20	Coastal Zone 1 to 2 and Zone 2 to 4 Pump Stations Rehabilitations	Treatment & Conveyance	Completed	Completed	Completed	GHD	Completed	Completed	Completed	Completed	In-Process	SS Mechanical	Jun-27	Jul-27	Infrastructure Planning
21	Wells 21/22 Desalter Valve Replacement	Treatment & Conveyance	Completed	Completed	Completed	Tetra Tech	Completed	Completed	Completed	Completed	Dec-26		Jun-27	Jul-27	Operations
22	Wells 6, 12, 14, and 15 Site Improvements	Treatment & Conveyance	Completed	Completed	Completed	Tetra Tech	Completed	Completed	Completed	Completed	In-Process	tbd	Oct-29	Nov-29	Infrastructure Planning
23	East Irvine Zone 3-4 Pump Station Rehabilitation	Treatment & Conveyance	Completed	Completed	In-Process	Jacobs	Dec-26	Feb-27	Apr-27	Aug-27	Nov-27	-	-	Jul-29	Infrastructure Planning
24	SOCWA Pump Station Tank Wall Repair	Treatment & Conveyance	On Hold	-	On Hold	-	-	-	-	-	On Hold	-	-	On Hold	Maintenance
25	LAWRP Tertiary Filter Media and Surface Wash Piping Replacement	Treatment & Conveyance	Completed	Completed	Completed	In-house/CDA	Completed	Completed	Completed	Completed	On Hold	-	-	On Hold	Maintenance
26	LAWRP Ponds Biosolids Removal and Land Application	Treatment & Conveyance	Completed	Completed	Completed	In-House	Completed	Completed	Completed	Completed	In-Process	Synagro	May-27	Jun-27	Operations
27	Santiago Creek Dam Improvements	Dams & Storage	Completed	Completed	In-Process	AECOM/GEI	Completed	Completed	Completed	Completed	Feb-27	-	-	Jun-32	Infrastructure Planning
28	Orange Heights Zone 6 Reservoir	Dams & Storage	Completed	Completed	In-Process	Tetra Tech	Completed	Completed	Completed	Apr-27	Feb-28	-	-	Jun-30	Infrastructure Planning
29	Orange Heights Zn 5 to 6 and C+ to E Pump Stations	Dams & Storage	Completed	Completed	In-Process	Lee & Ro	Completed	Apr-27	Jul-27	Oct-27	Jan-28	-	-	Oct-30	Infrastructure Planning
30	Sand Canyon Dam Seepage and Instrumentation Upgrades	Dams & Storage	Completed	Completed	In-Process	GEI	Completed	Completed	Completed	Completed	Jan-27	-	-	Jul-27	Dam Safety
31	San Joaquin Reservoir Outlet Valve Replacement	Dams & Storage	Completed	Completed	Completed	In-House	Completed	Completed	Completed	Completed	In-Process	Inland Potable Services	Jan-27	Jan-27	Dam Safety
32	San Joaquin Dam Drainage Improvements	Dams & Storage	Completed	Completed	Completed	JIG	Completed	Completed	Completed	Completed	In-Process	Orion Construction	Dec-26	Dec-26	Maintenance
33	San Joaquin Reservoir Filtration	Dams & Storage	Completed	Completed	Completed	Carollo	Completed	Completed	Completed	Completed	In-Process	RC Foster	Nov-26	Jan-27	Infrastructure Planning
34	Rattlesnake Dam Outlet Pipeline Rehabilitation	Dams & Storage	Completed	Completed	Completed	MKN	Completed	Completed	Completed	Completed	In-Process	Pacific Hydrotech	Jun-27	Jun-27	Dam Safety
35	HWTP Supply Pipeline Vault Rehabilitations	Dams & Storage	Completed	Completed	In-Process	WSC	Completed	Nov-26	Feb-27	May-27	Jul-27	-	-	Jul-28	Infrastructure Planning
36	El Modena NTS Improvements	Dams & Storage	In-Process	Dec-26	Feb-27	-	-	-	-	-	Aug-29	-	-	Aug-30	NTS
37	Syphon Reservoir Off Site Mitigation	Dams & Storage	In-Process	Nov-26	Feb-27	-	-	-	-	-	Aug-29	-	-	Aug-30	Infrastructure Planning
38	Sand Canyon Dam Spillway Rehabilitation	Dams & Storage	In-Process	Jan-27	Apr-27	-	-	-	-	-	Mar-29	-	-	Mar-31	Dam Safety
39	BWTP Chemical Line Repair	Dams & Storage	Completed	Completed	Completed	Carollo	Completed	Completed	Completed	Completed	In-Process	Cora Constructors Inc.	Mar-27	Apr-27	Maintenance
40	District-Wide Generator Fuel Storage Upgrades	Dams & Storage	Completed	Completed	Completed	Psomas	Completed	Completed	Completed	Completed	In-Process	SS Mechanical	Completed	Dec-26	Infrastructure Planning
41	Lake Forest Zone 4 Tanks Rehabilitation	Dams & Storage	Completed	Completed	Completed	Cannon	Completed	Completed	Completed	Completed	In-Process	Orion Construction	Jul-27	Sep-27	Infrastructure Planning
42	Shaw Tank Replacement	Dams & Storage	Completed	Completed	In-Process	Tetra Tech	Completed	Completed	Jan-27	Apr-27	Jul-27	-	-	Aug-29	Infrastructure Planning
43	MWRP Acid Phase Digester Rehabilitation	Dams & Storage	Completed	Completed	Completed	V&A	Completed	Completed	Completed	Completed	Jan-27	-	-	Nov-27	Maintenance
44	Sand Canyon Dam Liner Repair	Dams & Storage	Completed	Completed	Completed	In-House	Completed	Completed	Completed	Completed	In-Process	PaveWest	Nov-26	Dec-26	Operations
45	Foothill Zn 4-6 Pump Station Transformer Replacement	Dams & Storage	Completed	Completed	Completed	Psomas	Completed	Completed	Completed	Completed	In-Process	Southern Contracting	Sep-27	Sep-27	Infrastructure Planning
46	Syphon Reservoir Improvements	Dams & Storage	Completed	Completed	Completed	AECOM	Completed	Completed	Completed	Completed	In-Process	Sukut	May-31	May-31	Infrastructure Planning
47	Eastwood Zn A-Syphon Pump Station Equipping	Dams & Storage	Completed	Completed	In-Process	AECOM	Feb-27	Mar-27	Apr-27	Jun-27	Aug-27	-	-	Aug-28	Infrastructure Planning
48	MWRP Influent Meters (North and South)	Dams & Storage	In-Process	Feb-27	N/A	HDR	-	-	-	-	N/A	-	-	N/A	Operations
49	Santiago Creek Dam Improvements - Site Prep	Dams & Storage	Completed	Completed	Completed	AECOM/GEI	Completed	Completed	Completed	Completed	In-Process	James W. Fowler Co.	Jan-27	Feb-27	Infrastructure Planning
50	Harding Canyon Dam Rehabilitation/Removal Study	Dams & Storage	In-Process	Apr-27	N/A	Geosyntec	-	-	-	-	N/A	-	-	N/A	Dam Safety
51	I-5 Widening Sand Culver 36 inch RW Relocation Seg 2	Development & Pipelines	Completed	Completed	Completed	JIG	Completed	Completed	Completed	Completed	In-Process	L&S	Oct-26	Dec-26	OCTA
52	Modjeska Grade Road DW Pipeline Relocation	Development & Pipelines	Completed	Completed	Completed	JIG	Completed	Completed	Completed	Completed	In-Process	T.E. Roberts	Jan-27	Feb-27	OCPW

ENGINEERING PROJECT STATUS REPORT

	Project Name	Engineering Team	Planning/Study Phase		Design Phase						Construction Phase				General Project Info
		Group	Status	Completion	Status	Consultant	PDR / 30%	60%	90%	100%	Status	Contractor	In Service	Final Acceptance	Project Requested By
53	Orange Heights SAC/Baker Pipeline Relocation	Development & Pipelines	Completed	Completed	Completed	MBI	Completed	Completed	Completed	Completed	On Hold	-	-	On Hold	Development
54	Effluent Transmission Main Reach A Rehabilitation	Development & Pipelines	Completed	Completed	In-Process	Ardurra	Jan-27	Apr-27	Jul-27	Aug-27	Jan-28	-	-	Dec-28	Infrastructure Planning
55	Effluent Transmission Main Reach B Replacement	Development & Pipelines	Completed	Completed	In-Process	BKF	Completed	Completed	Completed	Dec-26	Mar-27	-	-	Oct-27	SOCWA
56	San Joaquin Hills Road RW Pipeline Replacement	Development & Pipelines	Completed	Completed	In-Process	MKN	Completed	Completed	Completed	Dec-26	Jan-27	-	-	Jul-27	Infrastructure Planning
57	Silkwood/Willowleaf RW Pipeline Replacement	Development & Pipelines	Completed	Completed	In-Process	Ardurra	Completed	Completed	Completed	Dec-26	Jan-27	-	-	Jun-27	Infrastructure Planning
58	Marine Way DW Conversion Improvements	Development & Pipelines	Completed	Completed	Completed	Stantec	Completed	Completed	Completed	Completed	Mar-27	-	-	Sep-27	Development
59	LAWRP Pipeline Diversion to MWRP	Development & Pipelines	In-Process	Nov-26	Jan-28	-	-	-	-	-	Oct-28	-	-	Apr-29	Infrastructure Planning
60	Portola Springs DW and RW Pipeline Rehabilitation	Development & Pipelines	In-Process	Feb-27	Mar-28	-	-	-	-	-	Dec-28	-	-	Jun-29	Infrastructure Planning
61	Irvine Business Complex Appurtenance Relocations Phase 3	Development & Pipelines	Completed	Completed	Completed	MBF Consulting	Completed	Completed	Completed	Completed	In-Process	T.E. Roberts	Jan-27	Apr-28	City of Irvine
62	Modjeska Harding DW Pipeline Replacement	Development & Pipelines	Completed	Completed	In-Process	tbd	Jun-27	Sep-27	Oct-27	Dec-27	May-28	-	-	Dec-28	Infrastructure Planning
63	EV Charging Facilities - Sand Canyon	Development & Pipelines	Completed	Completed	Completed	SCE/NV5	Completed	Completed	Completed	Completed	In-Process	SCE Contractor	Dec-26	Dec-26	Operations
64	EV Charging Facilities - Operations Center	Development & Pipelines	Completed	Completed	In-Process	SCE/BCF	Completed	Completed	Completed	Dec-26	Feb-27	-	-	Jul-27	Operations
65	Warner Avenue RW Pipeline Replacement	Development & Pipelines	Completed	Completed	In-Process	tbd	Feb-27	Jun-27	Jul-27	Aug-27	Nov-27	-	-	Jun-28	Infrastructure Planning
66	University Park DW Pipeline Replacement Phase 1	Development & Pipelines	Completed	Completed	In-Process	tbd	May-27	Sep-27	Oct-27	Nov-27	Apr-28	-	-	Apr-29	Infrastructure Planning
67	Turtle Rock NTS Structural Assessment	Development & Pipelines	Completed	Completed	In-Process	Simpson, Gumpertz	N/A	N/A	N/A	Jan-28	Mar-28	-	-	Jun-28	Operations
68	PA 51 District 2 Marine Way Sewer (from Alton to Bake)	Development & Pipelines	Completed	Completed	Completed	Hunsaker & Associates	Completed	Completed	Completed	Completed	In-Process	FYDAQ	Jan-27	Jan-27	Development
69	PA 51 Marine Way Stage 4 from Lynx to OCTA Rail (RA with Heritage Fields)	Development & Pipelines	Completed	Completed	Completed	Proactive	Completed	Completed	Completed	Completed	In-Process	FYDAQ	Feb-27	Feb-27	Development
70	PA 51 Framework DW, SS, RW	Development & Pipelines	Completed	Completed	Completed	Huitt Zollars	Completed	Completed	Completed	Completed	In-Process	Sukut	Jan-27	Jan-27	Development
71	PA 2, Gateway Village In Tract Backbone DW, RW (RA with City)	Development & Pipelines	Completed	Completed	Completed	Fuscoe	Completed	Completed	Completed	Completed	In-Process	Independent	Jan-27	Jan-27	Development
72	PA 2, Gateway Village Offsite DW (RA with City)	Development & Pipelines	Completed	Completed	Completed	Fuscoe	Completed	Completed	Completed	Completed	In-Process	Independent	Jun-27	Jun-27	Development
73	PA 2, Gateway Village Offsite SS (RA with City)	Development & Pipelines	Completed	Completed	Completed	Fuscoe	Completed	Completed	Completed	Completed	In-Process	Independent	Jun-27	Jun-27	Development
74	East Orange, Orange Heights Tract 16199 SS, RW (RA with TIC)	Development & Pipelines	Completed	Completed	Completed	Wilson Mikami	Completed	Completed	Completed	Completed	Sep-27	-	-	Dec-28	Development
75	East Orange, Orange Heights Tract 17995 DW, RW (RA with TIC)	Development & Pipelines	Completed	Completed	Completed	Proactive	Completed	Completed	Completed	Completed	Sep-27	-	-	Dec-28	Development
76	East Orange, Orange Heights Jamboree and Chapman DW SS, RW (RA with TIC)	Development & Pipelines	Completed	Completed	Completed	MBI	Completed	Completed	Completed	Completed	Sep-27	-	-	Dec-28	Development
77	East Orange, Orange Heights Neighborhood J2/J3 DW, (RA with TIC)	Development & Pipelines	Completed	Completed	Completed	Wilson Mikami	Completed	Completed	Completed	Completed	Sep-27	-	-	Dec-28	Development
78	East Orange, Orange Heights Tract 17995 SS, RW (RA with TIC)	Development & Pipelines	Completed	Completed	Completed	Proactive	Completed	Completed	Completed	Completed	Sep-27	-	-	Dec-28	Development
79	Water Resources Master Plan Update	Infrastructure Planning	In-Process	Apr-28	N/A	tbd	-	-	-	-	N/A	-	-	N/A	Infrastructure Planning
80	Water Quality Laboratory Remodel Study	Infrastructure Planning	In-Process	Mar-27	N/A	Austin Company	-	-	-	-	N/A	-	-	N/A	Water Quality
81	Condition Assessment Plan for DRWF Pipeline (Non-Invasive)	Infrastructure Planning	In-Process	Nov-27	N/A	HDR	-	-	-	-	N/A	-	-	N/A	Infrastructure Planning
82	DRWF Wells 1, 4, 5, 11, 13, and 18 Site Improvements	Future	-	-	-	-	-	-	-	-	-	-	-	-	Infrastructure Planning
83	Lake Forest Zone 5 East and West Tank Rehabilitation	Future	-	-	-	-	-	-	-	-	-	-	-	-	Infrastructure Planning
84	Biosolids Gas System Modifications	Future	-	-	-	-	-	-	-	-	-	-	-	-	Maintenance
85	Bayview LS Rehabilitation	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
86	Sewer Siphon Improvements Phase III	Future	-	-	-	-	-	-	-	-	-	-	-	-	Collections
87	Lake Forest Zone 4-5 West Pump Station Rehabilitation	Future	-	-	-	-	-	-	-	-	-	-	-	-	Infrastructure Planning
88	MWRP Loadout Room Roof Replacement and Crane Improvements	Future	-	-	-	-	-	-	-	-	-	-	-	-	Maintenance
89	MWRP & Biosolids Coating Repairs	Future	-	-	-	-	-	-	-	-	-	-	-	-	Maintenance
90	MWRP CAS Condition and Reliablity Assessment	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
91	MWRP Secondary Skimming Improvements	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
92	MWRP CAS Blower Replacement	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
93	MWRP Electrical Substation Replacement Planning	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
94	MWRP Back-up Generation Assessment	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
95	MWRP FEB Liner Replacement	Future	-	-	-	-	-	-	-	-	-	-	-	-	Maintenance
96	MWRP Primary Splitter Box Grating Replacement	Future	-	-	-	-	-	-	-	-	-	-	-	-	Operations
97	Electrical Condition Assessment above SCADA Equipment at MWRP/Biosolids/Baker	Future	-	-	-	-	-	-	-	-	-	-	-	-	Automation
98			-	-	-	-	-	-	-	-	-	-	-	-	-
99			-	-	-	-	-	-	-	-	-	-	-	-	-
100			-	-	-	-	-	-	-	-	-	-	-	-	-
101			-	-	-	-	-	-	-	-	-	-	-	-	-

November 17, 2026
Prepared by: J. Colston
Submitted by: K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

IRWD RESEARCH BUSINESS PLAN UPDATE

SUMMARY:

Staff will provide an update on the research projects in which IRWD is currently involved.

BACKGROUND:

Periodically, IRWD receives requests to participate in various research projects pertaining to emerging technologies through either direct funding or dedication of in-kind staff resources. Guidelines were developed to assist staff with their evaluation and response to those requests. These guidelines were incorporated into the IRWD Research Business Plan, which also provides a tracking mechanism for the various requests and ongoing research projects and programs in which IRWD participates. The Research Business Plan ensures that IRWD's research resources are being prioritized and utilized effectively.

One of the components of the Research Business Plan is for staff to provide a status update on the research projects to the Engineering and Operations Committee on a quarterly basis. IRWD actively participates in the Technology Approval Group (TAG) sponsored by Isle Utilities. The TAG hosts numerous developing technology providers to match interested agencies with their technologies.

Staff also track the many research projects sponsored by the Water Research Foundation (WRF) as IRWD is a member of the foundation. Since the last meeting, IRWD staff have submitted a letter of support for an application to the following WRF research project:

Risk-Based Prioritization of Critical Valves Using Machine Learning, Hydraulic Analysis, and Higher-Order Valve Inoperability Scenarios – Key goals of the research include:

- Providing relevant GIS and hydraulic system/model information for evaluating valve criticality, isolation impacts, and failure consequences;
- Providing relevant valve asset/GIS, inspection or exercising, maintenance, repair/failure, and operational records, as appropriate and available;
- Participating in technical discussions and project review meetings to provide practitioner input and ensure alignment with utility needs; and
- Collaborating in case study development and evaluation of the proposed models, methods, and decision-support tools.

If selected, IRWD anticipates contributing approximately $35,000 for in-kind cost sharing. This may include approximately four hours per month for three years (about 150 total hours) for data/model preparation, coordination, project meetings, technical review, interpretation of utility information, and evaluation of project outcomes.

The following research item is ongoing since the last report:

DDW Lithium Treatment in Drinking Water Study – The California Division of Drinking Water (DDW) is researching the removal of Lithium from drinking water sources. This research was spurred in response to the Unregulated Contaminant Monitoring Rule No. 5 (UCMR5) which included monitoring for Lithium. After reviewing the results of UCMR5, DDW has initiated a data gathering effort to determine if existing drinking water treatment systems also remove Lithium from drinking water. Specifically, DDW has requested, with assistance from IRWD, to monitor IRWD's Irvine Desalter Project – Potable Treatment Plant (IDP–PTP). IRWD is supporting this request; the sample bottles are expected to be sent to IRWD soon.

A summary of the current research projects is attached as Exhibit "A".

FISCAL IMPACTS:

Not applicable.

ENVIRONMENTAL COMPLIANCE:

Not applicable.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

Exhibit "A" – Research Projects Summary

Research Projects Summary Table

No.	Project Title	Project Description	IRWD Contact	Organizations Involved	Type of Research	IRWD Participation Resource	Start Date	Projected Completion Date
1	Lithium treatment in drinking water	The California Division of Drinking Water (DDW) is researching the removal of Lithium from drinking water sources. This research was spurred in response to the Unregulated Contaminant Monitoring Rule No. 5 (UCMR5) which included monitoring for Lithium. After reviewing the results of UCMR5, DDW has initiated a data gathering effort to determine if existing drinking water treatment systems also remove Lithium from drinking water. Specifically, DDW has requested, with assistance from IRWD, to monitor IRWD's IDP-PTP facility. IRWD is supporting this request.	Lori Rigby	California Division of Drinking Water, IRWD, and OCWD	Monitoring and data evaluation	Sample collection and analysis	Aug-26	Jul-27

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November 17, 2026
Prepared by: R. Huang
Submitted by: F. Nye / P. Weghorst
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

FINDINGS OF 2026 CLIMATE ADAPTATION PLAN

SUMMARY:

With the assistance of staff, Rincon Consulting has prepared Irvine Ranch Water District's 2026 Climate Adaptation Plan (CAP). The purpose of the CAP is to help IRWD understand potential climate change risks, prepare for potential effects on IRWD facilities, and prioritize actions while maintaining reliable services. At the meeting, staff will present an overview of the findings of the CAP.

BACKGROUND:

On November 11, 2024, the Board authorized Rincon to develop a CAP for IRWD. The plan includes a Climate Vulnerability Assessment that evaluates climate hazards, operational thresholds, vulnerabilities, and asset-specific risks across IRWD systems. The CAP also includes an energy management study, greenhouse gas emission forecasts, facility benchmarking, as well as solar array and battery energy storage evaluations. The 2026 CAP is provided as Exhibit "A" and the complete plan, with all appendices, is available on IRWD's website. Preparation of the plan is included as an item in the District's Strategic Planning Goals and Target Activities.

Climate Vulnerability Assessment:

The Climate Vulnerability Assessment identifies and quantifies the risk of climate change to IRWD facilities. Development of the assessment involved a series of staff workshops that defined IRWD-specific climate thresholds. Using a model developed for California's Fifth Climate Change Assessment, climate change projections were applied to the IRWD service area. The projections were based on 129 model simulations of four global warming levels that represent increases in temperature compared to the pre-industrial years of 1850 to 1900. The four warming levels are 0.8°C for the historic baseline; 1.5°C for near-term conditions; 2.0°C for mid-century planning; and 3.0°C for the late century forecasts. The climate projections evaluated climate hazard indicators mapped across the IRWD service area for:

- Drought;
- Extreme storms;
- Groundwater rise;
- Wildfire / Public Safety Power Shutoffs;
- Extreme heat; and
- Landslides and debris flow.

The climate projections were overlaid on IRWD asset-location maps to better understand IRWD climate change vulnerabilities. Staff workshops were convened to examine preliminary vulnerability findings across the following IRWD operational aspects:

- Water treatment and quality;
- Recycled water treatment and quality;
- Sewer collection system;
- Monitoring and control;
- Fleet and facilities; and
- Natural Treatment Systems.

The CAP provides an adaptive management strategy for IRWD to consider in preparing for climate change. Adaption actions to mitigate operational vulnerabilities to climate change were developed and ranked for each of the above operational systems. At the meeting, staff will present an overview of the methodologies, climate hazard findings, vulnerabilities, adaption actions, energy management opportunities, and implementation framework contained in the 2026 CAP. Staff's draft presentation is provided as Exhibit "B".

FISCAL IMPACTS:

Not applicable.

ENVIRONMENTAL COMPLIANCE:

This item is not a project as defined in the California Environmental Quality Act Code of Regulations, Title 14, Chapter 3, Section 15378.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

Exhibit "A" – Climate Adaptation Plan, November 2026
Exhibit "B" – Draft Presentation on Findings of the 2026 Climate Adaptation Plan

Irvine Ranch Water District



Climate Adaptation Plan
Irvine Ranch Water District

November 2026

Rincon Consultants
2060 Knoll Drive
Ventura, California 93003

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Appendix C Energy Optimization Measure Report and Energy Measure Selection Criteria
Appendix D Solar PV and Battery Energy Storage System Feasibility Analysis and Report
Appendix E Climate Action Legislative Driver Summary Report
Appendix F MAST Tool Summary Memo
Appendix G Complete List of Adaptation Actions

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Glossary

Adaptive Capacity: The ability of a system, facility, organization, or workforce to prepare for, respond to, and recover from climate-related impacts. Higher adaptive capacity generally reduces overall vulnerability.

Adaptive Management: A flexible decision-making approach that allows strategies, priorities, and actions to be adjusted over time as climate conditions, operational needs, monitoring data, and scientific understanding evolve.

Area of Analysis (AOA): The geographic area evaluated in the Climate Change Vulnerability Assessment (CVA), including both IRWD's service area and critical facilities or operational dependencies located outside IRWD boundaries.

Asset Management: The process of planning, operating, maintaining, replacing, and upgrading infrastructure to ensure long-term reliability, performance, and resilience.

Backup Power: Emergency power resources, such as generators and battery systems, that allow critical facilities and equipment to continue operating during utility outages or PSPS events.

Climate Adaptation: Actions taken to reduce vulnerability and increase resilience to current and future climate-related hazards, including drought, flooding, wildfire, extreme heat, groundwater rise, and landslides.

Climate Adaptation Plan (CAP): IRWD's long-term roadmap for addressing climate change while improving operational resilience, resource efficiency, sustainability, energy management, and service reliability.

Climate Change Vulnerability Assessment (CVA): A technical assessment that evaluates climate hazards, operational thresholds, vulnerabilities, and asset-specific risks across IRWD systems and serves as the foundation for the CAP.

Climate Mitigation: Actions taken to reduce or prevent greenhouse gas emissions, or to increase the removal of greenhouse gases from the atmosphere, in order to limit the magnitude of future climate change.

CMIP6 (Coupled Model Intercomparison Project Phase 6): A collection of global climate model simulations used to evaluate future climate conditions. The CVA used downscaled CMIP6 projections developed for California's Fifth Climate Change Assessment.

CoSMoS (Coastal Storm Modeling System): A modeling framework used to evaluate future sea level rise and groundwater rise conditions, including scenarios of approximately 0.8, 1.6, and 2.5 feet of sea level rise.

Compound Hazards: Multiple climate hazards or events that occur simultaneously or in sequence and create greater impacts than any single hazard acting alone, such as wildfire followed by heavy precipitation or extreme heat combined with power outages.

Drought: A prolonged period of below-normal precipitation that can reduce water availability, increase water quality challenges, and create operational impacts across water, wastewater, and recycled water systems.

Exposure: The degree to which facilities, assets, or systems are expected to experience climate hazards such as flooding, wildfire, groundwater rise, heat, or drought.

Extreme Heat: Periods of elevated temperatures and heatwaves that can affect worker safety, treatment operations, equipment performance, and energy demands.

Facility Thresholds: Operational conditions at which climate hazards begin to affect infrastructure performance, system reliability, workforce safety, regulatory compliance, or maintenance requirements.

Frequency Threshold: The frequency with which a climate hazard must occur before adaptation actions become warranted or necessary.

Global Warming Level (GWL): A framework that evaluates climate conditions based on increases in global average temperature rather than a specific year or emissions scenario. The CVA evaluated warming increments of approximately 0.8°C, 1.5°C, 2.0°C, and 3.0°C above historical temperatures.

Greenhouse Gases (GHGs): Gases in the atmosphere that trap heat and contribute to the Earth's greenhouse effect, leading to climate change. Major greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases such as hydrofluorocarbons (HFCs).

Groundwater Rise: An increase in groundwater elevations associated with sea level rise that may affect buried infrastructure, increase infiltration, accelerate corrosion, and create operational challenges before direct coastal flooding occurs.

Heavy Precipitation and Flooding: Intense or prolonged rainfall events that can increase inflow and infiltration, flood facilities, damage infrastructure, mobilize debris, and create operational disruptions.

Inflow and Infiltration (I&I): The entry of stormwater and groundwater into wastewater collection systems through manholes, cracks, joints, or other openings, increasing hydraulic loading and treatment demands.

Landslide and Debris Flow: Movement of soil, rock, sediment, and debris down steep slopes, often triggered by wildfire and intense rainfall, that can damage infrastructure, block access routes, and reduce system reliability.

MWRP (Michelson Water Recycling Plant): One of IRWD's primary recycled water treatment facilities and a key asset evaluated for flooding and groundwater rise vulnerabilities.

Natural Treatment System (NTS): Engineered or semi-natural facilities that use wetlands, vegetation, soils, sedimentation basins, and biological processes to improve water quality and manage urban runoff.

PSPS (Public Safety Power Shutoff): A planned utility power outage implemented to reduce wildfire risk during high-fire-weather conditions. PSPS events can affect treatment, pumping, communications, monitoring, and fleet operations.

SCADA (Supervisory Control and Data Acquisition): The communications and control infrastructure that provides real-time operational monitoring, data collection, automation, and remote control capabilities across IRWD facilities.

Sea Level Rise (SLR): An increase in ocean water levels resulting from climate change. Within the IRWD service area, sea level rise primarily contributes to groundwater rise rather than widespread direct inundation.

Severity Threshold: The magnitude, duration, or intensity of a climate hazard that is likely to cause operational disruption, infrastructure impacts, or increased costs.

SGMA (Sustainable Groundwater Management Act): California legislation focused on achieving long-term groundwater sustainability through planning, monitoring, and management of groundwater resources.

Shared Socioeconomic Pathway (SSP): A standardized future scenario used in climate modeling that combines assumptions about population growth, economic development, technology, and policy to estimate future greenhouse gas emissions and climate conditions. SSPs help planners evaluate how different social and economic futures may influence climate change impacts.

SPI (Standardized Precipitation Index): A drought indicator used in the CVA to evaluate short-term and long-term drought conditions using 24-month and 60-month precipitation records.

Vulnerability: The degree to which a system is susceptible to harm from climate hazards, based on exposure, sensitivity, and adaptive capacity. Vulnerabilities in the CVA were categorized as Low, Moderate, Moderate-High, or High.

Wildfire: A climate hazard that can directly damage facilities and infrastructure while also causing secondary impacts such as smoke, ash deposition, sediment mobilization, degraded water quality, and power outages.

Water Resilience: The ability of water, recycled water, sewer, and urban runoff treatment systems to continue providing reliable service despite climate-related stresses, disruptions, and changing environmental conditions.

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Executive Summary

The Climate Adaptation Plan (CAP or Plan) presents a comprehensive strategy for helping the Irvine Ranch Water District (IRWD) prepare for climate change while maintaining reliable water, recycled water, wastewater, and urban runoff treatment services. The CAP combines climate adaptation and energy management into a single planning framework that supports infrastructure resilience, operational reliability, greenhouse gas (GHG) reduction, and long-term sustainability.

IRWD serves approximately 181 square miles of Orange County and operates a diverse portfolio of water, recycled water, wastewater, monitoring and control, and natural treatment assets. The CAP recognizes that climate change will affect not only water resources but also treatment processes, infrastructure performance, energy use, workforce safety, emergency response capabilities, and long-term capital planning. The Plan was developed using several technical analyses including a Climate Vulnerability Assessment (CVA), greenhouse gas forecasting analyses, energy optimization studies, and renewable energy evaluations. Additionally, the Plan was informed by IRWD internal expertise provided through three adaptation planning workshops involving operational, engineering, maintenance, safety and management staff.

181
Square miles of Orange County served

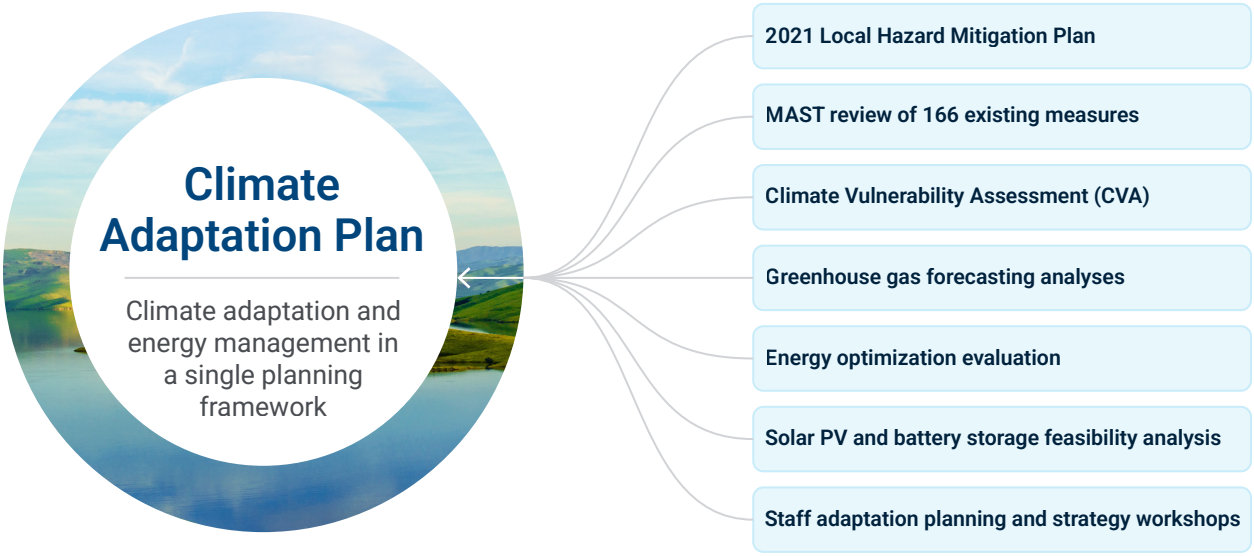
166
Measures, policies, and programs identified

6
Climate hazards evaluated

6
Interconnected operational systems

3
Staff adaptation planning workshops

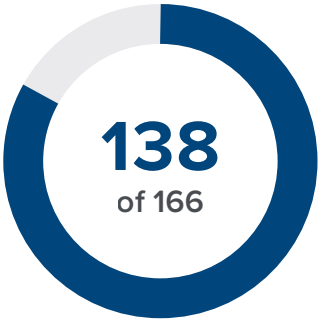
One Plan, Built From Several Inputs



Background and Measure Analysis and Success Tracking Tool

The CAP process began with a detailed analysis of IRWD's policies, programs, and actions related to existing climate adaptation, energy, and climate management strategies using input from IRWD staff collected via Rincon's Measure Analysis and Success Tracking (MAST) Tool. The MAST tool was used to evaluate IRWD's achievements and challenges in implementing adopted plans and identify lessons learned to incorporate into the CAP.

A total of 166 measures, policies, and programs were identified for assessment using the MAST tool, spanning topics such as water supply reliability, water quality, flood and drought management, seismic hazards, energy efficiency, battery storage, and greenhouse gas (GHG) reduction. The results of the analysis showed that a majority of IRWD's programs focused on operations, energy, and infrastructure, but relatively few policies focused on adaptation and climate hazards. Furthermore, IRWD has a strong history of implementation, with a majority (138 of 166) of projects having been completed or ongoing. The full MAST tool result can be found in Appendix F.



138 of 166 existing measures, policies and programs (83%) are completed or ongoing

IRWD has a strong implementation record. Most programs focus on operations, energy and infrastructure; relatively few address adaptation and climate hazards.

- Water supply reliability
- Water quality
- Flood & drought
- Seismic hazards
- Battery storage
- GHG reduction

Climate Hazards Facing IRWD

The CVA evaluated six primary climate hazards expected to affect IRWD operations during the coming decades. The hazards were identified by leveraging several existing documents including the 2021 Local Hazard Mitigation Plan. The primary hazards identified include:



Drought

More frequent short- and long-duration droughts

Lower reservoir inflows; more algae, thermal stratification, ammonia and BOD; concentrated wastewater flows.

MOST EXPOSED

Reservoirs, groundwater operations, treatment

Wildfire

Rising fire risk and power shutoffs, especially in the northeast

Ash, sediment and degraded source water; power outages and access limits that last long after the flames.

MOST EXPOSED

Irvine Lake, Syphon Reservoir

Heavy Precipitation & Flooding

Similar annual totals, more intense back-to-back storms

Flooding, treatment plant overloading, inflow and infiltration, erosion and infrastructure damage.

MOST EXPOSED

MWRP, low-lying sewers, reservoir systems

Extreme Heat

More heatwaves and warmer nights

Worker heat stress; strain on electronics, pumps and treatment processes; higher energy demand.

MOST EXPOSED

Baker Water Treatment Plant, Los Alisos WRP

Sea-Level & Groundwater Rise

Gradual but growing groundwater rise

Corrosion, infiltration, dewatering challenges and damage to buried utilities.

MOST EXPOSED

MWRP, Biosolids & Energy Recovery Facility, San Diego Creek

Landslides & Debris Flows

Fire plus heavy rain raises debris-flow risk

Threats to pipelines, reservoirs, natural treatment systems and access roads; post-fire sediment and debris.

MOST EXPOSED

Canyon and foothill areas

Combination Effects

Climate risks will increasingly occur as compound events, such as wildfire followed by intense rainfall or extreme heat occurring during power outages, creating operational challenges greater than the sum of individual hazards.



Drought

Climate projections indicate increasing frequencies of both short-duration and long-duration droughts throughout the watershed. Although IRWD benefits from a highly diversified water portfolio, prolonged droughts are expected to affect reservoir inflows, groundwater operations, water quality, and treatment processes. Drought conditions may increase algae growth, thermal stratification, ammonia concentrations, and biochemical oxygen demand (BOD), requiring additional monitoring and treatment. Droughts are also expected to affect wastewater systems through more concentrated flows, increased odors, corrosion, and operational complexity.



Wildfire

Wildfire conditions and Public Safety Power Shutoff (PSPS)-related outages are projected to increase, particularly in the northeastern portion of the IRWD service area. Beyond direct fire damage, wildfire creates risks through ash deposition, sediment loading, degraded source-water quality, power outages, and access limitations. Historical events, including the Santiago Fire, demonstrated how wildfire impacts can affect critical facilities such as Irvine Lake and Syphon Reservoir long after flames are extinguished.



Heavy Precipitation and Flooding

Although annual rainfall totals may remain similar, future storms are expected to become more intense and occur in larger clusters. Climate modeling indicates that back-to-back extreme storms will become increasingly common, increasing risks of flooding, treatment plant overloading, inflow and infiltration, erosion, and infrastructure damage. Facilities such as the Michelson Water Recycling Plant (MWRP), low-lying sewer infrastructure, and reservoir systems face elevated risks under these conditions.



Extreme Heat

The IRWD service area is projected to experience more frequent heatwaves, warmer nights, and increasing heat stress conditions. Elevated temperatures may affect worker safety, electronics, treatment processes, pumps, and energy demands. Some facilities, including Baker Water Treatment Plant and Los Alisos Water Recycling Plant, may experience more significant future temperature increases.



Sea-Level Rise and Groundwater Rise

Rising groundwater levels around MWRP, the Biosolids and Energy Recovery Facility, San Diego Creek, and adjacent infrastructure may increase corrosion, infiltration, dewatering challenges, and damage to buried utilities. These impacts are expected to occur gradually but become increasingly significant over time. Tidal inundation, coastal erosion and coastal flooding are not expected to directly impact IRWD's service area.



Landslides and Debris Flows

Wildfire and intense rainfall are expected to increase the likelihood of landslides and debris flows throughout canyon and foothill areas. These hazards could threaten pipelines, treatment facilities, reservoirs, natural treatment systems, and critical access roads. Post-fire sediment and debris accumulation also pose substantial water quality and maintenance challenges.

Where Climate Hazards Affect IRWD Service Areas and Facilities

The figure below summarizes where each climate hazard is expected to affect IRWD service areas and facilities, from the coastal plain and San Diego Creek corridor to the canyons and foothills in the northeast.



Drought

Reduced water availability, concentration of pollutants and increased treatment demands, odors, corrosion, and maintenance needs District-wide.

Wildfire

Damaged infrastructure, interrupted power and monitoring, restricted access, and ash in water supplies; highest exposure in the northeast, Silverado, Williams, and Modjeska Canyons, Irvine Lake, and Syphon Reservoir.

Heavy Precipitation & Flooding

Increased inflow, overwhelmed sewer and treatment capacity, restricted access, and overtopping, especially at MWRP, low-lying sewers and lift stations, Los Alisos WRP, and Sand Canyon and San Joaquin Reservoirs.

Extreme Heat

Reduced equipment efficiency, stress on pumps, electronics, and treatment processes, and unsafe working conditions, with the highest temperatures near Baker Water Treatment Plant and Los Alisos WRP.

Sea-Level Rise & Groundwater Rise

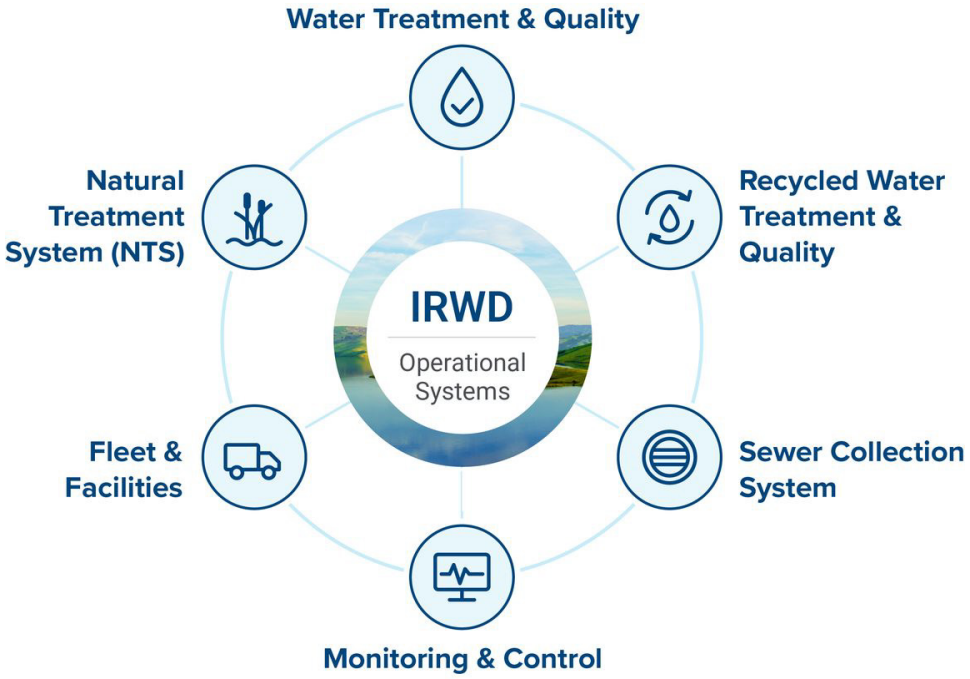
More infiltration, corrosion, and hydrostatic pressure on buried infrastructure, wells, pump stations, and pipelines, with the greatest exposure around MWRP and low-lying assets near San Diego Creek.

Landslides & Debris Flows

Restricted access or damage to pipelines, manholes, siphons, pump stations, natural treatment systems, and roads, especially in Silverado Canyon and other canyon and foothill areas.

Operational Structure and Climate Threshold Development

To evaluate climate impacts in a way that reflects daily operations, IRWD's assets were grouped into six interconnected systems:



For each operational system, IRWD reviewed operational procedures and infrastructure specifications to develop a set of thresholds beyond which a climate hazard would begin to have meaningful impacts on IRWD's ability to operate effectively. Thresholds were developed based on historical events and real-world data whenever possible.



Primary Operational Vulnerabilities

Using the identified climate thresholds as a reference point, IRWD utilized regionally-specific climate data from California's 5th Climate Assessment to identify when and how often thresholds would be crossed under future climate conditions. Across IRWD's operational systems, several recurring vulnerabilities emerged:

01 **Increasing treatment complexity associated with drought, wildfire, sediment, and degraded water quality.** More frequent droughts, wildfire impacts, and intense storm events are expected to degrade source water quality through increased algal activity, elevated ammonia and BOD, higher turbidity, sediment loading, nutrient inputs, and thermal stratification. These conditions can increase treatment complexity, chemical usage, operational costs, and reliance on monitoring and treatment infrastructure across both potable and recycled water systems.

02 **Greater exposure of wastewater and recycled water facilities to flooding, groundwater rise, and inflow and infiltration.** Extreme precipitation events are projected to increase hydraulic loading, inflow and infiltration, and flood risks across collection systems and treatment facilities, while sea-level rise-induced groundwater rise may increase corrosion, infiltration, dewatering demands, and maintenance requirements. Facilities such as the MWRP and infrastructure within the San Diego Creek corridor face particularly elevated risks from these conditions.

03 **Increased reliance on backup power, emergency communications, and operational redundancy during wildfireand PSPS events.** Climate projections indicate increasing wildfire potential and more frequent PSPS events, which could disrupt treatment processes, pumping operations, telemetry, Supervisory Control and Data Acquisition (SCADA) systems, and facility access. Maintaining reliable backup power, fuel supplies, communications systems, and operational flexibility will become increasingly important to ensure continuity of service during emergency conditions.

04 **Higher risks to workforce safety, facility operations, and equipment reliability from extreme heat.** More frequent heatwaves, warmer nighttime temperatures, and increasing heat index conditions are expected to affect employee safety, reduce opportunities for recovery during prolonged heat events, increase cooling demands, and place additional stress on pumps, electronics, communications equipment, and treatment infrastructure. Facilities without adequate climate control may experience reduced operational efficiency and increased maintenance requirements.

05 **Greater operational challenges posed by landslides, debris flows, erosion, and access disruptions.** Wildfire followed by intense precipitation increases the potential for landslides, debris flows, and sediment mobilization that can damage pipelines, reservoirs, the natural treatment system, and access roads. These hazards may reduce treatment performance, restrict access to critical facilities, delay emergency response, and increase maintenance and recovery costs, particularly in canyon, foothill, and burn-affected watersheds.

06 **Increasing maintenance demands associated with aging infrastructure exposed to climate stressors.** Climate-driven increases in flooding, groundwater rise, sediment accumulation, corrosion, heat exposure, and hydraulic loading are expected to accelerate wear on existing infrastructure and increase inspections, cleaning, rehabilitation, and replacement needs. Older sewer systems, lift stations, buried utilities, electrical systems, and facilities located in hazard-prone areas are expected to require additional investments to maintain long-term reliability and performance.

Adaptation Strategy Development

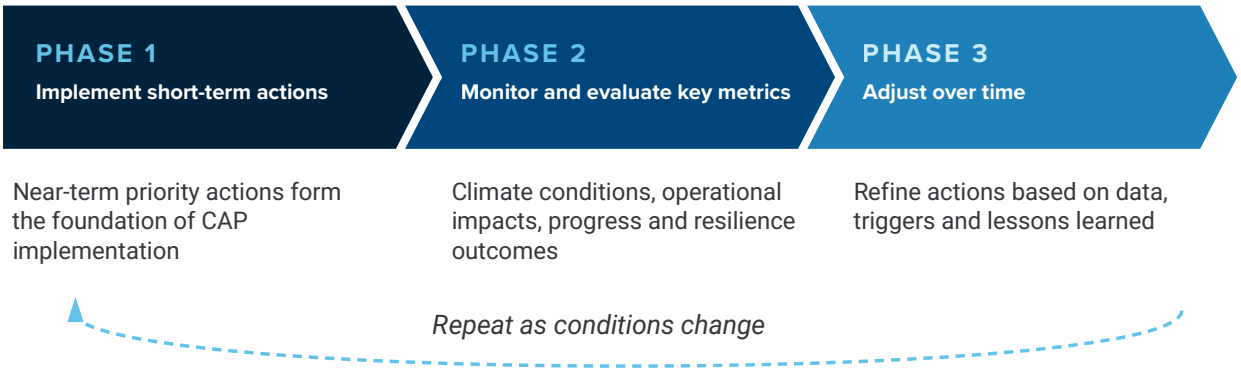
Once the primary vulnerabilities were identified, several workshops were held with IRWD staff to develop a suite of strategies that would allow IRWD to better adapt to climate change. IRWD staff utilized assessment criteria to rank actions based on key features including operational feasibility, cost and funding viability, resilience benefit, and others. Based on this overall score as well as other considerations such as overall project costs and whether the action was foundational to future high-priority actions, the phasing for project implementation was also identified. Project phasing was defined as:



Section 4 provides a summary of the actions developed for each operational system. A complete list of the actions developed for the CAP can be found in Appendix G. Section 6 of the CAP, however, provides a more focused short-term implementation plan organized around the concept of adaptive management.

While the CMIP6 data used for analyzing future climate hazards associated with IRWD's facilities is the best data set currently available, modeling climate impacts over decades remains a challenge. Uncertainty is introduced both through the climate data which has a wide range of potential outcomes driven by the efficacy of global mitigation efforts, positive feedback loops, and the overall complexity of climate patterns as well as changes in technology, and the actual, rather than perceived, adaptive capacity of existing infrastructure and operations.

To manage this uncertainty, this plan focuses on an adaptive management approach. Adaptive management acknowledges uncertainty is unavoidable, promotes transparency through ongoing data collection and analysis, establishes triggers to initiate deployment of appropriate adaptation strategies, and establishes a adjustment process based on outcomes and changing conditions. The CAP Implementation Framework (Section 6) highlights three phases which includes implementation of the short-term actions, monitoring and evaluation of key metrics, and adjustments made over time based on feedback from data collection and lessons learned. The near-term implementation program, an initial list of high-priority actions that will form the foundation of IRWD's implementation strategy for the CAP, is shown below by specific IRWD system (as well as District-Wide) and implementation phase.



Near-Term Implementation Program: High-Priority Actions

High-priority actions are listed below by IRWD system (and District-wide) with their implementation phase.

Water Treatment and Quality	Implementation Phase
Improve demand management and water use efficiency to improve source reliability during low-flow periods.	Ongoing
Develop climate-informed drought forecasting tools integrating imported supply reliability, groundwater availability, and recycled water demand projections.	Short Term
Enhance monitoring, forecasting, and operational response protocols for harmful algal blooms and cyanotoxins through monitoring, predictive tools, treatment optimization, and reservoir management strategies.	Short Term
Integrate climate change impacts into future urban water management plans.	Ongoing
Coordinate water banking and imported water reliability planning with Kern Fan groundwater storage partnerships to improve long-term drought supply resilience.	Short Term
Develop a post-fire sediment interception, watershed stabilization for Syphon Reservoir.	Short Term
Expand ongoing collaborations with fire fighting entities to understand and plan for wildfire fighting water needs in preparation for larger and more frequent wildfires in and around IRWD territory.	Ongoing
Continue to build or retrofit intake pretreatment systems, including the San Joaquin Reservoir Filtration Facility project to improve resilience to post-fire turbidity, nutrient loading, and degraded source water quality.	Ongoing
Evaluate the impacts of wildfire ash, sediment, turbidity, and nutrient loading on Irvine Lake, Syphon Reservoir, and treatment operations, and develop monitoring, operational, treatment, and infrastructure response measures.	Short Term
Coordinate with Edison to identify areas outside of the high wildfire zones that could be impacted by PSPS events.	Short Term
Continue to increase onsite fuel storage, portable generators, and mobile charging systems to maintain operations during PSPS events.	Ongoing
Develop a plan to conduct site walks periodically with firefighters at facilities located within the high fire zone and implement vegetation clearing and/or infrastructure hardening. Locations include pumps and reservoirs in and around Williams Canyon, Santiago Canyon, Orchard Hills, Manning Pump Station, and Los Trancos Canyon.	Short Term
Ensure each facility in and around high wildfire areas have backup power sufficient for 3 days.	Ongoing
Incorporate automated debris screening and sediment management infrastructure into Sand Canyon and San Joaquin Reservoir improvement projects and upland areas.	Ongoing
Formalize a regular spillway review and repair process prior to each winter season.	Ongoing
Evaluate reservoir projects for opportunities to increase capacity to capture additional precipitation while leaving capacity to limit releases.	Ongoing
Include extreme heat of temperatures over 105F as a design specification when designing new buildings or procuring new equipment.	Short Term

Water Treatment and Quality (continued)	Implementation Phase
Continue to track impacts of extreme heat to surface water reservoirs and evaluate cost/benefit of mitigation devices such as mechanical mixing, floating covers or solar.	Short Term
Work with regional land managers to develop and deploy post fire replanting and other stabilization approaches in landslide risk areas.	Short Term
Prepare for pipeline shutoff and repair in areas vulnerable to landslides, including but not limited to Silverado Canyon pipelines, by advancing landslide response plans.	Ongoing
Develop debris clearance protocols, contractor agreements, and emergency response procedures to rapidly restore facility access after landslides.	Short Term
Identify and establish alternative access routes, easements, and staging areas for facilities vulnerable to landslide-related road closures.	Short Term
Identify site stability models to utilize after wildfires in areas holding underground infrastructure like water pipes.	Short Term

Recycled Water Treatment and Quality	Implementation Phase
Develop protocols for discharging stormwater and bypassing treatment facilities with consideration for creeks already at full capacity.	Ongoing
Upgrade electrical and mechanical systems above flood levels, included in the EPA adaptation strategies.	Planned
Monitor floodwall performance and incorporate flood hardening, drainage upgrades, and wet-weather equalization improvements into planned Michelson Water Recycling Plant facility upgrades.	Short Term
Evaluate San Joaquin Marsh and San Diego Creek Pump Stations for sea-level induced groundwater rise impacts and capacity increase needs.	Short Term
Evaluate dewatering permitting constraints and discharge requirements as dewatering activities increase.	Short Term
Establish odor and corrosion trigger thresholds to initiate operational responses when low-flow conditions persist beyond defined limits.	Short Term
Implement formal condition assessments and monitoring programs to identify corrosion risks and establish proactive maintenance thresholds.	Short Term
Incorporate future climate conditions and operational stressors into design criteria for facility rehabilitation and upgrade projects.	Planned

Sewer Collection System	Implementation Phase
Audit sewer system to identify leaks which occur during large storms and flooding. Install sewer/stormwater monitoring equipment in key areas as a pilot project to identify potential leaks.	Planned
Coordinate conservation-related flow reduction planning to minimize impacts on conveyance operations.	Short Term
Expand inspection and monitoring of aging, corroding sewer lines vulnerable to cracking and releasing odors under dry soil conditions.	Ongoing

Sewer Collection System (continued)	Implementation Phase
Adjust sewer cleaning and flushing schedules in low-flow areas vulnerable to sediment buildup during drought.	Short Term
Utilize pump station cycling optimization and wet-well redesign to maintain turnover during low flow.	Short Term
Collaborate with partners (firefighters) to establish defensible space/fire safe practices at University and Bayview Lift Stations to maintain operational visibility during outages.	Short Term
Develop flooding continuity plans for University Lift Station and Bayview Lift Station including mobile generators, fuel staging, and emergency staffing assignments.	Ongoing
Incorporate creek crossing stabilization and scour protection into future sewer capital replacement projects. Raise or seal manholes in flood-prone areas.	Ongoing
Expand upon proposed lift station replacement projects to include climate-adjusted hydraulic capacity and flood protection standards.	Ongoing
Replace manhole covers and small leaks before they create infiltration challenges.	Short Term
Include system design specifications associated with 105F degree days in future equipment procurement guidelines.	Short Term
Increase inspection frequency of motor and other overheating equipment during heat events.	Short Term
Expand shaded staging and cooling areas for sewer maintenance crews.	Short Term
Upgrade pump motors, electrical systems, and telemetry equipment to operate reliably during sustained high temperatures by incorporating ventilation and cooling.	Ongoing
Work with regional land managers to develop and deploy post fire replanting and other stabilization approaches in landslide risk areas.	Short Term

Monitoring and Control	Implementation Phase
Expand systems already in place to manage smoke and ash monitoring.	Ongoing
Continue to develop procedures and operational triggers tied to PSPS notifications, wildfire proximity, and reservoir water quality degradation.	Ongoing
Consider expanding battery backup systems for key control systems.	Short Term
Expand proposed Radio Tower Improvements to support hardened emergency communications, redundant telemetry, and backup power during PSPS and wildfire conditions.	Ongoing
Maintain and enforce procurement specifications requiring equipment to passively withstand temperatures up to 50°C without performance degradation or additional cooling requirements.	Ongoing

Fleet and Facilities	Implementation Phase
Expand vegetation management and emergency access maintenance around facilities in very high wildfire hazard severity zones to improve emergency vehicle access.	Ongoing
Determine protocols for evacuation from remote facilities during wildfire events. Define when vehicles can re-enter areas post wildfire.	Short Term
Implement heat-health protocols that provide scheduled cooling breaks and designated air-conditioned refuge locations for field crews.	Short Term
Pre-position debris removal equipment and emergency repair materials ahead of major storm events.	Short Term
Identify alternative emergency access routes to facilities vulnerable to slope failure and debris blockage.	Short Term
Develop standing emergency contractor agreements and streamlined procurement processes to reduce permitting and contracting delays during emergency response.	Short Term
Complete expansion of Charge-ready program at IRWD headquarters and MWRP.	Ongoing
Ensure EV charging infrastructure is located in areas not affected by flooding/groundwater rise.	Short Term

Natural Treatment System (NTS)	Implementation Phase
Establish facility-specific post-wildfire response protocols, including rapid sediment removal, revegetation, intake protection, and first-flush storm preparedness measures to reduce erosion and protect treatment infrastructure.	Short Term
Develop operational and infrastructure measures to temporarily divert high-flow floodwaters and manage extreme runoff conditions, reducing damage to NTS facilities and preserving treatment performance during major storm events.	Ongoing
Implement well-specific salinity monitoring and threshold-based management protocols to protect dewatering systems from saltwater intrusion impacts.	Short Term
Establish streamlined permitting pathways and pre-approved environmental compliance procedures to accelerate NTS maintenance and emergency response.	Short Term

District-Wide	Implementation Phase
Establish a standardized “After Action Report” program following wildfire, flood, PSPS, drought, and water quality emergencies to document operational lessons learned, effective response measures, resource limitations, and infrastructure gaps.	Short Term
Formalize cross-training and staffing surge plans for treatment plants, lift stations, and operations centers to maintain coverage when access, commuting, or staffing availability is constrained by PSPS, wildfire, flooding, or extreme heat.	Short Term
Develop a project-level climate resilience screening checklist requiring evaluation of future flood risk, wildfire exposure, groundwater/sea level rise, extreme heat, and backup power needs for all major CIP projects and facility upgrades.	Short Term
Conduct multi-hazard emergency exercises simulating compound events such as wildfire followed by debris flows, or PSPS outages occurring during extreme heat events.	Ongoing

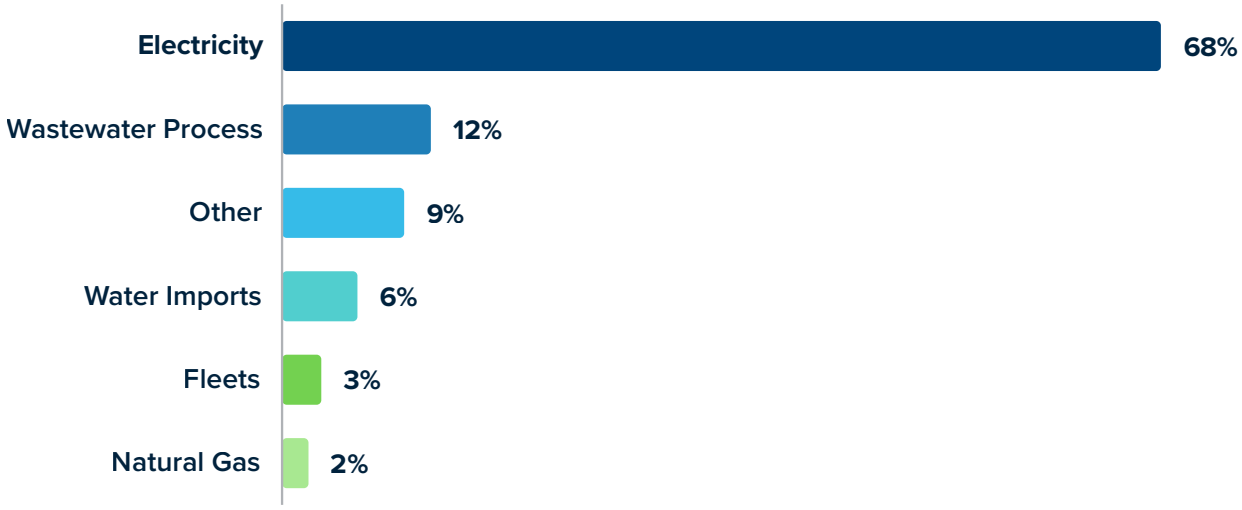
District-Wide (continued)	Implementation Phase
Establish emergency procurement agreements and pre-positioned contracts for fuel delivery, generators, debris removal, treatment chemicals, and emergency repair services during regional hazard events and PSPS outages.	Short Term
Coordinate with Metropolitan and MWDOC on drought planning and water resources management.	Ongoing
Expand coordination with local jurisdictions to increase the amount of stormwater infiltration projects in the IRWD watershed to reduce the impacts of heavy precipitation on infrastructure.	Short Term
Coordinate with firefighters/calFire to audit facilities/equipment in high wildfire risk zones to increase resilience through vegetation management and building hardening.	Short Term
Maintain partnership with local and regional agencies to develop mutual aid agreements for standby power (e.g., Regional Standby Generator Fleet through Emergency Response Network of the Inland Empire (ERNIE)).	Ongoing
Consolidate and share temperature, groundwater pumping, and drought-related operational data across departments to identify trends, evaluate climate impacts, and inform adaptive management strategies across IRWD systems.	Planned
Specify fire resistant design and materials for all facilities located in high wildfire zones.	Short Term
Expand redundant communications and power systems to maintain operational coordination during PSPS events, flooding, and wildfire emergencies.	Ongoing



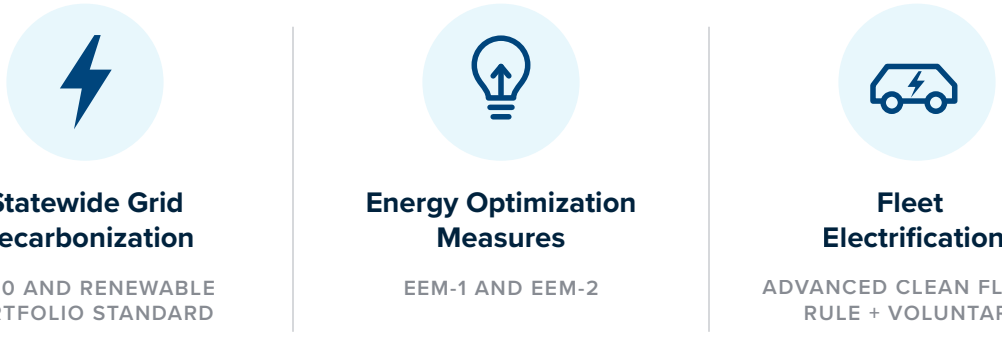
Greenhouse Gas Emissions and Energy Management

The adaptation and resilience strategies are complemented by an energy management strategy focused on reducing operational emissions while maintaining system reliability and cost effectiveness. Historical inventories show that electricity consumption associated with pumping and treatment represents IRWD's largest source of greenhouse gas emissions as shown in Figure 1. Additional emissions result from wastewater treatment processes, imported water, vehicle fleets, natural gas use, and biosolids management. Under a Business-as-Usual (BAU) scenario, emissions are projected to increase from approximately 41,100 metric tons of carbon dioxide equivalent (MT CO_2e) in 2023 to approximately 55,900 MT CO_2e by 2045 due to population growth, increasing water demands, and facility expansions.

Figure 1 2023 IRWD GHG Emissions by Source



To better understand the opportunities available to IRWD to reduce energy consumption, improve cost effectiveness, and ultimately decrease GHG emissions several detailed analyses were conducted. These analyses include a complete facility benchmarking process, development of several energy optimization studies, and a distributed energy resources (solar PV and battery energy storage system or BESS) analysis.



Energy Optimization Measure Evaluation Summary

Recognizing that electricity consumption is the largest source of greenhouse gas emissions across IRWD operations, Willdan completed a comprehensive energy optimization evaluation to identify opportunities to reduce energy use, lower emissions, improve cost effectiveness, and enhance operational resilience. The evaluation included facility benchmarking, site visits to major energy users, and analyses of solar photovoltaic (PV) and battery energy storage system (BESS) opportunities.

Facility Benchmarking. Energy benchmarking was conducted across IRWD's major treatment, pumping, and groundwater facilities by comparing facility energy intensity (kWh per million gallons treated, produced, or conveyed) against industry benchmarks developed from literature, prior studies, and engineering calculations. Results showed that a large share of IRWD's electricity consumption is concentrated at a relatively small number of facilities, particularly the Michelson Water Recycling Plant, Baker Water Treatment Plant, Deep Aquifer Treatment System (DATS), and Los Alisos Water Reclamation Plant. While these facilities account for substantial energy use, benchmarking found that many are already operating near the most efficient end of expected performance ranges. This suggests that significant emissions reductions through traditional operational efficiency improvements may be limited.

Site Assessments. Detailed site visits were conducted at several of IRWD's highest energy-consuming facilities, including Michelson Water Recycling Plant, DATS, Wells 21/22 Treatment Facility, Baker Water Treatment Plant, Rattlesnake Reservoir, and Zone A Pump Station. Findings from these visits informed the development of energy Rattlesnake Reservoir, and Zone A Pump Station. Findings from these visits informed the development of energy optimization projects to support energy savings and GHG reductions.

Energy Optimization Measures. Based on data from the facility benchmarking and site assessments, several energy optimization measures were developed. These measures were analyzed against several criteria includingfeasibility, cost effectiveness, resilience, and GHG reduction benefits. Three projects including hydro turbines at Baker Water Treatment Plant, a Mainspring linear Generator at Michelson Water Treatment Plant, and battery energy storage to slowly shut down well pumps during sudden power outages were identified as high scoring projects.

Hydro Turbines
Baker Water Treatment Plant

Mainspring Linear Generator
Michelson Water Recycling Plant

Battery Storage
Controlled well-pump shutdown during sudden power outages



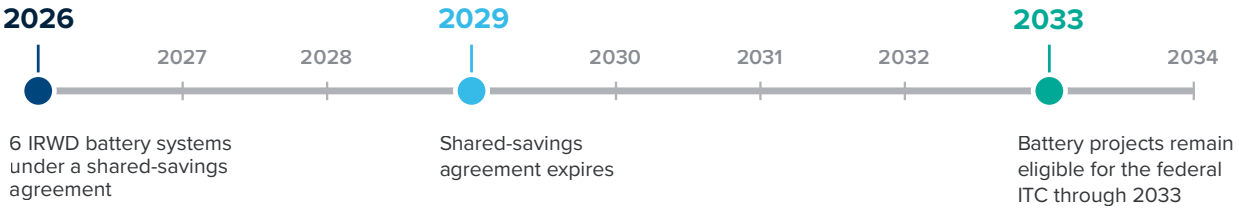
Solar PV and BESS Feasibility Analysis

Existing Battery Storage Systems. IRWD currently hosts six battery energy storage systems under a shared-savings agreement that expires in 2029. Four potential post-contract scenarios were evaluated, including system retirement, agreement extension, system buyout, and replacement with new battery systems. The analysis concluded that replacing the existing systems while leveraging the existing electrical infrastructure represents the most practical long-term strategy. This approach would allow IRWD to update system sizing and controls, avoid demolition costs, capitalize on new technologies, and maintain flexibility in selecting future service providers.

Future Solar and Battery Opportunities. Additional analyses evaluated new PV and BESS installations at Rattlesnake Reservoir, Michelson Water Recycling Plant, Zone A North Reservoir 3, and Baker Water Treatment Plant. Modeling demonstrated that solar and battery systems can help reduce utility costs by offsetting energy demand during periods of peak pricing while also providing resilience benefits during power outages and Public Safety Power Shutoff events. However, recent federal policy changes eliminated the 30% Investment Tax Credit (ITC) for most new solar projects not already underway, reducing overall project cost effectiveness. Battery storage projects remain eligible for the ITC through 2033, creating a more favorable incentive landscape for future BESS investments.

Battery storage projects may provide additional operational and resilience benefits but should be pursued strategically based on site-specific operational needs, load profiles, and available incentives. While current project economics generally did not meet IRWD's typical payback expectations, future changes in incentive programs, utility rate structures, or demand-response opportunities could improve project viability and justify phased implementation of distributed energy resources across the IRWD system.

BATTERY STORAGE OUTLOOK



SITES EVALUATED FOR NEW SOLAR + BATTERY STORAGE

Rattlesnake Reservoir | Michelson WRP | Zone A North Reservoir 3 | Baker WTP



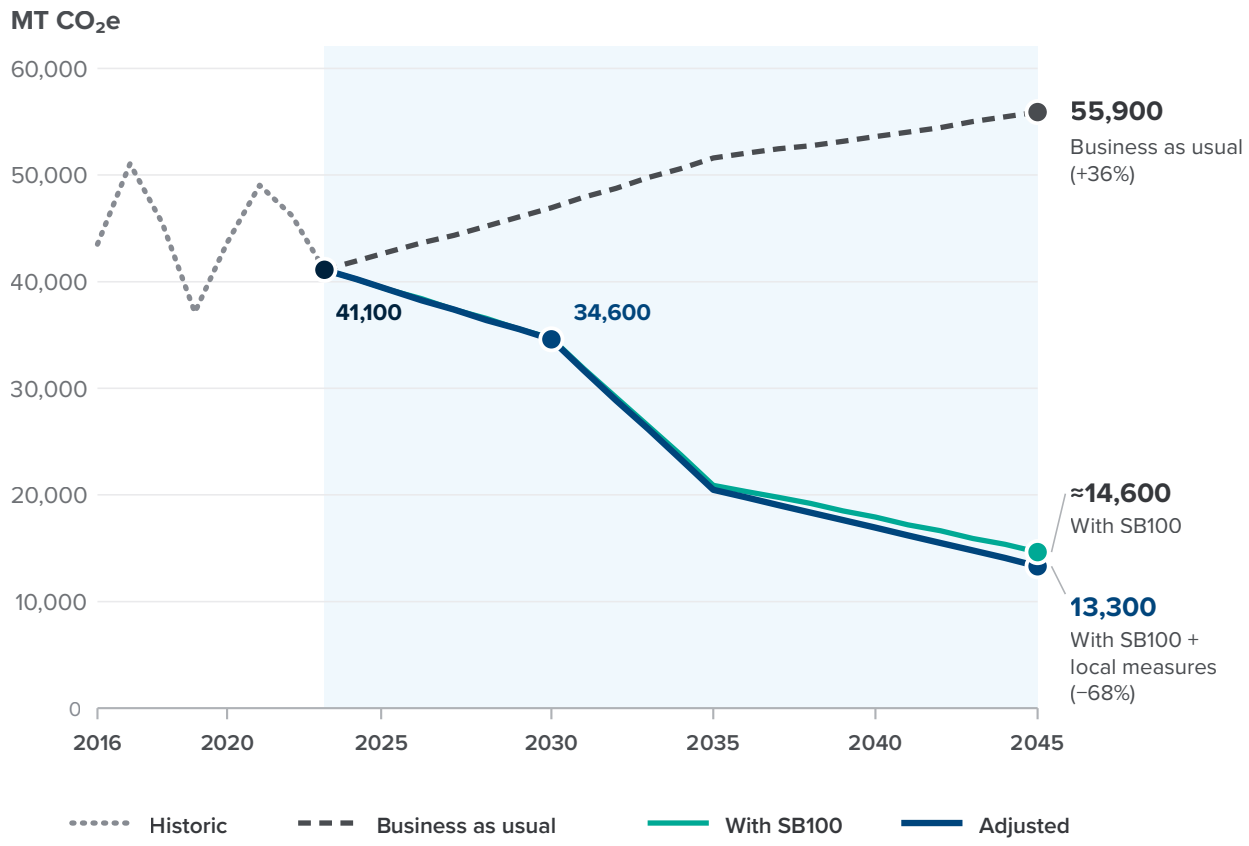
Adjusted GHG Emissions Forecast

While the BAU forecast shows emissions increasing over time as IRWD serves new homes and businesses, several factors could contribute to lowering future emissions. Primarily, existing State legislation is expected to reduce GHG emissions associated with IRWD's operations. California's Renewable Portfolio Standard and statewide grid decarbonization (SB100) will have a meaningful effect on IRWD's emissions profile since a majority of IRWD operations are powered by electricity. After accounting for SB100, IRWD emissions are expected to decrease by 61% by 2045 compared to 2023 levels.

Additional GHG emissions reductions from Energy Optimization Measures EEM-1 and EEM-2 and ongoing fleet electrification (due to the Advanced Clean Fleets rule and voluntary electrification) will further reduce IRWD emissions.

When incorporating these actions into a legislative-adjusted forecast, emissions are projected to decline from approximately 41,100 MT CO_2e in 2023 to approximately 34,600 MT CO_2e by 2030 and approximately 13,300 MT CO_2e by 2045, representing a 68 percent reduction relative to current conditions as shown in Figure 2. These reductions are driven primarily by California's transition toward carbon-free electricity, supplemented by local energy projects and fleet modernization efforts.

Figure 2 Legislative Adjusted Greenhouse Gas Emissions Forecast



Next Steps for Implementation

The CAP demonstrates that climate change presents both near-term and long-term challenges for IRWD's infrastructure, operations, workforce, and energy management programs. While IRWD already benefits from strong adaptive capacity, diversified water supplies, operational redundancy, and robust emergency response capabilities, future conditions are expected to place increasing pressure on many critical systems. Recognizing the uncertainty inherent in future climate conditions, the CAP emphasizes a flexible, data-driven implementation approach that integrates climate resilience into existing planning processes, asset management, capital improvement, operations, and equipment replacement processes. Through ongoing monitoring of climate indicators, infrastructure performance, operational impacts, and workforce considerations, IRWD can adaptively refine priorities, identify emerging risks, and make informed investment decisions as conditions evolve.

Key next steps include:

1. Develop an Implementation Program that identifies responsible departments, implementation schedules, and funding needs for the identified priority actions, while tracking both new and ongoing adaptation efforts.
2. Advance near-term resilience actions that can be incorporated into existing maintenance activities, equipment replacement cycles, capital projects, and operational procedures to provide immediate benefits.
3. Incorporate climate projections into future planning and design decisions, ensuring new infrastructure, facilities, and equipment are evaluated against projected climate conditions over their expected service life.
4. Conduct targeted analyses of high-risk facilities and systems to refine longer term adaptation strategies, evaluate costs and benefits, and identify investments needed to address IRWD's most vulnerable assets.
5. Implement the identified Monitoring Program to track climate conditions, operational impacts, implementation progress, and resilience outcomes using measurable indicators and performance metrics.
6. Use trigger-based decision making to guide future investments, allowing adaptation actions to be implemented when predefined climate, operational, or asset-performance thresholds are reached.
7. Pursue funding and financing opportunities and align future grant applications, capital investments, and partnership opportunities with identified adaptation priorities.
8. Update and maintain facility energy benchmarking to track energy performance over time and identify emerging opportunities for operational improvements as facilities, equipment, and treatment demands evolve.
9. Integrate selected energy optimization into capital planning and asset replacement programs, ensuring energy efficiency, demand management, and GHG reduction opportunities are considered during major equipment upgrades and facility improvements.
10. Develop a distributed energy resource roadmap that identifies priority solar PV and battery energy storage projects, implementation timing, funding needs, and decision points based on changing economics and utility programs.
11. Prepare for replacement of IRWD's existing battery energy storage systems following expiration of the current agreement in 2029, including evaluation of ownership structures, operational models, and available incentive programs.
12. Monitor changes in utility rates, demand response programs, and federal and state incentives that could significantly improve the cost-effectiveness of future solar PV and battery storage investments.

This adaptive management framework provides IRWD with a structured process for implementing priority actions today while maintaining the flexibility to respond to evolving climate risks and future uncertainties.

1 Introduction

1.1 Purpose

The purpose of the Climate Adaptation Plan (CAP) is to provide Irvine Ranch Water District (IRWD) with a comprehensive roadmap for responding to climate change while advancing operational resilience, resource efficiency, cost-effective energy efficiency and renewable energy initiatives, emissions reductions, and long-term service reliability. Building upon IRWD's longstanding commitment to innovation in water resource management, the CAP evaluates how climate change may affect IRWD's infrastructure, operations, workforce, and planning processes and identifies practical strategies to reduce risk, improve adaptive capacity, and support informed decision-making over time.

California is already experiencing significant climate change impacts that are affecting public health, water resources, infrastructure, ecosystems, and the economy. Rising temperatures are increasing the frequency and severity of extreme heat events, while more intense droughts, wildfires, flooding, and sea level rise are placing growing stress on communities, transportation networks, agricultural systems, and critical water infrastructure across the state. California's climate assessments project continued increases in heat, more variable precipitation patterns, declining snowpack, and worsening wildfire conditions, all of which threaten long-term water supply reliability and infrastructure resilience. These impacts are also imposing substantial economic costs. Recent analyses estimate that California is already incurring billions of dollars in losses from climate-related disasters, including approximately $117 billion in average annual economic losses associated with major wildfires between 2017 and 2021, $3 billion in agricultural losses during the 2020-2022 drought, and roughly $1.7 billion in annual flood damages. Extreme heat events between 2013 and 2022 alone resulted in an estimated $7.7 billion in damages, and future costs are expected to increase significantly without continued investment in climate adaptation and resilience actions (UC San Diego School of Global Policy and Strategy, 2025).

The CAP addresses climate-related hazards that are expected to affect IRWD facilities and operations, including drought, wildfire, extreme heat, heavy precipitation and flooding, sea-level rise, groundwater rise, and landslides or debris flows. These hazards have the potential to disrupt treatment and conveyance operations, degrade water quality, restrict access to critical facilities, increase energy demands, damage infrastructure, and create regulatory and compliance challenges. While impacts relating specifically to water supply availability are addressed through separate planning efforts, including the Water Supply Reliability Study Update, Urban Water Management Plan, and Water Shortage Contingency Plan, the CAP focuses on operational vulnerabilities and resilience across IRWD's water, recycled water, sewer, urban runoff treatment, monitoring, and support systems.

The CAP is informed in part by the findings of a Climate Change Vulnerability Assessment (CVA), which evaluated how future climate hazards may affect IRWD facilities, infrastructure, operations, and workforce activities. The CVA identified key climate vulnerabilities, operational thresholds, and asset-specific risks across IRWD's major systems and serves as the technical foundation for the adaptation strategies presented in this Plan. The full CVA is included in Appendix B.

Beyond evaluating vulnerabilities, the CAP is intended to provide an actionable framework for implementation. The Plan identifies opportunities to enhance climate resilience, improve energy performance, support greenhouse gas reduction efforts and protect critical infrastructure investments. Consistent with California's evolving climate policies and IRWD's leadership in sustainable water management, the CAP integrates climate adaptation and energy management into a single planning framework that supports efficient operations, regulatory readiness, fiscal responsibility, and long-term environmental stewardship.

A key principle of the CAP is adaptive management. Because future climate conditions cannot be predicted with complete certainty, the Plan is designed to support flexible decision-making based on evolving climate science, operational experience, and monitoring data. The CAP establishes resilience goals, adaptation strategies, implementation priorities, and future decision triggers that can be adjusted as conditions change. See Section 3.2 in Appendix B for detailed descriptions of thresholds and future decision triggers. This approach enables IRWD to proactively manage climate risks and continue providing reliable water, recycled water, wastewater, and urban runoff treatment services to its customers.

1.2 Legislative and Regulatory Framework

The CAP was developed within a rapidly evolving policy and regulatory landscape that increasingly emphasizes climate resilience, infrastructure reliability, and long-term resource sustainability. California continues to advance statewide guidance encouraging public agencies to integrate climate adaptation into planning, asset management, and capital investment decisions. The California Adaptation Planning Guide, which is being updated to reflect the latest climate science and adaptation best practices, promotes the use of vulnerability assessments, adaptive management, and implementation-focused resilience planning to prepare public infrastructure for future climate conditions. Consistent with this approach, the CAP provides a framework for understanding climate risks, integrating resilience into IRWD planning efforts, and identifying adaptation actions that can be implemented as conditions evolve over time. A Climate Action Legislative Driver Summary Report was developed to document these drivers and can be found in Appendix E.

State water policy also increasingly recognizes climate resilience as a critical component of sustainable water management. The Sustainable Groundwater Management Act (SGMA) has accelerated investment in groundwater sustainability, water reuse, groundwater recharge, storage, and regional water management throughout California. While SGMA primarily focuses on groundwater resources, its emphasis on long-term reliability, adaptive management, and resilience to hydrologic variability closely aligns with the objectives of the CAP. In parallel, major state investments, including funding made available through Proposition 4, are creating new opportunities for water agencies to implement projects related to watershed-wide resilience, flood protection, ecosystem restoration, wildfire resilience, and groundwater management. The CAP helps position IRWD to competitively pursue future funding opportunities by identifying priority adaptation actions and implementation pathways that support both resilience and operational reliability.

The CAP is also informed by regional and statewide regulatory requirements governing water quality, wastewater treatment, flood management, energy use, and greenhouse gas reduction. Climate change has the potential to affect compliance with National Pollutant Discharge Elimination System (NPDES) permits, recycled water regulations, Regional Water Quality Control Board requirements, and other water quality objectives as flooding, groundwater rise, and

extreme weather events place greater stress on treatment and conveyance systems. At the same time, California continues to advance ambitious energy and climate policies aimed at achieving carbon neutrality by 2045 through initiatives such as renewable energy deployment (SB100), electric fleet requirements (Advanced Clean Fleets), and energy efficiency programs. As a result, the CAP was intentionally developed as an integrated climate adaptation and energy management framework that recognizes the strong relationship between resilience, operational reliability, energy management, regulatory readiness, and long-term sustainability.

1.3 Technical Foundations for the CAP

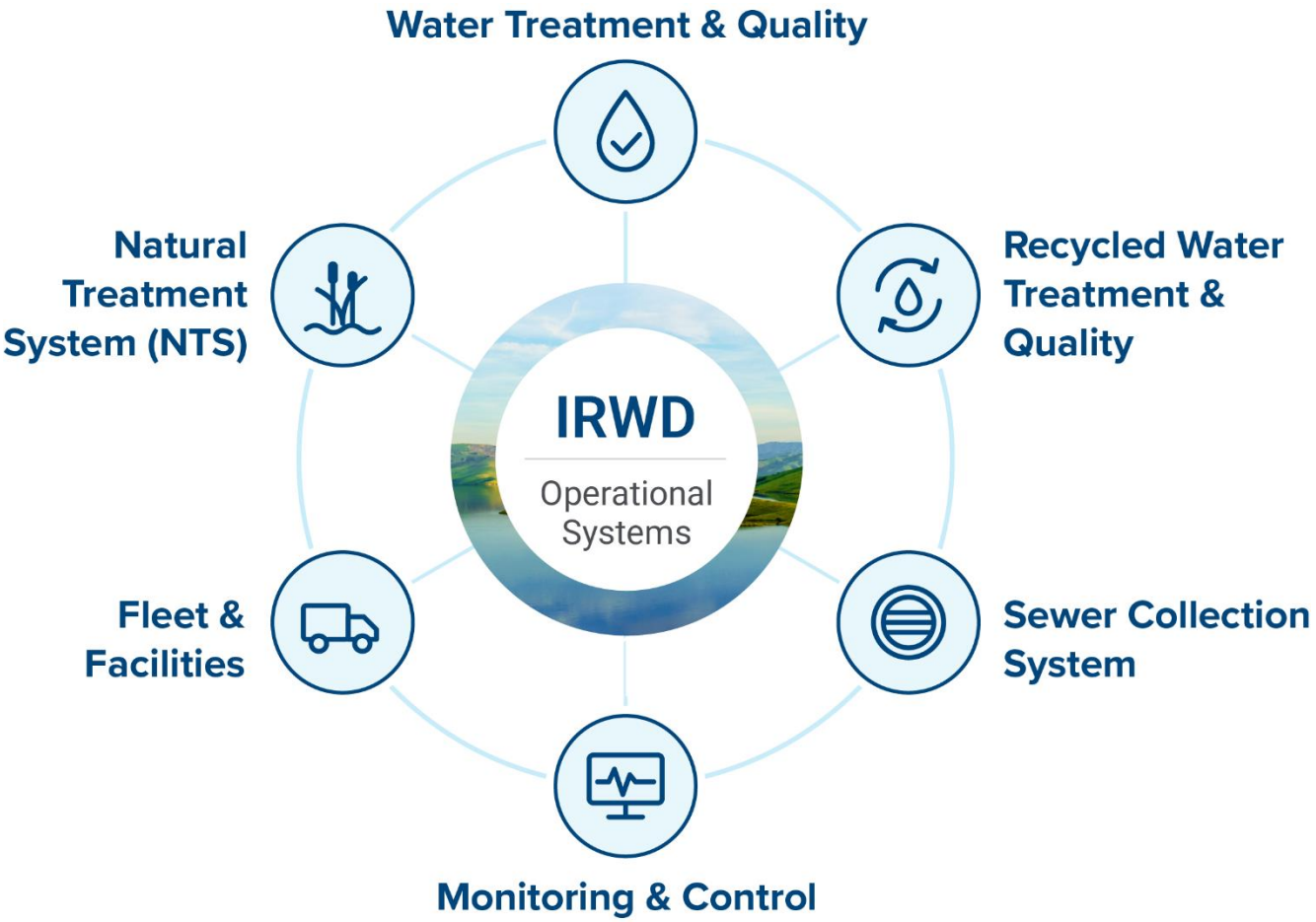
The CAP was developed through a series of interconnected assessments, analyses, and planning tools designed to provide IRWD with a comprehensive understanding of climate risks, energy use, GHG emissions, and opportunities to improve long-term operational resilience. These efforts established the technical foundation for identifying priority vulnerabilities, developing adaptation and energy management actions, and an implementation roadmap:

- **Greenhouse Gas Emissions and Energy Forecasting:** Creation of long-term forecasts of energy use and greenhouse gas emissions under business-as-usual and policy-adjusted future conditions. (Appendix A)
- **Climate Vulnerability Assessment**: Analysis of how current and future climate hazards may affect IRWD's infrastructure, operations, water supplies, water quality, and overall service reliability. (Appendix B)
- **Energy Optimization Measure Report and Energy Measure Selection Criteria**: Identification and evaluation of facility, equipment, and operational improvements that could reduce energy consumption, emissions, and operating costs. (Appendix C)
- **Renewable Energy and Battery Storage Evaluation**: Assessment of solar energy and energy storage opportunities, including decision-support tools to guide future renewable energy investments. (Appendix D)
- **Climate Action Legislative Driver Summary Report:** Review of current and emerging state and federal regulations, policies, and legislative initiatives that may influence IRWD's climate adaptation, greenhouse gas reduction, and energy management. (Appendix E)
- **MAST Tool:** an evaluation of existing IRWD efforts used to evaluate, compare, and prioritize adaptation, greenhouse gas reduction, and energy management measures to understand implementation status and determine hurdles to implementation of existing IRWD programs. (Appendix F)
- **Complete List of Adaptation Actions**: Development and evaluation of a comprehensive portfolio of potential climate adaptation strategies and actions designed to address identified vulnerabilities, increase infrastructure and operational resilience, reduce climate-related risks, and support long-term implementation planning. (Appendix G)

1.4 Summary of IRWD Infrastructure, Operations, and Assets

IRWD provides potable water, sewer, recycled water, and urban runoff treatment services across approximately 181 square miles in Orange County. The service area encompasses a diverse mix of urbanized communities, open space areas, coastal environments, foothill terrain, and major transportation corridors, creating a wide range of operational conditions and climate-related exposures. IRWD manages an integrated water system that includes potable water treatment and distribution facilities, sewer collection and treatment infrastructure, recycled water production and distribution systems, groundwater management facilities, monitoring and control systems, and fleet and operational support facilities. These assets support IRWD's ability to provide reliable water and wastewater services under changing environmental conditions. Figure 3 demonstrates the interconnected IRWD systems.

Figure 3 IRWD Asset Systems



For purposes of the CAP, IRWD's infrastructure and operations were organized into six primary operational systems:

1. Water Treatment and Quality[1]
2. Recycled Water Treatment and Quality
3. Sewer System
4. Monitoring and Control
5. Fleet and Facilities
6. Natural Treatment System (NTS)

IRWD's potable water system includes treatment plants, reservoirs, wells, pump stations, and distribution infrastructure that work together to maintain water quality and system reliability. IRWD benefits from a diversified water portfolio that includes local groundwater, local surface water, imported water, and recycled water. This diversified approach provides important water reliability and operational flexibility.

The recycled water system includes treatment facilities, storage facilities, pump stations, distribution infrastructure, and non-potable water delivery systems that support landscape irrigation, agricultural irrigation, and industrial uses. Key recycled water facilities include the Michelson Water Recycling Plant (MWRP) and the Los Alisos Water Recycling Plant (LAWRP), both of which are critical components of IRWD's water recycling program.

The sewer collection system consists of gravity pipelines, force mains, manholes, siphons, lift stations, and associated conveyance infrastructure. These assets transport wastewater throughout the service area and ultimately convey flows to treatment facilities. Many components of this system are located in low-lying areas, canyons, and drainage corridors where exposure to flooding, groundwater rise, landslides, and debris flows may increase over time.

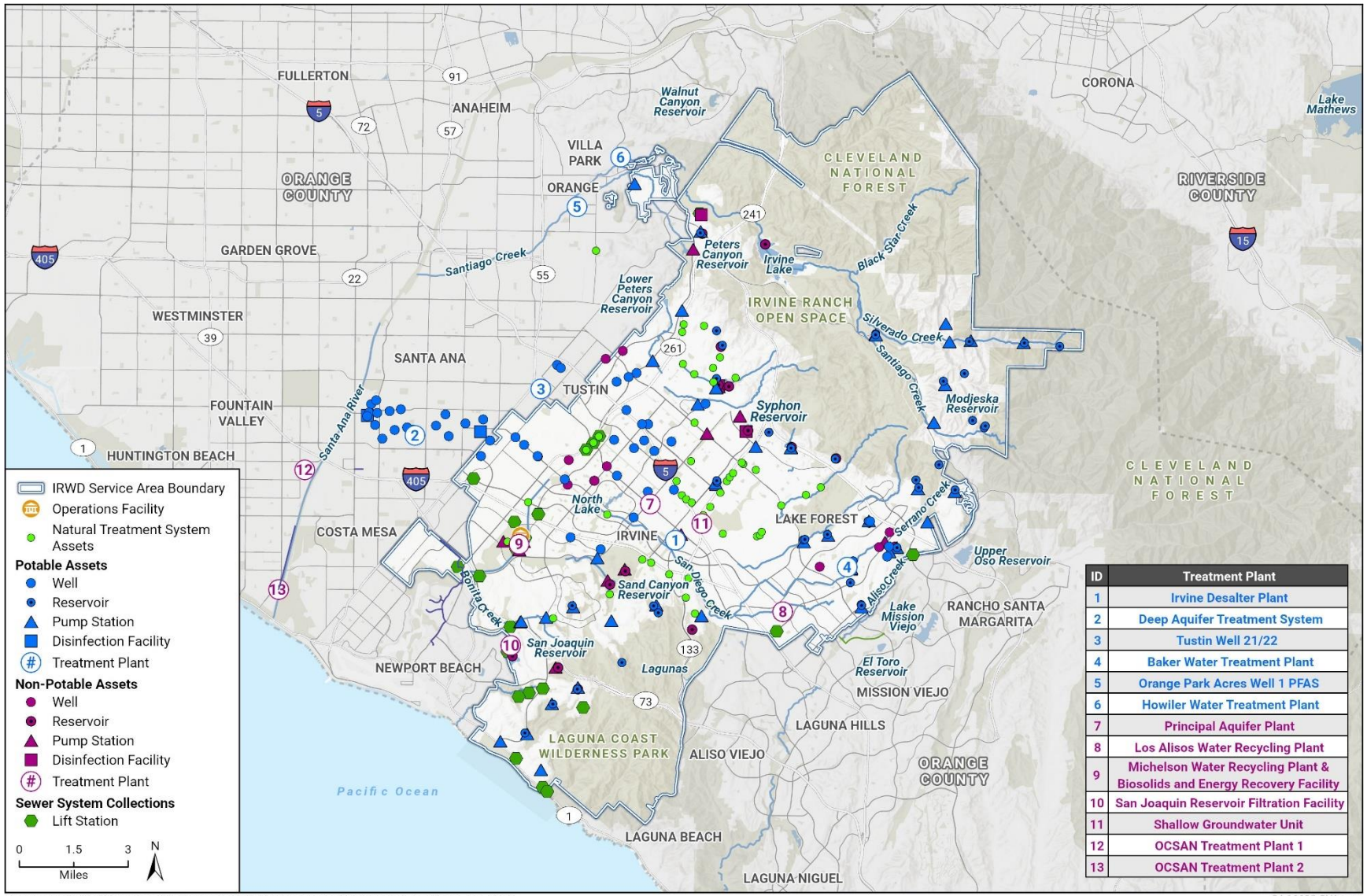
The Monitoring and Control system includes Supervisory Control and Data Acquisition (SCADA) infrastructure, telemetry systems, communications networks, sensors, antennas, repeaters, and automated controls that enable real-time operation of water and wastewater facilities. These systems provide critical operational visibility and support rapid response during emergency conditions.

Fleet and Facilities encompass administrative buildings, maintenance yards, emergency response facilities, vehicles, generators, energy systems, and other support infrastructure required to sustain operations. This system also includes resources needed to maintain continuity of operations during climate-related emergencies, including backup power and facility support functions.

The Natural Treatment System (NTS) uses natural physical, chemical, and biological processes to provide urban runoff treatment, water quality improvement, and flow attenuation. NTS assets include treatment wetlands, sedimentation features, vegetated treatment areas, and other nature-based infrastructure that support water quality and environmental objectives. See Figure 4 for a map of IRWD's key assets and locations.

[1] Recycled water reservoirs are an integral component of IRWD's overall water supply portfolio because they provide operational storage, demand balancing, and reliability for recycled water deliveries, reducing reliance on imported and potable water supplies during drought and other climate-related disruptions. As a result, some reservoirs that provide storage for recycled water are included in the Water Treatment and Quality system for the purposes of the CAP.

Figure 4 IRWD Assets and Infrastructure



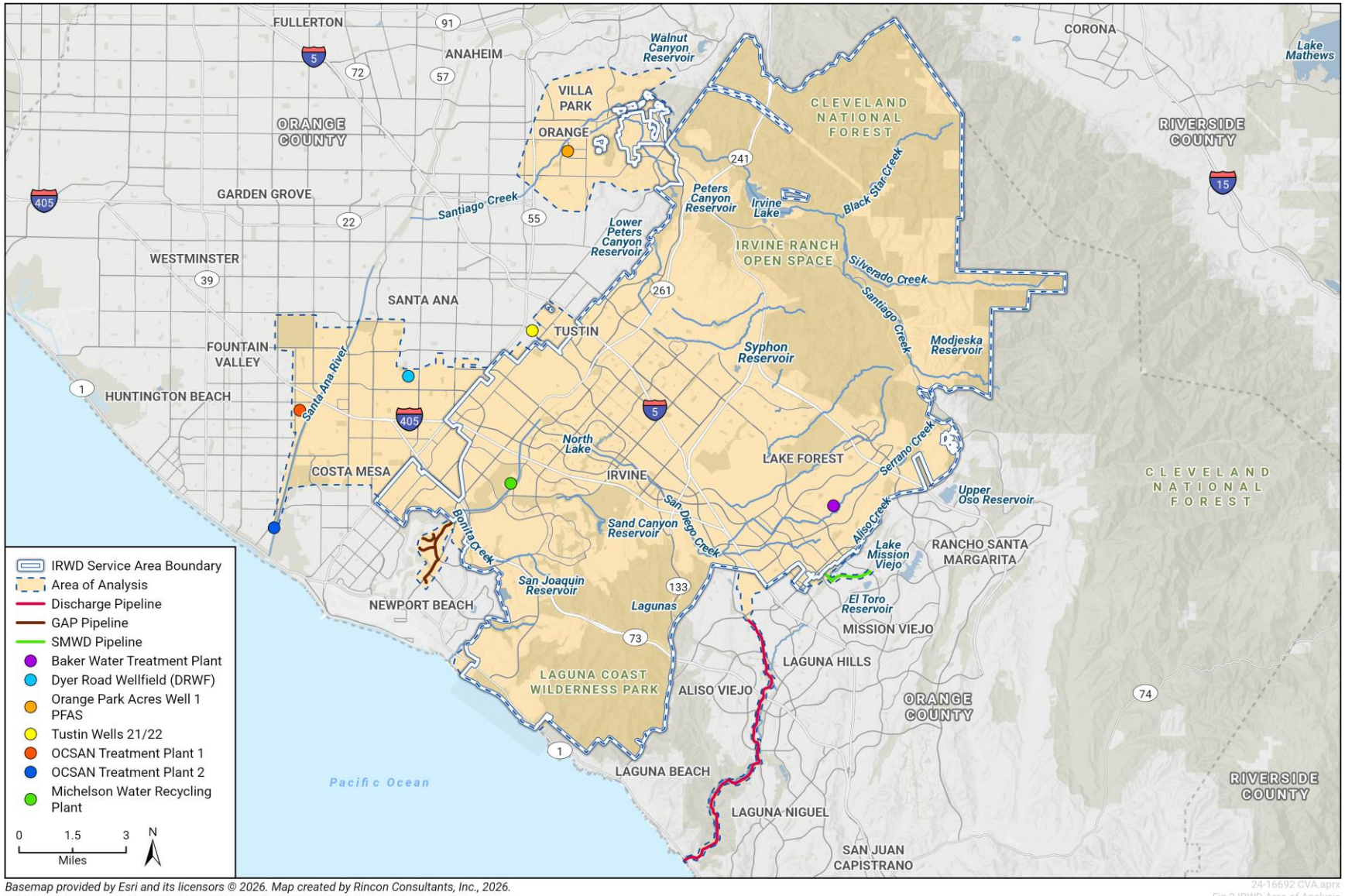
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Additional data provided by NHD, 2024; CPAD, 2025; IRWD, 2025.

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Fig 2 IRWD Assets

Area of Analysis

IRWD also owns, operates, or depends on several pieces of infrastructure outside of the service area boundary. To cover this additional infrastructure, a larger Area of Analysis (AOA) was established. The AOA extends beyond IRWD's formal service area boundary and is shown in Figure 5. The AOA includes facilities such as the Dyer Road Wellfield, Tustin Wells 21/22 Treatment Plant, portions of the Orange Park Acres well system, regional recycled water infrastructure connected to the Green Acres Project, wastewater conveyance infrastructure associated with the South Orange County Wastewater Authority (SOCWA), and sewer infrastructure connected to neighboring agencies. These facilities contribute to water supply reliability, wastewater management, recycled water delivery, and operational redundancy. This broader perspective recognizes that climate-related impacts occurring outside IRWD's service boundary could affect service delivery, regulatory compliance, operational flexibility, and long-term infrastructure planning within IRWD's service area. Groundwater banking programs are an important element of IRWD's regional water supply portfolio, but are located in Kern County outside the IRWD service area and the larger AOA.

Figure 5 IRWD Area of Analysis



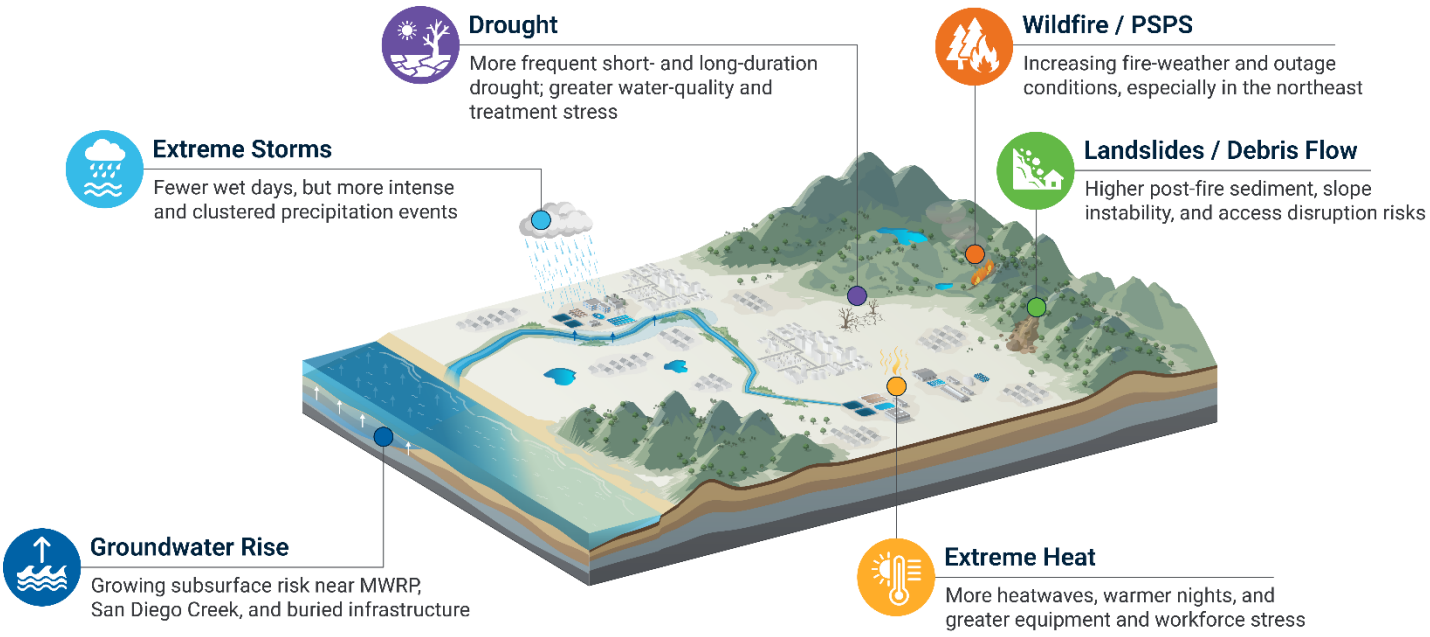
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Additional data provided by NHD, 2024; CPAD, 2025; IRWD, 2025.

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Fig 3 IRWD Area of Analysis

1.5 Identified Climate Hazards

The CVA evaluated six primary climate hazards that could affect IRWD facilities, infrastructure, operations, and workforce. Previous climate hazard planning was advanced through the 2021 Irvine Ranch Water District Local Hazard Mitigation Plan, which identified broad climate-related hazards and emergency preparedness considerations affecting IRWD. However, that effort relied on earlier generations of climate data and did not evaluate the vulnerability of specific IRWD facilities, infrastructure systems, operational thresholds, or climate-sensitive assets. The CVA developed for the CAP builds upon that foundation by utilizing updated 2026 climate projections, facility-specific analyses, and direct input from staff to evaluate how future climate conditions may affect IRWD's infrastructure, operations, workforce, and critical services. See Section 3.1 in Appendix B for detailed description of individual climate hazards. Figure 6 demonstrates the climate hazards relevant to the IRWD service area and related vulnerabilities to IRWD operations.

Figure 6 Climate Hazards in the IRWD Service Area



2 Methodology

2.1 Climate Hazard Methodology

The climate hazard analysis was designed to evaluate how future climate conditions may affect IRWD's infrastructure, facilities, and operations. The methodology follows a state-aligned approach consistent with the California Adaptation Planning Guide and integrates climate science, facility mapping, operational knowledge, and vulnerability assessment techniques.

The CVA utilized downscaled Coupled Model Intercomparison Project Phase 6 (CMIP6) climate projections developed for California's Fifth Climate Change Assessment. See Section 1.3 in Appendix B for additional information on methodology. Rather than relying on a subset of climate models, the CVA incorporated outputs from 129 climate model simulations to capture a broad range of future climate conditions and reduce uncertainty associated with any individual model. A Global Warming Level (GWL) framework was used to evaluate future climate conditions. Climate projections were organized around warming increments of approximately 0.8°C (historic baseline), 1.5°C (2024-2041), 2.0°C (2034-2054), and 3.0°C (2053-2083) above historical temperatures. The estimated years associated with each Global Warming Level represent model-based projections under Shared Socioeconomic Pathway 3-7.0 (recommended as the primary high-emissions scenario used by California's Fifth Climate Change Assessment) and may shift earlier or later depending on future greenhouse gas emissions, socioeconomic development patterns, technological advancements, and the extent of global climate mitigation efforts.[2]. This approach allows climate risks to be evaluated based on physical climate outcomes rather than assumptions about future greenhouse gas emissions pathways.

Operationally meaningful metrics based on projected future conditions were evaluated for each corresponding climate hazard. For drought, the CVA used 24-month and 60-month Standardized Precipitation Index (SPI) metrics to evaluate both short-duration and long-duration drought conditions. Wildfire analysis evaluated conditions associated with fire weather, including the occurrence of extended dry periods combined with sustained wind speeds exceeding 15 miles per hour. Conditions that typically result in Public Safety Power Shutoffs (PSPS) were also evaluated as a proxy for wildfire-related operational disruptions and power outages. Extreme heat analyses evaluated the frequency of heatwaves, days exceeding 105°F, elevated nighttime temperatures, and heat index conditions relevant to workforce safety and equipment performance. The CVA considered both daytime and nighttime temperatures because prolonged thermal stress and reduced overnight cooling were identified as operational concerns by IRWD staff.

[2] The assessment uses a Global Warming Level (GWL) framework, with 0.8°C representing the historical baseline and future climate conditions evaluated at approximately 1.5°C, 2.0°C, and 3.0°C of global warming. Under CMIP6 SSP3-7.0 projections, these warming levels are expected to occur around 2031, 2042, and 2065, respectively, although individual climate models produce a range of crossing dates. These timeline estimates are based on the use of Shared Socioeconomic Pathway 3-7.0 (SSP3-7.0). SSP 3-7.0 is a greenhouse gas emissions scenario developed as part of the Coupled Model Intercomparison Project Phase 6 (CMIP6). SSP3-7.0 represents a future characterized by regional rivalry, uneven economic development, limited international cooperation, and relatively slow progress in reducing greenhouse gas emissions. California's Fifth Climate Change Assessment identifies SSP3-7.0 as an appropriate scenario for long-term planning because it aligns with current emissions trends and captures a range of significant future climate risks relevant to infrastructure, water resources, ecosystems, and communities. https://climatedata.ca/resource/understanding-shared-socio-economic-pathways-ssps/

Heavy precipitation and flooding hazards were assessed using a series of precipitation metrics that included annual rainfall totals, extreme single-day rainfall events, prolonged multi-day rainfall events, and compound storms occurring in quick succession. These metrics were selected to capture the conditions most relevant to hydraulic overloading, flooding, inflow and infiltration, storage exceedance, and compliance challenges at treatment facilities. Sea level rise and groundwater rise were evaluated using Coastal Storm Modeling System (CoSMoS) data. Future conditions were assessed at 0.8-foot, 1.6-foot, and 2.5-foot sea level rise increments. Landslide and debris flow risks were evaluated qualitatively by examining the interaction of wildfire exposure, intense precipitation, steep terrain, and mapped landslide susceptibility zones. Although landslide occurrence itself was not directly modeled, the climate conditions that drive these hazards were assessed to identify areas where risk is likely to increase under future climate scenarios.

Proposed adaptation actions build on existing IRWD programs and planned capital improvements and are organized by implementation timeframe to support near-, medium-, and long-term planning. These actions are intended to improve source water reliability, maintain treatment performance, enhance emergency preparedness, and increase the ability of the system to respond to a range of future climate conditions.

2.2 Threshold Methodology

A central feature of the CVA was the development of climate impact thresholds based directly on IRWD operational experience. Threshold development occurred through a series of Climate Impact Threshold Workshops conducted with IRWD staff. Five workshops to establish thresholds were held, representing each major operational system: Water Treatment and Quality, Recycled Water Treatment and Quality, Sewer System, Monitoring and Control, and Fleet and Facilities. NTS facilities were included in the Water Treatment and Quality workshop. Staff provided insight regarding historical operational challenges, equipment limitations, process sensitivities, and climate conditions requiring operational response.

Two types of thresholds were developed: severity thresholds and frequency thresholds. A complete listing of thresholds is provided in Section 3.2 of Appendix B.

Severity Thresholds

Severity thresholds identify the magnitude, duration, or intensity of a climate hazard that is likely to cause operational disruption. Examples include:

- Multi-year drought conditions lasting longer than five years.
- Public Safety Power Shutoff events lasting more than two days.
- Multi-day heatwaves creating equipment or workforce challenges.
- Flooding conditions that exceed treatment, storage, or bypass capacities.
- Groundwater elevations that interfere with buried infrastructure or facility operations.

These thresholds represent conditions where normal operations become difficult, costly, or potentially unsustainable.

Frequency Thresholds

Frequency thresholds identify how often a climate hazard must occur before adaptation actions become warranted. Staff emphasized that recurring events often create greater operational burdens than isolated incidents. For example:

- Successive droughts occurring with limited recovery between events.
- Multiple storms occurring within the same week.
- Repeated PSPS events affecting operations year after year.
- Increasing occurrences of heatwaves that strain staff and equipment.

By evaluating both severity and frequency, the CVA was able to identify whether future climate conditions would exceed operational limits and whether those exceedances would occur often enough to justify adaptation investments.

2.3 Workshops and Engagement

Staff engagement was a foundational component of the CAP. Engagement occurred through three phases: climate impact threshold workshops, vulnerability assessment workshops, and adaptation strategy workshops.

Climate Threshold Workshops (Summer 2025)

Threshold workshops were organized by operational system and included staff representing Water Treatment and Quality, Recycled Water Treatment and Quality, Sewer System, Monitoring and Control, NTS, Fleet and Facilities and Safety. Participants identified climate sensitivities, operational stressors, and facility-specific concerns associated with drought, wildfire, flooding, extreme heat, sea level rise, groundwater rise, and landslides or debris flows. A key outcome of these workshops was the development of severity and frequency thresholds that define when climate hazards begin to disrupt normal operations or warrant adaptation investment.

Vulnerability Workshops (Winter 2025/2026)

During this phase, staff reviewed climate projections, exposure mapping, and preliminary vulnerability findings. Participants helped validate projected impacts, identify critical assets, refine vulnerability ratings, and provide context regarding existing adaptive capacity, operational redundancies, emergency response capabilities, and regulatory considerations. This collaborative review process ensured that vulnerability ratings reflected actual operating and planned for conditions rather than climate projections alone.

Adaptation Strategy Workshops (Summer 2026)

These workshops were organized by operational system and focused on transforming identified vulnerabilities into actionable adaptation actions. Staff evaluated operational, capital, planning, and policy-based strategies to improve resilience, maintain regulatory compliance, protect critical infrastructure, and ensure continuity of service under future climate conditions. Workshop outcomes included a system-specific portfolio of adaptation actions that informed the CAP and helped prioritize future resilience investments.

Across all phases, engagement included staff from operations, maintenance, engineering, treatment, collection system, monitoring and control, facilities, planning, and safety.

2.4 Vulnerability Scoring Methodology

The CVA evaluated each hazard and operational system by considering three primary components: exposure, sensitivity, and adaptive capacity. This framework is consistent with established climate adaptation planning approaches provided by the 2020 California Adaptation Planning Guide and provides a structured way to understand climate risk. See Tables 11-17 in Section 3.4 of Appendix B for the breakdown of vulnerability ratings by IRWD system and climate hazard.

Exposure

Exposure describes the degree to which a facility, asset, or system is expected to experience future climate hazards. Exposure was evaluated using geospatial analysis, climate modeling results, floodplain mapping, landslide susceptibility mapping, groundwater rise projections, and wildfire hazard information. Facilities located within projected hazard zones were considered more exposed than facilities outside those areas.

Sensitivity

Sensitivity evaluates how strongly a system responds when exposed to climate hazards. Some systems can tolerate substantial environmental change with little disruption, while others may experience performance degradation, operational limitations, regulatory challenges, or infrastructure damage. Sensitivity was informed heavily by staff workshops and operational experience.

Adaptive Capacity

Adaptive capacity reflects IRWD's ability to prepare for, respond to, and recover from climate impacts. Systems with greater redundancy and operational flexibility generally received lower vulnerability ratings than systems with fewer options for adaptation.

Factors contributing to adaptive capacity include:

- Infrastructure redundancy
- Backup power systems
- Treatment flexibility
- Monitoring and SCADA capabilities
- Emergency response procedures
- Asset management practices
- Institutional knowledge and operational experience

Vulnerability Determination

Vulnerability ratings were assigned by comparing projected climate conditions against the operational thresholds identified by staff and evaluating expected consequences when thresholds are exceeded. The assessment categorized vulnerabilities as Low, Moderate, Moderate-High, or High based on the severity, likelihood, and operational consequences of impacts. See Tables 11-17 in Section 3.4 of Appendix B for the breakdown of vulnerability ratings by IRWD system and climate hazard.

2.5 Adaptation Strategy Methodology

To identify the most effective and implementable resilience actions, adaptation actions were evaluated for each of the six systems using a weighted multi-criteria framework. The framework was designed to balance risk reduction benefits with practical implementation considerations, ensuring that recommended actions not only address climate vulnerabilities but can also be realistically integrated into IRWD's ongoing planning, operations, and capital improvement programs. Each action was scored on a scale of 1 to 3 against six evaluation criteria and assigned a weighted "Priority Score" between 1 and 3. Criteria related to feasibility and funding received the greatest emphasis, reflecting the importance of identifying actions that are both impactful and achievable in the near and long term. To reflect IRWD priorities, each criterion was assigned a weighting factor. The following criteria were used to evaluate and prioritize implementation actions:

- **Operational Feasibility (25%)**: Evaluates technical feasibility, implementation complexity, organizational readiness, permitting requirements, and overall ease of implementation.
- **Cost and Funding Viability (25%)**: Assesses the relationship between anticipated benefits, implementation costs, and availability of funding sources.
- **Resilience Benefit (15%)**: Evaluates the degree to which an action reduces climate-related risks to infrastructure, operations, ecosystems, and service reliability.
- **Hazard Occurrence Chance (15%)**: Considers the likelihood that the climate hazard being addressed will occur based on findings from the Climate Vulnerability Assessment.
- **Multiple Benefits (10%):** Evaluates the extent to which an action supports additional IRWD objectives beyond its primary purpose, including improvements to water supply reliability, water quality and operational efficiency.
- **Adaptability and Long-Term Effectiveness (10%)**: Assesses flexibility, scalability, and the ability of an action to remain effective under a range of future climate conditions.

Based on the overall scoring as well as other considerations such as overall project cost and whether the action was foundational to future high-priority actions, IRWD developed project implementation phases consisting of four categories:

- **Short Term (Year 1-3):** Short-term actions should be implemented over the course of the first three years of CAP implementation.
- **Medium Term (Year 4-6):** Medium term actions need additional data or information before being implemented.
- **Long Term (>6 Years):** Long term actions have high costs, operational impacts, or high degrees of uncertainty. These actions may become cost effective in the future, but long-term trends and a need to take action would need to be identified before implementation takes place.
- **Ongoing:** Actions that IRWD is already implementing through existing operational practices, capital improvement projects, monitoring programs, maintenance activities, policies, or management initiatives. These actions contribute to climate resilience today and may continue to be expanded or refined over time.
- **Planned:** Actions that IRWD has already identified, scoped, or incorporated into future planning documents, capital programs, operational strategies, or other agency initiatives but

that have not yet been fully implemented. These actions represent activities already under consideration and expected to advance as resources and opportunities become available.

The resulting prioritization framework provides a consistent approach for comparing adaptation actions and developing the implementation roadmap provided in Section 6. By considering climate risk reduction alongside feasibility, funding, co-benefits, and long-term performance, the framework helps IRWD focus resources on actions that are most likely to enhance resilience and deliver lasting value to IRWD. Section 6 provides a list of the ongoing and short-term actions and a full list of all adaption actions developed as part of the CAP is provided in Appendix G.

2.6 Greenhouse Gas Inventory Methodology

The GHG inventory and forecast were developed using IRWD's historical GHG inventories and operational data to establish a baseline understanding of emissions sources and project future emissions trends through 2045. The analysis utilized IRWD inventory data from 2016 through 2023, including Scope 1 emissions (direct fuel combustion and process emissions), Scope 2 emissions (purchased electricity), and select Scope 3 emissions associated with imported water, biosolids management, and wastewater exports. Historical inventories served as the foundation for understanding emissions trends and identifying the operational factors that most strongly influence IRWD's carbon footprint, including electricity consumption, water deliveries, water imports, wastewater treatment operations, and service population.

Using the 2023 inventory as the baseline year, a business-as-usual (BAU) forecast and a legislative-adjusted forecast was developed for the years 2030, 2035, 2040, and 2045. For the BAU forecast, future activity levels for each emissions source were projected using growth indicators derived from historical operational data and emissions trends. A statistical correlation analysis was performed to identify the operational metrics most closely associated with emissions growth, including total water demand, potable water demand, imported water supplies, and service population. Growth factors were then applied to forecast future activity data such as electricity consumption, fuel use, wastewater loading, and imported water deliveries. Emissions for each source were calculated by multiplying the projected activity data by emissions factors derived from the 2023 inventory.

Future capital projects, including the Syphon Reservoir Improvement Project, Michelson Water Recycling Plant expansions, the Michelson warehouse expansion, and the Howiler Treatment Plant, were incorporated into the forecast using energy use and operational assumptions derived from CEQA documentation and project-specific analyses.

A legislative-adjusted forecast built upon the BAU forecast by incorporating expected emissions reductions associated with adopted State policies and IRWD initiatives. Most notably, the analysis accounts for California's Renewable Portfolio Standard, Senate Bill 100, and Senate Bill 1020, which require a progressively cleaner electricity grid and eventual transition to 100 percent carbon-free electricity by 2045. Future electricity emissions factors were adjusted to reflect anticipated changes in utility renewable energy portfolios, resulting in substantial reductions to forecasted Scope 2 emissions over time. The adjusted forecast also incorporated planned IRWD projects, including on-site renewable energy generation, alternative energy installations at treatment facilities, and fleet electrification efforts. A detailed description of the methodology and results of the GHG emissions analysis can be found in Appendix A.

3 Climate Hazards and Exposure Results

The CVA evaluated six primary climate hazards that could affect IRWD facilities, infrastructure, operations, and workforce: drought, wildfire, heavy precipitation and flooding, extreme heat, sea level rise and groundwater rise, and landslides and debris flows. Using 129 downscaled CMIP6 climate model simulations and a Global Warming Level framework, the assessment found that future climate conditions are expected to become increasingly variable and extreme. Across the service area, projections indicate more frequent droughts, increasing wildfire and PSPS conditions, fewer but more intense precipitation events, longer and more severe heatwaves, rising groundwater tables associated with sea level rise, and greater potential for landslide and debris flow impacts following wildfire and extreme rainfall. A key finding of the assessment is that compound hazards, such as wildfire followed by heavy precipitation or extreme heat combined with power outages, are expected to become increasingly important drivers of operational risk. In this assessment, 0.8°C warming roughly represents conditions from 2002, 1.5°C reflects present-day conditions through 2030, 2.0°C provides a planning analogue for approximately 2047, and 3.0°C represents a potential late-century warming level that could occur around 2075, recognizing that actual timing is uncertain and depends on future emissions trajectories.[3]

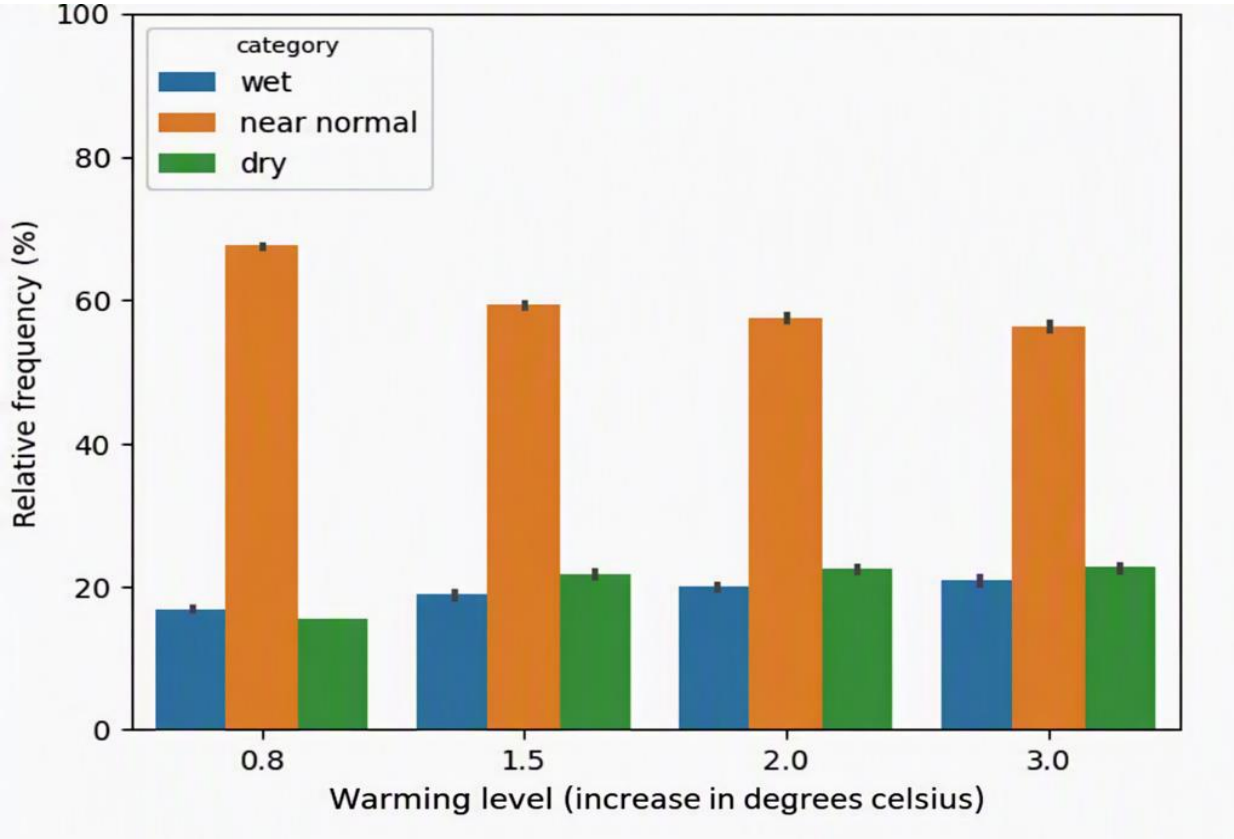
3.1 Drought

Climate modeling indicates a clear shift toward more frequent and more severe drought conditions within the Irvine Ranch Water District service area as temperatures increase. Analysis of both 24-month and 60-month Standardized Precipitation Index (SPI) metrics shows increasing frequencies of short-duration and multi-year droughts across all warming levels. Analysis of the 60-month SPI shows a high-confidence increase in the frequency of long-duration dry periods as climate change intensifies (Figure 7). While near-normal conditions remain most common, the relative occurrence of drought increases steadily over time. Results also suggest greater climate variability, with both prolonged droughts and extended wet periods becoming more common in the future.

For IRWD, drought impacts extend beyond water supply availability. Extended drought conditions can reduce reservoir and well inflows, increase water age within storage and distribution systems, and contribute to elevated biochemical oxygen demand (BOD), ammonia concentrations, algal activity, and thermal stratification. Drought also affects wastewater and recycled water operations by increasing sewage strength, raising treatment demands, increasing odor and corrosion concerns, and requiring additional monitoring and operational adjustments. Although IRWD's diversified water portfolio provides important resilience, projected increases in drought frequency and duration are expected to create ongoing operational challenges across multiple systems.

[3] This assessment utilized SSP (Shared Socioeconomic Pathway) 3-7.0. Each SSP includes different assumptions about how human civilization evolves and to what extent certain climate technologies will be implemented. Basing the analysis on Global Warming Level rather than specific years allows for the use of other SSP's to determine when impacts may occur in the future.

Figure 7 Multi-Model Frequency of Wet, Near-Normal, and Dry Conditions Based on the 60-Month SPI Under Increasing GWLs



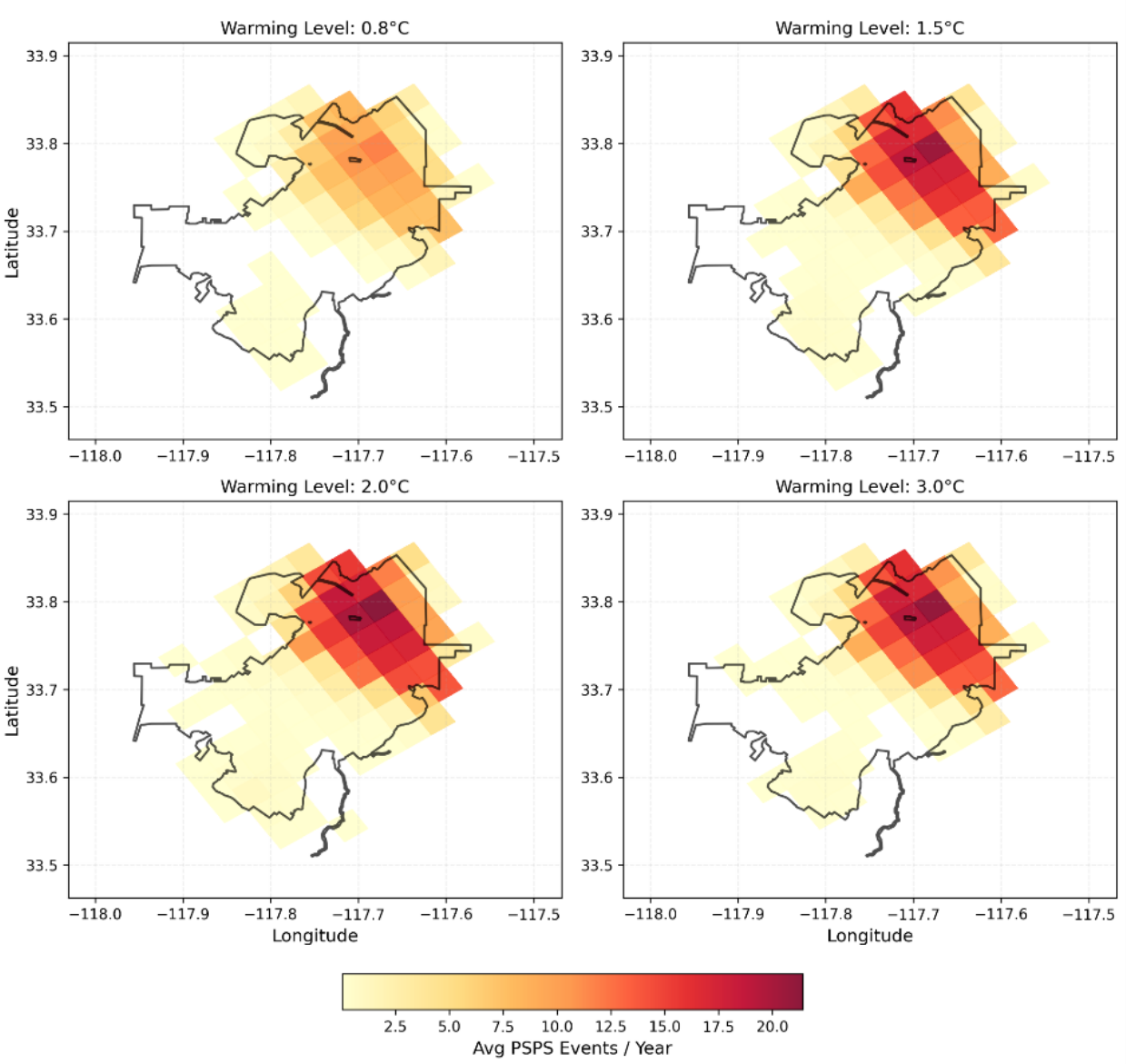
3.2 Wildfire

Climate projections indicate an increase in environmental conditions associated with wildfire conditions that are expected to increase the frequency of wildfires in the region. In addition to direct damage from wildfires, IRWD could also see an increase in electrical grid disruptions due to Public Safety Power Shutoff (PSPS) events.[4] As warming increases, the number of days characterized by extended dry periods combined with sustained wind speeds greater than 15 miles per hour is projected to increase, particularly in the northeastern portion of the service area. Modeling also indicates increases in critically low fuel moisture conditions and a growing number of PSPS-conducive days. At higher warming levels, wildfire conditions may occur across much longer portions of the year and extend beyond the traditional wildfire season. Modeling of PSPS-relevant conditions shows a clear increase in the average annual number of PSPS events per grid cell as GWLs rise (Figure 8). Across IRWD, the frequency of these events increases in a way that is concentrated in the northeastern portion of the service area. These results support moderate confidence that IRWD should expect an increase in the number of PSPS-relevant days per year as climate warming progresses

[4] Public Safety Power Shutoff (PSPS) events are utility-initiated power outages used to reduce wildfire ignition risk during high fire weather conditions, including periods of strong winds, low humidity, and elevated temperatures.

For IRWD, wildfire risks extend beyond direct fire damage. Smoke, ash, sediment, and debris can degrade source-water quality, while PSPS events can disrupt treatment, pumping, monitoring, and communications systems. Facilities within canyon and foothill areas face elevated risk from wildfire exposure, while utility power outages may affect facilities outside wildfire hazard zones. The assessment found that increased wildfire activity, combined with more frequent PSPS events, could create greater operational dependence on backup power, fuel availability, and emergency response resources.

Figure 8 Average Annual Number of Public Safety Power Shutoff (PSPS) – Relevant Events



3.3 Heavy Precipitation and Flooding

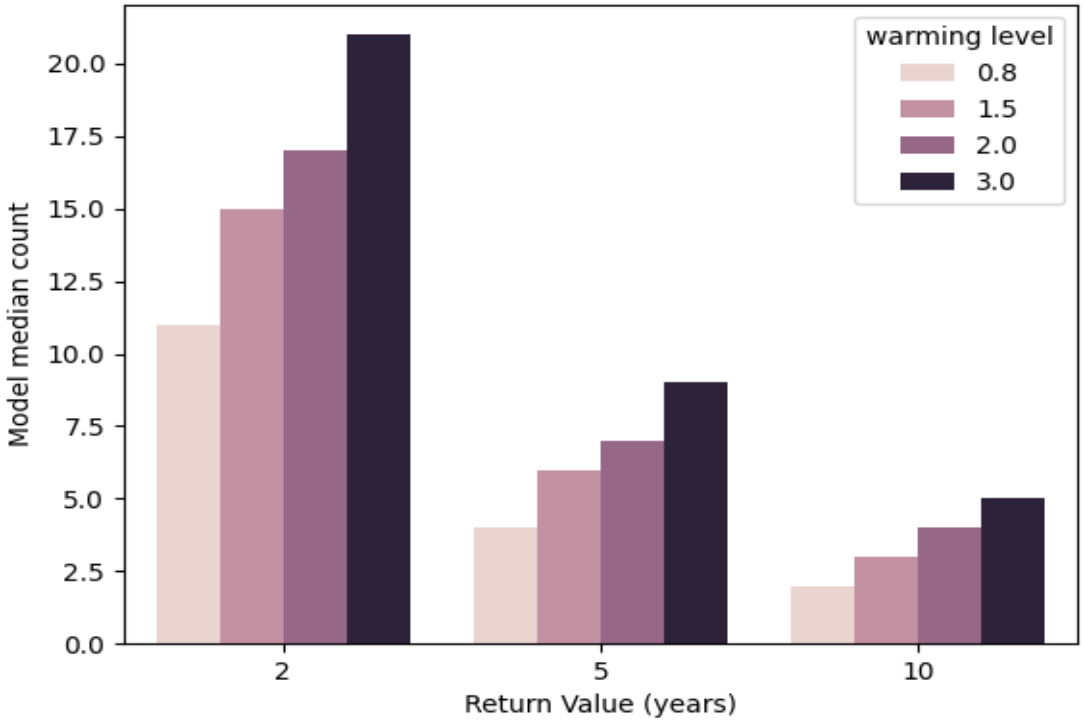
Although total annual precipitation is projected to remain relatively stable, the character of future rainfall is expected to change substantially. Climate models show a decrease in the overall number of wet days, coupled with increases in the intensity of multi-day and compound precipitation events. Future storms are expected to be more concentrated, with a greater likelihood of multiple storms occurring in rapid succession. These conditions increase the potential for flooding, inflow and infiltration, storage exceedance, erosion, and infrastructure damage. The assessment identified compound storm events as a particularly important concern.

Climate modeling indicates that back-to-back extreme rainfall events are likely to become more common in the future (Figure 9). Events involving at least three inches of rainfall within 24 hours followed by another significant storm within the same week are projected to become more frequent. These compound events occur when a major storm is followed by another significant storm within a short period, before soils and drainage systems have fully recovered. While overall precipitation may occur on fewer days each year, rainfall is expected to become more intense when it does occur. As a result, watersheds are more likely to experience repeated heavy storms over a short timeframe, increasing flood risk and reducing the effectiveness of existing flood management infrastructure. Several flood-related thresholds evaluated in the Climate Vulnerability Assessment show an increasing likelihood of being exceeded under future climate conditions, creating potential risks across IRWD's facilities and operations. Historic events, such as the storms of 1995, demonstrate how prolonged or successive storms can overwhelm drainage systems, inundate facilities, and create operational and regulatory challenges associated with high discharge volumes.[5]

Such conditions can create saturated watershed conditions, elevated inflows to treatment facilities, reservoir storage challenges, and compliance risks. Facilities such as MWRP, associated sewer conveyance systems, and low-lying infrastructure near San Diego Creek were identified as particularly sensitive to flooding and hydraulic overloading during prolonged wet-weather periods.

[5] In 1995, **Irvine** and the surrounding areas of **Orange County, California**, were struck by a historic series of relentless Pacific storms driven by a severe **El Niño** cycle. Two major waves of intense rainfall occurred in **January and March 1995**, causing widespread flooding, mudslides, and property damage across the region.

Figure 9 Frequency of Compound Extreme Precipitation Events, Defined as a ≥3-Inch Precipitation Event Within 24 Hours Followed by an Additional 1-in-2-Year, 1-in-5-Year, and 1-in-10-Year Precipitation Event Within the Same Week, Under Increasing GWLs

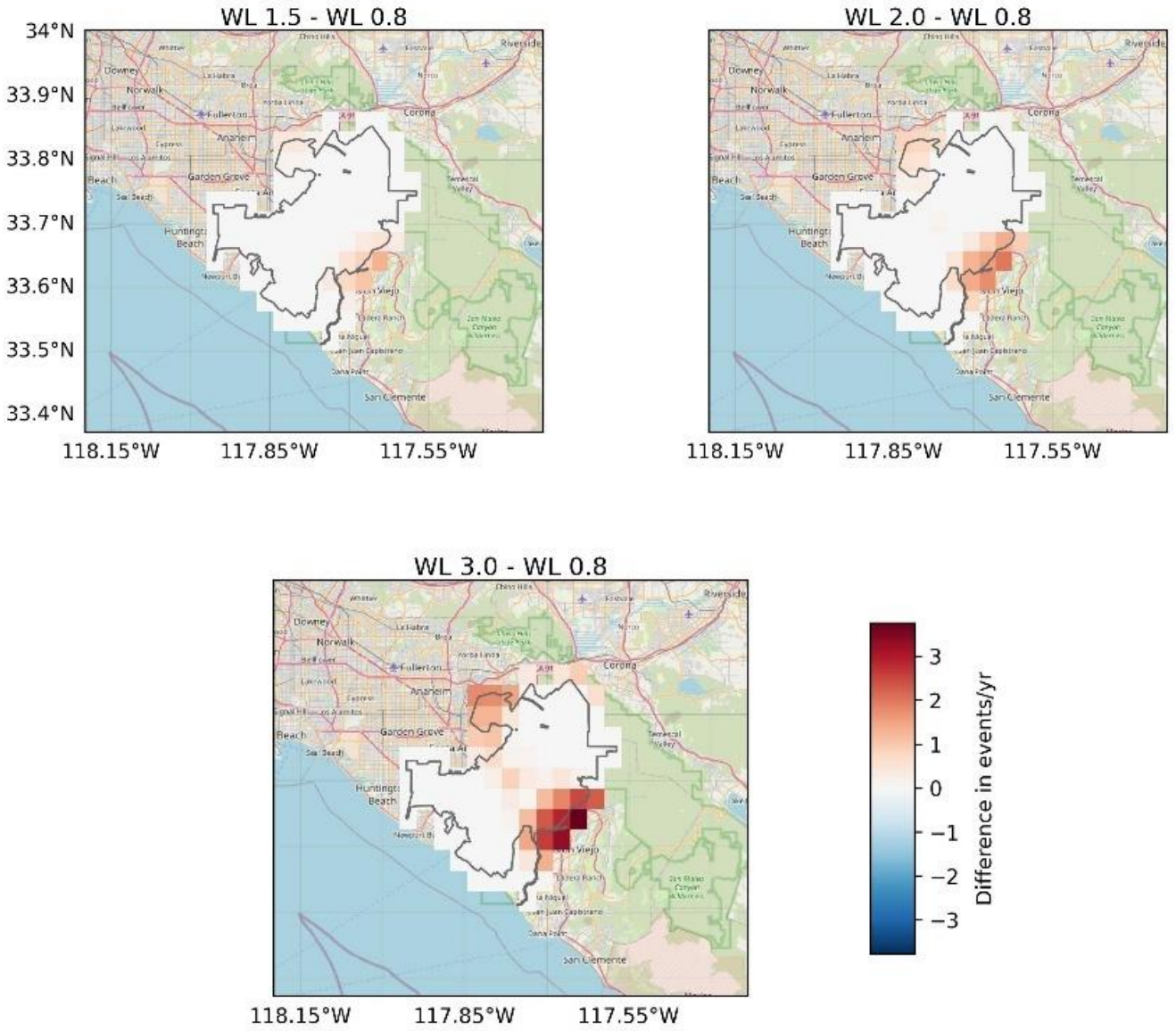


3.4 Extreme Heat

The assessment projects a substantially hotter future for the IRWD service area, characterized by more frequent heatwaves, increasing maximum temperatures, warmer nights, and expanding heat stress conditions. By higher warming levels, the service area is projected to experience significant increases in both 3-day and 10-day heatwave events. While days exceeding 105°F remain relatively infrequent, they become more common over time, particularly in inland portions of the service area. These areas are less influenced by moderating coastal marine air and are situated within inland valleys where surrounding topography can limit airflow and contribute to heat buildup, resulting in higher temperatures and more prolonged heat events. The most significant change may be the increase in nighttime temperatures, which reduces opportunities for cooling and recovery following extreme heat events. Days exceeding extreme maximum temperature thresholds increase under future warming scenarios, though they remain relatively infrequent overall. Across GWL 1.5 and GWL 2.0, days with maximum temperatures above 105°F occur sporadically and are spatially limited, with modest increases relative to present conditions (See Figure 10).

Heat-related impacts extend beyond air temperature alone. The assessment found substantial increases in NOAA Heat Index events that pose risks to worker health and safety, along with emerging winter heat conditions that historically have been uncommon. Elevated temperatures can increase treatment complexity, affect pumps and electronics, increase cooling demands, reduce equipment efficiency, and limit safe working conditions for field staff. Facilities such as Baker Water Treatment Plant and Los Alisos Water Recycling Plant are located in areas where future heat increases may be particularly significant.

Figure 10 Frequency of Days with Daily Maximum Temperature Exceeding 105°F Under Increasing GWLs

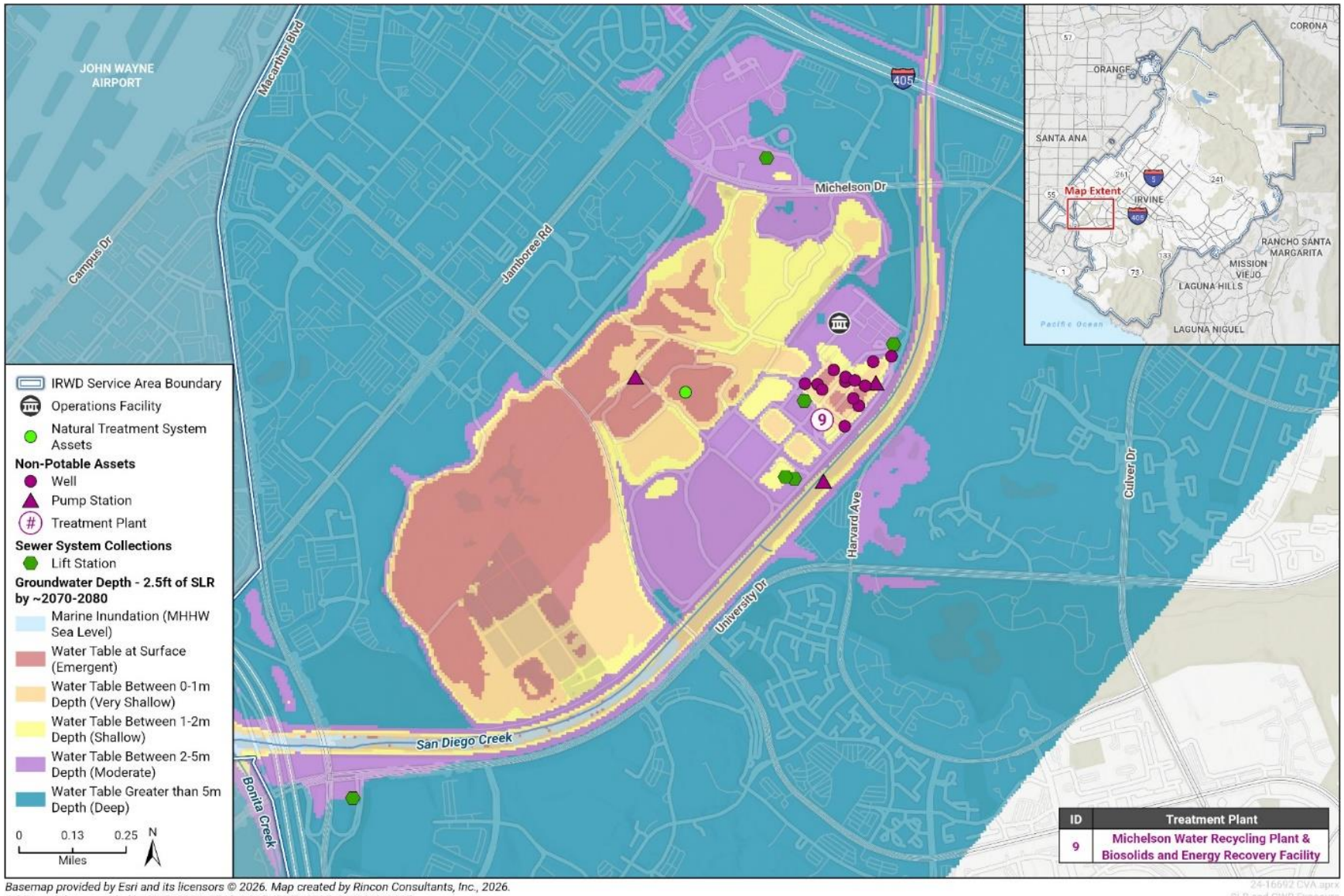


3.5 Sea Level Rise and Groundwater Rise

The assessment evaluated future conditions under 0.8-foot, 1.6-foot, and 2.5-foot sea level rise scenarios. Results indicate that direct marine inundation within the IRWD service area is relatively limited and largely confined to portions of the San Diego Creek corridor. Figure 11 depicts projected groundwater depth across the IRWD service area at 2.5 ft of sea level rise, expected to occur between 2070 and 2080. As shown in the figure, the MWRP and Biosolids and Energy Recovery Facility fall within zones where the water table is projected to rise to within 0–1 meter (m) of the surface, with some areas approaching emergent conditions.

Across all three scenarios (0.8-foot, 1.6-foot, and 2.5-foot sea level rise), the maps demonstrate that the MWRP and Biosolids and Energy Recovery Facility will increasingly overlap with shallow groundwater zones, heightening exposure of buried infrastructure, electrical conduits, dewatering wells, chemical pipelines, and below-grade mechanical systems. Numerous pump stations, siphons, and trunk sewer alignments fall within areas of projected shallow groundwater or marine inundation, increasing the risk of infiltration, corrosion, and loss of functionality for air-relief devices, vaults, and pipelines. As a result, direct flooding from sea level rise is not expected to be the primary climate concern for most IRWD facilities. Groundwater rise, however, emerged as a much more significant vulnerability. Modeling shows shallow groundwater conditions expanding northward and eastward under increasing sea level rise scenarios, particularly around the MWRP and Biosolids and Energy Recovery Facility, San Diego Creek corridor, and associated utility infrastructure. Rising groundwater may increase inflow and infiltration, accelerate corrosion, reduce the effectiveness of dewatering systems, affect buried electrical and mechanical infrastructure, and create long-term regulatory and operational challenges.

Figure 11 Groundwater Depth at 2.5 ft of Sea Level Rise (~2070-2080)



Basemap provided by Esri and its licensors © 2026. Map created by Rincon Consultants, Inc., 2026.
Additional data provided by NHD, 2024; CPAD, 2025; IRWD, 2025; CoSMoS, 2025.

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SLR and GWR Exposure

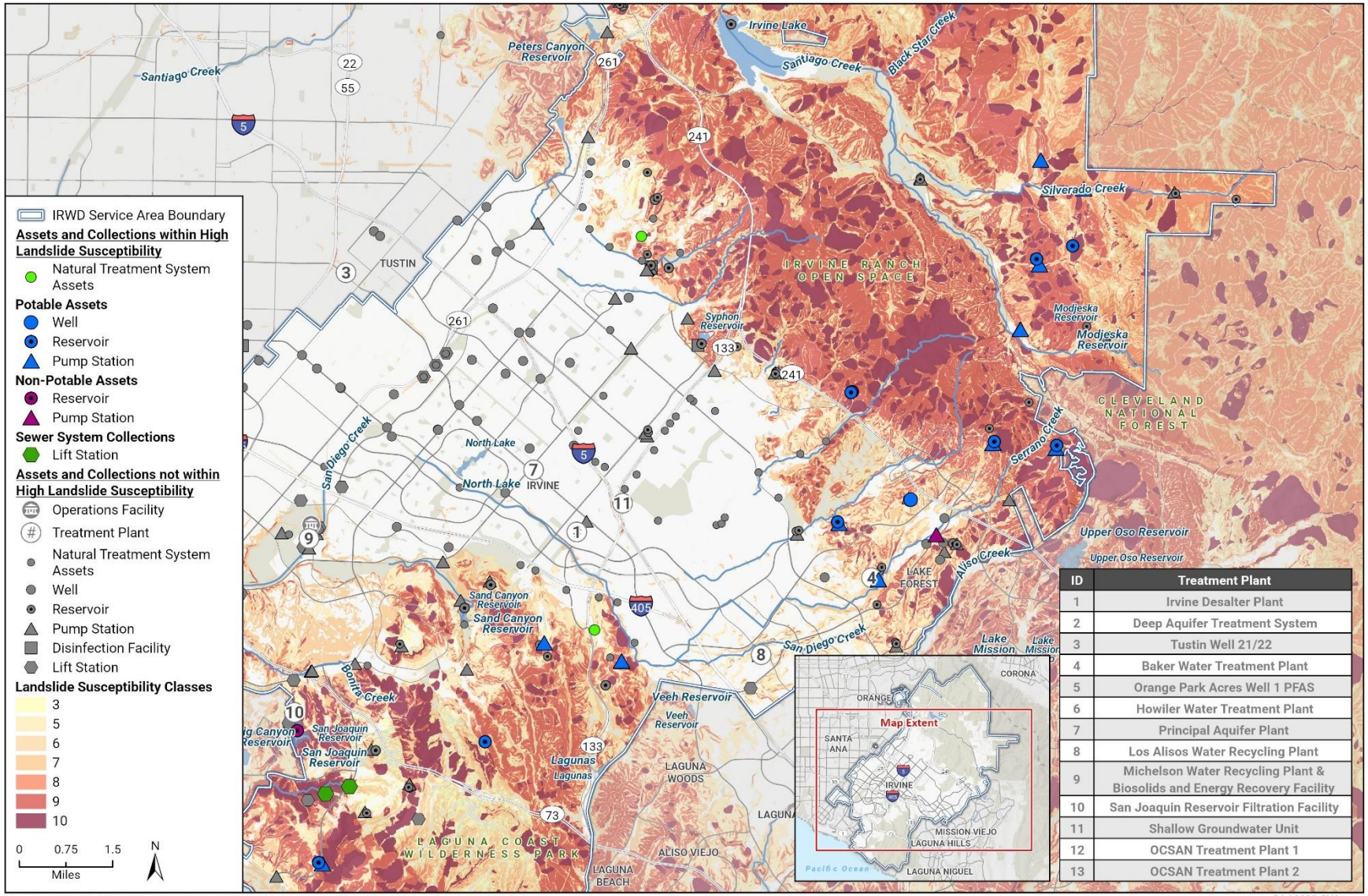
3.6 Landslide

Although landslides and debris flows were not modeled directly, the assessment evaluated the climate conditions that contribute to these hazards, including wildfire exposure, extreme precipitation, steep terrain, and mapped landslide susceptibility. The eastern and foothill portions of the service area contain extensive areas of high landslide susceptibility, including locations near pipelines, reservoirs, treatment infrastructure, and access roads. Future increases in wildfire conditions and extreme precipitation are expected to increase the likelihood of post-fire debris flows, erosion, and slope instability.

The landslide susceptibility mapping shown in Figure 12 is based on information from the California Geological Survey and evaluates the potential for deep-seated landslides based on two key factors: the steepness of a slope and the strength of the underlying geologic materials. In general, steep slopes underlain by weaker materials, such as shale, clay-rich soils, unconsolidated sediments, or areas with previous landslides, are considered more susceptible to slope failure than flatter areas or slopes underlain by stronger rock. The susceptibility rankings range from very low to very high, with the highest-risk categories representing steep slopes where geologic conditions are most favorable for landslides. It is important to note that the mapping shown in this figure addresses deep-seated landslides only and does not evaluate debris flows, which are typically caused by intense rainfall and are analyzed separately.

A particular concern identified in the assessment is the interaction of wildfire and subsequent storm events. Following wildfires, intense rainfall can mobilize large volumes of sediment, ash, and debris, resulting in debris flows that impact NTS facilities, reservoirs, pipelines, and road access. Irvine Lake and Baker Water Treatment Plant were specifically identified as susceptible to sedimentation and water quality degradation from post-fire runoff. Across the service area, landslide and debris flow hazards are expected to increase risks to conveyance infrastructure, treatment operations, the natural treatment system, and emergency access routes, particularly in canyon and burn-affected watersheds.

Figure 12 Landslide Susceptibility



Basemap provided by Esri and its licensors © 2026. Map created by Rincon Consultants, Inc., 2026.
Additional data provided by NHD, 2024; CPAD, 2025; IRWD, 2025; CGS, Map Sheet 58, 2018.

24-16692 CVA.aprx
Landslide Exposure

3.7 Climate Vulnerability and Adaptation Strategies

Using the CMIP6 climate models, the thresholds associated with each of the six IRWD operational systems were evaluated to determine their exposure to each climate hazard. During the Climate Impact Threshold Workshops, IRWD staff identified distinct operational characteristics, climate sensitivities, and adaptation considerations for each system; Water Treatment and Quality, Recycled Water Treatment and Quality, Sewer System, Monitoring and Control, Fleet and Facilities, and the Natural Treatment System. This approach allowed climate hazards to be evaluated at a systems level, recognizing that operational performance depends not only on individual facilities but also on how interconnected assets function together under stress. See Tables 11-17 in Section 3.4 of Appendix B for further detail on climate hazard analysis.

To identify the most effective and implementable resilience actions, adaptation actions were evaluated for each of the six systems using a weighted multi-criteria framework. The framework was designed to balance risk reduction benefits with practical implementation considerations, to ensure that recommended actions not only address climate vulnerabilities but can also be realistically integrated into IRWD's ongoing planning, operations, and capital improvement programs. Each action was scored on a scale of 1 to 3 against six evaluation criteria and assigned a weighted score. Criteria related to feasibility and funding received the greatest emphasis, reflecting the importance of identifying actions that are both impactful and achievable in the near and long term.

Because resources available for implementation are finite, adaptation actions were developed only for vulnerabilities identified as having **moderate to high climate risk** through the threshold-based assessment. Focusing on moderate- and high-risk vulnerabilities allowed IRWD to prioritize actions that address the most consequential threats to system reliability, regulatory compliance, operational continuity, and service delivery, while ensuring that adaptation investments are directed toward areas where resilience benefits are expected to be greatest. This risk-based approach aligns adaptation planning efforts with the vulnerabilities most likely to require operational, capital, or management responses under future climate conditions.

Priority Score Interpretation

As described in Section 2.5, the Priority Score provides a relative measure of the expected resilience value, feasibility of each adaptation action. Scores are intended to support decision-making by helping IRWD identify actions that offer the greatest overall benefit for reducing climate-related risks while aligning with operational needs, funding opportunities, and implementation constraints. While higher-scoring actions generally represent the strongest candidates for near-term investment, lower-scoring actions may still provide value under specific circumstances or become more relevant as climate conditions, regulatory requirements, technologies, and available resources evolve. The priority categories described below are intended to guide planning and implementation rather than serve as rigid recommendations, recognizing that adaptive decision-making will continue to be informed by future monitoring, operational experience, and agency priorities.

2.6–3.0 = High Priority - Actions that provide substantial resilience benefits, address significant or likely climate risks, and are generally feasible and cost-effective to implement. These actions

represent the strongest near- to long-term investments for reducing climate vulnerability and improving system reliability.

2.0–2.5 = Moderate Priority - Actions that provide meaningful resilience benefits but may address lower-risk hazards, have greater implementation challenges, higher uncertainty, or more limited benefits. These actions should be considered as part of ongoing planning and investment programs where resources and opportunities allow.

1.0–1.9 = Lower Priority - Actions that currently provide relatively limited resilience benefits, address less significant climate risks, or face substantial barriers related to cost, feasibility, or long-term effectiveness. These actions may warrant future consideration as conditions, funding availability, technologies, or risk profiles evolve.

Implementation Timeframes

Implementation timeframes are intended to provide a general indication of when an adaptation action could reasonably be initiated and completed, recognizing that implementation may depend on funding availability, regulatory requirements, operational needs, and coordination with other capital improvement projects.

Short Term (Year 1-3): Short-term actions should be implemented over the course of the first three years of CAP implementation.

Medium Term (Year 4-6): Medium term actions need additional data or information before being implemented.

Long Term (>6 Years): Long term actions have high costs, operational impacts, or high degrees of uncertainty. These actions may become cost effective in the future, but long-term trends and a need to take action would need to be identified before implementation takes place.

Ongoing: Actions that IRWD is already implementing through existing operational practices, capital improvement projects, monitoring programs, maintenance activities, policies, or management initiatives. These actions contribute to climate resilience today and may continue to be expanded or refined over time.

Planned: Actions that IRWD has already identified, scoped, or incorporated into future planning documents, capital programs, operational strategies, or other agency initiatives but that have not yet been fully implemented. These actions represent activities already under consideration and expected to advance as resources and opportunities become available.

4 Adaptation Actions

4.1 Water Treatment and Quality

4.1.1 Asset Overview and Adaptive Capacity

The Water Treatment and Quality system encompasses the facilities, infrastructure, and operational programs responsible for delivering safe and reliable water throughout IRWD's service area. Assets evaluated within this system include treatment plants, recycled water and drinking water reservoirs, wells, pump stations, distribution infrastructure, chemical dosing systems, filtration facilities, and water quality monitoring programs. Key facilities and assets identified in the assessment include Irvine Lake, Syphon Reservoir, Sand Canyon Reservoir, San Joaquin Reservoir, Baker Water Treatment Plant, Orange Park Acres Well facilities, and associated treatment and conveyance infrastructure. Recycled water reservoirs are evaluated within this system because their primary role is long-term water storage, operational flexibility, and supply reliability, which are closely tied to water resource management and water quality objectives. The treatment and production of recycled water itself is evaluated separately under the Recycled Water system.

IRWD maintains a relatively high degree of adaptive capacity through its diversified water supply portfolio, groundwater banking programs, operational redundancy, monitoring systems, and established maintenance and emergency response programs. However, future climate conditions may place increasing pressure on these resources by reducing operational flexibility, affecting source-water quality, and increasing reliance on energy-intensive treatment and water management activities.

4.1.2 Facility Thresholds

Facility thresholds for the Water Treatment and Quality system were developed with IRWD staff through the Climate Impact Threshold Workshops and were designed to identify the conditions under which climate hazards begin to affect treatment performance, infrastructure reliability, or operational effectiveness. Key thresholds include prolonged drought conditions lasting more than five years, repeated droughts occurring with limited recovery between events, wildfire and PSPS conditions associated with extended dry periods and sustained winds, multi-day and compound precipitation events that affect source-water quality and reservoir operations, heatwaves exceeding operational comfort and equipment performance limits, groundwater rise that affects buried infrastructure, and post-fire storm events that mobilize sediment and debris into reservoirs and treatment facilities. See Section 3.4 of Appendix B for more detail.

4.1.3 Key Vulnerabilities

The Water Treatment and Quality system is exposed to a wide range of climate hazards, with the highest vulnerabilities associated with drought, wildfire, heavy precipitation and flooding, extreme heat, and landslides or debris flows. See Section 4.1 of Appendix B for more detail.

Drought

Increasing frequency and severity of 2-year and 5-year droughts will reduce local inflows, degrade water quality (higher BOD, ammonia, algal activity, stratification), and increase treatment complexity and chemical demand, creating Moderate–High vulnerability despite IRWD's diversified supply and monitoring programs.

Wildfire

Wildfire could impact several facilities directly including those located in Silverado Canyon, Williams Canyon, and Modjeska Canyon. Wildfire smoke, ashfall, and PSPS-related outages threaten treatment reliability by degrading source-water quality, increasing turbidity and chemical demand, and limiting staffing and process oversight, creating Moderate–High vulnerability at surface-water intakes and electrically dependent treatment facilities in PSPS-prone areas. Historical fires including the Santiago Fire in 2007 impacted Irvine Lake Reservoir and Syphon Reservoir. This fire left ash and other contaminants in the reservoir that impacted treatments plans. Current upgrades at Syphon Reservoir should also consider filtration needs in the future given the higher wildfire risk.

Heavy Precipitation and Flooding

Intense and clustered storms rapidly degrade source-water quality (turbidity, debris, organics, nutrients), overtop or damage natural treatment and reservoir spillways, and restrict operator access during flooding, creating Moderate to Moderate-High vulnerability where storm intensity, sediment mobilization, and access constraints challenge timely treatment adjustments. Historical challenges with overtopping occurred at Sand Canyon reservoir and IRWD has taken subsequent action to drain and manage reservoir supplies before storms. However, multiple back-to-back storms could still cause challenges to spillways.

Extreme Heat

Prolonged extreme heat and warm nighttime temperatures elevate source-water temperatures and increase chemical and biological treatment challenges. However, IRWD does not rely significantly on surface water which is more impacted by extreme heat than groundwater. More widespread will be indoor heat constraints at facilities without heating, venting or air conditioning (HVAC), resulting in Moderate to Moderate-High vulnerability where cooling limitations, sustained warm influent, or staff comfort issues reduce operational efficiency. The hottest temperatures are expected to be near Baker Water Treatment Plant but increases in temperatures and heatwaves are expected service-area wide.

Landslide and Debris Flow

Landslides and debris flows (especially following wildfire or high-intensity storms) can deliver large sediment, turbidity, and debris loads to reservoirs and NTS facilities, reducing intake reliability, overwhelming treatment processes, and limiting operator access, resulting in Moderate to Moderate-High vulnerability for surface-water-dependent facilities in steep or burn-affected areas. Several potable water lines also run through high landslide susceptibility areas including pipelines in Silverado Canyon and similar terrain.

4.1.4 Adaptation Actions

Climate change is expected to increase operational challenges across IRWD's water supply and treatment systems through more frequent droughts, worsening source water conditions, increased wildfire impacts, extreme storm events, and rising temperatures. Although IRWD's diversified water portfolio, robust monitoring programs, and ongoing capital improvements provide important resilience benefits, projected changes in climate conditions are expected to increase the frequency and severity of these challenges over time.

The list below identifies recommended implementation actions to improve resilience of IRWD's water treatment and quality systems. See Appendix G for a detailed list of proposed adaptation actions. Building on the findings of the Climate Vulnerability Assessment, actions were developed to reduce identified vulnerabilities, strengthen treatment reliability, improve operational flexibility, and support long-term resilience of IRWD's water supply and treatment infrastructure. Actions include both ongoing initiatives and additional strategies that can be implemented over time to address future climate risks.

Summary of Proposed Actions:

- Improve drought resilience and water supply reliability through climate-informed forecasting, demand management, water banking, and diversified supply planning.
- Expand operational flexibility and storage capacity to optimize use of reservoirs, imported water, groundwater, and recycled water during shortages.
- Enhance source water quality monitoring and treatment preparedness for drought-related impacts such as algal blooms, cyanotoxins, ammonia, and reservoir stratification.
- Strengthen wildfire resilience at water supply facilities through backup power, emergency preparedness, vegetation management, and coordination with utilities and fire agencies.
- Reduce post-wildfire water quality risks by upgrading pretreatment infrastructure, stabilizing watersheds, intercepting sediment, and developing reservoir bypass and blending strategies.
- Improve reservoir and treatment system resilience to extreme storms and flooding through debris management, flood protection measures, spillway maintenance, and operational storage enhancements.
- Adapt facilities and operations to extreme heat by protecting sensitive equipment, modifying operational practices, and incorporating high-temperature design standards into future projects.
- Reduce landslide and debris flow risks through watershed stabilization, infrastructure protection, emergency access planning, pipeline response measures, and development of rapid recovery protocols.

4.2 Recycled Water Treatment and Quality

4.2.1 Asset Overview and Adaptive Capacity

The Recycled Water Treatment and Quality system includes IRWD's recycled water treatment plants, non-potable water distribution infrastructure, storage facilities, wells, pump stations, treatment processes, and water quality monitoring programs that support recycled water production and reuse throughout the service area. Key facilities evaluated in the CVA include the Michelson Water Recycling Plant (MWRP), Los Alisos Water Recycling Plant (LAWRP),

disinfection facilities, pump stations, and associated conveyance infrastructure. The system benefits from strong adaptive capacity due to operational redundancy, SCADA-enabled process controls, backup power resources, well-established wet-weather operational procedures, and experienced operations staff. However, the system remains sensitive to large hydraulic fluctuations, biological treatment challenges, flooding, groundwater rise, and changing wastewater characteristics associated with drought conditions.

4.2.2 Facility Thresholds

Key climate thresholds for the Recycled Water Treatment and Quality system focus on conditions that affect hydraulic loading, treatment performance, compliance, and facility operations. Drought thresholds center on increasing wastewater strength, elevated ammonia concentrations, reduced flows, and increased treatment demands associated with long-duration dry periods. Wildfire thresholds emphasize power disruption risks associated with PSPS events and their effects on biological treatment and operational continuity. Heavy precipitation thresholds focus on inflow and infiltration, hydraulic overloading, treatment capacity exceedance, flood exposure, storage exceedance, and compliance risks during compound storms. Sea level rise thresholds primarily relate to groundwater rise surrounding MWRP, including impacts to dewatering systems, buried infrastructure, corrosion, and facility operations. See Section 3.4 of Appendix B for more detail.

4.2.3 Key Vulnerabilities

The Recycled Water Treatment and Quality system is generally resilient due to operational redundancy, advanced process controls, backup power capabilities, and experienced operations staff. However, the Climate Change Vulnerability Assessment identified several climate hazards that could significantly affect treatment performance, regulatory compliance, infrastructure reliability, and operational continuity. Of particular concern are heavy precipitation and flooding, sea-level rise and groundwater rise, and drought, all of which have the potential to alter influent characteristics, challenge biological treatment processes, increase infrastructure maintenance needs, and strain operational resources. Because facilities such as MWRP and LAWRP play a critical role in IRWD's recycled water program, disruptions to treatment operations could have implications for regulatory compliance, recycled water reliability, and overall system performance. These vulnerabilities are expected to become increasingly important as climate conditions become more variable and extreme over time. See Section 4.1 of Appendix B for more detail. Key vulnerabilities include the following:

Heavy Precipitation and Flooding

Extreme single-day, multi-day, and compound storms significantly increase influent flows and inflow and infiltration, stressing hydraulic and biological processes, raising bypass and compliance risks, and exposing electrical/mechanical systems to flooding, resulting in Moderate–High vulnerability at facilities operating near capacity or with aeration-dependent treatment in flood-prone areas. MWRP is located in a flood zone and has experienced near flooding events in the past. These events are likely to occur more frequently and with more intensity.

Sea-Level Rise and Groundwater Rise

While direct marine inundation is limited, sea level rise-induced groundwater rise expands shallow groundwater zones that surround MWRP, creating Moderate–High vulnerability for that facility.

Drought

Increases in water conservation and drought conditions have already been impacting the Water Recycling and Quality systems. While facilities like MWRP have been able to deal with these impacts so far, further or more regular decreases in flows as well as higher concentrations will likely continue to impact operations. Staff specifically identified odors and ammonia increases as key considerations.

4.2.4 Adaptation Actions

The CVA identified several climate-related challenges that could affect the performance and reliability of IRWD's wastewater treatment and water recycling facilities. Key vulnerabilities include more frequent extreme storm events, rising groundwater levels associated with sea-level rise, and reduced wastewater flows during prolonged drought conditions. These stressors have the potential to increase hydraulic loading, strain treatment processes, affect regulatory compliance, damage infrastructure, and increase operational and maintenance requirements. MWRP and LAWRP face particular exposure to these risks due to their locations, treatment processes, and reliance on collection and conveyance systems that may be affected by flooding, inflow and infiltration, groundwater intrusion, and changing wastewater characteristics. In addition, future climate conditions may increase the frequency of operational challenges associated with high-flow storm events, elevated groundwater conditions, and more concentrated wastewater during drought periods.

The list below identifies recommended implementation actions to improve resilience of IRWD's recycled water and treatment system. See Appendix G for a detailed list of proposed adaptation actions. The proposed actions build upon existing facility upgrades, operational programs, and capital improvement projects and are organized by implementation timeframe. These measures are intended to improve treatment reliability, reduce flood and groundwater intrusion risks, maintain regulatory compliance, and ensure the continued production of recycled water under a range of future climate conditions.

Summary of Proposed Actions:

- Improve flood resilience at MWRP and LAWRP through flood hardening, drainage improvements, and facility upgrades.
- Reduce inflow and infiltration and expand wet-weather management capacity to maintain treatment performance during extreme storm events.
- Enhance emergency discharge, storage, and conveyance capabilities to improve operational reliability during flooding and high-flow conditions.
- Protect pump stations, wells, and critical infrastructure from groundwater rise and sea level rise impacts through dewatering improvements, waterproofing, and infrastructure retrofits.
- Incorporate corrosion protection and groundwater intrusion measures into future rehabilitation and capital improvement projects.

- Adapt treatment processes and equipment to lower flows and more concentrated wastewater associated with drought and conservation-driven demand reductions.
- Strengthen monitoring and asset management programs to proactively address odor, corrosion, ammonia loading, and other climate-driven operational challenges.
- Integrate future climate conditions into facility planning, design, and technology investments, including evaluation of advanced treatment and ammonia recovery technologies.

4.3 Sewer System Collections

4.3.1 Asset Overview and Adaptive Capacity

The Sewer System includes gravity sewers, force mains, siphons, lift stations, pump stations, manholes, collection pipelines, and associated conveyance infrastructure that transport wastewater to treatment facilities. The system extends throughout urbanized areas, low-lying basins, canyon corridors, and hillside environments across the service area. Key assets identified in the assessment include the University Lift Station, Bayview Lift Station, trunk sewer alignments near San Diego Creek, force mains, pump stations, and pipelines located in hillside and canyon environments. Adaptive capacity is supported by established maintenance programs, odor and corrosion control efforts, portable generators, bypass pumping capability, inspection programs, emergency response procedures, and long-term asset management practices. Despite these strengths, the system remains vulnerable to inflow and infiltration, corrosion, flooding, groundwater rise, debris flows, and prolonged access limitations during extreme weather events.

4.3.2 Facility Thresholds

Facility thresholds for the Sewer System focus on the conditions that impair conveyance performance, increase overflow potential, accelerate infrastructure degradation, or reduce operational reliability. Drought thresholds include reduced wastewater flows, decreased conveyance velocities, increased sediment deposition, corrosion, odor production, and hydrogen sulfide generation. Wildfire and PSPS thresholds address interruptions to lift station operations, pumping reliability, and emergency response capabilities during extended outages. Flooding thresholds focus on inflow and infiltration, manhole surcharging, hydraulic capacity exceedance, prolonged soil saturation, and compound storm events that reduce recovery time between storms. Groundwater rise thresholds address elevated infiltration, increased hydrostatic pressures, corrosion, and impacts to buried infrastructure. Landslide and debris flow thresholds focus on pipeline burial, exposure, structural damage, sediment blockage, and limited access in canyon and burn-affected areas. These thresholds represent conditions under which system reliability, maintenance requirements, and compliance risks increase substantially. See Section 3.4 of Appendix B for more detail.

4.3.3 Key Vulnerabilities

The Sewer System was identified as one of the most climate-sensitive operational systems evaluated in the CVA. While IRWD benefits from strong adaptive capacity through established maintenance programs, odor and corrosion control efforts, backup power resources, emergency response procedures, and long-term asset management practices, several climate hazards have the potential to significantly affect conveyance performance, infrastructure condition, operational reliability, and regulatory compliance. Of particular concern are heavy precipitation

and flooding, sea-level induced groundwater rise, drought, and landslide or debris flow hazards, all of which can increase inflow and infiltration, accelerate asset deterioration, impair access to critical infrastructure, or increase the likelihood of sanitary sewer overflows and maintenance demands. Many of these risks are concentrated within older sewer infrastructure, low-lying conveyance corridors, lift stations, and areas located near San Diego Creek and other flood-prone or groundwater-sensitive locations.

The CVA found that climate change may place increasing pressure on the Sewer System through both direct and indirect mechanisms. More intense storms are expected to increase hydraulic loading and inflow and infiltration, while prolonged drought conditions may exacerbate corrosion, odor generation, and sediment accumulation. Rising groundwater levels may increase hydrostatic pressure and infiltration into buried infrastructure, while extreme heat can affect the performance of pumps and electrical systems. Although wildfire was generally identified as a lower-priority concern for portions of the sewer system, associated PSPS events, road closures, and post-fire debris can still affect operations and emergency response capabilities. See Section 4.1 of Appendix B for more detail. Key vulnerabilities include the following:

Drought

Lower flows reduce conveyance velocities, increasing sediment deposition, odor, and corrosion; extended dry periods exacerbate hydrogen sulfide generation, accelerate pipe degradation, and impair pump station cycling and wet-well turnover, resulting in Moderate–High vulnerability, especially in low-gradient sewers, older pipe segments, corrosion-vulnerable facilities, and pump stations that require minimum flow to maintain performance. Challenges with odor control and corrosion were identified as a key impact already being experienced at IRWD. These challenges require additional maintenance and cleaning programs as well as more frequent visits by staff which increase costs.

Wildfire

Wildfire and PSPS-related outages can interrupt pump station operations and increase the likelihood of sanitary sewer overflows; ash and post-storm debris can enter sewer segments, elevating blockage risk and maintenance needs; smoke, closures, or damaged roads can delay field response, creating Moderate–High vulnerability, particularly for lift/pump stations on PSPS-prone circuits, low-point wet wells, and force mains requiring continuous pumping. IRWD has been proactive in planning for back-up generation and only one lift station remains without backup power, but duration of available on-site fuel will be an important consideration.

Heavy Precipitation and Flooding

More intense storms raise rapid inflow, manhole surcharging, and capacity exceedance; prolonged and compound storms saturate soils, significantly increasing inflow and infiltration and reducing system recovery time; mobilized debris can obstruct inlets and trigger localized backups, producing High vulnerability, especially at lift/pump stations in low-lying basins, older segments with known inflow and infiltration, and areas prone to access disruptions or debris loading during major events.

Extreme Heat

High temperatures increase thermal loading on pumps, blowers, and auxiliary electronics, leading to overheating, surging, or abnormal operation; extended heatwaves and warm nights limit equipment cooling and recovery, particularly in low-lying or enclosed sites, resulting in Moderate–High vulnerability for lift stations, air-vac facilities, and pump stations with heat-sensitive electronics or limited ventilation.

Sea-Level Rise & Groundwater Rise

While direct marine inundation is limited, sea level rise-induced groundwater rise expands shallow groundwater zones that intersect pipelines, manholes, and vaults, increasing inflow and infiltration, reducing the effectiveness of air-relief devices, accelerating corrosion, and elevating hydrostatic pressure, creating Moderate–High vulnerability for assets near San Diego Creek and other low-elevation corridors where recurring shallow groundwater conditions are expected. Impacts to sewer systems surrounding MWRP will face the greatest groundwater rise threats.

Landslide & Debris Flow

Pipelines, manholes, siphons, and pump stations in steep terrain or downstream of burn scars are susceptible to burial, exposure, deformation, or debris impacts; slope failures and road closures can block access needed for inspections and emergency response, resulting in High vulnerability for canyon and drainage-corridor assets where post-fire debris-flow risk is elevated.

4.3.4 Adaptation Actions

The CVA identified several climate-related risks that could affect the performance and reliability of IRWD's sewer collection and conveyance system. Key vulnerabilities include reduced wastewater flows during droughts, wildfire and Public Safety Power Shutoff (PSPS) events, increasingly intense storm events, extreme heat, rising groundwater levels associated with sea-level rise, and landslides or debris flows in canyon and hillside areas. These hazards can affect collection system performance by increasing inflow and infiltration, accelerating corrosion, disrupting lift station operations, damaging pipelines, limiting site access, and increasing maintenance requirements.

The list below identifies recommended implementation actions to improve resilience of IRWD's sewer system. See Appendix G for a detailed list of proposed adaptation actions. The proposed actions build upon ongoing maintenance programs, planned lift station upgrades, sewer rehabilitation projects, and capital improvement efforts. These actions are intended to improve collection system reliability, reduce flood and corrosion risks, enhance emergency preparedness, protect critical infrastructure, and ensure continued wastewater conveyance under a range of future climate conditions.

Summary of Proposed Actions

- Adapt sewer operations for drought-driven low flows through targeted cleaning, flushing, monitoring, and hydraulic optimization to reduce sediment buildup, odors, and corrosion.
- Improve condition assessment and asset management of aging sewer infrastructure to identify and address corrosion-prone and vulnerable segments before failures occur.
- Strengthen lift station resilience to wildfire and PSPS events through backup power, fuel storage, microgrids, and operational continuity planning.

- Reduce wildfire-related system impacts by implementing debris exclusion measures and improving vegetation management and defensible space around critical facilities.
- Improve flood resilience across the sewer system through inflow and infiltration reduction, flood-proofing, manhole improvements, and climate-informed rehabilitation projects.
- Upgrade lift stations, pipelines, and conveyance infrastructure to accommodate future storm intensity, flooding, and changing hydraulic conditions.
- Protect critical sewer assets from extreme heat, sea level rise, and groundwater intrusion through equipment upgrades, cooling measures, floodproofing, and corrosion-resistant materials.
- Reduce landslide and debris flow risks through slope stabilization, creek crossing protection, pipeline hardening or relocation, watershed restoration, and emergency response planning.

4.4 Monitoring and Control

4.4.1 Asset Overview and Adaptive Capacity

The Monitoring and Control system includes Supervisory Control and Data Acquisition (SCADA) infrastructure, telemetry systems, communications networks, sensors, antennas, repeaters, remote monitoring facilities, automated controls, and supporting power systems. These assets provide real-time visibility into treatment processes, distribution systems, collection systems, reservoirs, pump stations, and operational conditions across IRWD. Because nearly all operational systems rely on monitoring and communications infrastructure, this system serves as a critical operational backbone supporting decision-making, emergency response, and regulatory compliance. Adaptive capacity is relatively high due to redundant communications pathways, backup power systems, uninterruptible power supplies (UPS), automated controls, remote visibility capabilities, and established procedures for operating under degraded conditions. However, the system remains vulnerable to power outages, communication failures, environmental exposure, and increasing thermal stress on electronic equipment

4.4.2 Facility Thresholds

Monitoring and Control thresholds focus primarily on environmental conditions that reduce communication reliability, interrupt power supplies, or impair electronic equipment. Wildfire thresholds emphasize PSPS events, communication disruptions, damage to telemetry infrastructure, and extended operating periods where remote control becomes critical. Extreme heat thresholds address overheating of electronics, sensor drift, abnormal equipment behavior, communication failures, reduced cooling opportunities, and cumulative stress from elevated nighttime temperatures. Flooding thresholds relate to communication interruptions, telemetry failures, increased alarm frequency, and heavy reliance on remote operations during periods of limited physical access. Groundwater rise thresholds focus on long-term moisture exposure to buried conduits, sensor pits, communications infrastructure, and electrical systems. These thresholds identify points at which data quality, operational visibility, communications reliability, and system control may be compromised. See Section 3.4 of Appendix B for more detail.

4.4.3 Key Vulnerabilities

Although the Monitoring and Control system benefits from a high degree of adaptive capacity through redundant communications pathways, backup power systems, uninterruptible power

supplies (UPS), remote monitoring capabilities, and established operating procedures, disruptions to monitoring and control assets have the potential to affect multiple operational systems simultaneously. As a result, vulnerabilities within this system are often amplified because they can reduce operational awareness, limit remote control capabilities, delay response actions, and hinder decision-making during emergency conditions. See Section 4.1 of Appendix B for more detail. Key vulnerabilities include the following:

Wildfire

Wildfire and related PSPS events are going to increase across the northern range of the service area (with PSPS events extended beyond). This could impact monitoring and control systems in these areas as they are either directly damaged by wildfire or indirectly impacted by PSPS events.

Extreme Heat

Extreme heat has been shown to impact electronics and decrease efficiency of electric equipment.

4.4.4 Adaptation Actions

The CVA identified several climate-related risks that could affect the reliability of IRWD's monitoring, communications, and control systems. Many of these risks are concentrated in the northern portion of the service area, where wildfire exposure and PSPS events are expected to increase over time. Communication outages, degraded telemetry, and loss of visibility into system conditions could limit IRWD's ability to respond effectively to changing operational conditions.

The list below identifies recommended implementation actions to improve resilience of IRWD's monitoring and control system. See Appendix G for a detailed list of proposed adaptation actions. The proposed actions build upon existing radio tower improvements, SCADA modernization efforts, and emergency preparedness programs and are organized by implementation timeframe. These measures are intended to strengthen operational awareness, maintain critical communications during emergencies, improve system reliability during extreme weather events, and support continued operation of essential monitoring and control functions under future climate conditions.

Summary of Proposed Actions

- Strengthen emergency communications and telemetry resilience through radio tower upgrades, redundant communications systems, and backup power.
- Expand real-time monitoring capabilities for wildfire smoke, ash, reservoir conditions, and water quality impacts, with integration into SCADA systems.
- Automate operational responses to climate hazards by developing triggers linked to PSPS events, wildfire threats, and water quality conditions.
- Improve power reliability for critical monitoring and control systems through battery backup systems and enhanced emergency power capabilities.
- Protect SCADA, communications, and control equipment from extreme heat using temperature monitoring, backup cooling systems, and upgraded environmental controls.

- Increase operational readiness during extreme weather events through enhanced staffing, system monitoring, and emergency response protocols.
- Incorporate climate resilience into equipment procurement and technology standards by requiring monitoring and communications equipment to withstand high-temperature conditions.

4.5 Fleet and Facilities

4.5.1 Asset Overview and Adaptive Capacity

The Fleet and Facilities system includes administrative buildings, maintenance facilities, fleet vehicles, generators, energy systems, operational support infrastructure, emergency response equipment, maintenance yards, and other facilities necessary to support day-to-day operations. The system also encompasses employee safety considerations, access routes, and continuity-of-operations resources. Because these assets support every major operational division, their performance directly affects IRWD's ability to respond to emergencies and maintain service reliability. Adaptive capacity is generally strong due to established emergency response capabilities, flexible deployment of personnel and equipment, dedicated maintenance resources, fuel supplies, backup power systems, and operational experience managing extreme events. Nevertheless, increasing climate hazards are expected to place additional strain on facilities, staff, equipment, generators, and transportation resources

4.5.2 Facility Thresholds

Key thresholds for Fleet and Facilities focus on conditions that affect worker safety, facility functionality, emergency response, and operational continuity. Wildfire thresholds include smoke impacts, PSPS events, extended generator operation, restricted facility access, and increasing fleet dependence on electricity as vehicles become electrified. Flooding thresholds relate to facility flooding, stormwater intrusion, reduced access, emergency mobilization, and increased wear on vehicles and generators during prolonged response efforts. Extreme heat thresholds focus on worker safety, facilities lacking HVAC systems, prolonged heatwave conditions, elevated nighttime temperatures, and increased demands on cooling equipment and facility management. Groundwater rise thresholds include increasing saturation around facility foundations, utility vaults, roadways, and dewatering systems. Landslide and debris flow thresholds focus on blocked access routes, debris removal operations, emergency mobilization requirements, and facilities located near steep terrain. These thresholds identify the conditions that can reduce operational flexibility and increase demands on support resources. See Section 3.4 of Appendix B for more detail.

4.5.3 Key Vulnerabilities

The Fleet and Facilities system supports nearly every aspect of IRWD's operations and is critical to maintaining continuity of service during emergency conditions. While the system benefits from strong adaptive capacity through established emergency response procedures, backup power resources, dedicated maintenance staff, fuel supplies, and flexible deployment of personnel and equipment, climate-related disruptions can have cascading effects across multiple operational systems. The CVA found that fleet vehicles, generators, maintenance facilities, access routes, and support infrastructure would be increasingly exposed to the effects of wildfire, extreme heat, and landslides or debris flows. Because these assets are relied upon

to support emergency response, inspections, maintenance, and restoration activities, disruptions to Fleet and Facilities can reduce IRWD's ability to respond effectively to climate-related or other incidents elsewhere in the system.

The most significant vulnerabilities identified for this system are associated with increasing wildfire and PSPS events, prolonged extreme heat, and access limitations caused by landslides, debris flows, and severe storms. Wildfire and PSPS events have the potential to directly affect facilities while also creating operational challenges as IRWD's vehicle fleet becomes increasingly electrified and more dependent on reliable power supplies. Extreme heat can reduce staff safety and operational flexibility while increasing wear on fleet assets, generators, cooling equipment, and facilities without adequate climate control. In canyon and hillside environments, landslides, debris flows, and road closures can delay emergency response, restrict access to critical facilities, and increase reliance on heavy equipment and recovery operations. See Section 4.1 of Appendix B for more detail. Key vulnerabilities include the following:

Wildfire

Wildfire and related PSPS events are going to increase across the northern range of the service area (with PSPS events extended beyond). This could impact facilities directly through wildfire damage or indirectly through PSPS events. Fleets also will be increasingly impacted by PSPS events as vehicles are electrified.

Extreme Heat

Extreme heat reduces opportunities for staff physiological recovery, affects indoor working conditions at facilities without HVAC, and can limit safe working hours for field crews. High temperatures increase wear on fleet assets, portable generators, and cooling equipment needed to support operations during peak-heat periods. Facility cooling limitations may also intersect with equipment and personnel protection needs, creating Moderate–High vulnerability, particularly for facilities lacking cooling systems, outdoor field operations, and locations where sustained heat limits operational flexibility.

Landslides & Debris Flow

Landslides, debris flows, and washed-out roads can restrict fleet mobility, delay response and repair activities, and require deployment of heavy equipment for debris removal or slope stabilization. Facilities located downslope of steep terrain may be exposed to sediment deposition, erosion, or access constraints during major storm events. Extended recovery operations increase equipment wear and elevate safety risks for field crews—resulting in Moderate–High vulnerability for facilities and access routes in steep terrain, canyons, or areas subject to post-wildfire debris-flow risk.

4.5.4 Adaptation Actions

The CVA identified several climate-related risks that could affect IRWD's facilities, vehicle fleet, and field operations. Key vulnerabilities include wildfire and Public Safety Power Shutoff (PSPS) events, extreme heat, flooding, landslides, debris flows, and transportation disruptions. These hazards can restrict access to critical facilities, impact emergency response capabilities, disrupt power supplies, and create challenges for maintaining safe and reliable operations during extreme weather events.

The list below identifies recommended implementation actions to improve resilience of IRWD's fleet and facilities. See Appendix G for a detailed list of proposed adaptation actions. The proposed actions build upon existing emergency preparedness programs, facility improvement projects, fleet modernization initiatives, and vegetation management efforts. Organized by implementation timeframe, these actions are intended to improve emergency response capabilities, maintain access to critical facilities, support workforce safety, strengthen operational continuity during outages and extreme weather events, and enhance the long-term resilience of IRWD's physical assets and operations.

Summary of Proposed Actions

- Improve fleet and facility resilience to wildfire and PSPS events through emergency power capabilities, resilient charging infrastructure, and operational continuity planning.
- Leverage fleet electrification to support emergency operations by expanding charging infrastructure and evaluating vehicle-to-grid and bi-directional charging capabilities.
- Enhance facility access and defensible space management through vegetation management, emergency access maintenance, and wildfire evacuation protocols.
- Protect staff health and safety during extreme heat through cooling stations, heat-health protocols, adjusted work schedules, and access to climate-controlled facilities.
- Incorporate climate resilience into fleet, charging, and facility investments by siting and designing infrastructure to withstand wildfire, flooding, groundwater rise, and extreme heat.
- Improve emergency preparedness for landslides, debris flows, and severe storms through alternative access routes, pre-positioned equipment, and emergency repair materials.
- Stabilize vulnerable facility sites and access corridors by addressing slope, drainage, and erosion issues around maintenance yards, roads, and critical facilities.
- Strengthen emergency response capabilities through standing contractor agreements, streamlined procurement procedures, and rapid deployment of resources during disaster events.

4.6 Natural Treatment System

4.6.1 Asset Overview and Adaptive Capacity

The natural treatment system is comprised of engineered and semi-natural facilities that use vegetation, soils, microbial communities, wetlands, sedimentation basins, and other natural processes to improve water quality and treat urban runoff. These systems provide treatment through physical, chemical, and biological mechanisms while supporting environmental and habitat objectives throughout the service area. Key NTS assets identified in the CVA include the San Joaquin Marsh, Peters Canyon facilities, Upper Eastfoot, Middle Eastfoot, Lower Eastfoot, Eastfoot Retarding Basin, Forge Meadow, and other NTS facilities. Compared to IRWD's traditional infrastructure systems, adaptive capacity is generally more limited because treatment performance depends heavily on ecological processes, vegetation communities, and watershed conditions that can be difficult to control or rapidly restore following disturbance events.

4.6.2 Facility Thresholds

NTS thresholds focus on the climatic conditions that reduce treatment performance, alter ecological function, or increase maintenance demands. The most significant threshold involves sediment accumulation and debris loading following wildfire and intense precipitation events, particularly when storms occur within three to six months after a wildfire. Under these conditions, large sediment loads may overwhelm treatment basins, clog infrastructure, reduce detention times, compromise vegetation-based treatment processes, and require extensive maintenance. Groundwater rise thresholds focus on rising water tables, increasing saturation, reduced infiltration capacity, salinity intrusion, altered vegetation communities, and changing wetland function, particularly within the San Joaquin Marsh. Wildfire thresholds address direct impacts to vegetation, increased ash deposition, sediment accumulation, degraded treatment performance, and post-fire erosion throughout contributing watersheds. These thresholds reflect the conditions under which NTS facilities may experience reduced effectiveness, increased maintenance requirements, or long-term ecological change. See Section 3.4 of Appendix B for more detail.

4.6.3 Key Vulnerabilities

The NTS provides water quality treatment, runoff management, and habitat benefits across the IRWD service area. Unlike traditional engineered infrastructure, these systems rely heavily on natural processes, including vegetation, soils, wetlands, microbial activity, and sedimentation, to achieve their treatment objectives. As a result, their performance is closely tied to environmental and watershed conditions and can be more difficult to control or rapidly restore following disturbance events. While NTS facilities provide important resilience and ecological benefits, their dependence on natural processes creates unique vulnerabilities to climate-driven changes in hydrology, sediment transport, vegetation health, groundwater conditions, and water quality. See Section 4.1 of Appendix B for more detail.

The assessment identified sea-level induced groundwater rise, wildfire, and landslide or debris flow hazards as the primary threats to NTS. Rising groundwater levels may alter infiltration capacity, change vegetation communities, and affect treatment effectiveness over time, particularly at low-lying facilities such as San Joaquin Marsh and Peters Canyon. Wildfires have the potential to directly damage vegetated treatment systems while also increasing erosion, sediment transport, and downstream water quality impacts. Similarly, landslides, debris flows, and post-fire storm events can overwhelm NTS facilities with sediment and debris, reducing treatment performance, increasing maintenance requirements, and limiting access for operations and recovery activities.

Sea Level Rise & Groundwater Rise

Rising groundwater levels may affect the natural treatment system before direct coastal flooding occurs, particularly at low-lying sites such as the San Joaquin Marsh and Peters Canyon. Groundwater rise and associated salinity changes could reduce infiltration capacity, impact vegetation communities, and gradually decrease treatment effectiveness. These long-term operational challenges create Moderate–High vulnerability, despite limited direct inundation risk.

Landslides & Debris Flow

Sediment and debris mobilized during landslide, debris-flow, and post-fire storm events can overwhelm NTS facilities, reducing infiltration capacity and treatment performance. Access constraints and upstream infrastructure disruptions may also delay maintenance and recovery activities. These combined impacts result in Moderate–High vulnerability, particularly following severe storms or wildfire events.

Wildfire

Increasing wildfire conditions may directly damage vegetated treatment areas and degrade natural treatment functions. Wildfire also increases erosion potential, elevating the risk of sediment accumulation and clogging during subsequent storm events. These impacts could reduce system performance and increase maintenance needs, resulting in Moderate–High vulnerability.

4.6.4 Adaptation Actions

The CVA identified several climate-related risks that could affect the performance of IRWD's Natural Treatment System, particularly facilities located in the northern portion of the service area. Key vulnerabilities include post-wildfire debris flows, landslides, extreme storm events, sediment and turbidity loading, sea-level rise impacts, and access limitations during emergencies. Because these facilities rely on natural processes and are closely connected to surrounding watersheds, changes in watershed conditions can directly influence treatment performance and maintenance requirements.

The list below identifies recommended implementation actions to improve resilience of NTS facilities. See Appendix G for a detailed list of proposed adaptation actions. The proposed actions focus on reducing sediment and debris impacts, strengthening watershed monitoring and forecasting capabilities, improving facility access during emergencies, addressing long-term sea-level rise concerns, and enhancing operational preparedness following wildfire and storm events. Organized by implementation timeframe, these actions are intended to maintain treatment performance, protect critical infrastructure, and improve the long-term reliability of the natural treatment system under a range of future climate conditions.

Summary of Proposed Actions

- Reduce sediment, debris, and turbidity impacts through construction of forebays, sedimentation basins, and pretreatment infrastructure upstream of vulnerable natural treatment facilities.
- Enhance monitoring and predictive capabilities by developing subwatershed-based monitoring programs and risk models to identify climate-related threats to treatment performance.
- Improve resilience to post-wildfire and extreme storm events through facility-specific response plans, sediment management strategies, and temporary intake protection measures.
- Strengthen access and operational continuity by hardening roads, stabilizing slopes, upgrading culverts, and pre-positioning debris removal equipment at vulnerable facilities.
- Manage flooding impacts on treatment systems through floodwater diversion and enhanced sediment control measures that protect water quality and treatment effectiveness.

- Prepare for sea-level induced groundwater rise and salinity intrusion by evaluating relocation of vulnerable intakes and pump stations and implementing salinity monitoring and management protocols.
- Protect water quality and treatment performance through enhanced pretreatment controls that capture contaminated sediment before it reaches natural treatment facilities.
- Improve emergency response and maintenance capabilities through streamlined permitting, pre-approved environmental compliance procedures, and rapid-response protocols.

4.7 System Wide Operational Changes

While many adaptation actions are tied to specific facilities or operational systems, several recommendations provide benefits across the entire organization. These system-wide actions strengthen IRWD's ability to prepare for, respond to, and recover from a broad range of climate hazards. Rather than addressing a single vulnerability, these actions improve organizational preparedness, operational flexibility, decision-making, workforce resilience, and long-term infrastructure planning. The proposed actions below help embed climate resilience into everyday operations and future investment decisions, incorporating resilience considerations across all IRWD programs and facilities.

Policy, Planning, and Operational Improvements

1. **Establish a standardized After-Action Report program** to document lessons learned following droughts, floods, wildfires, PSPS events, and water quality emergencies, creating a formal process to identify operational gaps, successful response measures, and future improvement opportunities.
2. **Formalize cross-training and staffing surge plans** to ensure critical treatment, conveyance, and operational functions can be maintained when staffing availability or access to facilities is disrupted by hazardous conditions.
3. **Implement a climate resilience screening checklist for capital projects** so that flood risks, wildfire exposure, sea-level rise, groundwater impacts, extreme heat, and backup power needs are evaluated consistently during project planning and design.
4. **Continue to formalize extreme heat operational protocols** that protect employees through adjusted work schedules, hydration requirements, cooling measures, and other workforce safety practices during high-temperature events.
5. **Conduct annual multi-hazard emergency exercises** that simulate compound events such as wildfire followed by debris flows or power outages occurring during heat emergencies to improve emergency preparedness and coordination.
6. **Establish emergency procurement agreements and pre-positioned contracts** for generators, fuel, treatment chemicals, debris removal, and emergency repair services to accelerate response and recovery during regional emergencies.
7. **Expand coordination with local jurisdictions on stormwater infiltration projects** to reduce runoff volumes, lessen flooding impacts, improve groundwater recharge, and increase watershed resilience.
8. **Continue to coordinate with Orange County Fire Authority, CalFire, and emergency responders to assess facilities** in high wildfire risk areas and identify opportunities for vegetation management, defensible space improvements, and facility hardening.

9. **Maintain and expand mutual aid partnerships with regional agencies** to improve access to emergency resources, including standby generators, specialized equipment, and emergency response personnel.
10. **Develop a District-wide climate data management and analytics program** that uses operational data such as temperature trends, groundwater levels, pumping records, and drought indicators to identify emerging risks, evaluate system performance, and support climate-informed decision making.

Facility and Infrastructure Improvements

1. **Transition backup generators to renewable diesel where feasible** to reduce greenhouse gas emissions while maintaining emergency power capabilities and operational resilience.
2. **Install heat pump systems in administrative and operational facilities** to improve energy efficiency, reduce emissions, and provide reliable heating and cooling under changing climate conditions.
3. **Retrofit maintenance facilities and operations centers with cooling systems**, shaded work areas, and air filtration to protect employees and maintain productivity during extreme heat and poor air quality events.
4. **Incorporate fire-resistant materials and design standards into facilities** located in high wildfire hazard areas to reduce damage risk and improve operational continuity during wildfire events.
5. **Expand redundant communications and backup power systems** to maintain situational awareness, coordination, and critical operations during PSPS events, flooding, extreme heat, and other emergencies.
6. **Support watershed conservation and restoration activities** that improve ecosystem health, reduce erosion and sedimentation, enhance groundwater recharge, and provide long-term resilience benefits across multiple IRWD systems.

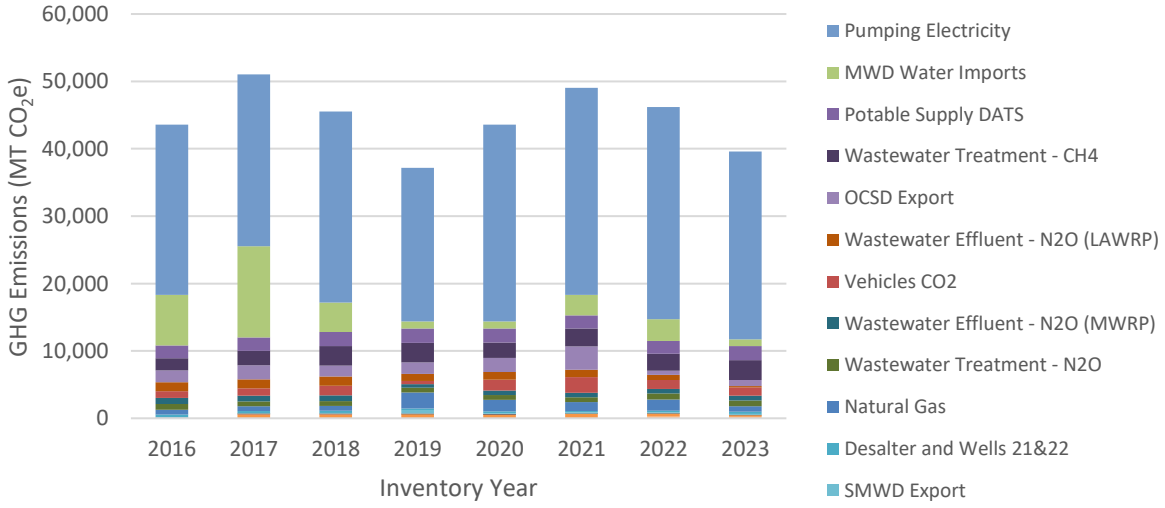
5 GHG Emissions and Climate Change Mitigation Opportunities

In addition to addressing the climate change impacts, this Plan also quantified the GHG emissions associated with IRWD's operations and completed technical analysis, site visits, and modeling exercises to better understand the opportunities available for IRWD to reduce their GHG emissions. Without mandated GHG reduction targets, IRWD voluntarily reduces GHG emissions. In addition to the GHG quantification, Willdan, an engineering firm, benchmarked IRWD facilities, identified energy optimization measures and analyzed opportunities for solar PV and BESS. Willdan also created a framework for analyzing future distributed energy resource projects at IRWD. This section outlines the results of the GHG emissions modeling, energy optimization assessment, and battery energy storage system and renewable energy analysis.

5.1 GHG Emissions Inventory

As a first step in understanding IRWD's contributions to climate change, a comprehensive GHG emissions inventory was developed. The inventory serves to highlight where GHG emissions are generated from IRWD operations as well as to identify trends in emissions over time. The results of the GHG inventory show that IRWD's GHG emissions are primarily associated with electricity consumption used to pump, treat, distribute, and recycle wastewater, with additional emissions generated from vehicle fuel consumption, natural gas use, wastewater treatment processes, imported water, and biosolids management. Because water and wastewater operations are inherently energy-intensive, IRWD's emissions profile is closely linked to water demand and treatment requirements. As part of the CAP, historical emissions trends were evaluated to establish major drivers of emissions. The single largest source of emissions for IRWD (and most water agencies) is electricity use associated with water pumping. Historical IRWD GHG Emissions can be seen in Figure 13. Appendix A discusses the GHG emissions and forecast in more detail.

Figure 13 Historical IRWD GHG Emissions by Year

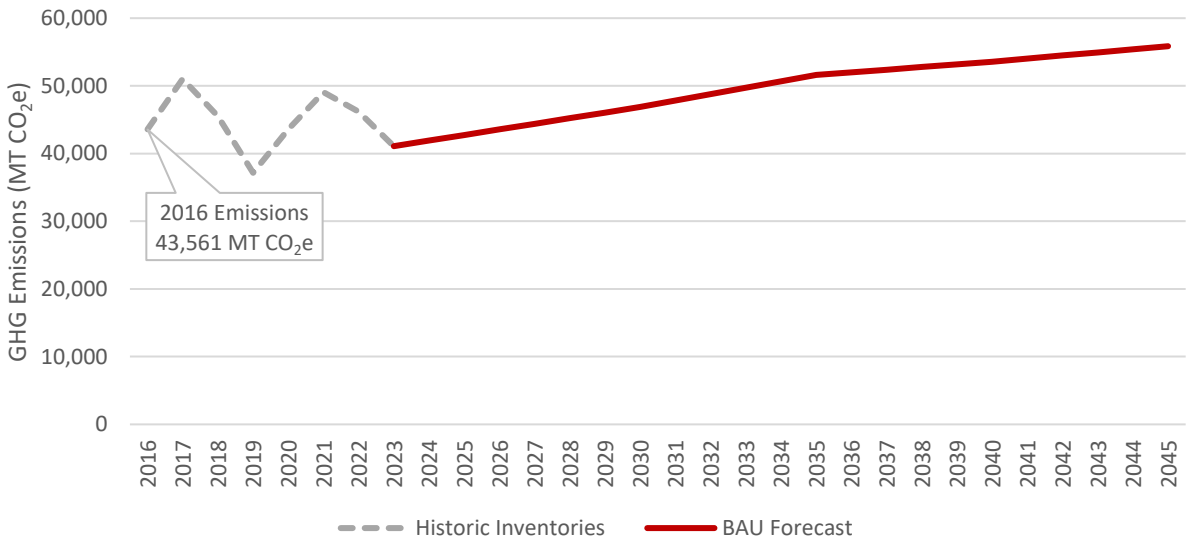


5.1 Business-as-Usual GHG Emissions Forecast

Based on IRWD's historical inventories from 2016 through 2023 the business-as-usual forecast projects how emissions might change over time without any additional GHG emissions reduction strategies. The forecast incorporated anticipated increases in service area population, potable and non-potable water demands, imported water supplies, wastewater treatment flows, and planned facility expansions. Future emissions were estimated by applying growth factors derived from operational metrics such as water demand, population served, and imported water purchases to the emissions factors used in the 2023 inventory. Planned capital projects, including the Syphon Reservoir Improvement Project, MWRP expansions, and recently acquired treatment facilities, were also incorporated into the forecast.

Under the BAU scenario, total emissions are projected to increase from approximately 41,100 metric tons of carbon dioxide equivalent (MT CO2e) in 2023 to nearly 55,900 MT CO2e by 2045, representing approximately 36 percent growth over the planning horizon. The forecast indicates that electricity consumption associated with water pumping and treatment will remain the largest source of emissions, followed by wastewater treatment processes, imported water supplies, and fleet operations. These results highlight the importance of reducing grid electricity dependence and improving operational energy efficiency to manage long-term emissions growth. Forecasted emissions can be seen in Figure 14.

Figure 14 Historic Inventories and BAU Forecast Scenario Results (MT CO_2e)



However, IRWD has several avenues to reduce GHG emissions and make progress towards the statewide GHG reduction targets.

5.2 Energy Optimization Measure Evaluation Summary

As shown in the GHG inventory, electricity consumption is the largest emissions source for IRWD. To understand opportunities to reduce emissions associated with electricity (and other

energy sources) and increase cost effectiveness, Willdan conducted an energy optimization evaluation of IRWD facilities. The evaluation included benchmarking of IRWD facilities, site visits to the facilities with the largest energy footprints, and the development of several energy saving measures.

5.2.1 Operations Benchmarking

Willdan conducted energy benchmarking for each of IRWD's facilities. The process of energy benchmarking includes a comparison of IRWD's facilities with similar facilities from other water agencies. Annual electricity consumption and corresponding energy intensity of key treatment and pumping facilities within the system were quantified across IRWD operations. Energy intensity values were developed and are expressed in kilowatt-hours per million gallons (kWh/MG) of water produced, treated, or delivered. This metric allows for a direct comparison of relative efficiency across facilities. Benchmark ranges were developed using industry literature, prior IRWD studies, and physics-based calculations to represent the expected operating energy intensity ranges for similar facilities. The Energy Intensity Percentile in Table 1 represents each facility's position relative to the benchmark range for IRWD facilities with over 1 million kWh of annual energy consumption. A full list of benchmarking results can be found in Appendix C. Lower values indicate more efficient operation, while higher values reflect less efficient performance than other similar facilities.

The benchmarking process demonstrated that a majority of IRWD's electricity consumption is concentrated in large-scale treatment facilities like Michelson Wastewater Treatment Plant, Los Alisos Wastewater Treatment Plant, Baker Water Treatment Plant, and DATS. The benchmarking process also showed that many of these large energy users are operating at or near the low end of energy intensity, demonstrating efficient operations.

Table 1 Summary of IRWD Facility Benchmarking Results

Site	Annual Energy Consumption (kWh)	Energy Intensity (kWh/MG)	Energy Intensity Benchmark Low (kWh/MG)	Energy Intensity Benchmark High (kWh/MG)	Energy Intensity Percentile
Michelson Water Reclamation	38,149,081	4,818	4,748	8,621	2%
Baker Water Treatment Plant	16,703,214	1,767	1,974	2,237	0%
Deep Aquifer Treatment System (DATS)**	8,987,208	3,579	466	4,198	83%
Los Alisos Water Reclamation Plant*	7,277,143	3,983	4,640	8,621	0%
Coastal Zn B-D PS B	3,150,514	1,990	166	2,998	64%
Dyer Road Well 15	2,913,859	2,356	1,346	6,728	19%
East Irvine Zn 1-3 PS*	2,784,950	1,228	166	2,998	38%
Dyer Road Well 10	2,678,207	2,594	1,346	6,728	23%
Foothill Zn 4-6 PS*	2,417,682	2,317	166	2,998	76%
Coastal Zn B-D PS A	2,092,658	2,453	166	2,998	81%

Site	Annual Energy Consumption (kWh)	Energy Intensity (kWh/MG)	Energy Intensity Benchmark Low (kWh/MG)	Energy Intensity Benchmark High (kWh/MG)	Energy Intensity Percentile
IDP Potable Treatment Plant*	1,984,408	2,691	666	8,332	26%
Eastwood Pump Station*	1,919,229		166	2,998	-
Tustin Well 21/22 Treatment Plant	1,803,548	2,956	666	8,332	30%
Well 21 Mitchell and Debusk	1,637,477	2,345	1,346	6,728	19%
Dyer Road Well 18	1,564,412	3,127	1,346	6,728	33%
Dyer Road Well 14	1,340,956	1,291	1,346	6,728	0%
Dyer Road Well 04 Segerstrom Park	1,336,871	1,904	1,346	6,728	10%
East Irvine Zn A-B PS	1,288,974	768	166	2,998	21%
Dyer Road Well 17	1,276,489	2,300	1,346	6,728	18%
Portola Hills Zn 6-8 PS	1,211,795	2,175	166	2,998	71%
Turtle Rock Zn 1-3 PS	1,133,864	1,078	166	2,998	32%
Dyer Road Well 11	1,112,003	1,760	1,346	6,728	8%
Well ET2 / TIC Well 113 (CERCLA)	1,077,067	2,947	1,346	6,728	30%
Dyer Road Well 01 Segerstrom/Thornton Pk	1,036,188	2,588	1,346	6,728	23%

Notes:

*SCADA flow data was unreliable or absent. Energy Intensity if available is from a previous IRWD study (Navigant Consulting, Inc. 2015 IRWD Embedded Energy Plan, Final Report).

**Benchmarks do not include well pumps.

General Notes:

1. Well benchmark range is calculated based on possible well conditions, ranging for a pump head of 300 ft to 1500 ft.
2. Energy intensity was calculated by summing daily water production data from SCADA to match the corresponding monthly electricity consumption. Monthly energy use (kWh) was then divided by total water production (MG) for each facility to determine energy intensity (kWh/MG).
3. Pump station benchmark range is estimated based on flat to hilly geography.
4. Annual data is from the most recent 12 months of data available at the time of the analysis, generally, January 2024 to December 2024.

5.2.2 Site Visits

Based on the benchmarking results and discussions with IRWD staff, Willdan conducted site visits with IRWD's Director of Water & Recycling Operations Jose Zepeda, Senior Energy and Water Resources Planner Robert Huang, and several IRWD facility operators at key facilities. The purpose of the visits was to perform facility walkthroughs and gather operational and

energy performance information at the following sites: Michelson Water Recycling Plant (MWRP), Deep Aquifer Treatment System (DATS), Wells 21/22 Treatment Facility, Baker Water Treatment Plant, Rattlesnake Reservoir, and Zone A Pump Station. Additional information on the site visit and benchmarking findings can be found in Appendix C.

5.2.3 Energy Optimization Measures

Although IRWD facilities were found to be within range for energy performance, Willdan identified three potential energy optimization measures designed to improve efficiency or operational efficiency. While individual projects vary by facility, the overall objective is to reduce energy consumption associated with pumping, treatment, process equipment, and facility operations through operational improvements, equipment upgrades, and modernization efforts. Measures were evaluated using multiple criteria weighted with feedback from IRWD staff, inluding:

- Cost Effectiveness - Weight: 30%
- Capital Requirements - Weight: 10%
- Technical Feasibility - Weight: 15%
- Operational Impact - Weight: 20%
- Grants and Incentives - Weight: 5%
- Stakeholder Support - Weight: 10%
- Benchmarking - Weight: 5%
- Resilience Benefit - Weight: 3%
- Greenhouse Gas Benefit - Weight: 3%

Three primary strategies were identifeid, while several additional strategies were flagged as having potential savings. For a full list of energy optimization measures, see Appendix C.

EEM-1 Hydro turbine Installation at Baker Water Treatment Plant (Score: 6.975 - 6.775)

This measure proposes installing a hydro turbine to capture wasted energy from reducing the incoming water pressure from 45 psi to 5 psi. The high flow and required pressure reduction present a great opportunity to capture and use clean energy. The recovered energy will be converted to electricity via the turbine and used onsite, reducing purchased electricity, GHG emissions and utility costs. The system is passive and requires minimal maintenance and can provide an estimated annual generation of 836,000 kWh depending on operating conditions.

Energy savings for this measure are estimated at 836,000 kWh which assumes an average power output of 95 kW 24/7 and an average blended utility rate of $0.159/kWh. This provides annual utility cost savings of $132,924.

EEM-2 Mainspring Linear Generator at Michelson Water Recycling Plant (Score: 7.025)

Willdan proposes installing one or more Mainspring Linear Generators at the Michelson Water Recycling Plant to supplement the existing microturbines. The fuel-flexible Mainspring Linear Generator does not use a traditional combustion process but instead relies on a low-temperature reaction of fuel and air that leads to higher electrical efficiency (~45%) and lower NOx emissions.

Energy savings are estimated at 1,642,500 kWh, which assumes a 250 kW linear generator provides an additional 6,570 hours above what is provided by the microturbines and a blended electricity rate of $0.15/kWh. This results in annual utility cost savings of $246,375.

EEM-3 Battery Energy Storage System (BESS) at Key Well Sites for Pump Soft Shutdown (Score: 5.15)

IRWD well sites do not currently have backup power to allow the well pumps to ride-through or perform a controlled shutdown of the pumps during unplanned power outages. When power is lost, pumps shut off suddenly, leading to pump and motor damage. These hard stops introduce mechanical and electrical stress, reduce pump life, and increase maintenance costs. This measure proposes installing battery energy storage systems (BESS) at well sites to provide a "soft stop" for well pumps in the event of an unplanned power outage. Operators reported pump and motor damage resulting from power outages. Installing BESS at well sites will allow the system to perform a controlled shutdown of the pumps to prevent damage to the system, pumps, and/or motors. This reduces mechanical and electrical stress, extends pump lifespan, and minimizes unplanned downtime.

No energy savings were identified for this project as the batteries are sized for only a few minutes of use.

These strategies can provide reductions in electricity consumption and/or a reduction in operating costs while also supporting long-term resiliency objectives. Because energy efficiency measures reduce electricity use regardless of future grid conditions, they represent a complementary strategy that compounds the benefits of renewable energy deployment and statewide grid decarbonization.

5.3 Solar PV and BESS Feasibility Analysis Summary

A Solar PV and BESS Feasibility Analysis and Report was also produced by Willdan for IRWD to understand the feasibility of expanding solar and battery storage resources at IRWD facilities as well as provide a pathway for managing the six existing BESS systems. The full Solar PV and BESS Feasibility Analysis can be found in Appendix D which includes the complete assessment of the selected solar PV and BESS systems.

5.3.1 Existing BESS System Option Evaluation

IRWD currently holds a contract with Hybrid Electric Building Technologies who owns and operates six BESS sites at IRWD facilities. The current savings sharing agreement with Hybrid Electric Building Technologies sunsets in 2029. As part of the analysis, Willdan analyzed four potential scenarios for IRWD to follow as the existing contract expires as shown in Table 2.

Table 2 Scenarios for Six Existing District BESS Sites After Agreement Sunset

Type	Description	Benefits	Concerns
Scenario 1: End of Life Existing Systems	Hybrid Electric Building Technologies covers the cost of demolition of existing systems. The District takes no further action to replace systems.	No risk or cost is incurred to the District	Current savings from BESS are not refreshed.
Scenario 2: New System Replacement	Hybrid Electric Building Technologies covers cost of demolition of existing systems, and the District utilizes remaining infrastructure in place for new system installation.	Refreshed savings opportunities, flexibility to choose new operator and type of agreement	Utility demand response revenue opportunities are difficult to predict. The District may end up taking more financial risk for other bill savings operations such as peak shaving.
Scenario 3: Extension of Existing Agreement	The District extends shared savings agreement with Hybrid Electric Building Technologies, and existing systems remain in place.	Low-hassle approach to refresh savings	Future utility demand response revenue opportunities are uncertain as Hybrid Electric Building Technologies may not be willing to extend contract under current conditions (namely the minimum savings guarantee). As systems approach their original 10-year operation date, maintenance for extended operation would likely increase. Demo cost coverage of existing systems would be forfeit.
Scenario 4: System Buyout	The District purchases the systems from current operator, and selects a third-party to continue operating the systems.	Flexibility to extract new bill savings measures from existing systems	Existing controllers would not be compatible with a new operating algorithm, and significant control system retrofits would be required. Finding a suitable control operator who is willing and able to manage 10- year-old hardware and continue their maintenance is likely to prove difficult.

Under the current agreement with the Hybrid Electric Building Technologies, the systems will be considered end-of-life at Year 10 (2029), at which point all costs of demolition and removal of these systems will be covered. Ultimately, Willdan identified Scenario 2 as the most reasonable path forward for IRWD's six BESS systems. Scenario 2 allows IRWD to leverage existing electrical infrastructure but make updates to systems sizing and controls, avoid demolition costs, and potentially enter into an agreement with another service provider.

5.3.2 New PV and BESS System Analysis

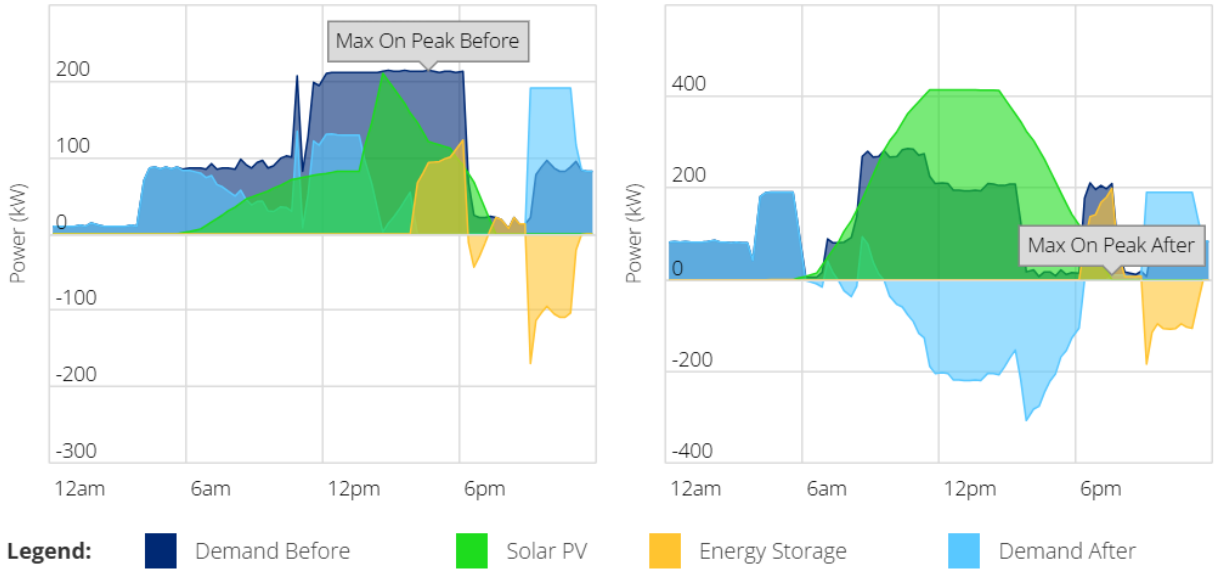
In addition to the analysis of the existing BESS systems, the feasibility of installing new distributed energy systems was also analyzed. Adding additional solar PV or BESS systems could lower GHG emissions for IRWD operations and provide resilience benefits in the case of power outages. IRWD identified the following sites for the PV and BESS analysis:

- Rattlesnake Reservoir Baseball Field
- Michelson Water Recycling Plant
- Zone A North Reservoir 3
- Baker Water Treatment Plant

At the four proposed Solar PV/BESS sites, a site audit was conducted as an initial step to understand the site-specific scope of work associated with developing the distributed energy resource (DER) systems. The interconnection with the electric utility requires an interconnection application and subsequent interconnection study carried out by Southern California Edison (SCE), to ensure the DER project will meet performance requirements and that the utility-side infrastructure can handle additional resources importing from and exporting to its grid.

Next, 12 months of recent 15-minute electricity usage data from each of the focus facilities was analyzed to understand overall energy demand. Since IRWD is on a time-of-use rate structure (with electricity rates changing depending on time of day) understanding when and how much electricity can be offset by a distributed energy resource is key to accurately modeling financials. Two example scenarios are shown in Figure 15 where solar PV and BESS systems are able to shift demand (dark blue) away from peak energy pricing (4pm to 9pm) to less costly times of day (light blue). The left and right graphs represent two different scenarios and baseline electricity demand curves and demonstrate how solar and BESS can be used to shift loads to less expensive times of day.

Figure 15 Zone A North and Rattlesnake Reservoir BESS + Solar PV Simulation



A rate structure analysis was also completed to understand current utility rates and to inform the cost savings that a PV and/or BESS system could provide. Finally, current utility programs that support distributed energy resources (like PV and BESS) were summarized to understand the additional financial incentives and allowances currently supported by IRWD's utility provider, Southern California Edison. One major change to PV and BESS programs were the changes to the Federal Incremental Tax Credit (ITC) implemented by the One Big Beautiful Bill Act in July 2025. Under these changes, Solar PV projects not underway by 07/04/2026 can no longer receive the 30% ITC credit. However, the Federal ITC base rate for BESS projects will remain at 30% of total project costs (provided labor and apprenticeship requirements are met) for projects commencing construction through 2033.

Based on these analyses, the resulting PV and BESS system sizes, blended demand charges, and savings expectations are included in Table 3. If the ITC was renewed, or a similar cost reduction program was instituted, the payback periods were found to be much better, with multiple projects having payback periods shorter than the systems expected lifespan as shown in Table 4.

In summary, the key factors influencing cost-effectiveness across all scenarios include site load shape, demand charge structure, export compensation methodology, system sizing discipline, and availability of financial incentives such as the ITC. RES-BCT Solar PV represents the best near-term opportunity for the District. BESS investments should remain targeted and load-driven rather than incentive driven. For all projects examined, calculated simple paybacks are not within the District's desired typical payback periods for capital investment.

Should the ITC be reinstated and additional incentives or demand response programs be offered for Solar PV and BESS systems, the District is advised to:

- Consider a phased, stepwise implementation approach that prioritizes RES-BCT solar development at suitable sites with attractive paybacks,
- Prepare for strategic BESS replacement post-2029, and
- Remain flexible to re-evaluate Solar PV deployment broadly

Table 3 Summary of Solar PV and BESS system Analysis (Without ITC)

Site	System Type	PV System Size (kWDC)	BESS System Size (Inverter Capacity/ Energy Capacity)	Blended Demand Charges ($/kW)	Year 1 Solar PV Savings ($)	Year 1 BESS Savings ($)	Year 1 DSGS Program Payments ($)	Year 1 Total Savings ($)	Total Project Cost ($)	Simple Payback (Years)
Michelson Water Recycling Plant	Solar Paired Storage	1809.6	449 kW / 1795 kWh	42.3	272,738.15	141,415	37,160	451,314	11,385,556	25
Baker Water Treatment Plant	Solar Paired Storage	355.2	326 kW / 1306 kWh	39.8	56,018.24	69,984	27,026	153,028	3,847,928	25
Deep Aquifer Treatment System	Standalone Storage	N/A	100 kW / 406 kWh	42.6	-	17,434	8,280	25,714	782,600	30
Los Alisos Water Recycling Plant	Standalone Storage	N/A	100 kW / 406 kWh	42.0	-	18,566	8,280	26,846	782,600	29
Potable Treatment Plant	Standalone Storage	N/A	60 kW / 120 kWh	35.7	-	3,998	3,768	7,766	331,189	43
Wells 21/22 Desalter Facility	Standalone Storage	N/A	50 kW / 203 kWh	24.3	-	4,240	4,140	8,380	564,473	67

Table 4 Summary of Solar PV and BESS system Analysis (With ITC)

Site	System Type	PV System Size (kWDC)	BESS System Size (Inverter Capacity/ Energy Capacity)	Blended Demand Charges ($/kW)	Year 1 Solar PV Savings ($)	Year 1 BESS Savings ($)	Year 1 DSGS Program Payments ($)	Year 1 Total Savings ($)	Total Project Cost ($)	Simple Payback (Years)
Michelson Water Recycling Plant	Solar Paired Storage	1809.6	449 kW / 1795 kWh	42.3	272,738.15	141,415	37,160	451,314	7,969,889	18
Baker Water Treatment Plant	Solar Paired Storage	355.2	326 kW / 1306 kWh	39.8	56,018.24	69,984	27,026	153,028	2,693,550	18
Deep Aquifer Treatment System	Standalone Storage	N/A	100 kW / 406 kWh	42.6	-	17,434	8,280	25,714	547,820	21
Los Alisos Water Recycling Plant	Standalone Storage	N/A	100 kW / 406 kWh	42.0	-	18,566	8,280	26,846	547,820	20
Potable Treatment Plant	Standalone Storage	N/A	60 kW / 120 kWh	35.7	-	3,998	3,768	7,766	231,832	30
Wells 21/22 Desalter Facility	Standalone Storage	N/A	50 kW / 203 kWh	24.3	-	4,240	4,140	8,380	395,131	47

5.4 GHG Savings Opportunities

Based on the technical analysis completed by Willdan and a review of existing legislation, several voluntary and regulatory driven opportunities to reduce emissions relative to the BAU were identified. These opportunities include statewide electricity grid decarbonization (SB100), renewable energy and BESS systems discussed in Section 5.3, fleet electrification, and the energy optimization projects identified in Section 5.2. Based on project feasibility, several of these projects were identified for inclusion in an adjusted forecast that demonstrates IRWD's ability to reduce GHG emissions over time. The following section outlines the projects and regulations considered for the adjusted forecast and identifies why they were or were not included, their status as a voluntary or mandatory requirement, and their associated benefits.

Renewable Portfolio Standard (RPS)

California's Renewable Portfolio Standard (RPS), Senate Bill 100 (SB 100), and Senate Bill 1020 establish increasingly stringent requirements for utilities to procure renewable and carbon-free electricity, culminating in a statewide goal of 100 percent carbon-free electricity by 2045. Because purchased electricity accounts for the majority of IRWD's emissions, these statewide policies are projected to provide the single largest source of emissions reductions available to IRWD. As utility electricity becomes progressively cleaner, the emissions intensity associated with pumping, treatment, and facility operations declines substantially without requiring changes to water service levels. The analysis found that RPS-driven grid decarbonization alone could reduce emissions by nearly 40,000 MT CO2e annually by 2045 compared to BAU conditions.

Electric Vehicles and Advanced Clean Fleets (EVs)

IRWD currently generates direct emissions from gasoline and diesel fuel consumption associated with fleet operations. Under California law, the Advanced Clean Fleets (ACF) rule requires public fleets (including water agencies) to phase out fossil fuel powered medium and heavy-duty vehicles for carbon free versions. The rule currently requires 50% of new covered vehicle purchases to meet ACF requirements. Under the current implementation timeline this number will be increased to 100% by 2030. This analysis assumed approximately 70 percent of IRWD's F-250 fleet would be replaced with electric vehicles (EVs) or lower-emission alternatives by 2030, with a longer-term goal of transitioning the entire fleet to electric or other carbon-free fuels by 2045. As California's electricity grid becomes increasingly carbon-free, electrification provides progressively greater emissions benefits over time. In addition to reducing GHG emissions, fleet electrification can lower fuel costs, reduce maintenance requirements, and support compliance with emerging state transportation and air quality regulations.

Solar PV and BESS Systems

Due to the overall poor financial performance of the solar PV and BESS projects analyzed, they were not selected for inclusion in the adjusted forecast.

Energy Optimization Projects

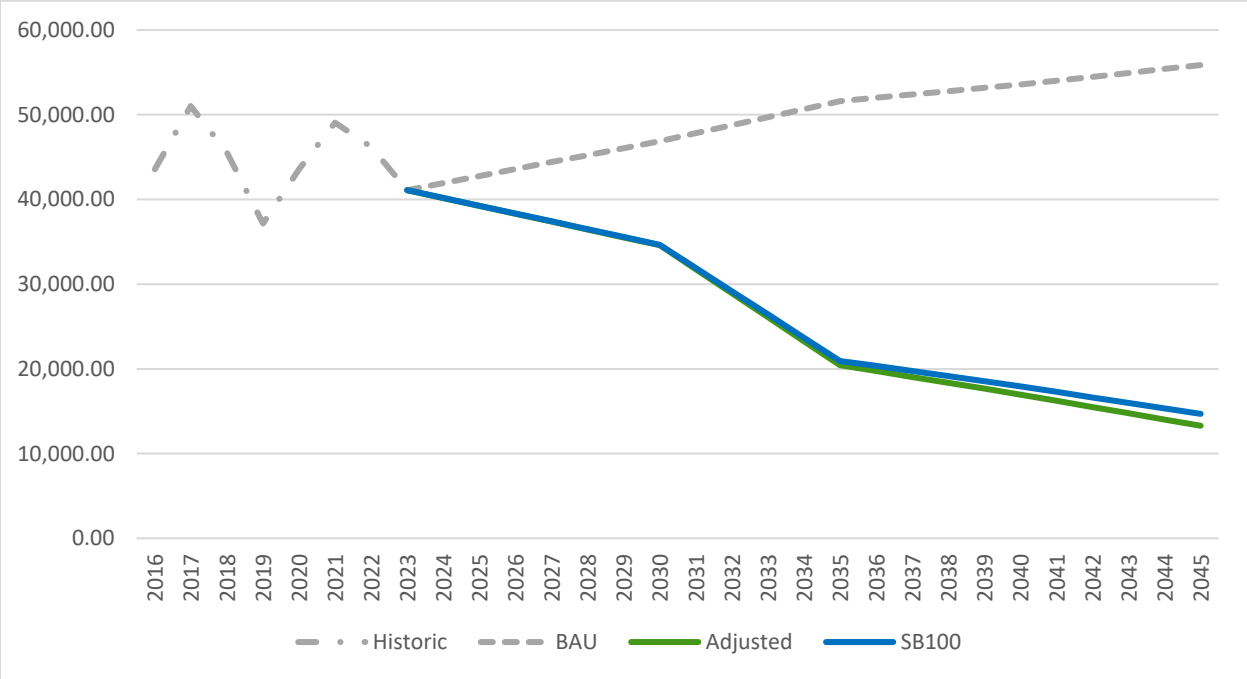
Two of the energy optimization projects identified in Section 5.2 were included in the adjusted forecast based on their overall high prioritization scores and ability to reduce costs and energy

consumption at IRWD facilities. EEM-3 BESS at Key Well Sites for Pump Soft Shutdown was not included in the Adjusted Forecast since it does not produce any measurable GHG emissions reductions. Both EEM-1 Hydro turbine Installation at Baker Water Treatment Plant and EEM-2 Mainspring Linear Generator at Michelson Water Recycling Plant were included in the adjusted forecast. EEM-3 was not included since any GHG benefits would be negligible.

5.4.1 Adjusted GHG Forecast

To better understand the combined effects of legislation and planned IRWD initiatives, a legislative-adjusted forecast was developed that incorporates statewide electricity decarbonization requirements and planned IRWD mitigation projects. Unlike the BAU forecast, which assumes current emissions factors remain unchanged, the adjusted forecast reflects reductions associated with the RPS, energy optimization projects, and fleet electrification efforts. As a result, forecasted emissions decline substantially over time despite projected growth in population, water demand, and IRWD operations. Two adjusted forecasts are shown below in Figure 16, one which reflects just the impacts of SB100 (100% carbon free electricity by 2045) as well as an additional forecast which reflects the impacts of SB100 and the additional GHG reduction strategies discussed above.

Figure 16 Historic Inventories and SB100 and Adjusted Forecast (MT CO_2e)



Under the adjusted scenario, total emissions decrease from approximately 41,100 MT CO_2e in 2023 to approximately 34,600 MT CO2e by 2030, representing a 16 percent reduction. By 2045, emissions are projected to decline to approximately 13,300 MT CO_2e, representing a 68 percent reduction relative to the 2023 baseline. Most of these reductions occur due to SB100 (blue line) as California's electric grid transitions toward carbon-free power generation. Additional GHG reductions from the voluntary energy optimization measures and ongoing fleet electrification reduce emissions beyond the reductions provided by SB100. Under the adjusted forecast the majority of IRWD's GHG emission remaining in 2045 are tied to Scope 1 emissions sources

including wastewater treatment process emissions, the DATS facility, and natural gas combustion.

The adjusted forecast demonstrates that IRWD is well-positioned to benefit from statewide climate policies while leveraging voluntary local initiatives to further reduce emissions as they are deemed to be feasible by IRWD. While statewide grid decarbonization is expected to provide the largest reductions, additional energy optimization projects and fleet electrification measures can further strengthen IRWD's climate leadership, reduce operational costs, and support IRWD's broader sustainability and resilience objectives.

6 Priority Actions and Implementation Framework

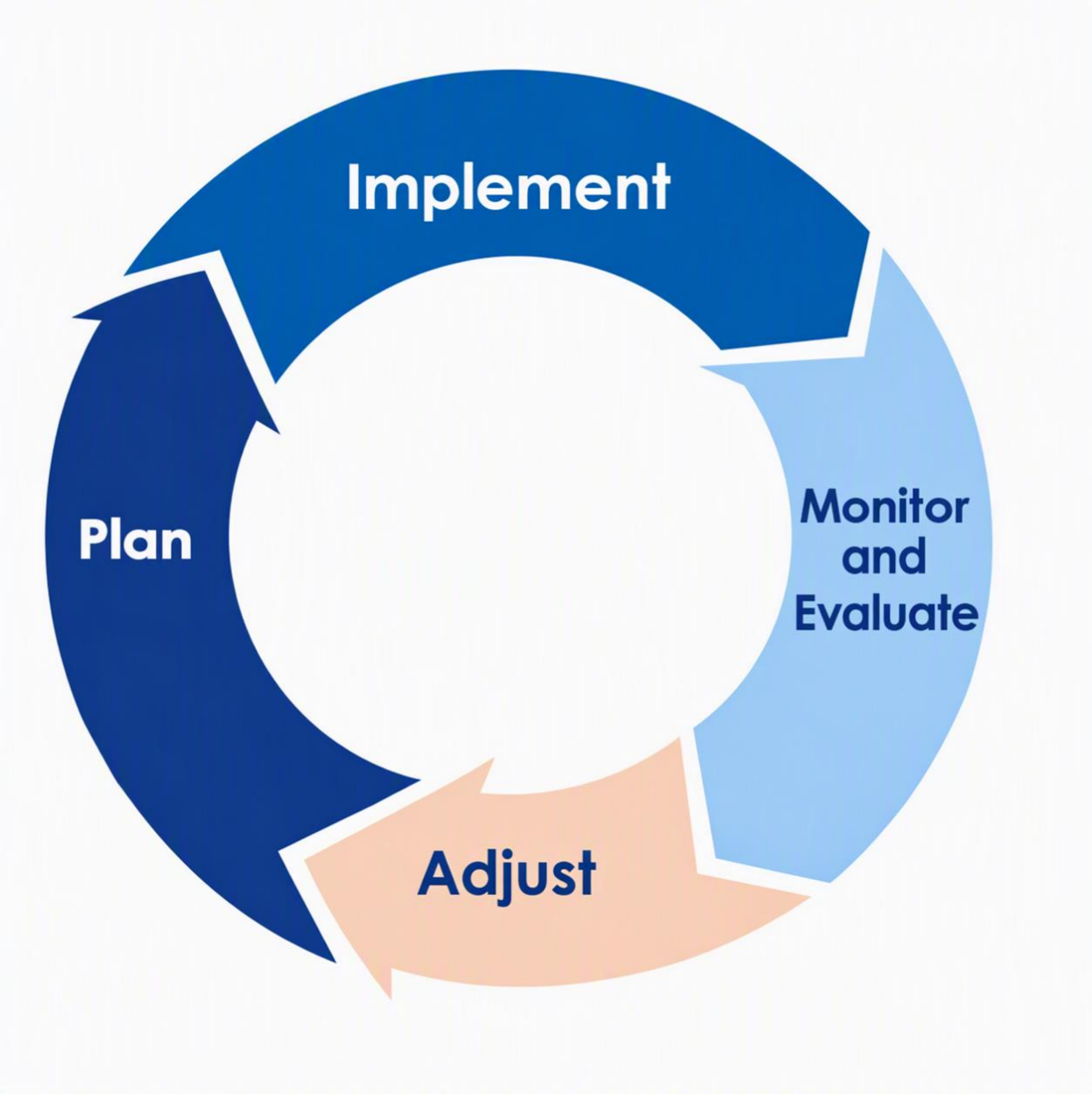
While the CMIP6 data used for analyzing future climate hazards associated with IRWD's facilities is the best data set currently available, modeling climate impacts over decades remains a challenge. Uncertainty is introduced both through the climate data which has a wide range of potential outcomes driven by the efficacy of global mitigation efforts, positive feedback loops, and the overall complexity of climate patterns as well as changes in technology, and the actual, rather than perceived, adaptive capacity of existing infrastructure and operations. To manage this uncertainty, this plan focuses on an adaptive management approach. Adaptive management acknowledges uncertainty is unavoidable, promotes transparency through ongoing data collection and analysis, establishes triggers to initiate deployment of appropriate adaptation strategies, and establishes a process to make adjustments based on outcomes and changing conditions.

Even with future uncertainties, IRWD is already experiencing climate impacts. Many of the actions identified in this section can be integrated into existing operations and decision-making processes. The Implementation Framework described below provides a pathway for IRWD to address existing risks, collect and analyze critical climate data, and weigh upfront costs against future impacts in a systematic manner.

6.1 Implementation Framework

IRWD will utilize an adaptive management approach to preparing for climate change. Adaptive management is a structured approach to managing uncertainty. The CAP provides both the initial steps for implementation as well as a framework to adapt and change over time as conditions shift. As shown in Figure 17, adaptive management involves implementing the initial phases of the plan, monitoring and evaluating both the progress made and the changing climate conditions and adjusting implementation in response to emerging needs.

Figure 17 Adaptive Management Process



Implementation involves the preparation of an **Implementation Program** which highlights the activities, priorities, timelines, costs, responsible parties overseeing implementation, and funding and resources available or needed to pursue each adaptation strategy. Specifically, IRWD will develop an implementation program that will:

1. Identify responsible parties who are currently implementing adaptation actions and/or will oversee implementation of each strategy.
2. Identify existing strategies, those ready for implementation and those ready for implementation but require additional funding.
3. Identify strategies that require further refinement or feasibility assessments.
4. Identify strategies that are implemented only when certain triggers are reached.

The **Monitoring Program** involves monitoring changing climate and operational conditions and tracking effectiveness of adaptation strategies to determine if adjustments are needed. A monitoring program will include clear monitoring and evaluation metrics to track climate and operational conditions, including thresholds and triggers, and adaptation action implementation progress and effectiveness assessments. The purpose of the monitoring program is to determine whether the strategies are achieving intended outcomes and whether triggers are reached.

Findings from the monitoring and evaluation phase will then inform the process of identifying how and what **adjustments** should be made. If monitoring indicates that a strategy is not effective, the strategy should be carefully assessed to determine the extent to which it can be bolstered to address climate change impacts. If a trigger threshold is reached, IRWD will initiate the relevant adaptation actions to address vulnerabilities.

IRWD will develop an Implementation Program, Monitoring Program, and Adjustment Protocols as an immediate next step to implementation of the CAP. The following sections provide an initial framing for each component of the adaptive management approach.

6.2 Near-Term Implementation Program

The near-term implementation program is an initial list of priority actions that will form the foundation of IRWD's implementation strategy for the CAP. IRWD conducted a ranking and prioritization exercise on CAP adaptation actions. Each action was ranked based on its scoring across multiple categories, as described in detail in Section 3.7. Actions were ranked as 1, 2 or 3 with 1 being a low priority and/or benefit and 3 being a high priority. Actions were also identified as being planned (included in an IRWD planning process or document) ongoing (currently being deployed by IRWD), Short Term (priority action for the next 3 years), medium term (4-6 year actions), or long term (>6 year actions). The prioritization of each action was based on their rankings as well as whether the action was foundational to the later implementation of other priority actions.

Areas within IRWD's area of analysis that were deemed to be high risk should be further investigated in the short term to better understand the benefits and costs associated with upgrades. Priority should be given to hazards and facilities identified in the CVA as having a Moderate-High or High vulnerability, including MWRP flooding and groundwater rise risks, sewer system inflow and infiltration systems, critical conveyance infrastructure, NTS facilities exposed to sediment loading, and facilities susceptible to extreme heat and PSPS-related disruptions. Additional analyses may include facility-level adaptation studies, benefit-cost analyses, engineering assessments, conceptual designs, and implementation roadmaps with threshold triggers.

6.2.1 Implementation Plan Actions

The following section identifies the adaptation actions that should form the foundation of IRWD's initial implementation program. These actions were selected from the broader portfolio of adaptation strategies based on a combination of their prioritization scores, implementation timing, readiness for deployment, and alignment with existing IRWD programs and capital planning efforts. The implementation program focuses primarily on actions that are already underway, planned, or can reasonably be advanced in the near term through ongoing operations,

maintenance activities, equipment replacement cycles, capital improvements, and planning efforts.

While prioritization scores were used to identify actions that provide the greatest resilience benefits relative to cost, feasibility, and operational needs, not all high-scoring actions are appropriate for immediate implementation. Some medium- and long-term actions received high prioritization scores but require additional planning, engineering analysis, funding, partnerships, or trigger-based conditions before implementation.

6.2.1.1 Water Treatment and Quality Short Term Implementation Actions

The following actions represent the highest-priority adaptation actions identified through the vulnerability assessment and prioritization process for IRWD's Water Treatment and Quality System. These actions received some of the highest overall scores because they address moderate to high climate risks while also demonstrating strong operational feasibility, cost effectiveness, funding viability, and potential for implementation in the near term. Many of these measures are already being advanced through existing IRWD programs and capital improvement efforts, while others can be initiated in the short term with relatively limited barriers to implementation.

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Drought Increasing frequency and severity of 2- and 5-year droughts reduce local inflows and degrade water quality (elevated BOD, ammonia, algal activity, and stratification), increasing treatment complexity and chemical demand, resulting in Moderate–High vulnerability despite IRWD's diversified supply and monitoring programs.								
Improve demand management and water use efficiency to improve source reliability during low-flow periods.	Ongoing	2	3	3	3	3	2	2.75
Develop climate-informed drought forecasting tools integrating imported supply reliability, groundwater availability, and recycled water demand projections.	Short Term	2	3	3	3	1	3	2.65
Enhance monitoring, forecasting, and operational response protocols for harmful algal blooms and cyanotoxins through monitoring, predictive tools, treatment optimization, and reservoir management strategies.	Short Term	2	3	3	3	1	2	2.55
Integrate climate change impacts into future urban water management plans.	Ongoing	1	3	3	3	2	2	2.50
Coordinate water banking and imported water reliability planning with Kern Fan groundwater storage partnerships to improve long-term drought supply resilience.	Short Term	2	3	2	2	3	2	2.25

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Wildfire Wildfire impacts facilities in Silverado Canyon, Williams Canyon, and Modjeska Canyon, with smoke, ashfall, and PSPS-related outages degrading source water quality (higher turbidity and chemical demand) and limiting staffing and process oversight. Historical impacts from the 2007 Santiago Fire affected Irvine Lake Reservoir and Siphon Reservoir, with ash and contaminants impairing treatment; future filtration upgrades at Siphon Reservoir may be needed, resulting in Moderate–High vulnerability at surface water intakes and PSPS-prone facilities								
Develop a post-fire sediment interception, watershed stabilization for Syphon Reservoir.	Short Term	3	3	3	3	2	3	2.90
Expand ongoing collaborations with fire fighting entities to understand and plan for wildfire fighting water needs in preparation for larger and more frequent wildfires in and around IRWD territory.	Ongoing	2	3	3	3	1	2	2.55
Continue to build or retrofit intake pretreatment systems, including the San Joaquin Reservoir Filtration Facility project to improve resilience to post-fire turbidity, nutrient loading, and degraded source water quality.	Ongoing	2	3	3	2	3	2	2.50
Evaluate the impacts of wildfire ash, sediment, turbidity, and nutrient loading on Irvine Lake, Syphon Reservoir, and treatment operations, and develop monitoring, operational, treatment, and infrastructure response measures.	Short Term	1	3	3	3	2	2	2.50
Coordinate with Edison to identify areas outside of the high wildfire zones that could be impacted by PSPS events.	Short Term	1	3	3	3	1	2	2.40
Continue to increase onsite fuel storage, portable generators, and mobile charging systems to maintain operations during PSPS events.	Ongoing	2	3	3	2	1	2	2.30

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Develop a plan to conduct site walks periodically with firefighters at facilities located within the high fire zone and implement vegetation clearing and/or infrastructure hardening. Locations include pumps and reservoirs in and around Williams Canyon, Santiago Canyon, Orchard Hills, Manning Pump Station, and Los Trancos Canyon.	Short Term	3	3	2	2	1	2	2.20
Ensure each facility in and around high wildfire areas have backup power sufficient for 3 days.	Ongoing	3	3	2	2	1	2	2.20
Heavy Precipitation and Flooding Intense and clustered storms degrade source water quality (turbidity, debris, organics, nutrients), damage or overtop reservoirs and the natural treatment system, and restrict operator access, creating Moderate to Moderate–High vulnerability. Historical overtopping risks at Sand Canyon Reservoir require drawdown actions, but back-to-back storms still pose spillway challenges.								
Incorporate automated debris screening and sediment management infrastructure into Sand Canyon and San Joaquin Reservoir improvement projects and upland areas.	Ongoing	3	3	3	3	1	3	2.80
Formalize a regular spillway review and repair process prior to each winter season.	Ongoing	2	3	3	3	2	2	2.65
Evaluate reservoir projects for opportunities to increase capacity to capture additional precipitation while leaving capacity to limit releases.	Ongoing	1	3	3	3	1	2	2.40
Extreme Heat Prolonged heat and warm nights increase source water temperatures and treatment complexity; although IRWD relies less on surface water, indoor heat constraints at facilities without HVAC reduce operational efficiency. The highest temperatures are expected near Baker Water Treatment Plant, contributing to Moderate to Moderate–High vulnerability service-area wide.								
Include extreme heat of temperatures over 105F as a design specification when designing new buildings or procuring new equipment.	Short Term	3	3	3	3	1	2	2.70

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Continue to track impacts of extreme heat to surface water reservoirs and evaluate cost/benefit of mitigation devices such as mechanical mixing, floating covers or solar.	Short Term	1	3	3	3	2	2	2.50
Landslide and Debris Flow Post-wildfire or high-intensity storm-driven landslides and debris flows increase sediment, turbidity, and debris loads, impacting treatment reliability and access especially in relation to Sand Canyon Reservoir and San Joaquin Reservoir. Vulnerability is elevated for facilities in steep or burn-affected watersheds and along pipelines in Silverado Canyon and similar terrain, resulting in Moderate to Moderate–High vulnerability.								
Work with regional land managers to develop and deploy post fire replanting and other stabilization approaches in landslide risk areas.	Short Term	2	2	3	3	3	2	2.60
Prepare for pipeline shutoff and repair in areas vulnerable to landslides, including but not limited to Silverardo Canyon pipelines, by advancing landslide response plans.	Ongoing	3	2	3	2	2	3	2.50
Develop debris clearance protocols, contractor agreements, and emergency response procedures to rapidly restore facility access after landslides.	Short Term	2	2	3	3	2	2	2.50
Identify and establish alternative access routes, easements, and staging areas for facilities vulnerable to landslide-related road closures.	Short Term	1	2	3	3	2	2	2.35
Identify site stability models to utilize after wildfires in areas holding underground infrastructure like water pipes.	Short Term	1	2	3	3	1	2	2.25

6.2.1.2 Recycled Water Treatment and Quality Short Term Implementation Actions

The following actions represent the highest-priority adaptation actions identified for IRWD's recycled water treatment and water quality systems. These actions focus on addressing the most significant climate-related risks affecting the Michelson Water Recycling Plant (MWRP), Los Alisos Water Recycling Plant, associated pump stations, and the broader recycled water system. Key priorities include improving resilience to extreme precipitation and flooding through flood hardening, drainage improvements, wet-weather flow management, and operational response protocols; preparing for sea-level rise and groundwater rise impacts through infrastructure assessments and capacity planning; and reducing drought-related operational challenges by strengthening monitoring, corrosion management, and proactive response measures during extended low-flow conditions. Many of these actions build upon existing IRWD programs and planned facility improvements, while others can be implemented in the short term to address emerging vulnerabilities before they result in more significant operational, regulatory, or maintenance concerns.

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Heavy Precipitation and Flooding Extreme single-day, multi-day, and compound storms increase influent flows and inflow/infiltration, stressing hydraulic and biological processes and raising bypass and compliance risks. Flood exposure at MWRP, which is already located in a flood zone and has experienced near-flood events, results in Moderate–High vulnerability as well as and Los Alisos WRP which experienced issues with accelerated inflow.								
Develop protocols for discharging stormwater and bypassing treatment facilities with consideration for creeks already at full capacity.	Ongoing	2	3	3	3	2	2	2.65
Upgrade electrical and mechanical systems above flood levels, included in the EPA adaptation strategies.	Planned	3	3	2	2	1	2	2.20
Monitor floodwall performance and incorporate flood hardening, drainage upgrades, and wet-weather equalization improvements into planned Michelson Water Recycling Plant facility upgrades.	Short Term	3	3	2	2	1	2	2.20

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Sea-Level Rise & Groundwater Rise Sea-level rise-induced groundwater expansion increases shallow groundwater around MWRP, creating subsurface exposure and operational risks, including inundation of wells and pump stations, compromising operational reliability and increasing corrosion and maintenance demands resulting in Moderate–High vulnerability despite limited direct marine inundation.								
Evaluate San Joaquin Marsh and San Diego Creek Pump Stations for sea-level induced groundwater rise impacts and capacity increase needs.	Short Term	3	3	2	2	2	2	2.30
Evaluate dewatering permitting constraints and discharge requirements as dewatering activities increase.	Short Term	1	3	1	3	2	2	2.00
Drought Reduced flows and increased concentrations linked to conservation and drought conditions impact system performance, with documented concerns at MWRP including odor and ammonia increases, resulting in ongoing and increasing operational stress.								
Incorporate future climate conditions and operational stressors into design criteria for facility rehabilitation and upgrade projects.	Planned	3	3	2	2	1	3	2.30
Establish odor and corrosion trigger thresholds to initiate operational responses when low-flow conditions persist beyond defined limits.	Short Term	2	3	3	3	2	3	2.75
Implement formal condition assessments and monitoring programs to identify corrosion risks and establish proactive maintenance thresholds.	Short Term	1	3	3	3	2	3	2.60

6.2.1.3 Sewer System Collections Short Term Implementation Actions

The following actions represent the highest-priority adaptation actions identified for IRWD's sewer collection system. These actions focus on protecting wastewater conveyance infrastructure, lift station operations, and maintenance activities from climate-driven challenges including drought, wildfire, flooding, extreme heat, and landslides. Key priorities include addressing low-flow conditions that increase odor, corrosion, sediment accumulation, and hydrogen sulfide generation through enhanced monitoring, targeted cleaning programs, and operational planning; improving reliability during wildfire and Public Safety Power Shutoff events through backup power, defensible space management, and emergency response coordination; and strengthening resilience to heavy precipitation by reducing inflow and infiltration, protecting lift stations from flooding, and integrating climate-adjusted design standards into future capital improvements. Additional actions focus on preparing infrastructure and field staff for more frequent extreme heat events through equipment upgrades, cooling measures, and heat-informed design specifications, while also improving readiness for landslides and debris flows that could damage pipelines and restrict access to critical facilities. Many of these measures build upon existing maintenance, inspection, capital improvement, and emergency preparedness programs already underway at IRWD, while others can be implemented in the short term to reduce operational risks and maintenance costs.

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Drought Lower flows reduce velocities, increasing sediment deposition, odor, and corrosion, while hydrogen sulfide generation accelerates pipe degradation. Vulnerability is highest in low-gradient sewers and aging infrastructure, with existing odor and corrosion challenges requiring increased maintenance and costs, resulting in Moderate–High vulnerability.								
Coordinate conservation-related flow reduction planning to minimize impacts on conveyance operations.	Short Term	3	3	3	3	1	3	2.80
Expand inspection and monitoring of aging, corroding sewer lines vulnerable to cracking and releasing odors under dry soil conditions.	Ongoing	2	3	3	3	2	3	2.75
Adjust sewer cleaning and flushing schedules in low-flow areas vulnerable to sediment buildup during drought.	Short Term	2	3	3	3	1	2	2.55

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Utilize pump station cycling optimization and wet-well redesign to maintain turnover during low flow.	Short Term	2	3	2	2	1	2	2.05
Wildfire Wildfire and PSPS events disrupt lift station operations, increase overflow risk, and introduce ash/debris into systems; response may be delayed by access constraints. Vulnerability is greatest at PSPS-exposed lift stations and relies on backup power and fuel duration (with one lift station lacking backup power), resulting in Moderate–High vulnerability.								
Collaborate with partners (firefighters) to establish defensible space/fire safe practices at University and Bayview Lift Stations to maintain operational visibility during outages.	Short Term	2	2	3	3	2	2	2.50
Heavy Precipitation and Flooding Intense and prolonged storms increase inflow, surcharging, and inflow/infiltration, while debris and access limitations drive localized failures. Vulnerability is highest at low-lying lift stations, aging infrastructure, and constrained access areas, resulting in High vulnerability.								
Develop flooding continuity plans for University Lift Station and Bayview Lift Station including mobile generators, fuel staging, and emergency staffing assignments.	Ongoing	3	3	3	3	2	2	2.80
Audit sewer system to identify leaks which occur during large storms and flooding. Install sewer/stormwater monitoring equipment in key areas as a pilot project to identify potential leaks.	Planned	3	3	2	3	2	2	2.55
Incorporate creek crossing stabilization and scour protection into future sewer capital replacement projects. Raise or seal manholes in flood-prone areas.	Ongoing	2	3	3	2	2	2	2.40
Expand upon proposed lift station replacement projects to include climate-adjusted hydraulic capacity and flood protection standards.	Ongoing	3	3	2	2	2	2	2.30

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Replace manhole covers and small leaks before they create infiltration challenges.	Short Term	3	3	2	2	2	2	2.30
Extreme Heat Elevated temperatures stress pumps and electronics, particularly in enclosed or poorly ventilated systems, reducing reliability in lift stations and air-vac facilities, resulting in Moderate–High vulnerability.								
Include system design specifications associated with 105F degree days in future equipment procurement guidelines.	Short Term	3	3	3	3	1	3	2.80
Increase inspection frequency of motor and other overheating equipment during heat events.	Short Term	2	3	3	3	2	2	2.65
Expand shaded staging and cooling areas for sewer maintenance crews.	Short Term	2	3	3	3	2	2	2.65
Upgrade pump motors, electrical systems, and telemetry equipment to operate reliably during sustained high temperatures by incorporating ventilation and cooling.	Ongoing	2	3	3	2	2	2	2.40
14. Landslide & Debris Flow Slope failures and post-fire debris flows threaten pipelines and access routes in steep terrain and canyon corridors, resulting in burial, deformation, and response delays, leading to High vulnerability.								
Work with regional land managers to develop and deploy post fire replanting and other stabilization approaches in landslide risk areas.	Short Term	2	2	3	3	3	2	2.60

6.2.1.4 Monitoring and Control Short Term Implementation Actions

The following actions represent the highest-priority adaptation actions identified for IRWD's monitoring and control systems, including telemetry networks, communications infrastructure, SCADA-related operations, and environmental monitoring programs. These actions are primarily focused on reducing operational disruptions associated with wildfire, Public Safety Power Shutoff events, and extreme heat, which pose some of the most significant climate-related risks to the reliability of monitoring, communications, and decision-support systems. Key priorities include strengthening emergency communications and telemetry through radio tower improvements, redundant communications pathways, battery backup systems, and backup power capabilities that allow critical monitoring and control functions to remain operational during extended outages. Additional actions focus on expanding smoke and ash monitoring capabilities and establishing operational triggers tied to wildfire activity, PSPS notifications, and water quality degradation to support more proactive decision-making during emergency conditions. Many of these actions build upon systems and procedures already in place, allowing IRWD to further enhance situational awareness, operational continuity, and emergency response capabilities.

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Wildfire Wildfire and PSPS events increasingly affect monitoring and control systems across the northern service area, causing direct damage or power-related outages.								
Expand systems already in place to manage smoke and ash monitoring.	Ongoing	2	3	3	3	3	3	2.85
Continue to develop procedures and operational triggers tied to PSPS notifications, wildfire proximity, and reservoir water quality degradation.	Ongoing	2	3	3	3	3	2	2.75
Consider expanding battery backup systems for key control systems.	Short Term	3	3	3	2	2	2	2.55
Expand proposed Radio Tower Improvements to support hardened emergency communications, redundant telemetry, and backup power during PSPS and wildfire conditions.	Ongoing	2	3	3	2	1	2	2.30

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Extreme Heat High temperatures degrade electronic equipment performance and reduce operational efficiency of monitoring and control systems.								
Maintain and enforce procurement specifications requiring equipment to passively withstand temperatures up to 50°C without performance degradation or additional cooling requirements.	Ongoing	2	3	3	3	1	3	2.65

6.2.1.5 Fleet and Facilities

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Wildfire Wildfire and PSPS events across the northern service area directly threaten facilities and indirectly affect operations, with increased exposure for electrified fleet assets during outages.								
Expand vegetation management and emergency access maintenance around facilities in very high wildfire hazard severity zones to improve emergency vehicle access.	Ongoing	2	3	3	3	1	2	2.55
Determine protocols for evacuation from remote facilities during wildfire events. Define when vehicles can re-enter areas post wildfire.	Short Term	2	3	3	3	1	2	2.55
Extreme Heat Extreme heat reduces safe working conditions, limits field operations, and increases wear on fleet assets and generators. Facilities without HVAC face compounded risks to equipment and personnel, resulting in Moderate–High vulnerability.								
Implement heat-health protocols that provide scheduled cooling breaks and designated air-conditioned refuge locations for field crews.	Short Term	2	3	3	3	1	2	2.55
Landslides & Debris Flow Landslides, debris flows, and road washouts restrict access and delay response in steep terrain and canyon areas, increasing reliance on heavy equipment and elevating safety risks, resulting in Moderate–High vulnerability.								
Pre-position debris removal equipment and emergency repair materials ahead of major storm events.	Short Term	2	2	3	2	1	2	2.15
Identify alternative emergency access routes to facilities vulnerable to slope failure and debris blockage.	Short Term	1	2	3	2	2	2	2.10

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Flooding Heavy precipitation and flooding increase demands on fleet mobilization for inspections, generator deployment, and emergency response. Flooded roadways can limit staff access to facilities, pump stations, and treatment sites, delaying critical maintenance or corrective actions. Facilities themselves may face localized flooding, stormwater intrusion, or stress on electrical and mechanical systems during prolonged wet periods resulting in moderate vulnerability overall with low lying facilities like Michelson having elevated vulnerability.								
Develop standing emergency contractor agreements and streamlined procurement processes to reduce permitting and contracting delays during emergency response.	Short Term	3	3	3	3	1	3	2.80
Complete expansion of Charge-ready program at IRWD headquarters and MWRP.	Ongoing	2	3	3	2	1	3	2.40
Ensure EV charging infrastructure is located in areas not affected by flooding/groundwater rise.	Short Term	3	3	1	3	1	3	2.30

6.2.1.6 Natural Treatment System Short Term Implementation Actions

The following actions represent the highest-priority adaptation actions identified for IRWD's natural treatment system, including constructed wetlands, dewatering systems, creek intakes, pump stations, and associated treatment infrastructure. These actions focus on strengthening resilience to the combined impacts of wildfire, landslides, debris flows, flooding, and sea-level induced groundwater rise, which can increase sediment and debris loads, impair treatment performance, damage infrastructure, and limit access to critical facilities. Key priorities include developing facility-specific post-wildfire response protocols, implementing rapid sediment removal and revegetation strategies, protecting intakes from erosion and debris, and improving preparedness for first-flush storm events that can overwhelm treatment systems following wildfire. Additional actions emphasize enhancing flood management by developing operational and infrastructure measures to safely convey extreme runoff, reducing damage to the natural treatment system while maintaining treatment effectiveness during major storm events. To address long-term groundwater rise and salinity concerns, recommended measures include well-specific salinity monitoring programs, threshold-based operational triggers, and evaluations of future infrastructure modifications, including relocation of vulnerable intakes and pump stations where feasible. The portfolio also includes efforts to streamline permitting and environmental compliance procedures, allowing IRWD to respond more quickly to changing site conditions and emergency maintenance needs.

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Landslides, Wildfire, Groundwater Rise and Debris Flow Sediment, turbidity, and debris loads from post-wildfire storms and landslides overwhelm treatment processes and limit access, creating Moderate to Moderate–High vulnerability for systems in steep or burn-affected watersheds, with higher susceptibility at Eastfoot, Forge Meadow, Orchard, and Rattlesnake in the northern service area.								
Establish facility-specific post-wildfire response protocols, including rapid sediment removal, revegetation, intake protection, and first-flush storm preparedness measures to reduce erosion and protect treatment infrastructure.	Short Term	2	3	3	3	3	3	2.85

Vulnerabilities to Hazards & Proposed Adaptation Actions	Implementation Phase	Risk Reduction	Hazard Occurrence	Operational Feasibility	Cost and Funding Viability	Multiple Benefits	Adaptability Under Uncertainty	Overall Priority
Develop operational and infrastructure measures to temporarily divert high-flow floodwaters and manage extreme runoff conditions, reducing damage NTS facilities and preserving treatment performance during major storm events.	Ongoing	2	3	3	3	3	3	2.85
Implement well-specific salinity monitoring and threshold-based management protocols to protect dewatering systems from saltwater intrusion impacts.	Short Term	2	3	3	3	3	3	2.85
Establish streamlined permitting pathways and pre-approved environmental compliance procedures to accelerate NTS maintenance and emergency response.	Short Term	2	3	3	2	2	2	2.40

6.2.2 Integration of Climate Projections into Infrastructure, Equipment, and Operations Projects

In addition to the priority actions identified above,, IRWD will also consider the changing climate as part of new infrastructure designs and equipment purchases. The CVA (Appendix B) developed for this report provides high fidelity data and projections for each of the climate hazards identified for IRWD's Area of Analysis. Climate resilience should be incorporated into the District's asset management, capital improvement planning, facility master plans, equipment replacement programs, emergency preparedness planning, and procurement processes. Integrating climate considerations into existing planning and investment cycles is often more cost-effective than implementing stand-alone resilience projects after vulnerabilities emerge. The following steps should be taken when analyzing projects and equipment purchases for climate impacts.

a. Identify the location of the planned infrastructure/equipment.
b. Cross check this location to the hazard maps provided in the CVA.
c. For all applicable hazards, identify the projected occurrence of climate hazards based on the provided analysis.
d. Consider the lifespan of the equipment or infrastructure and align with the appropriate climate warming levels. For projects with a design life extending beyond 2045, consider climate conditions associated with approximately 2°C of warming. For projects with service lives extending beyond 2075, consider climate conditions associated with approximately 3°C of warming. Hazards for each warming level can be found in Appendix B.
e. Based on the provided climate projections, incorporate project features such as siting outside hazard zones, materials changes, specialized equipment, and passive or active design attributes that could address or lessen the impact of the climate hazard.
f. Identify the incremental cost of more resilient design features or equipment by comparing the incremental cost of building more resilient infrastructure or more resilient equipment with the direct and indirect costs incurred from owning less resilient infrastructure. Direct costs include the cost of repairing damage from expected climate hazards as well as the costs of the temporary solutions to get operations online in the short term. Indirect costs include the impact on operations and the health and safety of workers, and potential short-term revenue losses. IRWD is revenue neutral and would recover costs through rates and charges.

Where uncertainty exists, preference should be given to flexible, scalable, and adaptive solutions that can be expanded or modified as climate conditions evolve. Examples may include modular infrastructure, phased implementation approaches, future expansion allowances, redundant systems, and nature-based solutions that provide multiple benefits.

6.2.3 Funding and Financing Pathways for More Resilient Infrastructure

For high upfront cost projects, IRWD could consider additional funding pathways including grants, green bonds, resilience bonds, or other strategies. Addressing upfront costs with these mechanisms can be critical in spreading out high upfront costs especially when addressing uncertain but high-risk climate hazards that have a low chance of occurrence, but a very high impact if they do occur.

Funding opportunities should be reviewed annually and aligned with the adaptation priorities identified in this Plan. Potential sources may include Proposition 4 funded programs, FEMA hazard mitigation funding, Bureau of Reclamation programs, Department of Water Resources grants, State Revolving Fund programs, energy efficiency incentives, and regional partnership opportunities. Projects that provide multiple benefits, including water reliability, water quality improvement, habitat enhancement, flood protection, energy savings, or greenhouse gas reductions, may have better success in securing grant funding.

6.3 Monitoring Program

The second phase of adaptive management is the monitoring and evaluation phase. During this phase, IRWD will begin collecting and analyzing key metrics and data points and charting trends over time. The Monitoring Program should include both implementation related information such as major hurdles or successes in implementing the actions identified in the Implementation Program as well as important climate metrics that will cumulatively drive when medium- and long-term actions should be implemented. This section provides guidance for IRWD to develop a robust monitoring program for the CAP.

Data Collection and Metric Monitoring

Critical climate-related data points should be monitored and compiled for trends tracking over time. Data such as frequency of climate related infrastructure impacts, extreme heat days, heat related staff impacts, frequency of equipment repairs, and other data should be collected and analyzed at least annually for any long-term trends in climate impacts. This data should begin to inform IRWD's decision making processes.

An IRWD-specific Climate Resilience Scorecard summarizing key climate indicators and observed impacts would support this monitoring. Critical metrics include the following:

1. Number of PSPS events affecting facilities
2. Number of wildfire events impacting facilities
3. Days exceeding operational heat thresholds
4. Number of flooding incidents at critical facilities
5. Inflow and infiltration volumes
6. Groundwater elevations at vulnerable facilities
7. Climate-related emergency response activations
8. Treatment disruptions and equipment failures
9. Staff safety incidents caused by extreme heat, flooding and wildfire conditions
10. Climate-related maintenance costs.

Results should be reviewed annually and periodically reported to District leadership and the Board to support future investment decisions.

Where feasible, IRWD should establish trigger thresholds that prompt additional analysis or implementation of adaptation actions. For example, thresholds may include repeated flooding at a facility, recurring heat-related equipment failures, increased groundwater levels near critical infrastructure, or repeated PSPS events requiring emergency response actions.

Metrics by Operational System

The following metrics and data points should be tracked to inform ongoing adaptive management of the CAP implementation program. Metrics are organized by operational system and include the time period over which the metrics or data should be summarized. IRWD already tracks some of the metrics. Metrics may be modified or added as the program is developed and new needs are identified.

Table 5 Baseline Monitoring Program Metrics

	Time period
Water Treatment and Quality Metrics	
Harmful Algal Bloom (HAB) levels	Monthly
Harmful Algal Bloom (HAB) events	Annual
Source water turbidity levels	Monthly
Annual Treatment Chemical Use	Annual
Annual Treatment Chemical Costs	Annual
Reservoir Water Temperatures	Monthly
Hours of PSPS/Power Outages at Facilities	Annual
Sites evaluated for vegetation management needs	Annual
Water quality impacts post-wildfire	After wildfire event
Emergency generator operating hours	Monthly
Post-wildfire sediment or debris loading events (event requiring cleanup)	Annual
Equipment failures and equipment lifespan by equipment type	At failure
Spillway repair projects	Annual
Post-flooding pipeline damage events and location	Annual
Recycled Water Treatment and Quality	
Hours of PSPS/power outage impacts	Annual
Groundwater pumping/dewatering volumes	Annual
Treatment system bypass events	Annual
Salinity of San Diego Creek/dewatering outflows	Monthly
Estimated infiltration rates	Monthly
Number of odor complaints	Annual
Number of corrosion related repairs/replacements	Annual
Hours outside of treatment parameters	Annual
Influent ammonia levels	Monthly
Equipment failures and equipment lifespan by equipment type	At failure
Sewer System	
Number of odor complaints	Annual
Number of corrosion related repairs/replacements	Annual
Hours of PSPS/power outage impacts	Annual
Pipeline damage events and location	Annual
Equipment failures and equipment lifespan by equipment type	At failure

	Time period
Monitoring and Control	
Equipment failures and equipment lifespan by equipment type	At failure
Hours of PSPS/power outage impacts	Annual
Fleet	
Hours of PSPS/power outage impacts	Annual
Uncharged/undercharged EV events	Annual
Mobile generation deployments	Annual
Days with access challenges by location	Annual
Natural Treatment System	
Sedimentation/maintenance events in NTS by location	Annual
Wildfire events affecting NTS facilities by location	Annual
Salinity levels in effected NTS facilities by location	Annual
System Wide Metrics	
Days over 95 degrees	Monthly
Flooding events	Annual
Inches of rain during two-week period	At flooding event
Heat related staff health/safety reports	Annual
Costs driven by climate impacts[6]	Annual
CAP actions implemented	Annual
Metropolitan imports	Annual (Ongoing)
Water banking recharge and recovery	Annual (Ongoing)

6.4 Adjustment and Future Implementation Programs

The third-phase of the adaptive management approach is making future adjustments to the Implementation and Monitoring Programs. As IRWD implements the priority actions in Section 6, overall uncertainty of future climate conditions will continue to decrease.

Existing infrastructure and equipment should be upgraded preventively when collected data (maintenance occurrences, climate impacts, or staff impacts) has sufficiently reduced uncertainty about the future and the cost of the necessary upgrade is lower than the ongoing costs of the status quo.

Decisions to advance major adaptation investments should be informed by both observed conditions and projected future climate risks. Trigger-based implementation allows IRWD to avoid premature investments while reducing the likelihood of reactive emergency expenditures.

[6] IRWD could establish project codes or budget categories for costs associated with:
- Repairs resulting from extreme weather events (e.g., flood damage, wildfire impacts, heat-related equipment failures).
- Accelerated asset deterioration linked to higher temperatures, more intense storms, or changing water quality conditions.
- Additional operational costs during climate events, such as emergency pumping, supplemental water purchases, increased treatment requirements, or wildfire response.
- Adaptation investments that exceed standard replacement costs, such as upsizing drainage infrastructure, elevating equipment, adding backup power, or selecting more heat- and flood-resistant materials.

Considerations may include increasing maintenance costs, repeated service disruptions, regulatory compliance risks, recurring climate-related incidents, declining asset performance, workforce safety concerns, or achievement of predefined climate thresholds identified through monitoring efforts.

This implementation framework should be revisited at least every five years, or following major climate-related events, to incorporate new climate science, operational experience, infrastructure investments, regulatory requirements, and changing District priorities.

7 References

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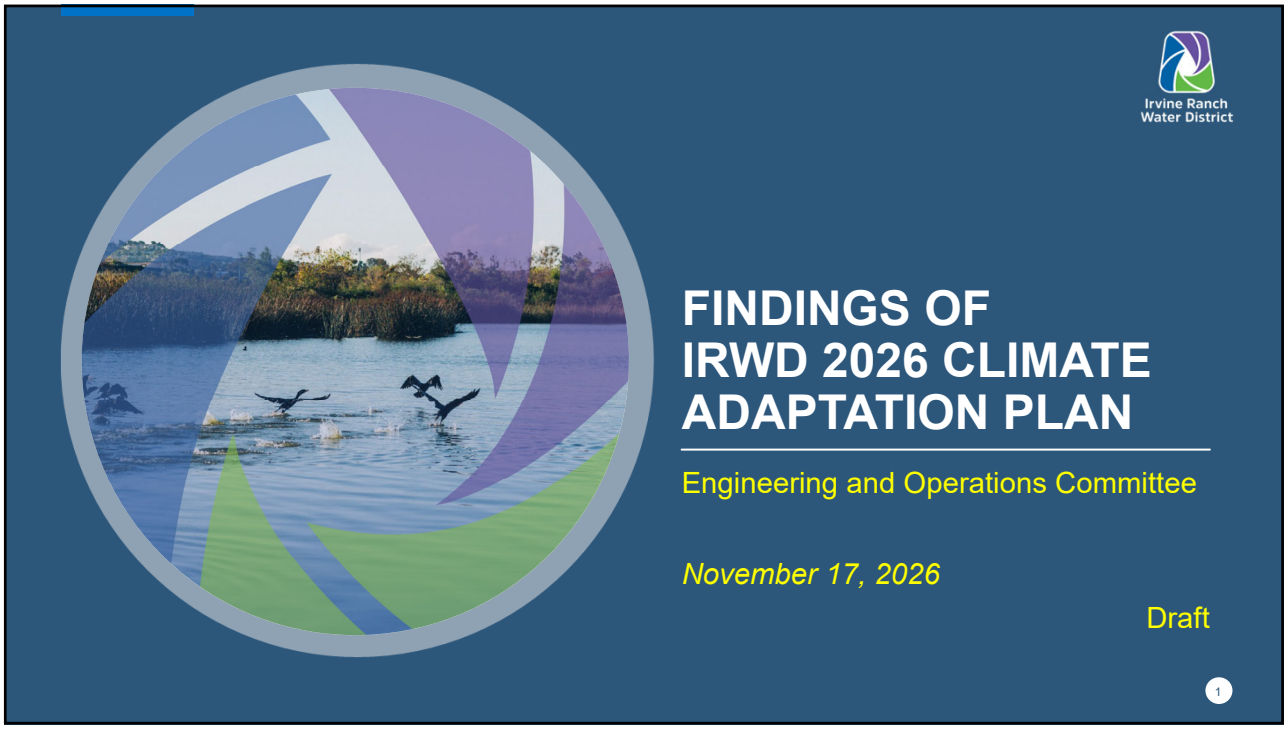
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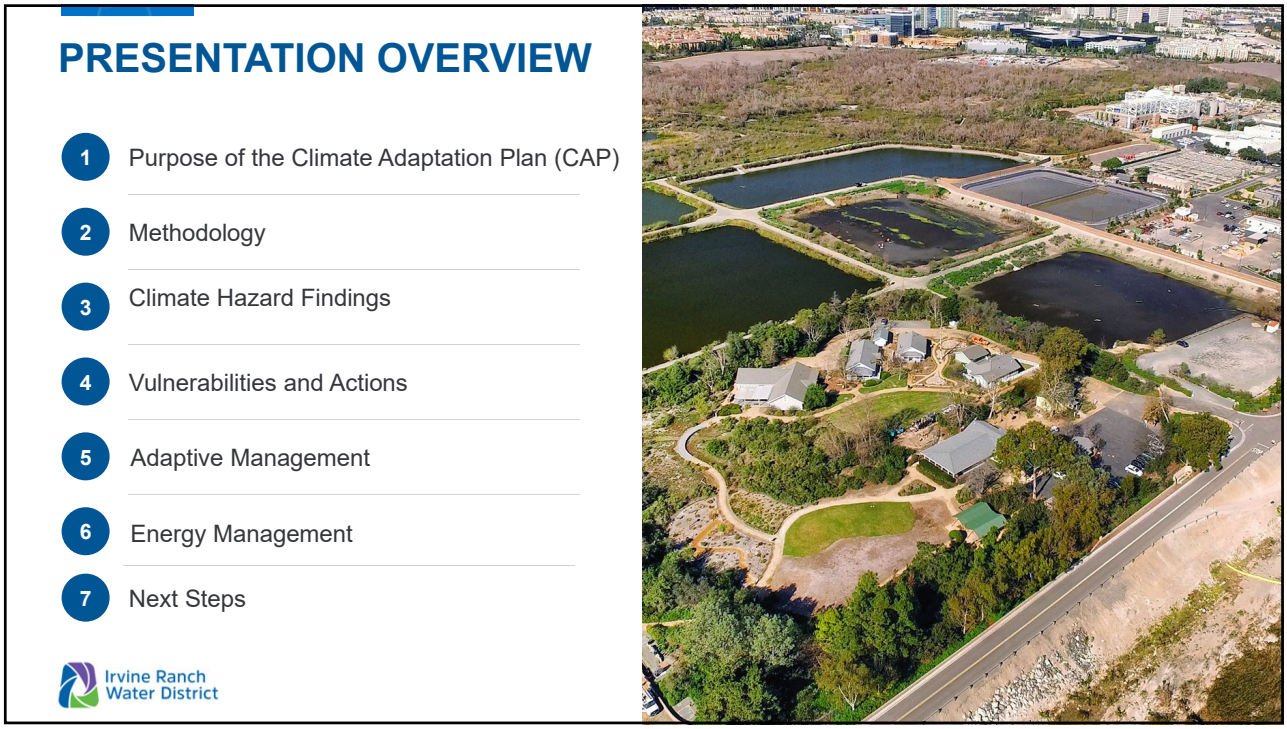
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FINDINGS OF IRWD 2026 CLIMATE ADAPTATION PLAN
Engineering and Operations Committee
November 17, 2026
Draft
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PRESENTATION OVERVIEW
1 Purpose of the Climate Adaptation Plan (CAP)
2 Methodology
3 Climate Hazard Findings
4 Vulnerabilities and Actions
5 Adaptive Management
6 Energy Management
7 Next Steps
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PURPOSE OF CLIMATE ADAPTATION PLAN

1 Understand risk

Climate Vulnerability Assessment evaluated future climate hazards, operational thresholds, and asset-specific vulnerabilities.

2 Identify actions

Developed adaptation actions to strengthen infrastructure, operations, workforce safety, and emergency readiness.

3 Adaptative Management

Priority actions were paired with monitoring, triggers, and adjustment protocols to use as conditions evolve.

4 Energy management

GHG forecasting, facility benchmarking, energy optimization, and solar and battery evaluations.

5 Provide strategic value

Clear near-term priorities, transparent decision points, and integration with capital and asset planning.

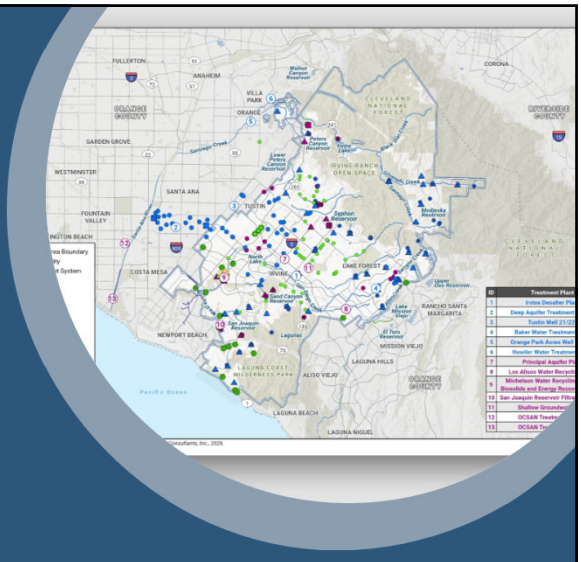
Outcome: A comprehensive roadmap for responding to climate change while advancing operational resilience, resource efficiency, cost-effective energy efficiency and renewable energy, emissions reductions, and long-term service reliability.

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METHODOLOGY



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BUILDING THE ASSESSMENT

1
Staff workshops
In-person and virtual workshops identified key metrics and existing efforts to leverage.

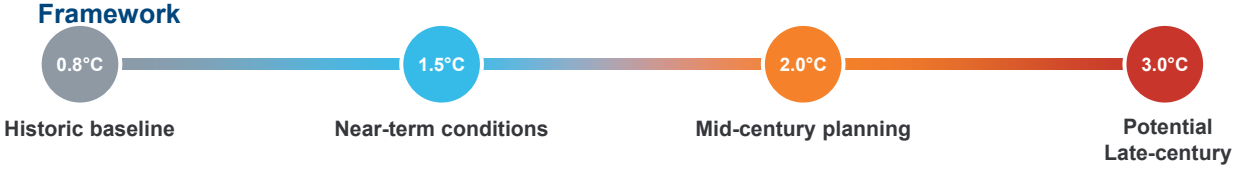
2
129 simulations
Downscaled projections developed for California's Fifth Climate Change Assessment.

3
Warming levels
0.8°C baseline, then 1.5°C, 2.0°C, and 3.0°C to evaluate physical climate outcomes.

4
Facility mapping
Hazard projections overlaid with IRWD facilities and operational dependencies.

5
Operational metrics
Hazard-specific indicators for drought, PSPS, storms, heat, groundwater rise, and slope instability.

Global Warming Level (WL) Planning Framework



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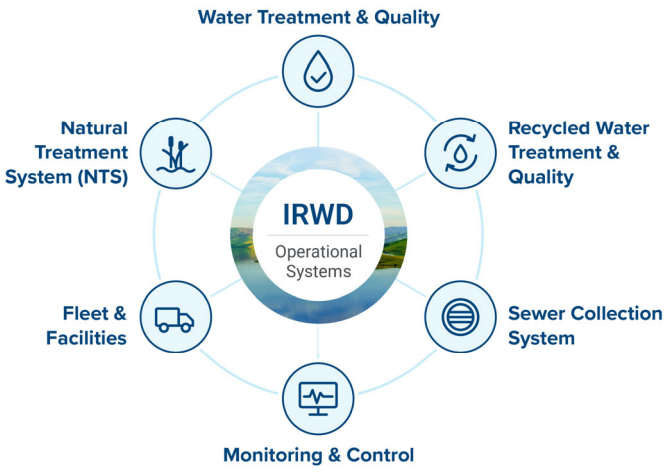
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THRESHOLDS, VULNERABILITY, AND ACTIONS BY SYSTEM

Operational thresholds
Staff defined severity and frequency conditions that begin to disrupt facilities, equipment, workforce, or compliance.

Vulnerability rating
Exposure + sensitivity + adaptive capacity produced Low, Moderate, Moderate-High, or High ratings.

Action prioritization
Actions were scored on a 1 to 3 scale using six weighted criteria, then assigned an implementation phase.



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CLIMATE HAZARD FINDINGS



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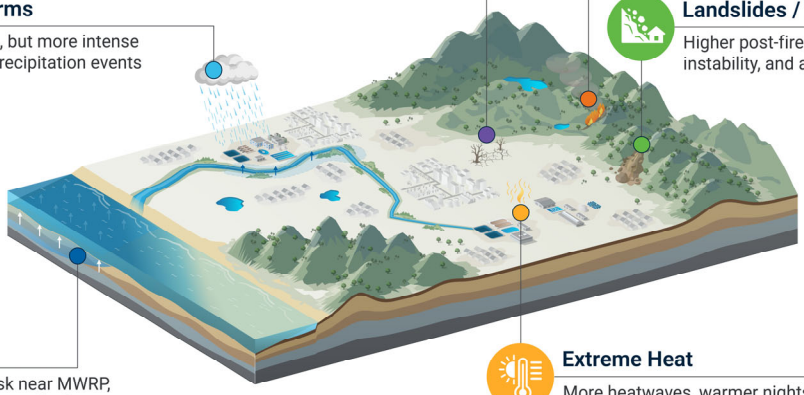
INCREASING VARIABILITY AND COMPOUND RISK

Drought
More frequent short- and long-duration drought; greater water-quality and treatment stress

Wildfire / PSPS
Increasing fire-weather and outage conditions, especially in the northeast

Extreme Storms
Fewer wet days, but more intense and clustered precipitation events

Landslides / Debris Flow
Higher post-fire sediment, slope instability, and access disruption risks



Groundwater Rise
Growing subsurface risk near MWRP, San Diego Creek, and buried infrastructure

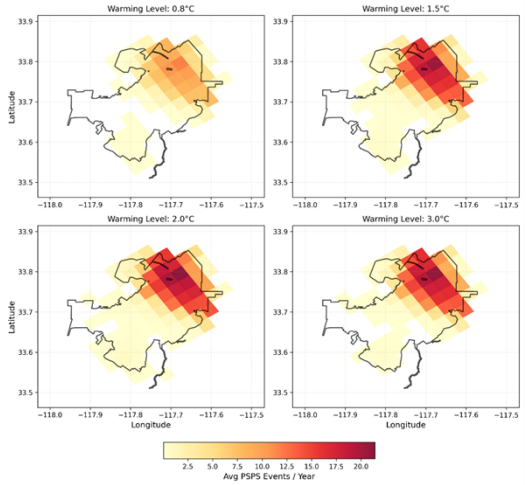
Extreme Heat
More heatwaves, warmer nights, and greater equipment and workforce stress

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WILDFIRE AND PSPS EVENTS



Wildfire and PSPS conditions increase – mainly in northeast

- Ash, smoke, sediment, and nutrients degrade water quality.
- Power outages interrupt operations.
- Canyon/ foothill facilities face direct exposure and access limitations.

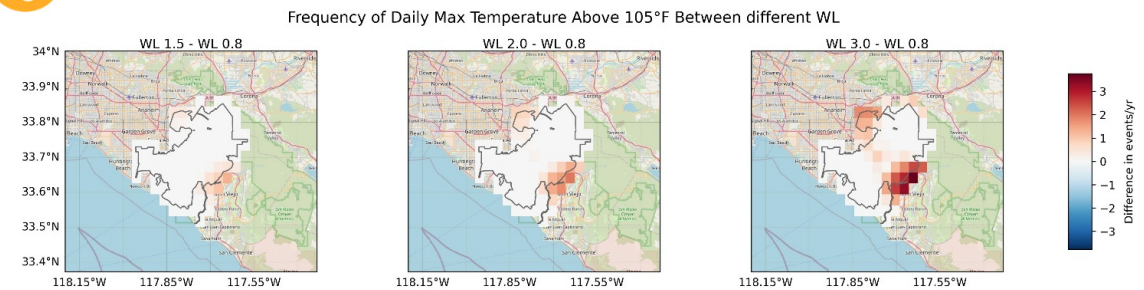


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EXTREME HEAT EVENTS



Baker WTP and LAWRP face greatest temperature increases.

Workforce safety
Higher temperatures raise heat-illness risk for staff.

Equipment
Pumps, electronics, communications equipment, and treatment processes are stressed.

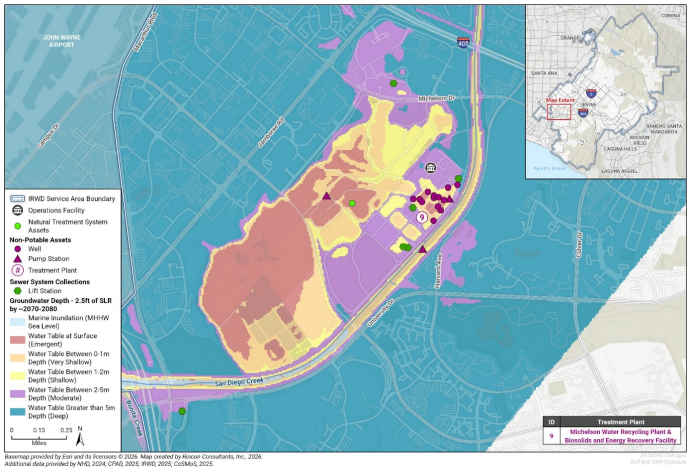
Warm Nights
Less overnight recovery for staff and equipment during prolonged events.

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GROUNDWATER RISE



Sea level rise leads to shallow groundwater at MWRP

- Buried assets face increased infiltration, corrosion, and hydrostatic pressure.
- Dewatering requirements and permitting constraints may increase over time.

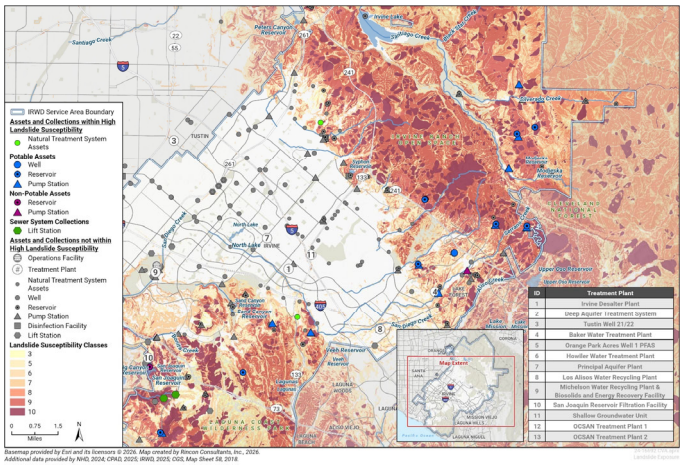


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LANDSLIDES / DEBRIS FLOWS



Eastern foothill areas have high landslide susceptibility

- Post-fire rainfall mobilizes ash, sediment, rock, and debris into reservoirs and NTS.
- Slope failures damage/expose pipelines and restrict access.
- Irvine Lake, Baker WTP, canyon pipelines, and northern NTS sites are key areas of concern.



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VULNERABILITIES AND ACTIONS



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KEY OPERATIONAL VULNERABILITIES

Treatment complexity

Rising with drought, wildfire, sediment, and degraded water quality.

Wastewater & recycled water exposure

Greater flooding, groundwater rise, and inflow and infiltration.

Backup power reliance

More need for backup power, emergency communications, and redundancy during wildfire and PSPS.

Workforce & equipment risk

Extreme heat threatens worker safety, facility operations, and equipment reliability.

Access & slope challenges

Landslides, debris flows, erosion, and access disruptions.

Maintenance demands

Aging infrastructure exposed to climate stressors needs more upkeep.

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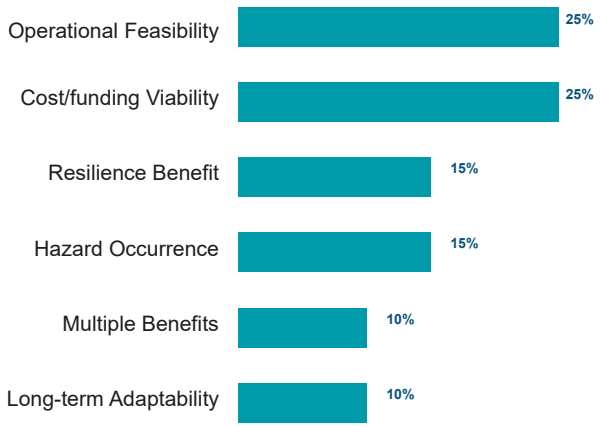
ADAPTATION ACTIONS: HOW DOES IRWD ADAPT?

- **144 actions** developed to address climate vulnerabilities for IRWD infrastructure and operations
- **76 actions** deemed high priority based on the following:

Rank Actions were scored 1 to 3 on six weighted criteria. Actions ranked above 2 were prioritized.

Implementation timeframe Short-term, ongoing, and planned actions were prioritized.

Priority criteria and weights



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ADAPTATION ACTIONS BY SYSTEM

Number of Actions Organized by IRWD System

Water Treatment	23
Recycled Water Treatment	8
Sewer Collection System	15
Monitoring & Control	5
Fleet & Facilities	8
Natural Treatment System (NTS)	5
District-Wide Improvements	12

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ADAPTATION ACTIONS: WATER TREATMENT

23 actions · 13 short term · 10 ongoing (1 of 2)

Short Term | Ongoing | Planned

Proposed High-Priority Adaptation Actions	Implementation Phase
Improve water use efficiency.	Ongoing
Develop drought forecasting tools.	Short Term
Enhance monitoring of algal blooms/ cyanotoxins.	Short Term
Integrate climate change impacts into UWMP.	Ongoing
Incorporate long-term drought into supply reliability efforts.	Short Term
Develop post-fire protocols for Syphon Reservoir.	Short Term
Collaborate w/firefighters on wildfire-fighting water needs.	Ongoing
Pretreat post-fire turbidity, nutrient loading, and degraded water quality.	Ongoing
Evaluate wildfire operational impacts and develop response measures.	Short Term
Identify PSPS events outside of the high wildfire zones.	Short Term
Increase backup systems to maintain operations during PSPS events.	Ongoing
Clear vegetation/ harden infrastructure in high fire zone facilities.	Short Term
Ensure high wildfire zone facilities has 3 days of backup power.	Ongoing

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ADAPTATION ACTIONS: WATER TREATMENT (CONTINUED)

23 actions · 13 short term · 10 ongoing (2 of 2)

Short Term | Ongoing | Planned

Proposed High-Priority Adaptation Actions	Implementation Phase
Initiate reservoir debris screening/sediment management.	Ongoing
Formalize a regular spillway review and repair process.	Ongoing
Evaluate reservoir projects for opportunities to increase capacity.	Ongoing
Include 105°F as a design specification.	Short Term
Track impact of extreme heat on reservoirs.	Short Term
Deploy post-fire replanting in landslide risk areas.	Short Term
Prepare landslide response plans.	Ongoing
Develop procedures to restore access after landslides.	Short Term
Establish alternative access routes for vulnerable facilities.	Short Term
Identify site stability models for areas with underground infrastructure.	Short Term

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ADAPTATION ACTIONS: RECYCLED WATER TREATMENT

8 actions · 5 short term · 1 ongoing · 2 planned

Short Term | Ongoing | Planned

	Proposed High-Priority Adaptation Actions	Implementation Phase
	Develop stormwater discharge/treatment bypass protocols.	Ongoing
	Upgrade electrical/mechanical systems above flood levels.	Planned
	Incorporate flood resiliency in planned MWRP upgrades.	Short Term
	Evaluate pump stations groundwater rise impacts.	Short Term
	Examine dewatering permit and discharge requirements.	Short Term
	Establish odor and corrosion trigger thresholds.	Short Term
	Implement monitoring programs to identify corrosion risks.	Short Term
	Incorporate future climate conditions into facility design criteria.	Planned

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ADAPTIVE MANAGEMENT



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ADAPTIVE MANAGEMENT

1 Confirm ownership
Assign responsible departments and executive sponsors.

2 Sequence actions
Define schedules, dependencies, costs, and funding needs.

3 Embed climate criteria
Apply hazard maps and warming levels to capital and equipment decisions.

4 Launch monitoring
Track priority metrics annually and report trends.

5 Use triggers
Advance future investments when operational, climate, or asset thresholds are reached.

6 Revisit regularly
Update the framework at least every five years or after major events.

Repeat the cycle

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ENERGY MANAGEMENT

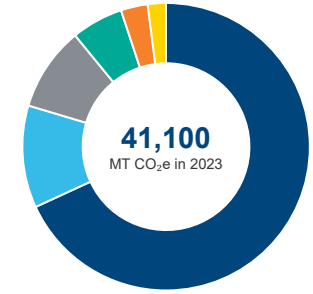


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ENERGY MANAGEMENT ANALYSIS: KEY FINDINGS



- **68%** Electricity
- **12%** Wastewater
- **9%** Other
- **6%** Water imports
- **3%** Fleets
- **2%** Natural gas

- **Electricity is IRWD's largest emissions source, driven primarily by pumping and treatment.**
- **IRWD's largest energy use sites are already efficient.**
- **Potential energy projects offer additional opportunities.**
- **Existing battery storage replacement should be examined.**

State grid decarbonization is the biggest driver of future emissions reductions

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NEXT STEPS



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CLIMATE ADAPTATION PLAN: WHAT COMES NEXT?

1. High-Priority Climate Adaptation Actions:
   a) Develop system to track action progress and status
   b) Assign actions to responsible departments and executive sponsors
   c) Integrate actions into existing planning documents
   d) Define action schedules, dependencies, costs, and funding needs
2. Energy Management Actions:
   a) Evaluate recommended potential energy projects
   b) Evaluate existing battery replacement project opportunities



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QUESTIONS

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November 17, 2026
Prepared by: M. Alvarez / B. Waite
Submitted by: K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

MICHELSON WATER RECYCLING PLANT 2025 FLOWS AND LOADS UPDATE
PHASE III EXPANSION

SUMMARY:

The 2025 Flows and Loads Update analyzes the most recent sewage flows and loading rates coming into to Michelson Water Recycling Plant (MWRP) including pandemic-era data to reassess future flow and loading projections. These projections are then used to evaluate the most viable treatment technology alternatives for the next expansion (Phase III) of MWRP including planning level facility sizing. The results of the treatment alternative economic and non-economic evaluations identified membrane bioreactor (MBR) as the preferred approach for the MWRP Phase III Expansion.

Staff will present the 2025 Flow and Loads Update findings and recommendations to the Engineering and Operations Committee prior to advancing the Phase III Expansion to the design phase.

BACKGROUND:

The 2021 Sewage Treatment Master Plan (STMP) established the District's long-term strategy for wastewater treatment, capacity expansion, regulatory compliance, and water recycling. Subsequent updates to the STMP were performed in 2023 and 2025 to incorporate additional historical data, update flow projections, reassess regulatory requirement assumptions and future treatment needs.

The 2025 Flows and Loads Update evaluated two long-term planning scenarios. Scenario 1 would retain and modernize the Los Alisos Water Recycling Plant (LAWRP) while expanding to the projected ultimate buildout flow of 32.4 million gallons per day (mgd) at MWRP and 3.6 mgd at LAWRP. Scenario 2 would permanently divert all LAWRP wastewater flows to MWRP, resulting in a projected buildout flow of 36.0 mgd at MWRP.

Based on the detailed evaluation and results of the 2025 Flows and Loads Update, staff recommends expanding the capacity of MWRP to 32.4 mgd using MBR technology and decommissioning the conventional activated sludge (CAS) facility. The MBR treatment alternative has a similar 50-year life cycle cost compared to the other CAS related alternatives while offering greater non-economic benefits including improved recycled water quality, greater treatment flexibility and robustness, and the opportunity to retire aging treatment facilities. Staff also recommends retaining and rebuilding LAWRP with a modernized treatment process to be identified at a future date.

Staff proposes to advance the preliminary and final design of the MWRP Phase III Expansion, adding a new MBR treatment facility sized for over 23 mgd at the southeast area of the plant.

Additional assessments are required for various existing MWRP facilities such as the CAS condition and reliability assessment to ensure consistent operation until the Phase III expansion is completed.

A draft of the MWRP 2025 Flows and Loads Update Phase III Expansion Presentation is provided as Exhibit "A".

FISCAL IMPACTS:

No expenditure or project budget approval is requested as part of this informational update. The life-cycle costs presented are for planning-level comparison of alternatives. Any future design or construction funding requests will be considered separately, as appropriate.

ENVIRONMENTAL COMPLIANCE:

This project is subject to the California Environmental Quality Act (CEQA). In conformance with the California Code of Regulations Title 14, Chapter 3, Section 15004, the appropriate environmental document will be prepared when "meaningful information" becomes available.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

Exhibit "A" – MWRP 2025 Flows and Loads Update Phase III Expansion Presentation Draft


Irvine Ranch
Water District
MWRP 2025 FLOWS AND LOADS UPDATE - PHASE III EXPANSION
Engineering and Operations Committee
November 17, 2026
Draft
1

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AGENDA
1. Review of Objectives
2. Background, Flow Projections, and Planning Values
3. MWRP Treatment Alternatives
• Economic Evaluation
• Non-Economic Evaluation
4. Cost-Benefit Analysis
5. Recommended Next Steps
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OBJECTIVES

Update evaluation of wastewater flow and constituent loading

Update treatment alternatives evaluation for MWRP and LAWRP

Define MWRP future expansions and fate of LAWRP

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BACKGROUND

2021 SEWAGE TREATMENT MASTER PLAN (STMP)

- Established IRWD's long-term strategy for sewage management, treatment-capacity expansion, regulatory compliance, and water recycling.
- Developed future flows and loads, conveyance and treatment needs, and a phased capital improvement program for MWRP and LAWRP.

PLAN UPDATES

- 2023 STMP update added historical data and evaluated pandemic-era wastewater characteristics.
- 2025 Flows and Loads Update incorporates 2023–2025 data, revised flow projections, updated regulatory assumptions, assessed future treatment requirements.

2021
Sewage Treatment Master Plan

2023
STMP Update

2025
Flows and Loads Update

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PLANNING SCENARIOS

Scenario 1
Treatment Expansion at MWRP and Treatment Modernization at LAWRP

- No change to collection system
- Expand MWRP to meet projected flows and loads
- Modernize LAWRP

Scenario 2
Treatment of All Flows at MWRP and Repurpose LAWRP

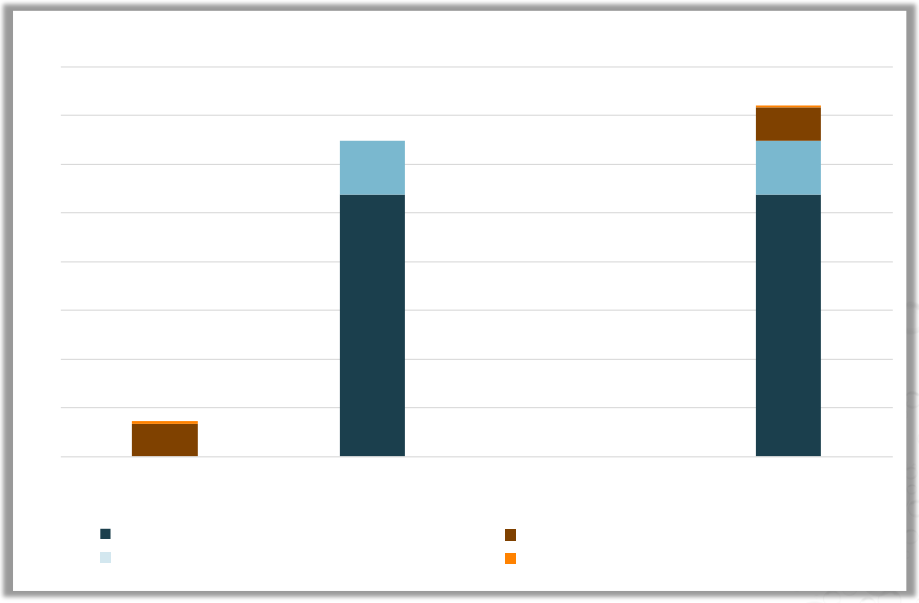
- Redirect all LAWRP sewershed flow to MWRP
- Expand MWRP to treat combined MWRP and LAWRP flows and loads
- Demolish LAWRP and repurpose site

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MWRP AND LAWRP BUILD OUT FLOW PROJECTIONS

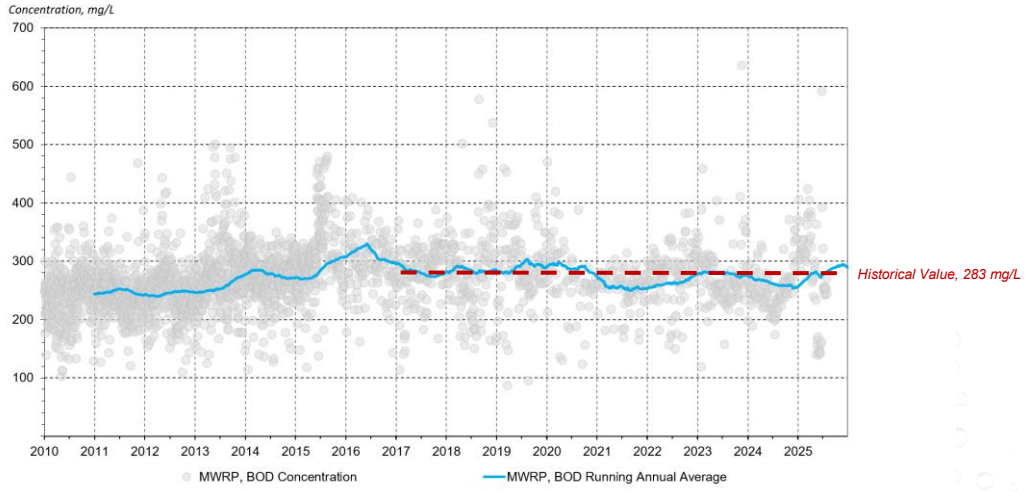


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MWRP INFLUENT LOADING ANALYSIS



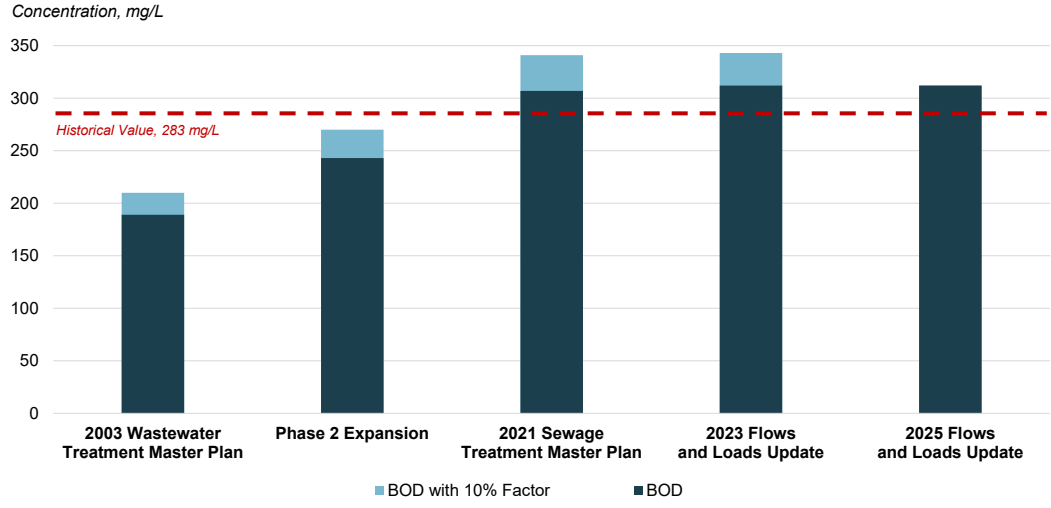
Need to revisit planning assumptions to avoid being overly conservative

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MWRP PLANNING VALUES



Planning Decision

Avoid carrying forward concentration growth that has not been observed in historical data.

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MWRP TREATMENT ALTERNATIVES

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TREATMENT ALTERNATIVE CONSIDERATIONS

Regulatory Drivers

- Currently no nitrate-N limit
- Future nitrate-N limit is 10.2 mg/L
- Reservoir TDS limit of 720 mg/L

Technology Screening

- Carries forward screening framework from 2021 STMP and 2023 Update.
- Considered permitting approval risk, implementation, proven technology, and community impacts.

MWRP Treatment Focus

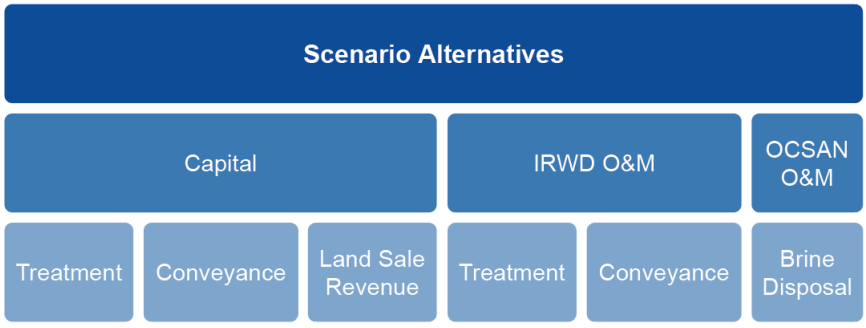
- Consider only proven technologies.
- Maintain current CAS process, improve CAS process or replace with full MBR

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ECONOMIC EVALUATION ELEMENTS



Basis of Estimate

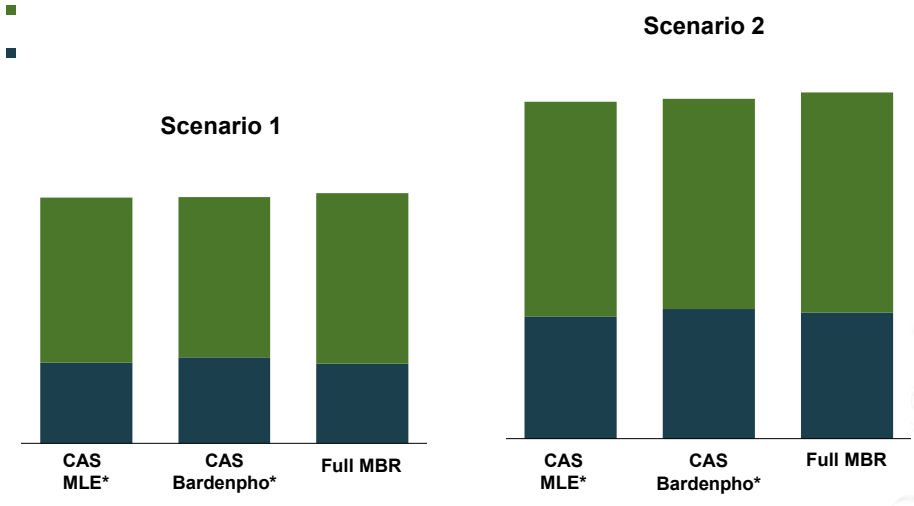
- Base year: 2026
- Analysis period: 50-year (ending 2076)

Planning-Level Cost Estimates

AACE Class 5 estimates were developed for comparing alternatives, not final budgeting or procurement.

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50-YEAR LIFECYCLE COST



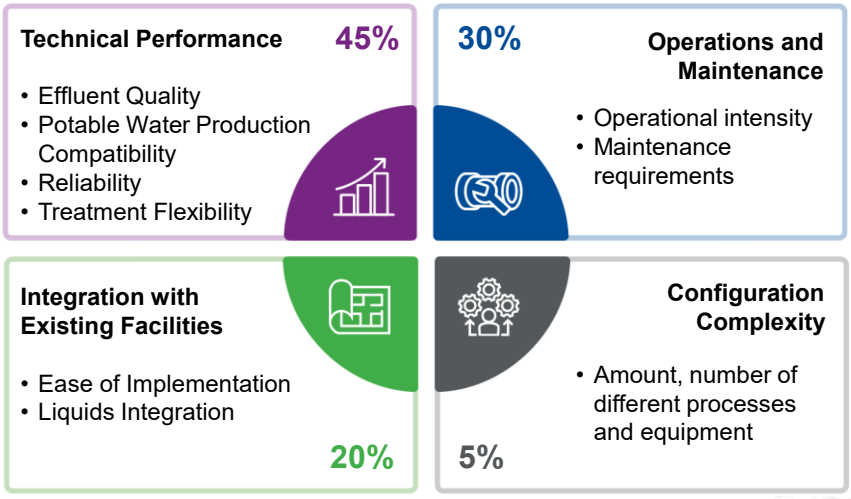
Economic Comparison

Full MBR has a comparable life-cycle cost to CAS MLE and CAS Bardenpho

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*CAS alternatives include a new 10-11 mgd West MBR facility as part of Phase III.

NON-ECONOMIC CRITERIA AND WEIGHTING



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NON-ECONOMIC EVALUATION RESULTS

Category	Weight	CAS MLE	CAS Bardenpho	MBR
Technical Performance	45%	Moderate	Moderately Strong	Very Strong
Operation and Maintenance	30%	Moderately Strong	Moderately Strong	Strong
Integration with Existing Facilities	20%	Moderately Low	Moderately Low	Very Strong
Complexity and Risk of Treatment Requirements	5%	Low	Extremely Low	Strong
Overall Weighted Score		**4.90**	**5.15**	**7.70**

Overall Weighted Score

CAS MLE:	4.90
CAS Bardenpho:	5.15
MBR:	**7.70**

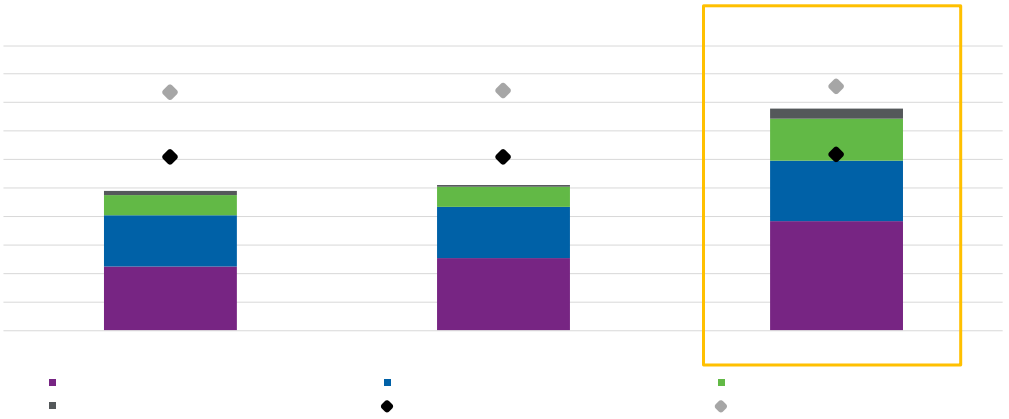
*Options were scored from 1 (Extremely Low) to 9 (Extremely Strong) and weighted by criterion.

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COST-BENEFIT ANALYSIS



Preferred Alternative: MBR

100% MBR at MWRP provides the best recycled water quality, greater treatment flexibility and robustness at a similar life-cycle cost.

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BENEFITS AND CONSIDERATIONS OF LAWRP DECISION

Scenario 1
Modernize LAWRP

BENEFITS
- Maintains treatment flexibility and redundancy
- Supports future direct potable reuse opportunities
- Retains multiple effluent disposal opportunities
- Sewer collection system capacity unaffected

CONSIDERATIONS
- Requires LAWRP modernization
- Maintains O&M responsibilities at two modern plants

Scenario 2
Repurpose LAWRP Site

BENEFITS
- Consolidates wastewater treatment at MWRP
- Reduces number of treatment facilities to operate

CONSIDERATIONS
- Requires long-term conveyance of LAWRP flows
- Limits ability for direct potable reuse at Baker WTP
- Reduces flexibility in where sewage can be treated
- Reduces SD Creek interceptor sewer capacity

Recommendation: Modernize LAWRP

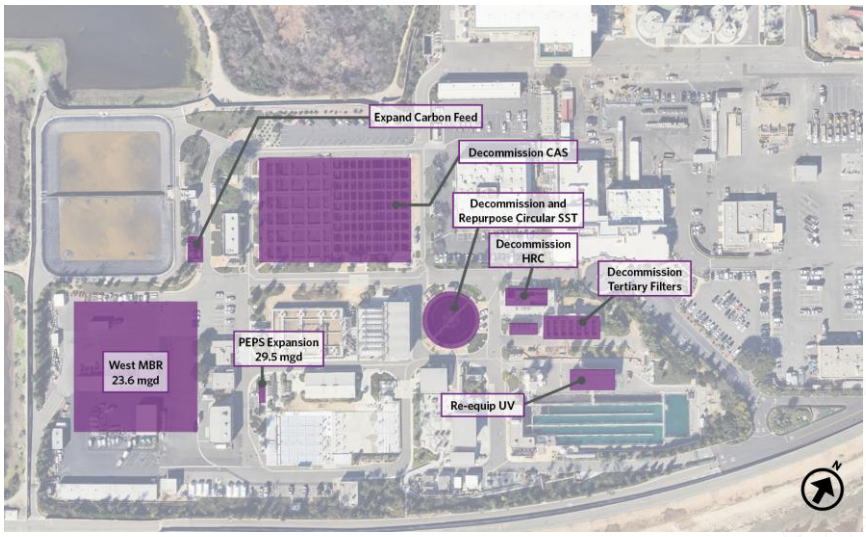
Modernizing LAWRP provides the greatest flexibility and resiliency with treatment and effluent disposal and allows future direct potable reuse

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RECOMMENDED MWRP PHASE III CONFIGURATION



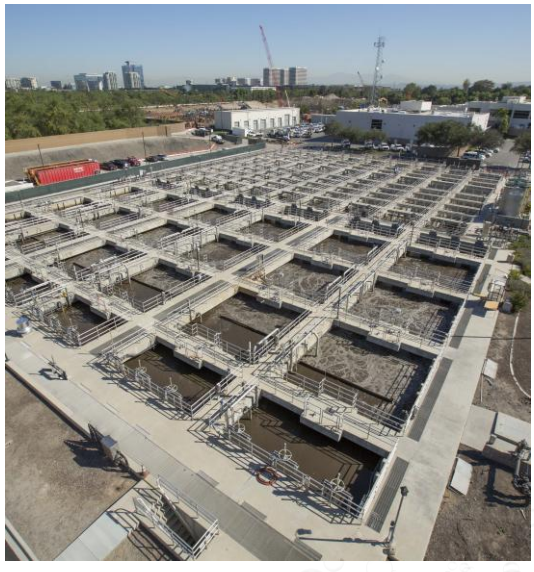
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CAS DECOMMISSIONING

- Decommission CAS treatment at the end of Phase III, avoiding major CAS rehabilitation and simplifying future process integration.
- CAS condition and reliability assessment will identify any interim work needed before decommissioning.

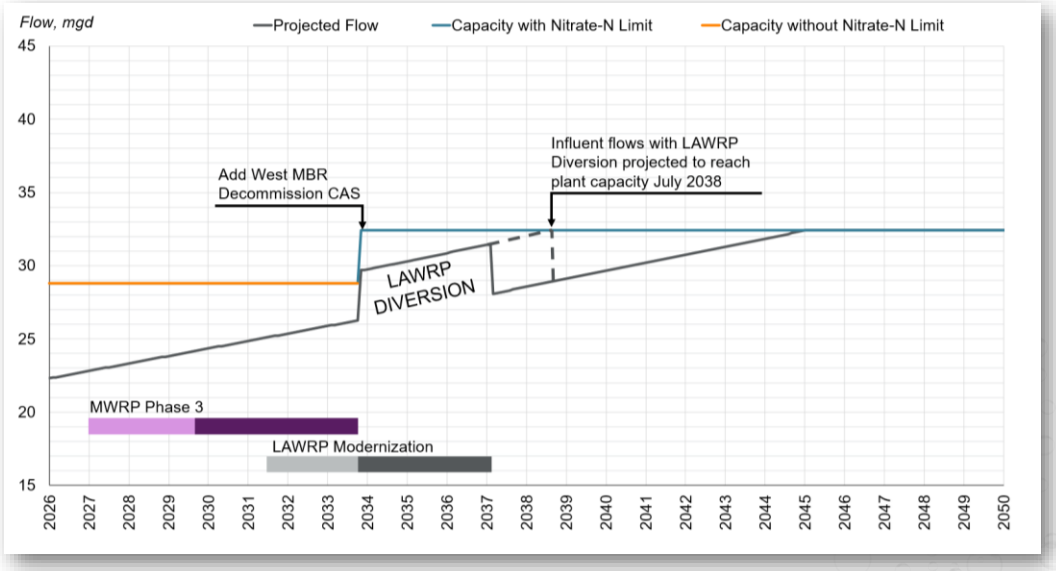


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PHASE III IMPLEMENTATION SEQUENCING



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RECOMMENDED NEXT STEPS

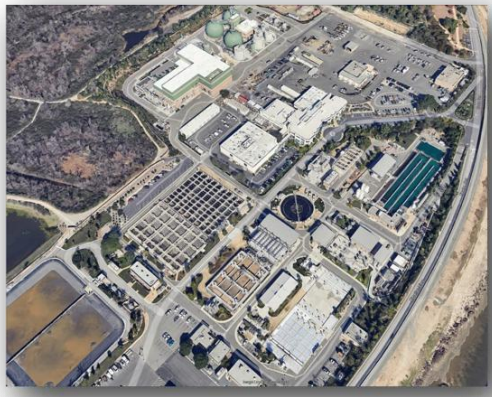
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RECOMMENDED NEXT STEPS

Anticipated Date	Recommended Action
Q1 2027	**Initiate RFP for preliminary and final design of the MWRP Phase III Expansion.**
Q2-Q3 2027	**Complete targeted CAS condition assessment and reliability assessment.** • Findings will inform interim rehabilitation needs and CAS decommissioning requirements.
Q2 2027	**Complete disinfection evaluation comparing UV and chlorine disinfection alternatives.** • Findings will inform the disinfection improvements and associated facilities incorporated into Phase III design.
Q3-Q4 2027	**Initiate design of temp LAWRP sewershed diversion facilities.** • Coordinate diversion requirements and implementation schedule with Phase III construction timeline.



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QUESTIONS?

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November 17, 2026
Prepared by: G. Radvar / J. Moeder
Submitted by: K. Burton
Approved by: Paul A. Cook

ENGINEERING AND OPERATIONS COMMITTEE

SYPHON RESERVOIR IMPROVEMENT PROJECT
CONSULTANT SELECTION FOR SYSTEM INTEGRATOR SERVICES

SUMMARY:

As construction of the Syphon Reservoir Improvement Project (SRIP) progresses, specialized system integration services are needed to program and test the new dam control and water treatment systems and integrate them with IRWD's supervisory control and data acquisition (SCADA) system. Staff solicited proposals from three qualified firms and evaluated them based on qualifications, experience, technical approach, and overall value. Staff recommends that the Board authorize the General Manager to execute a Professional Services Agreement with Prime Systems Industrial Automation, Inc. in the amount of $415,840 for system integrator services.

BACKGROUND:

SRIP will replace the existing Syphon Dam and expand recycled water storage capacity from approximately 535 acre-feet to 5,000 acre-feet. Project improvements include a new dam, inlet/outlet facilities, a dam control building, and a downstream water treatment facility. The dam control building will contain controls for reservoir-related equipment, and the treatment facility will include filtration, chemical treatment, and associated instrumentation and controls.

The construction contract includes furnishing and installing the instrumentation and control equipment and vendor-provided control systems. A separate System Integrator (SI) is needed to develop and test the project programmable logic controller (PLC), operator interface, and SCADA applications; coordinate integration with equipment vendors; and support system testing, startup, and commissioning. The SI will coordinate with IRWD Automation staff, the construction management team, AECOM as the Engineer of Record, the general contractor Sukut Construction, subcontractors, and equipment suppliers.

System Integrator Services and Consultant Selection Process:

On September 3, 2026, staff issued a Request for Proposals to three qualified firms: Enterprise Automation, Advanced Integration & Controls (AIC), and Prime Systems Industrial Automation, Inc. (PSIA). Staff held a pre-proposal meeting on September 21, 2026. Following the meeting, Enterprise Automation declined to submit a proposal. Staff received proposals from AIC and PSIA.

Staff evaluated the proposals based on technical approach, qualifications, experience, availability, and overall value. The proposed fees were comparable, with PSIA proposing $415,840 and AIC proposing $417,054.64. PSIA demonstrated a thorough understanding of the project through its detailed review of the contract documents, identification of key system interfaces, and recommendations for addressing potential integration challenges. PSIA also

brings relevant IRWD experience with similar control systems and SCADA platforms. In addition, PSIA proposed a more experienced technical team with greater depth in senior-level programming support, providing additional flexibility and continuity throughout the project. PSIA's proposal, provided as Exhibit "A", includes pricing based on the proposed project schedule as described below.

The consultant evaluation matrix, provided as Exhibit "B," reflects the results of this process.

Schedule:

The SI will begin with document review and coordination, starting in 2027. Programming and testing for the dam control building are anticipated in 2028, followed by treatment facility programming and integration in 2029. Startup and commissioning are anticipated in late 2029 through early 2030, with documentation and closeout to follow. The SI schedule will be coordinated with Sukut's approved schedule.

FISCAL IMPACTS:

The Syphon Reservoir Improvements, Project 03808, is included in the Fiscal Year 2026-27 Capital Budget. Sufficient budget is available to fund the recommendations presented herein.

ENVIRONMENTAL COMPLIANCE:

This project is subject to the California Environmental Quality Act (CEQA). The Syphon Reservoir Improvement Project Final Environmental Impact Report (EIR) was adopted by the IRWD Board of Directors on July 26, 2021. Addendum No. 1 to the Syphon Reservoir Improvement Project Final EIR was adopted by the IRWD Board of Directors on August 26, 2024. Addendum No. 2 to the Syphon Reservoir Improvement Project Final EIR was adopted by the IRWD Board of Directors on May 12, 2025. Addendum No. 3 to the Syphon Reservoir Improvement Project Final EIR was adopted by the IRWD Board of Directors on October 27, 2025. Corresponding Notices of Determinations were filed with the County of Orange.

RECOMMENDATION:

That the Board authorize the General Manager to execute a Professional Services Agreement with Prime Systems Industrial Automation, Inc. in the not-to-exceed amount of $415,840 for system integrator services for the Syphon Reservoir Improvement Project.

LIST OF EXHIBITS:

Exhibit "A" – Prime Systems Industrial Automation Proposal
Exhibit "B" – System Integrator Services Evaluation Matrix

PRIME SYSTEMS
INDUSTRIAL AUTOMATION, INC.

PROPOSAL FOR

System Integrator Services

Syphon Reservoir Improvement Project

Request for Proposals PR 03808

SUBMITTED TO

Irvine Ranch Water District
15600 Sand Canyon Avenue, Irvine, CA 92618
Attention: Giti Radvar, Project Manager

SUBMITTED BY

Prime Systems Industrial Automation, Inc.
6236 River Crest Drive, Suite B, Riverside, CA 92507
Marc Smith, President | 951-237-7916

October 12, 2026

PRIME SYSTEMS
INDUSTRIAL AUTOMATION, INC.

October 12, 2026

Irvine Ranch Water District
15600 Sand Canyon Avenue
Irvine, CA 92618
Attention: Giti Radvar, Project Manager
Ethan Fike, Senior Automation System Administrator

Subject: **Irvine Ranch Water District Proposal**
System Integrator Services – Syphon Reservoir Improvement Project

Reference: IRWD Request for Proposals for System Integrator Services
Syphon Reservoir Improvement Project (PR 03808)
dated September 3, 2026

Thank you for this opportunity for *Prime Systems Industrial Automation, Inc.* (Prime Systems) to present the following proposal to provide System Integrator (SI) Services for the Irvine Ranch Water District (IRWD) Syphon Reservoir Improvement Project. Our fee proposal is submitted separately, as required by the RFP.

Company Information

Prime Systems Industrial Automation, Inc.
6236 River Crest Drive, Suite B
Riverside, CA 92507

Phone:	951-656-7139
FAX:	951-656-8139
Website:	www.psia.biz
Federal Tax ID:	20-4208685
Business Type:	C Corporation
Years in Business:	28 Years
Authorized Officer:	Marc Smith, President
	951-237-7916

Sincerely,

Marc Smith
President
Prime Systems Industrial Automation, Inc.

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Section 1 – Project Understanding, Approach, and Scope

1. Project Understanding

IRWD is replacing the existing 1949 Syphon Dam with a new, approximately 138-foot-high earth embankment dam, increasing seasonal recycled water storage from approximately 535 acre-feet to approximately 5,000 acre-feet. Because Syphon Dam is under the jurisdiction of the California Department of Water Resources, Division of Safety of Dams (DSOD), the instrumentation and control systems supporting the dam must be dependable, well documented, and fully tested before they are placed into service.

From a system integration standpoint, the Project consists of two distinct facilities, each with its own construction timeline:

- **Dam Control Building (2028)** – houses PLC-200 (control panel CP-200), the reservoir aeration system, the automatic data acquisition system (ADAS), and the pneumatic systems that operate the reservoir inlet/outlet facilities. PLC-200 programming must address control of the seven pneumatically actuated inlet/outlet fish screen valves through the PAS-CP panel, monitoring and remote control of the aeration compressors, permissives and interlocks, alarming, and the transfer of operating data to IRWD SCADA.
- **Water Treatment Facility (2029 – 2030)** – located at the downstream toe of the dam and consisting of fourteen (14) filters, dechlorination, chlorination, backwash, and associated mechanical and electrical systems. This facility includes vendor-provided control systems that must be integrated with PLC-100 (control panel CP-100), the operator interface, the Project communications network, and IRWD's existing SCADA system.

IRWD is looking for an SI that will (1) find and resolve conflicts in the contract documents before they become field problems, (2) deliver PLC, HMI, and SCADA applications that comply with IRWD Automation standards, (3) work cooperatively with IRWD, the Construction Management Team (CMT), AECOM, Sukut, the electrical subcontractor, and equipment vendors, (4) follow IRWD's Workflow Sequence for System Integrator Software Development and Testing (Exhibit A) and the start-up process in Section 01510, and (5) remain available and flexible across a multi-year construction schedule that will change as the work progresses. Prime Systems has delivered this type of construction-phase integration for Southern California water and wastewater agencies for more than twenty-eight (28) years.

2. Control System Overview

Based on our review of the conformed Project Drawings (Exhibit C) and Project Manual (Exhibit B), the instrumentation and control system is organized around two PLC control panels connected by fiber optic cable (Drawing I-002):

- **CP-100, Treatment Building** – PLC-100 with a local I/O rack and an expansion I/O rack, a panel-mounted OIT, a remote OIT in the chemical area hallway, Ethernet Switch 100, and the GE MDS Orbit MCR 900 MHz licensed radio (RAD-A) that provides the Project's link to IRWD SCADA.
- **CP-200, Dam Control Building** – PLC-200 with a local I/O rack, a panel-mounted OIT, and Ethernet Switch 200, connected to CP-100 through fiber patch panels over a 12-fiber cable.

Section 17300 specifies **Schneider Electric Modicon M580** PLCs (BMEP581020 controllers with BMENOC0311 Ethernet modules and X80/M340 I/O, Modicon "no equal") and **Maple Systems OMI6815B** operator interface terminals running **AVEVA Edge** (1,500-tag runtime). Networking uses Hirschmann BRS20 managed Ethernet switches and a Lantronix serial-to-Ethernet bridge (Section 17350). The I/O list in Section 17305 identifies approximately 400 hardwired I/O points: about 345 at PLC-100 (230 DI, 59 DO, 43 AI, 15 AO) and about 55 at PLC-200 (37 DI, 15 DO, 3 AI). Section 17000 confirms that IRWD, through its System Integrator, will provide the PLC, local HMI, and SCADA programming, while each vendor package system is delivered fully programmed by its vendor. IRWD SCADA development uses AVEVA System Platform (ArchestrA) with the District's standard templates and objects. Prime Systems has programmed this same M580, AVEVA Edge, and System Platform combination to IRWD standards on prior IRWD projects, including the Fleming Zone 8 Tank and Booster Pump Station (see Section 3).

Prime Systems' scope is the integration of PLC-100, PLC-200, the OITs, and IRWD SCADA. The table below summarizes the equipment and vendor systems that will be integrated with the PLCs, OITs, and SCADA.

System	Panel / Drawings	PLC / OIT / SCADA Integration
Algae filtration system, filters FLT-401 to FLT-414	Amiad package with vendor-programmed Modicon M580 PLC in CP-400 (I-101, I-102; Sections 11904, 17101)	PLC-100 Ethernet data exchange with the Amiad PLC: backwash call/stop/inhibit, filter bypass, remote reset, backwash fail, filtration capacity, PIT-435 pressure, power and valve fault alarms; OIT and SCADA displays
Backwash supply and return pumps	VMP-400; VFDs PMP-431 and PMP-432 (I-104, I-105)	PLC-100 logic for duty pump selection and speed reference per Section 17101; Modbus TCP status and alarm data from the VFDs to the OIT and SCADA
Sodium hypochlorite and sodium bisulfite feed	Metering pump VFDs PMP-310 to PMP-350 and PMP-210 to PMP-240 (I-106 to I-109)	PLC-100 logic for chlorination and dechlorination per Section 17101; tank levels, pump status, and alarms on the OIT and SCADA
Power monitoring	PM-MSB-100, PM-MCC-010, -020, -030 (I-002)	Modbus TCP power meter data read by PLC-100 and displayed on the OIT and SCADA
Reservoir inlet/outlet	Pneumatic Air System Control Panel PAS-CP; fish screen valves BFV-600 to BFV-660; VCP-600 (I-200)	PLC-200 open/close commands and open/closed/remote status for seven valves; CMP-600 run/fail and pressure alarms; reservoir level LT-600
Reservoir aeration (24/7 operation)	Rotary screw compressors with vendor controllers; receiver T-700 (I-201; Sections 11371, 17101)	PLC-200 Ethernet monitoring, alarming, and remote start/stop of each compressor; header pressure, high/low pressure alarm, receiver drain valve
Weather station	RS-485 through Lantronix serial/Ethernet bridge in CP-200 (I-002)	Weather data read by PLC-200 and displayed on the OIT and SCADA
ADAS dam monitoring	Campbell Scientific CR6-based system with RF452 radios and cellular modem (I-017; Section 17011)	None; autonomous system with no SCADA connection per Section 17011 (see review items)
Security and panel status	Hatch and door intrusion switches; UPS status (I-110, I-111, I-202)	Intrusion and UPS alarms to PLC, OIT, and SCADA

Programming, configuration, and parameter setup of the vendor equipment listed above, including the Amiad filtration PLC, VFDs, metering pumps, compressor controllers, the PAS-CP and VCP-600 panels, power meters, analyzers, and the ADAS, are by the Contractor and equipment vendors and are not part of Prime Systems' scope.

3. Preliminary Review of the Project Drawings

Our initial review of the drawings and specifications identified several items that we would raise for clarification early in Task 1. They are typical of what our contract document review is designed to find before programming begins.

- **SCADA communications during the 2028 Dam Control Building startup.** The only path from PLC-200 to IRWD SCADA is the fiber link to CP-100 and the RAD-A radio in the Treatment Building (I-002). Section 01510 requires Operational Train Testing and System Acceptance Testing to be performed "end to end" from the field device through SCADA. If CP-100, the fiber, or the radio is not in service when the Dam Control Building is started up in 2028, an interim communication path will be needed to complete those tests.
- **Aeration compressor tags.** The communication block diagram (I-002) and the CP-200 signal conduit schedule (S-202, S-203) identify the compressors as CMP-701 and CMP-702, while the aeration P&ID (I-201) and the power conduit schedule (P-203, P-204) identify them as CMP-710 and CMP-720 with vendor panels CP-710 and CP-720. Tag numbers should be reconciled before the I/O list and SCADA database are built.
- **ADAS programming responsibility.** Section 17011 states that the ADAS will be functionally autonomous, will not connect to IRWD SCADA, and that the District will be responsible for all ADAS programming and software configuration after acceptance. The RFP scope does not include ADAS programming, so Prime Systems has excluded it; we can provide it as an additional service if IRWD wishes.
- **Vendor data exchange definitions.** Section 17101 states that the aeration compressor data points will be determined from the data available from the compressor manufacturer, and the Amiad filtration PLC exchanges several control and alarm signals with PLC-100 over Ethernet. The protocol, addressing, and data map for each vendor interface will be confirmed in writing with the vendors before programming.

4. Approach

Prime Systems will perform the work in accordance with IRWD Automation Department's Workflow Sequence for System Integrator Software Development and Testing (Exhibit A), the Project Manual (Exhibit B), and the Project Drawings (Exhibit C). Our approach is organized around the following principles.

Resolve issues on paper first

Before any programming begins, we will review the P&IDs, I/O lists, control strategies, panel drawings, network drawings, electrical schematics, and IRWD-approved submittals together. We will build a consolidated I/O and communications register for each facility and compare it against the control strategies and the vendor submittals. Conflicts, missing information, and interface issues will be submitted to IRWD in a tracked issues log so that they can be resolved through the Project RFI process while there is still time in the schedule.

Program to IRWD standards

All PLC, HMI/OIT, and SCADA development will follow the programming, SCADA, communications, cybersecurity, and configuration standards furnished by IRWD Automation staff. Using IRWD's standard templates, tag naming, alarm philosophy, and display conventions gives IRWD Operations a system that looks and behaves like the rest of the District's facilities and is maintainable by IRWD Automation staff after the Project is closed out.

Lock down vendor interfaces early

Vendor-provided control systems (the CP-400 filter control panel, VMP-400, the VCP-600 and aeration compressor panels, the PAS-CP pneumatic actuation panel, and the VFDs) are a common source of late-stage integration problems. We will contact each vendor early to obtain communication data maps, protocol and addressing details, and command and status definitions, and we will confirm them in writing before programming the interfaces.

Test thoroughly before the field

Each PLC and OIT application will be developed and bench tested at our Riverside facility before field deployment, using simulated I/O to exercise control sequences, permissives, interlocks, alarms, and setpoints. We will invite IRWD Automation and Operations staff to review HMI/SCADA displays during bench testing so that comments are incorporated before loop checks begin.

Follow the Section 01510 start-up process

Prime Systems understands that the SI is integral to the testing and start-up process in IRWD General Requirements Section 01510 (Figure 1). We will participate in and support each step of that process for both the Dam Control Building and the Treatment Building:

- Development and bench testing of the PLC program before field deployment to the PLC and Operator Interface Terminal (OIT)

- Loop Check Test 1 (Unwitnessed) and Loop Check Test 2 (Witnessed)
- Operational Train Testing 1 (Unwitnessed) and Operational Train Testing 2 (Witnessed)
- System Acceptance Testing
- Reliability Acceptance Testing

Plan for two phases

Because the Dam Control Building will be placed into service roughly a year before the Treatment Building, we will structure the PLC-200 and SCADA applications so that the dam facilities can operate and report to IRWD SCADA on their own in 2028, and PLC-100 and the treatment facility can then be added in 2029 without re-testing or disrupting the dam controls already in service. Because PLC-200 reaches IRWD SCADA through CP-100 and the RAD-A radio, we will work with IRWD and Sukut early to confirm that this communication path, or an interim alternative, is available for the 2028 startup.

Protect IRWD's systems

Prime Systems will comply with IRWD's cybersecurity standards and the Data Protection and Security Addendum. Access to existing IRWD systems will be coordinated through IRWD Automation staff, only IRWD-approved and maintained engineering laptops will be connected to Project networks, and all program files will be kept under revision control with a documented change log that supports the Task 5 closeout deliverables.

5. Scope of Services

Prime Systems confirms the Scope of Services described in Section C of the RFP. Our scope is the integration of the Project PLCs (PLC-100 and PLC-200), OITs, and IRWD SCADA, and we will provide the following.

Task 1 – Project Coordination and Contract Document Review

- Review the Contract Documents and IRWD-approved I&C submittals, including drawings, specifications, P&IDs, I/O lists, control strategies, panel drawings, and electrical schematics.
- Identify conflicts, discrepancies, missing information, and interface issues, and submit them to IRWD for resolution through a tracked issues log.
- Participate in Project progress and system integration meetings (up to forty (40) hours over the duration of the assignment), including preparation and follow-up for each meeting.

Task 2 – PLC, HMI, and SCADA Programming

- Program the Project PLCs to implement the approved control strategies, including control sequences, equipment controls, permissives, interlocks, alarms, setpoints, and equipment status.
- Develop the HMI/OIT and SCADA displays required for operation and monitoring of the Dam Control Building and the Treatment Facility.
- Coordinate with equipment vendors to obtain the communication information needed for vendor system interfaces, and program the interfaces between vendor control systems and the Project PLC and SCADA systems, including commands, status, alarms, and process data.

Task 3 – System Integration Testing

- Bench test and field test I/O functionality, control logic and operating sequences, HMI and SCADA functionality, and communications with vendor-provided control systems.
- Correct and retest programming and configuration issues identified during testing.
- Participate in each step of the Section 01510 testing and start-up process described above.

Task 4 – Startup and Commissioning Support

- Provide on-site system integration support during startup and commissioning, troubleshoot control system and communication issues, modify programming as required, and retest affected functions.
- Coordinate with IRWD, AECOM, the CMT, Sukut, the electrical subcontractor, and equipment vendors to resolve system integration issues.

- Include the $20,000 allowance for as-needed on-site startup and commissioning support, to be used only as authorized by IRWD.

Task 5 – Documentation and Closeout

- Incorporate all changes made during testing, startup, and commissioning into the final programs.
- Provide IRWD with final PLC programs, HMI and SCADA applications, configuration files, and backups.
- Provide documentation of programming and configuration changes made during the Project.
- Provide one (1) 4-hour training session for IRWD Operations and Automation staff covering HMI/SCADA displays, operating modes, control sequences, alarms, interlocks, and operator-adjustable setpoints.

6. Assumptions, Exclusions, and Recommendations

Assumptions

- IRWD Automation staff will provide applicable programming, SCADA, communications, cybersecurity, and system configuration standards, and will coordinate all activities requiring access to existing IRWD systems.
- The Contractor will furnish and install all instrumentation, control panels, PLC and OIT hardware, network equipment, conduit, and wiring, and will perform instrument calibration, consistent with Section F of the RFP.
- OIT runtime licenses (AVEVA Edge, 1,500 tags) are furnished with the OIT hardware under Section 17300. Prime Systems retains active Modicon EcoStruxure Control Expert and AVEVA Edge development licenses and will use them for this Project at no additional cost to IRWD.
- In accordance with Section 17000, vendor package systems (including the Amiad filtration system, the aeration and inlet/outlet compressor controls, and the PAS-CP pneumatic actuation panel) will be delivered with their PLC and HMI programming complete, and VFDs, metering pumps, power meters, and instruments will be configured by the Contractor and vendors, including their communication settings. Prime Systems will program and test the PLC, OIT, and SCADA side of the interfaces to that equipment.
- ADAS programming and configuration (Section 17011) are excluded, as described in the review items above.
- Control strategies, I/O lists, and vendor communication data maps will be provided in the Contract Documents and approved submittals. Significant changes to approved control strategies after programming is complete will be reviewed with IRWD before additional work is performed.
- Field testing will be scheduled in coordination with the Contractor's readiness. Additional site visits caused by incomplete installation or Contractor-driven schedule changes may be charged against the Task 4 allowance with IRWD's prior authorization.
- Billing rates will remain fixed for the duration of the contract, as required by the RFP.

Exclusions

- Programming, configuration, or parameter setup of vendor equipment and packaged systems, including VFDs, metering pumps, the Amiad filtration PLC, compressor controllers, the PAS-CP and VCP-600 panels, power meters, analyzers, instruments, and the ADAS.
- Furnishing of hardware, panels, instruments, network equipment, or software licenses.
- Field installation, wiring, terminations, and instrument calibration (by the Contractor).

- Network or IT infrastructure design, and cybersecurity assessments beyond compliance with IRWD standards.

Recommendations

Prime Systems recommends one modification to the Scope of Services. The RFP assumes up to twenty (20) hours of Project meetings. Because system integration will span two facilities and several years of construction (2028 through early 2030), with coordination among IRWD, the CMT, AECOM, Sukut, the electrical subcontractor, and multiple equipment vendors, Prime Systems has included up to forty (40) hours for Project and system integration meetings in Task 1.

Within the proposed scope, we also recommend the following practices, which we have found reduce field rework:

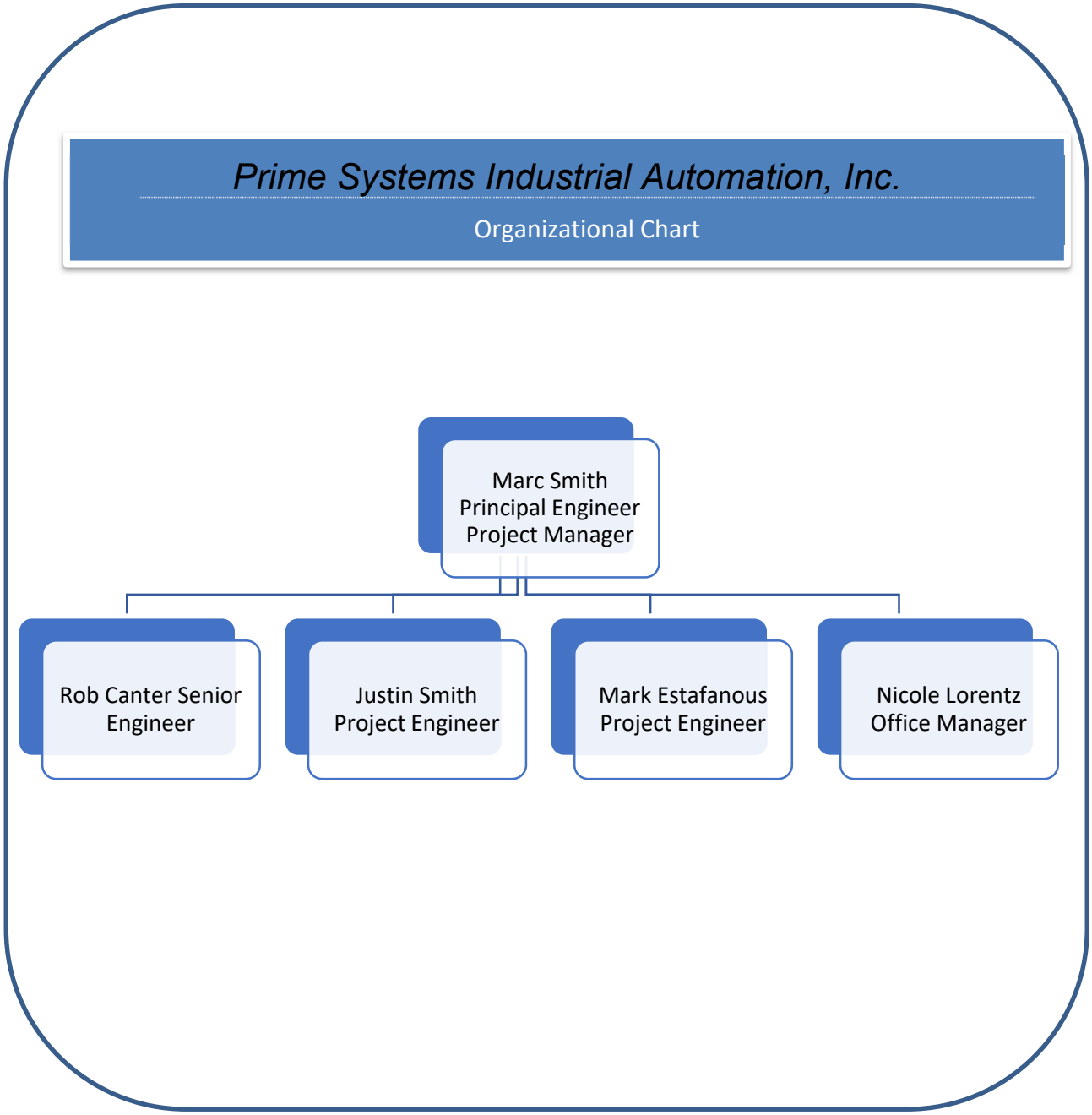
- A vendor communications coordination meeting early in each phase to confirm data maps and protocols.
- IRWD Operations review of HMI/SCADA displays during bench testing, before Loop Check Test 1.
- A short interim-operation narrative for the Dam Control Building describing how the dam facilities operate and report to SCADA before the Treatment Facility is placed into service.

Additional Services Available

If requested by IRWD, Prime Systems can also provide control panel design and fabrication, instrument calibration and verification, additional operator training, and post-commissioning SCADA support.

Section 2 – Team

1. Organizational Chart



2. Firm Overview

Prime Systems Industrial Automation, Inc. is a Riverside, California systems integration firm founded in 1998 and incorporated as a "C" Corporation in January 2006. Prime Systems provides engineering services for control system design, PLC and SCADA programming, PLC control panel design and fabrication, field services, testing, startup, and training. Our customer base is primarily water and wastewater agencies, and we have supported more than 400 customers across water, wastewater, and industrial markets.

Prime Systems operates from its own commercial office and shop at 6236 River Crest Drive, Suite B, Riverside, California, approximately one hour from the Project site. The firm has been financially stable since its inception, has never been removed from a project, and has never failed to complete its commitments on a project. Our engineers maintain active Systems Integrator program enrollment and licensing for the major PLC and SCADA platforms used in the water industry, including Schneider Electric Modicon (the M580/M340 platform specified for this Project), Allen-Bradley (Rockwell Automation), and AVEVA (Wonderware) software, and each engineer is equipped with the laptops, software, and communication equipment needed to support the Project. Prime Systems currently employs seven (7) full-time and two (2) part-time staff.

3. Key Personnel

The following table summarizes each team member's role on the Project. Brief biographical sketches follow, and full resumes are included in Appendix A.

Team Member	Project Role	Primary Responsibilities
Marc Smith, Principal Engineer	Project Manager / System Integrator	Single point of contact for IRWD; meetings and coordination; contract document review; QA/QC of all deliverables; schedule and staffing
Robert Canter, Senior Engineer	Assistant Project Manager / Lead PLC Engineer	PLC programming for the Dam Control Building and Treatment Facility; vendor interfaces; bench and field testing
Justin Smith, Project Engineer	HMI / SCADA Lead	HMI/OIT and SCADA displays; integration with IRWD SCADA; communications; documentation and training
Mark Estafanous, Project Engineer	PLC Programming and Field Testing	PLC programming support under the lead PLC engineer; field installation testing, I/O verification, and loop checks

Marc Smith, Principal Engineer – Project Manager / System Integrator

Marc Smith received his Bachelor of Science in Electrical Engineering, with an emphasis in Control Systems, from California State University, Fullerton in 1992 and completed his Master of Science in Computer Engineering there in 1995. During his graduate program he began working as a Control Systems Engineer developing PLC and SCADA applications, and in 1998 he founded Prime Systems. Marc has more than thirty-three (33) years of experience in the design, programming, testing, and startup of control systems at more than one hundred (100) water and wastewater facilities.

Marc will serve as Project Manager and System Integrator for the Syphon Reservoir Improvement Project. He will be IRWD's single point of contact, lead the contract document review and Project meetings, and review all programming and test documentation before it is submitted to IRWD.

Robert Canter, Senior Engineer – Assistant Project Manager / Lead PLC Engineer

Rob Canter graduated from the Georgia Institute of Technology in 1997 with a Bachelor of Science in Chemical Engineering. After working as an applications engineer for scrubber systems and as a project engineer performing control system design, Rob joined Prime Systems, where he has more than twenty-six (26) years of combined control systems experience. Rob is fluent in all Modicon PLC programming packages (ProWorx, Concept, and Unity Pro/EcoStruxure Control Expert) and in Allen-Bradley Logix programming. He programmed the Modicon M340 PLC upgrades and programming for approximately 175 remote sites at Rancho California Water District and has led PLC programming, I/O checkout, and functional testing on treatment plant projects.

Rob will serve as Assistant Project Manager and lead PLC engineer, responsible for the Dam Control Building and Treatment Facility PLC programs, vendor system interfaces, and bench and field testing.

Justin Smith, Project Engineer – HMI / SCADA Lead

Justin Smith studied Computer Engineering at California Polytechnic State University, San Luis Obispo, and joined Prime Systems full time after graduating in 2012, following eight (8) years of part-time work with the firm. Justin has more than fourteen (14) years of full-time experience in PLC and SCADA application development, with a primary focus on Wonderware/AVEVA System Platform, historian and reporting applications, and Ethernet and radio communication networks for water and wastewater systems.

Justin will lead development of the AVEVA Edge OIT applications and SCADA displays, integration with IRWD's existing SCADA system, program documentation, and the operator training session.

Mark Estafanous, Project Engineer – PLC Programming and Field Testing

Mark Estafanous received his Bachelor of Science in Bioengineering from the University of California, Riverside in 2019 and has more than five (5) years of controls experience. Before joining Prime Systems as a Project Engineer in March 2026, he was an Instrumentation & Controls Engineer at Sulzer EMS USA, where he configured and programmed Schneider Electric Modicon M340 and M580 PLCs in Control Expert, designed control panels, and performed point-to-point I/O verification and on-site testing and commissioning. Earlier, he designed and programmed PLC and HMI controls for reverse osmosis water treatment systems at Ampac USA.

Mark will support PLC programming under Rob Canter's direction, and will support field installation testing, including I/O verification and loop checks, for both the Dam Control Building and the Treatment Facility.

Section 3 – Relevant Experience

Prime Systems has been the primary systems integrator on numerous water and wastewater projects similar to the Syphon Reservoir Improvement Project. The three projects below were selected because together they cover treatment facility PLC and SCADA integration, vendor control system interfaces, the Modicon PLC platform specified for this Project, and construction-phase testing and startup.

Prior Work for IRWD

Prime Systems has also performed work for IRWD on the following projects:

- **Desalter Shallow Groundwater Unit (SGU) Optimization for PFAS Treatment**, Project No. 11834
- **Fleming Zone 8 Tank and Zone 8 to 9 Booster Pump Station**, PR 10101 – Modicon M580, AVEVA System Platform SCADA, and AVEVA Edge OIT programming to IRWD standards
- **Turtle Rock Zone 3 Reservoir Chloramine Booster Station**, Project No. 11840 – Modicon M580 PLC, OIT, and SCADA programming for chemical dosing control

1. Adelanto PUA – Wastewater Treatment Plant Improvement

19101 Jonathan Street, Adelanto, CA 92301

Contact: Tristan (Dutch) Hause, Lead Operator, Woodard & Curran, Inc.
(760) 669-7441
tristan.hause@woodardcurran.com

Project: Wastewater Treatment Plant Rehabilitation and Upgrade (2012 – 2013)

Woodard & Curran, Inc. contracted with Prime Systems to design, install, and commission the instrumentation and control systems for the City of Adelanto's wastewater treatment plant upgrade, which had two separate legacy PLC and SCADA systems (GE Fanuc and Innotech) serving the headworks through the tertiary filters, chemical feed, chlorine disinfection, and effluent reuse pump station.

Prime Systems provided PLC control panel design and fabrication, Allen-Bradley CompactLogix PLCs, instrumentation, integration of OEM equipment control systems, and a new Wonderware SCADA system that unified all three control systems into a single SCADA system at the plant operations building, followed by testing and commissioning while the plant remained in service.

Role of Proposed Key Personnel

- Marc Smith – Project Manager; control system design and QA/QC
- Robert Canter – PLC programming, OEM interfaces, testing, commissioning
- Justin Smith – SCADA development, testing, and training

2. Rancho California Water District – Modicon M340 PLC and SCADA Upgrades

42135 Winchester Road, Temecula, CA 92590

Contact: Lance Vess, Electrical Services Supervisor
Office: (951) 296-6966 | Cell: (909) 841-7373
vessl@ranchowater.com

Project: PLC Control Panel and SCADA System Upgrades (2012 – Current)

Rancho California Water District is upgrading approximately 175 remote sites, including wells, booster stations, reservoirs, turnouts, and spreading grounds, together with its SCADA system. The upgrades include complete PLC control panel replacements, conversion of the existing Modicon PLCs to Modicon M340 PLCs programmed to the District's new programming standards, Modicon Magelis OIT programming, and migration of the SCADA software from RSView32 to Citect.

Prime Systems supports the District with system integration for these sites, new capital projects, and SCADA upgrades. Working directly with the District and its electrical contractors, Prime Systems performs I/O checkout, PLC programming, OIT programming, SCADA programming, software installation, and system functional testing to the District's Modicon programming standards.

Role of Proposed Key Personnel

- Marc Smith – Project Manager; coordination with District staff and contractors
- Robert Canter – Modicon M340 PLC and OIT programming, I/O checkout, testing
- Justin Smith – SCADA programming and communications

3. Three Valleys MWD – Treatment Plant PLC and SCADA Upgrade

1021 E. Miramar Avenue, Claremont, CA 91711

Contact: Stephen Lang, Chief Operations Officer
Office: (909) 621-5568
Mobile: (909) 477-9698

Project: Treatment Plant and SCADA Upgrades and Support (2001 – Current)

Three Valleys Municipal Water District operates a water treatment plant and approximately thirty (30) remote sites. The treatment plant uses a Modbus TCP Ethernet network connecting six (6) local PLCs to the SCADA system. Prime Systems designed, fabricated, programmed, and installed a new Modicon Quantum main PLC, replacing an undersized controller, together with new Wonderware InTouch SCADA software. The cutover was bench tested in advance and completed during a one (1) week annual scheduled shutdown, on schedule and with no impact to plant operations.

Role of Proposed Key Personnel

- Marc Smith – Project Manager; system design and cutover planning
- Robert Canter – PLC and OIT programming, testing, and support
- Justin Smith – SCADA programming and communications

Section 4 – Schedule and Availability

1. Proposed Schedule

Prime Systems will perform its services in coordination with the Project construction schedule and will adjust the timing of its work as the Contractor's schedule changes. Based on the current baseline schedule, we anticipate the following:

Phase	Anticipated Timing	Prime Systems Activities
Contract award and document review	Upon Notice to Proceed	Task 1 review of Contract Documents and submittals; issues log; vendor contact list; Project meetings
Dam Control Building	2028	PLC and OIT programming; SCADA displays; bench testing; Loop Check Tests 1 and 2; Operational Train Testing; System and Reliability Acceptance Testing; startup
Treatment Building programming and integration	2029	PLC, HMI, and SCADA programming; vendor control system interfaces; integration with IRWD SCADA; bench testing
Treatment Building integration testing	2029	Loop Check Tests 1 and 2; Operational Train Testing 1 and 2; correction and retesting
Startup and commissioning	Late 2029 – early 2030	System and Reliability Acceptance Testing; on-site startup and commissioning support; allowance work as authorized
Documentation and closeout	Following commissioning	Final programs, applications, configuration files, and backups; change documentation; 4-hour training session

2. Availability

The proposed team is available to support the Project through programming, testing, startup, and commissioning from contract award through closeout. Prime Systems' workload is managed so that key personnel are not reassigned during active project phases, and Marc Smith, as owner and Principal Engineer, controls staff scheduling directly. Our core project team (Marc Smith, Rob Canter, and Justin Smith) has worked together for many years, which allows any team member to cover for another without loss of continuity.

Our Riverside office is approximately one hour from the Project site, allowing staff to respond to field requests on short notice. Prime Systems has always provided 24x7 on-call support to its water and wastewater clients and will make that same support available during startup and commissioning.

Section 5 – Fee Proposal

In accordance with Section D.5 of the RFP, Prime Systems' not-to-exceed fee proposal, broken down by task and team member with estimated labor hours, billing rates, and other direct costs, is submitted separately from this technical proposal. The fee proposal includes the $20,000 Task 4 allowance, and the billing rates will remain fixed for the duration of the contract.

Section 6 – Conflict of Interest

Prime Systems certifies that no personal or organizational conflicts of interest prohibited by law exist with respect to this assignment. Neither Prime Systems nor any member of the proposed team has a financial interest that would be affected by the performance of these services. Prime Systems has no current work with Sukut, the Project's construction contractor.

Section 7 – Insurance

Prime Systems maintains insurance coverage that meets or exceeds IRWD's requirements. A certificate from our insurance producer is included in Appendix B, and current coverage limits are summarized below. Any additional premium required for this coverage is included in the proposed fee, and IRWD will not be charged a separate insurance surcharge.

Coverage	IRWD Minimum	Prime Systems Coverage
Professional Liability (Errors & Omissions)	$1,000,000	$2,000,000 each claim / $2,000,000 aggregate (Professional Liability & Cyber Liability)
Commercial General Liability	$1,000,000 per occurrence / $2,000,000 aggregate	$2,000,000 each occurrence / $4,000,000 general aggregate
Automobile Liability	—	$1,000,000 combined single limit
Umbrella Liability	—	$1,000,000 each occurrence / $1,000,000 aggregate
Workers' Compensation / Employers' Liability	—	Statutory / $1,000,000

Section 8 – Contract

Prime Systems has reviewed IRWD's sample Professional Services Agreement (Exhibit D), including the Data Protection and Security Addendum, and does not propose any modifications to the standard terms and conditions.

Appendix A – Resumes

Prime Systems Industrial Automation, Inc.

Staff Resumes

Marc Smith, Principal Engineer

Education:

Bachelor of Science, Electrical Engineering (BSEE), Cal State Fullerton, 1992
Master of Science, Computer Engineering (MSCE), Cal State Fullerton, 1995
Numerous Programming Certificates (Basic, Visual Basic, C, SQL, Intellution Fix32, Wonderware)

Level of Experience:

Over thirty-three (33) years of engineering design, development, implementation, and support of industrial control systems. Control systems services include electrical, instrumentation, programming, PLC, SCADA, database, radio, communication networks for commercial and municipal water/wastewater systems. Principal Engineer, owner, and President of *Prime Systems Industrial Automation, Inc.* a Riverside based Systems Integration firm for twenty-eight (28) years.

Relevant Experience:

- Complete SCADA System upgrade for Modicon Compact PLC to Modicon Quantum PLC with upgrade of Lookout SCADA Software to Wonderware SCADA Software. Upgrade and expand system capability and functionality. Custom control panel design, fabrication, and installation. Field installation and testing completed during scheduled one week annual Treatment Plant downtime.
- Complete SCADA System upgrade and expansion for Wastewater Treatment Facility. SCADA System upgrade included consolidation of GE Cimplicity and Innotech SCADA Systems into new Wonderware SCADA System with radio communication network.
- Complete SCADA System radio network upgrade to comply with new FCC Narrow banding requirements. Radio network upgrade consisted of twenty (20) remote sites.
- Complete SCADA System design, programming, installation and testing for Municipal Water District potable water system. SCADA System design included electrical panel design, AutoCAD, hardware specification, Allen Bradley PLC Programming, RSView32 Programming, Allen Bradley PanelView programming, RSView Messenger, Data Collection, Daily and Shift Reporting. The SCADA System Data Collection PLC was an Allen Bradley 64K SLC 5/05 communicating to RSView32. Rockwell Software RAD Server and Clients provided Water District Management personnel with remote monitoring capabilities of district wide system status. The SCADA System consisted of 43 remote monitoring and control sites with point-to-point radio communications.
- SCADA, PLC, Radio, Controls and Automation projects at more than one hundred (100) Water and Wastewater facilities.

Professional Affiliations and Certificates:

- Instrumentation Society of America, Senior Member
- Wonderware Certified, Application Developer, InTouch
- Wonderware Certified, Application Developer, SCADAlarm

- Intellution, Advanced FIX SCADA Software

Robert Canter, Senior Engineer

Education:

Bachelor of Science, Chemical Engineering (BSCE), Georgia Institute of Technology, 1997

Level of Experience:

Over twenty-six (26) years of control systems engineering design, programming, and support services across multiple disciplines. Project experience includes project management, design, procurement, fabrication, implementation, programming, installation, and testing.

Relevant Experience:

- Implemented site specific security system into existing Water District SCADA System. Project included mechanical and electrical installation of security hardware, integration of security hardware into remote site PLCs, and SCADA System programming and alarming.
- Completed water treatment facility filter system Allen Bradley CompactLogix programming and Operator Interface program development. Project included PLC control panel design, AutoCAD, panel fabrication/wiring, field electrical terminations, I/O checkout, Allen Bradley CompactLogix program development and testing, Allen Bradley PanelView + program development and testing.
- Water Treatment and Distribution System ongoing support contract for Municipal Water District SCADA System. Project tasks include Modicon Quantum PLC, Modicon M340 PLC, Modicon Magelis OIT, Wonderware SCADA, Computer Systems, network systems, MDS Radio programming, instrumentation, electrical troubleshooting and support.
- Ongoing remote site control upgrades for Municipal Water District. Project includes complete control panel replacement, Modicon Compact PLC upgrade to Modicon M340 PLCs, Modicon Magelis OIT programming, RSView32 SCADA programming, software installation and testing for 175 remote sites.
- Provided complete take-over service and support for Wastewater Treatment facility Fuel Cell system following removal of previous Systems Integrator. Tasked to complete punch list items and ongoing continued support for new system. Project support consisted of Allen Bradley ControlLogix, CompactLogix, PanelView Plus, RSView32 SCADA System, Electrical and Controls service and support.
- Control System design, development, installation, and testing for numerous projects across multiple disciplines including Water/Wastewater, Mining, Foods, Packaging, Conveying Systems, Batching Systems.

Professional Affiliations and Certificates:

- Wonderware Certified, Application Developer, InTouch
- Rockwell Automation, Fundamentals of Programmable Controllers using RSLogix5/RSLogix500

- Rockwell Automation, RSLogix5000 Training
- Rockwell Automation, PLC5 Programming
- Rockwell Automation, PLC5 Advanced Programming

Areas of Expertise:

- SCADA System Design, Programming, Implementation, Testing, and Support
- Allen Bradley Programming for PLCs, PACs, OIT, VFDs, DeviceNet, ControlNet, Ethernet
- Modicon PLC Programming utilizing ProWorx, Concept, and Unity Pro/EcoStruxure Control Expert
- Modicon Magelis Operator Interface Program Design and Implementation
- Radio Systems design, programming, installation, integration and troubleshooting
- Control Panel Design, AutoCAD, Fabrication, Installation and Testing
- Electrical and Controls Testing and Troubleshooting
- Water/Wastewater Industry Process Automation and Controls
- Process Instrumentation Calibration

Justin Smith, Project Engineer

Education:

Bachelor of Science, Computer Engineering (BSCE), Cal Poly San Luis Obispo, 2012

Level of Experience:

Eight (8) years of continuous part time work followed by fourteen (14) years of full time Project Engineering work following graduation from Cal Poly San Luis Obispo with BSCE. Work experience includes Allen Bradley PLC programming, Modicon ProWorx, Modicon Concept, Modicon Unity Pro/EcoStruxure Control Expert, SCADA System programming and support, radio system installation, programming and support.

Relevant Experience:

- Complete SCADA System radio network upgrade to comply with new FCC Narrow banding requirements. Radio network upgrade consisted of twenty (20) remote sites.
- Completed advanced SCADA System upgrade for Wonderware System Platform applications. Project included extended programming and service support consisting of Wonderware InTouch, Wonderware Historian, Reporting, Allen Bradley CompactLogix PLC programming, and MDS Radio support.
- Completed SCADA System development for Wastewater Treatment Facility expansion. Project consisted of complete SCADA system design, development, installation, testing, and training.
- Provided Ethernet network design, implementation, and testing to bridge multiple networks into one cross connected network for radio system communication across the Water District SCADA System.

Professional Affiliations and Certificates:

- Wonderware Certified, Application Developer, InTouch

Areas of Expertise:

- SCADA System Programming, Implementation, Testing, and Support
- Wonderware System Platform SCADA System Programming
- Allen Bradley Programming for PLCs, PACs, Operator Interfaces
- Radio Systems programming, installation, implementation, integration and troubleshooting
- Control Panel Fabrication, Installation and Testing
- Electrical and Controls Testing and Troubleshooting
- Water/Wastewater Industry Process Automation and Controls
- Process Instrumentation Calibration
- Ethernet Network Systems
- Historical Database (SQL) Programming and Implementation

Mark Estafanous, Project Engineer

Education:

Bachelor of Science, Bioengineering, UC Riverside, 2019
Associate of Science, Math & Science, Mt. San Antonio College, 2016

Level of Experience:

Over five (5) years of control system design, PLC/HMI programming, control panel design, I/O verification, and commissioning, including Schneider Electric Modicon M340/M580 programming in Unity Pro/EcoStruxure Control Expert. Project Engineer with Prime Systems since March 2026.

Relevant Experience:

- Prime Systems Industrial Automation (2026 – Present): Programs, troubleshoots, and modifies Schneider Electric, Allen-Bradley, and Automation Direct PLC/HMI systems; performs control system upgrades, I/O verification, functional testing, and startup; commissioned and verified automated water treatment systems.
- Sulzer EMS USA, Instrumentation & Controls Engineer (2023 – 2026): Configured and programmed Schneider Electric Modicon M340 and M580 PLCs using Unity Pro/EcoStruxure Control Expert, including processor, digital I/O, and analog I/O configuration; engineered PLC, MCC, and RTU control systems and custom control panels; performed point-to-point I/O verification and on-site PLC testing, troubleshooting, and commissioning support.
- Ampac USA, Project Manager (2021 – 2023): Designed and built custom reverse osmosis water treatment systems; programmed PLC logic in ladder logic, structured text, and sequential function chart; developed HMI/SCADA applications; rebuilt and replaced PLC and HMI systems.

Areas of Expertise:

- Schneider Electric Modicon M340/M580 PLC Programming (Unity Pro/EcoStruxure Control Expert)
- Allen-Bradley PLC Programming (Studio 5000, RSLinx) and FactoryTalk View ME HMI
- Ladder Logic, Structured Text, and Sequential Function Chart
- PLC I/O Verification, Functional Testing, and Commissioning
- Control Panel Design, Electrical Schematics, and MCC Design
- Instrumentation, VFDs, and Soft Starters
- AutoCAD and SOLIDWORKS

PRIME SYSTEMS
INDUSTRIAL AUTOMATION, INC.

October 12, 2026 Letter: 2026-10 IRWD Syphon Fee Proposal.docx

Subject: **Irvine Ranch Water District Proposal**
System Integrator Services – Syphon Reservoir Improvement Project

Reference: IRWD Request for Proposals for System Integrator Services
Syphon Reservoir Improvement Project (PR 03808)
dated September 3, 2026

Fee Proposal

The following Fee Proposal is submitted separately from, and in conjunction with, the *Prime Systems Industrial Automation, Inc.* Technical Proposal dated October 12, 2026 for System Integrator Services for the Irvine Ranch Water District Syphon Reservoir Improvement Project, as required by Section D.5 of the RFP. The fee is a not-to-exceed amount broken down by task and year, including estimated labor hours and labor rates by year.

Labor Cost Breakdown

Task	Description	Year	Hours	Labor Rate (per hour)	Total
1	**Task 1 – Project Coordination and Contract Document Review**		**200**		**$49,920**
	Labor – 2027	2027	80	$240	$19,200
	Labor – 2028	2028	40	$248	$9,920
	Labor – 2029	2029	40	$256	$10,240
	Labor – 2030	2030	40	$264	$10,560
2	**Task 2 – PLC, HMI, and SCADA Programming**		**806**		**$202,240**
	Labor – 2027	2027	106	$240	$25,440
	Labor – 2028	2028	400	$248	$99,200
	Labor – 2029	2029	200	$256	$51,200
	Labor – 2030	2030	100	$264	$26,400
3	**Task 3 – System Integration Testing**		**480**		**$122,880**
	Labor – 2028	2028	160	$248	$39,680
	Labor – 2029	2029	160	$256	$40,960
	Labor – 2030	2030	160	$264	$42,240
4	**Task 4 – Startup and Commissioning Support**		**-**		**$20,000**
	As-needed on-site startup and commissioning support allowance (only as authorized by IRWD)		-	-	$20,000
5	**Task 5 – Documentation and Closeout**		**80**		**$20,800**
	Labor – 2029	2029	40	$256	$10,240
	Labor – 2030	2030	40	$264	$10,560
	Total (Labor plus Task 4 Allowance)		**1,566**		**$415,840**

Fee Summary

Fee Summary	Basis	Total
Labor – Tasks 1, 2, 3, and 5	1,566 hours @ annual labor rates	$395,840
Task 4 – as-needed startup and commissioning allowance (only as authorized by IRWD)	Per RFP	$20,000
Total Not-to-Exceed Fee		**$415,840**

Labor Rates:

Prime Systems Industrial Automation, Inc. labor rates for this Project apply to all personnel and are based on the year in which the work is performed:

Labor rates by year are shown in the table below. Travel time is billable at the labor rate for the year in which the travel occurs.

Labor by Year

Year	Labor Rate (per hour)	Labor Hours	Labor Total
2027	$240.00	186	$44,640
2028	$248.00	600	$148,800
2029	$256.00	440	$112,640
2030	$264.00	340	$89,760
Total		**1,566**	**$395,840**

All invoices are due and payable on net 30-day terms.

General Billing Terms and Conditions:

1. Work will be invoiced monthly as Time and Material (T&M) based on the *Prime Systems Industrial Automation, Inc.* labor rates for the year in which the work is performed, as detailed above, not to exceed the total fee without IRWD's written authorization.
2. Travel time is billable at the labor rates detailed above.
3. Travel Mileage is billable at the IRS Mileage Rate.
4. Travel time and mileage is calculated door-to-door from the *Prime Systems Industrial Automation, Inc.* office in Riverside, CA.
5. The Task 4 startup and commissioning allowance will be used only as authorized in advance by IRWD.
6. No equipment, computer, phone, software license, or insurance surcharges will be billed.

I hope this Fee Proposal is responsive to your needs, and I look forward to working with the Irvine Ranch Water District on the Syphon Reservoir Improvement Project. If you have any questions, please don't hesitate to call me at our office, 951-656-7139.

Sincerely,

Marc Smith

Marc Smith
President
Prime Systems Industrial Automation, Inc.

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CONSULTANT SELECTION MATRIX

Syphon Reservoir Improvement Project System Integrator Services Evaluation Matrix						
Item	Description	Weights	**Prime Systems Industrial Automation, Inc.**		**Advanced Integration and Controls**	
A	TECHNICAL APPROACH					
1	Project Understanding & Approach	40%	1		2	
2	Project Experience	30%	1		2	
3	Project Team	30%	1		2	
	Weighted Score		1.0		2.0	
	Ranking of Consultants		**1**		**2**	
B	SCOPE OF WORK					
TASK			Task Hours	Fee	Task Hours	Fee
1	Project Management		200	$49,920	170	$34,691
2	PLC, HMI, and SCADA Programming		806	$202,240	1,165	$236,054
3	System Integration Testing		480	$122,880	471	$96,795
4	Startup and Commissioning Support (Include $20,000 Allowance)		-	$20,000	78	$16,402
5	Documentation and Closeout		80	$20,800	60	$13,113
					Additional	$20,000
	Total Engineering Services Fee		1,566	**$415,840**	1,944	**$417,055**
C	Key Personnel		Roles	Years Experience	Roles	Years Experience
			Project Manager/ System Integrator	33	Project Manager	20
			Assistant Project Manager/ Lead PLC Engineer	26	Technical Lead	8
			HMI / SCADA Lead	14	Automation Engineer	2
			PLC Programming and Field Testing	5	Autmation Engineer	2
	Insurance (Professional & General Liability)		Yes		Yes	
D	Relevant Experience					
			Desalter Shallow Groundwater Unit Optimization for PFAS Treatment		Michelson WRP Tertiary Filter Improvements	
			Fleming Zone 8 Tank and Zone 8 to 9 Booster Pump Station		On-Call Control Systems Integrator Services	
			Turtle Rock Zone 3 Reservoir Chloramine Booster Station		SCADA & Field Site RTU Programming	
			Adelanto PUA - Wastewater Treatment Plant Improvement			
			Rancho California Water District- Modicon M340 PLC & SCADA Upgrades			
			Three Valleys MWD- Treatment Plant PLC and SCADA Upgrade			

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