CALIFORNIA WATER FIX
RELIABLE. CLEAN. WATER.

MODELING

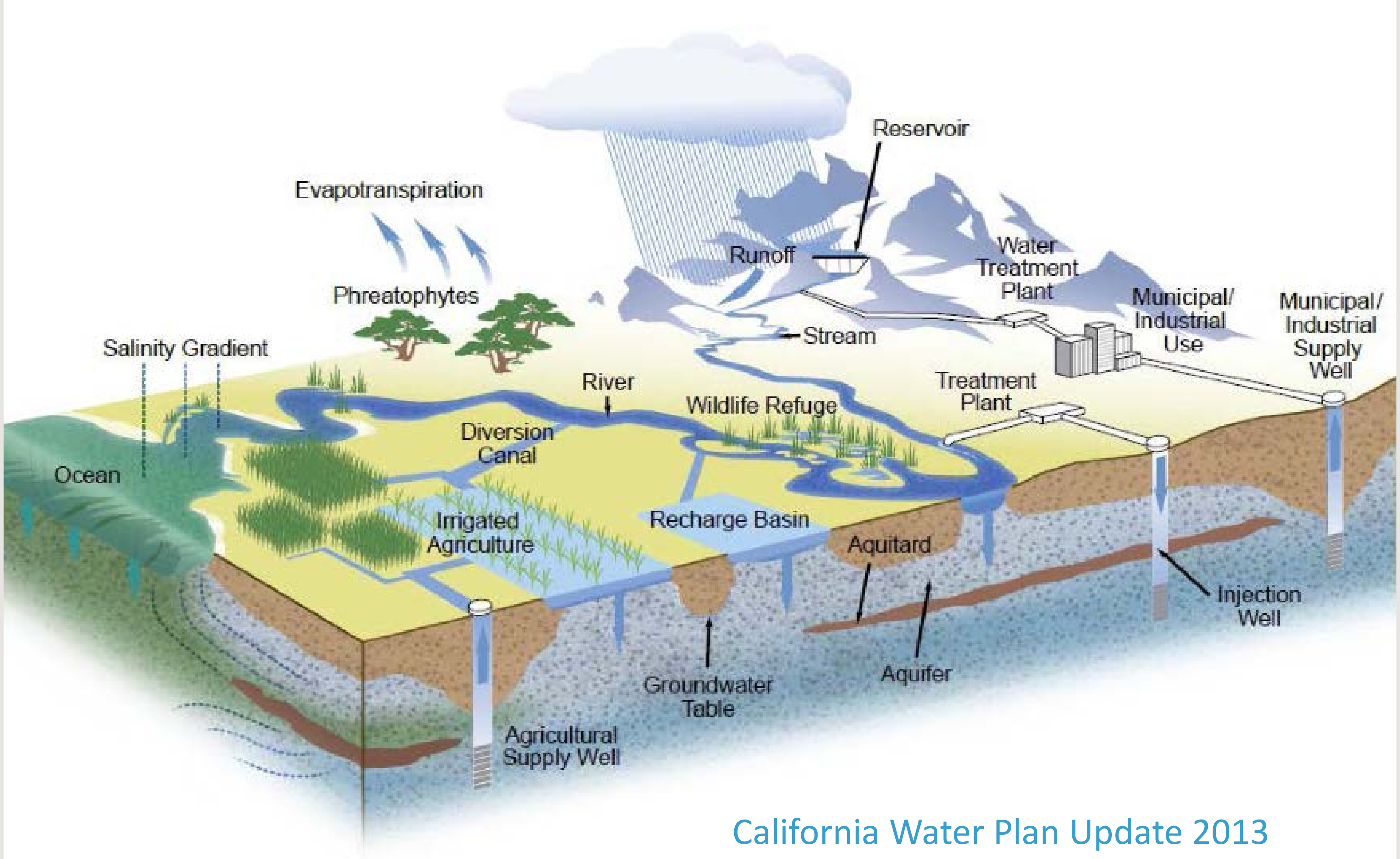
MODELING PRESENTATION OVERVIEW

- **Overview of CWF Models and Tools**
  - CalSim II
  - DSM2
- **CWF Modeling Scenarios and Assumptions**
- **Water Supply Modeling Results**
- **Delta Salinity and Water Level Modeling Results**
- **Summary Findings**

MODEL DEFINITIONS

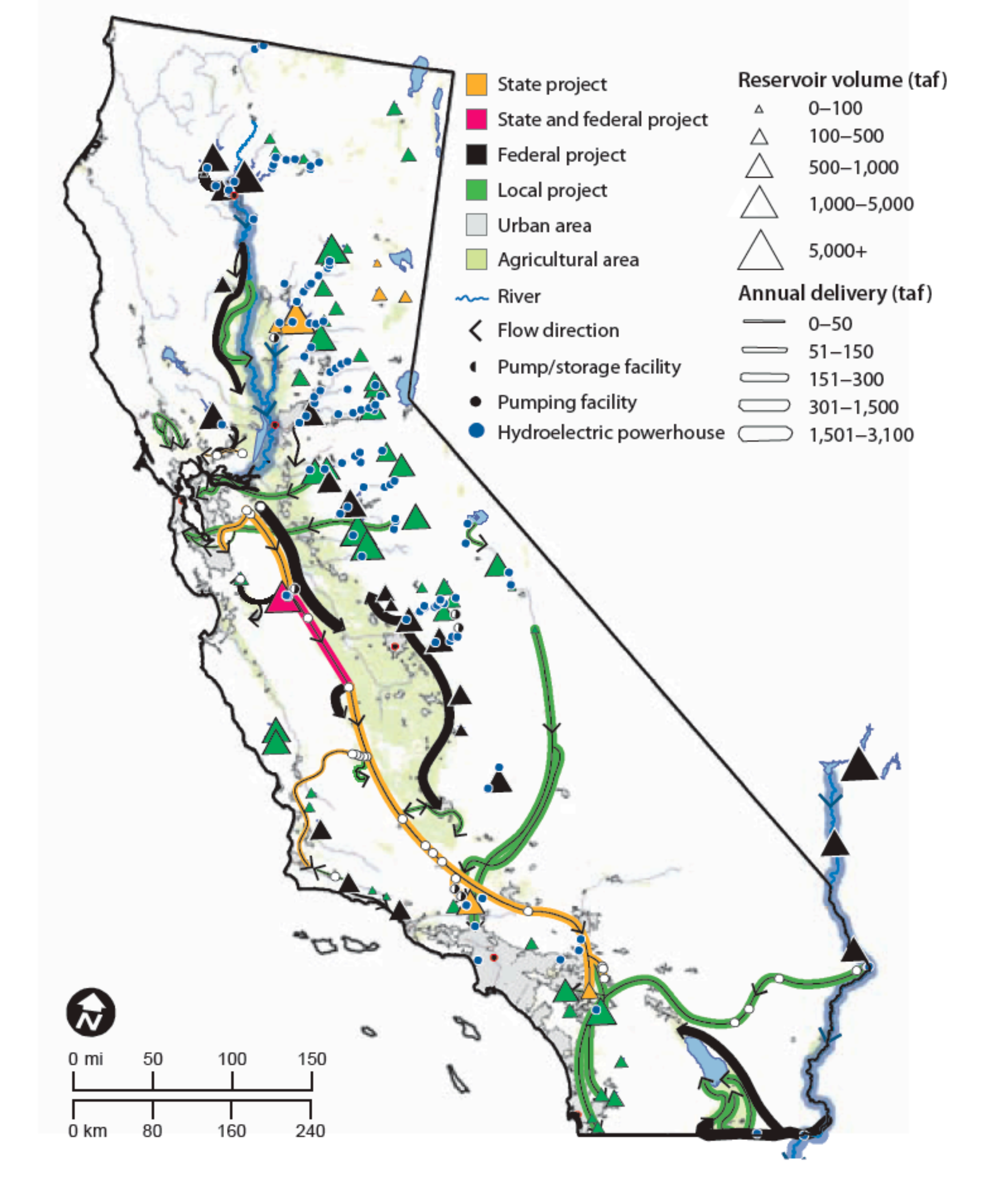
- **Mathematical Model:**
  - A systematic description of an object or phenomenon that shares important characteristics with the object or phenomenon.
  - A simplified representation used to explain the workings of a real world system or event.

AN INTENSELY INTEGRATED HYDROLOGIC SYSTEM



California Water Plan Update 2013

… AND AN INTERTIED WATER SYSTEM



MODELING APPROACH

Hydrology and System Operations (CalSim II)
(monthly time-step)

River flows, reservoir storage, diversions and deliveries

↓

Delta Hydrodynamics (DSM2-Hydro)
(15 minute time-step)

Delta channel flows, velocities, stage

↓

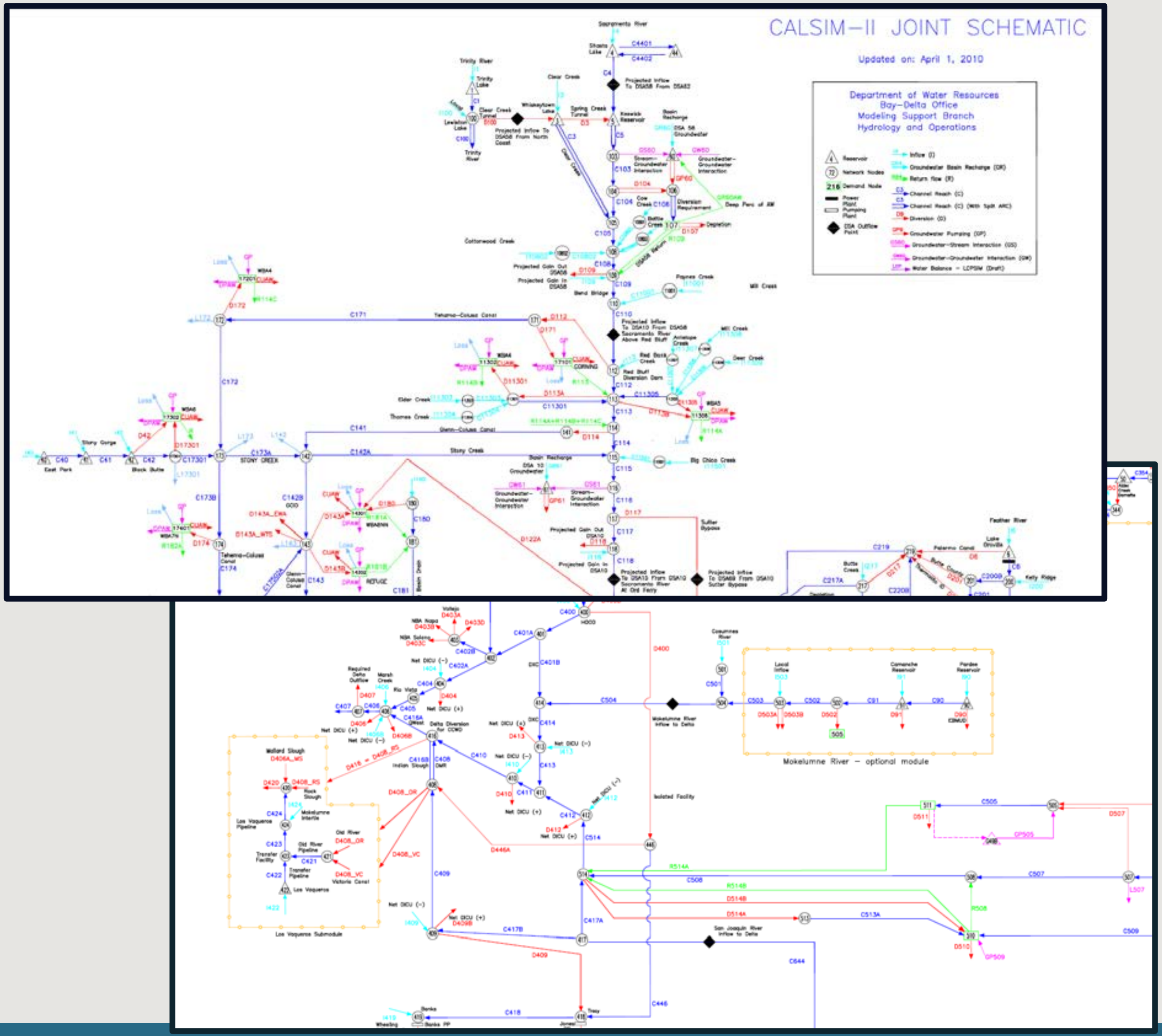
Delta Water Quality (DSM2-QUAL)
(15 minute time-step)

Salinity (EC and Cl)

CalSim II

- **CalSim II simulates long-term operational scenarios of the SWP and CVP**
  - Under a Coordinated Operations Agreement (COA)
  - On a monthly time-step
  - For various conditions (e.g. level of development, climate change, facilities, regulations)
  - Best available tool for long-term planning of the SWP/CVP system
- **CalSim II is most appropriately used for comparative purposes and not for predictive purposes**
- **CalSim II is a planning tool, and should NOT be used to replicate historical conditions**

CALSIM II MODEL SCHEMATIC

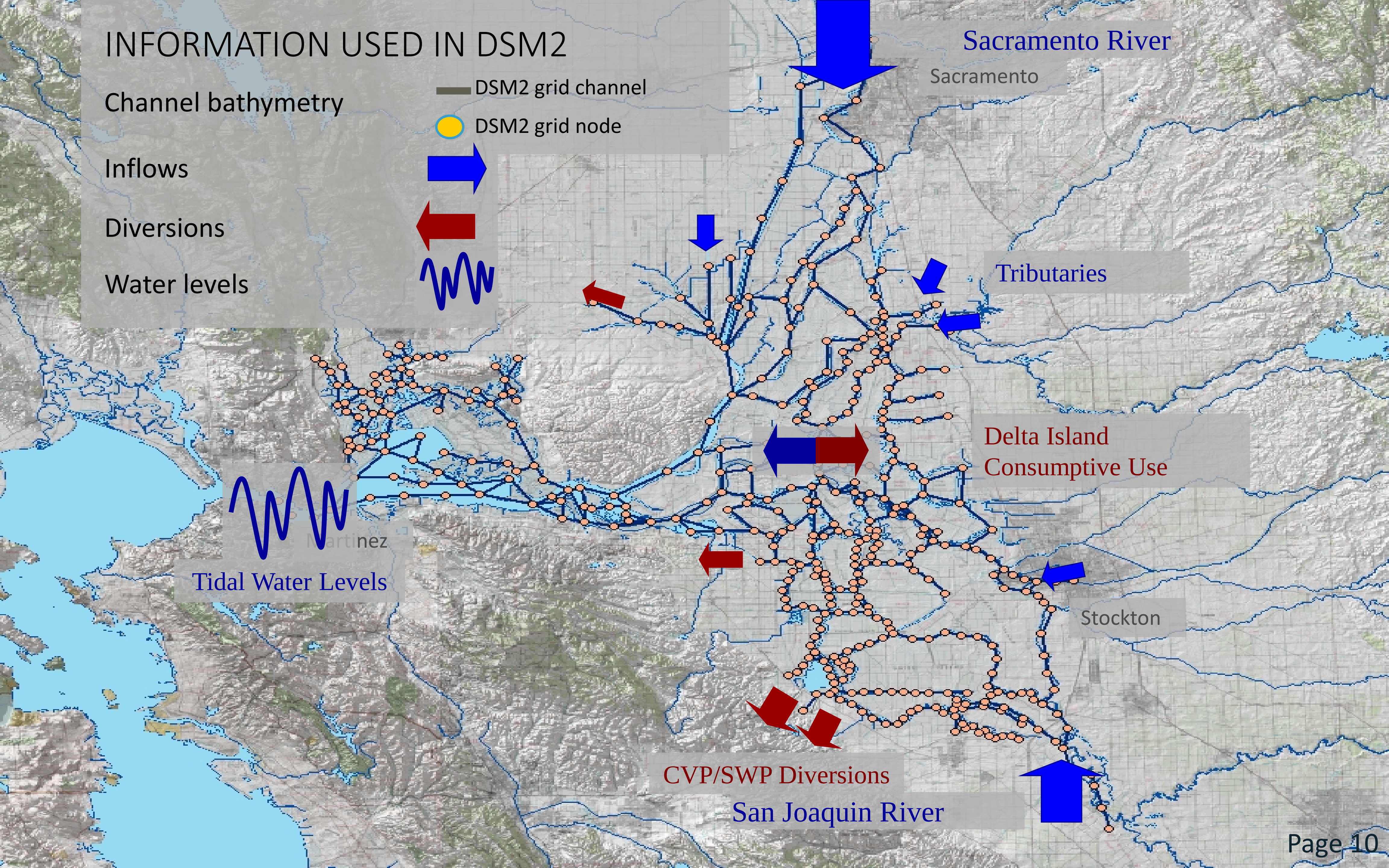


- Representing hydrology and operations
- Trinity and Shasta Reservoirs to terminal reservoirs of the SWP
- Complex network of nodes (junctions and storage) and arcs (flows)

DELTA SIMULATION MODEL 2 (DSM2)

- **Simulates Delta Hydrodynamics and Water Quality**
  - Tidal flows
  - Water levels (stage)
  - Water quality
- **Uses a 15-minute time step**
- **Developed by DWR**

INFORMATION USED IN DSM2



CALSIM II MODEL FEATURES

- **Input Hydrology and Demands**
- **System Representation**
- **SWP/CVP and Other Related Operations**
- **Simulated Parameters**

DELTA CONSTRAINTS IN CalSim II

- **Old and Middle River Flow (OMR)**
- **Minimum Required Delta Outflow (MRDO)**
  - Including X2 Requirements
- **Export/Inflow Ratio**
- **Delta Salinity Objectives**
- **San Joaquin Inflow/Export Ratio**
- **Cross Channel Gate Operation**
- **Rio Vista Flow**
- **Head of Old River Gate (HORG)**

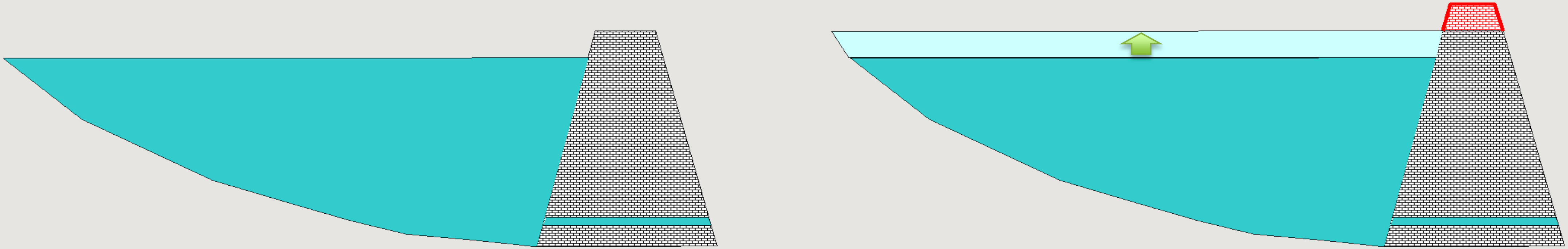
MEETING D-1641 WATER QUALITY OBJECTIVES

- **Artificial Neural Networks (ANNs) are used to estimate EC at select locations in the Delta**
- **ANNs correlate Delta inflow, Delta diversions, Delta cross-channel position, and tidal energy to changes in EC**
- **ANNs were trained on DSM2 simulation results**

D-1641 OBJECTIVES MODELED IN CalSim II

- **Flow-salinity relationship comes from ANN**
- **Municipal and Industrial Use:**
  - Old River at Rock Slough
  - Banks/Jones Pumping Plants
- **Agricultural Beneficial Use:**
  - Sacramento River at Emmaton
  - San Joaquin River at Jersey Point
- **Fish and Wildlife Beneficial Uses:**
  - Sacramento River at Collinsville

COMPARATIVE ANALYSIS REPRESENTATION



Base Case **Modeled Scenario**

Comparative analysis to determine system response to structural and non-structural changes to that system

MODELING SCENARIOS (2015)

- **No Action Alternative**
- **CWF Initial Operational Range Scenarios**
  - Initial Operational Range H3
  - Initial Operational Range H4
- **CWF Boundary Scenarios**
  - Boundary 1 – Lower outflow
  - Boundary 2 – Higher outflow

SUMMARY OF MODELING ASSUMPTIONS

	9,000 cfs North Delta Diversion	Fall X2	Delta Outflow requirements	NMFS BiOp SJR i-e ratio	OMR Requirements	Head of Old River Barrier/Gate
No Action Alternative	No	Yes	Per D-1641	Yes	Yes; per BiOps	Temporary barrier installed in fall months
Boundary 1	Yes	No	Per D-1641	No	Yes; per BiOps	Permanent gate operating in fall months consistent with NAA
H3	Yes	Yes	Per D-1641	No	Yes; more restrictive of either BiOps or new OMR requirements identified in the RDEIR/SDEIS for Alternative 4A	Permanent gate operating in fall, winter and spring months (partial closure)
H4	Yes	Yes	Per D-1641 and increased Delta Outflow requirements during March-May	No		
Boundary 2	Yes	Yes	Per D-1641 and increased Delta Outflow goals in all months	No	Yes; more restrictive of either BiOps or new OMR requirements identified in the RDEIR/SDEIS Appendix C	Permanent gate operating in fall, winter and spring months (full closure)

NO ACTION ALTERNATIVE & CALIFORNIA WATERFIX

NO ACTION ALTERNATIVE

- **Represents the continuation of policy and management direction**
- **Includes implementation of water operation components of the existing Reasonable and Prudent Alternative (RPA) actions specified in the 2008 U.S. Fish and Wildlife Service (USFWS) and 2009 National Marine Fisheries Service (NMFS) Biological Opinions (BiOps)**

NO ACTION ALTERNATIVE (CONT'D)

- **Includes future level of development**
- **Considers climate change and sea level rise effects**
- **No San Joaquin River Restoration (SJRRP) flows**
- **Modified Fremont Weir notch**

COMMON FEATURES IN CWF SCENARIOS

- **Dual Conveyance**
  - Existing south delta pumps
  - Proposed north delta diversion (NDD)
- **New Facilities include:**
  - Three new 3,000 cfs capacity NDD intakes
  - Permanent operable Head of Old River Gate (HORG)

COMMON FEATURES IN CWF SCENARIOS

- **Additional Operational Requirements:**
  - NDD bypass flow and sweeping velocity requirements
  - Additional Old and Middle River (OMR) flow requirements and CVP/SWP diversions restrictions
  - January – August Rio Vista minimum flow requirements

COMMON FEATURES IN CWF SCENARIOS*

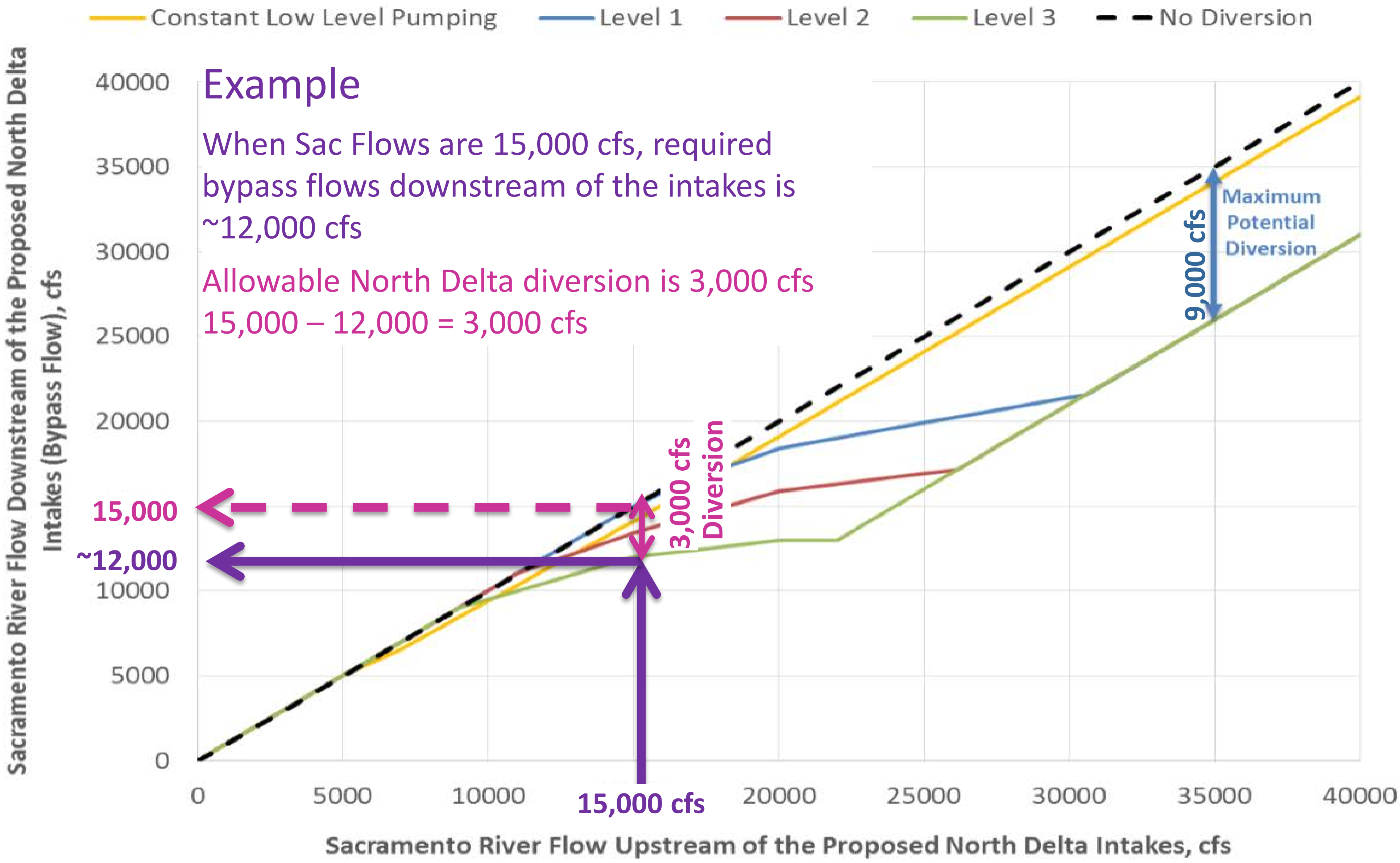
- **More restrictive South Delta operations**
  – New OMR restrictions in October-December
  – More restrictive OMR in above normal and wet years October-June
  – April – June OMR based on Vernalis flows – replaces NMFS BiOp Action, SJR I-E ratio constraint in April and May
  – Greater of OMR requirement under BiOps and the more restrictive CWF South Delta operations
  – October – June Head of Old River Gate (HORG) operations

* CWF scenario Boundary 1 is unique and includes OMR and HORG similar to NAA. See slide 17.

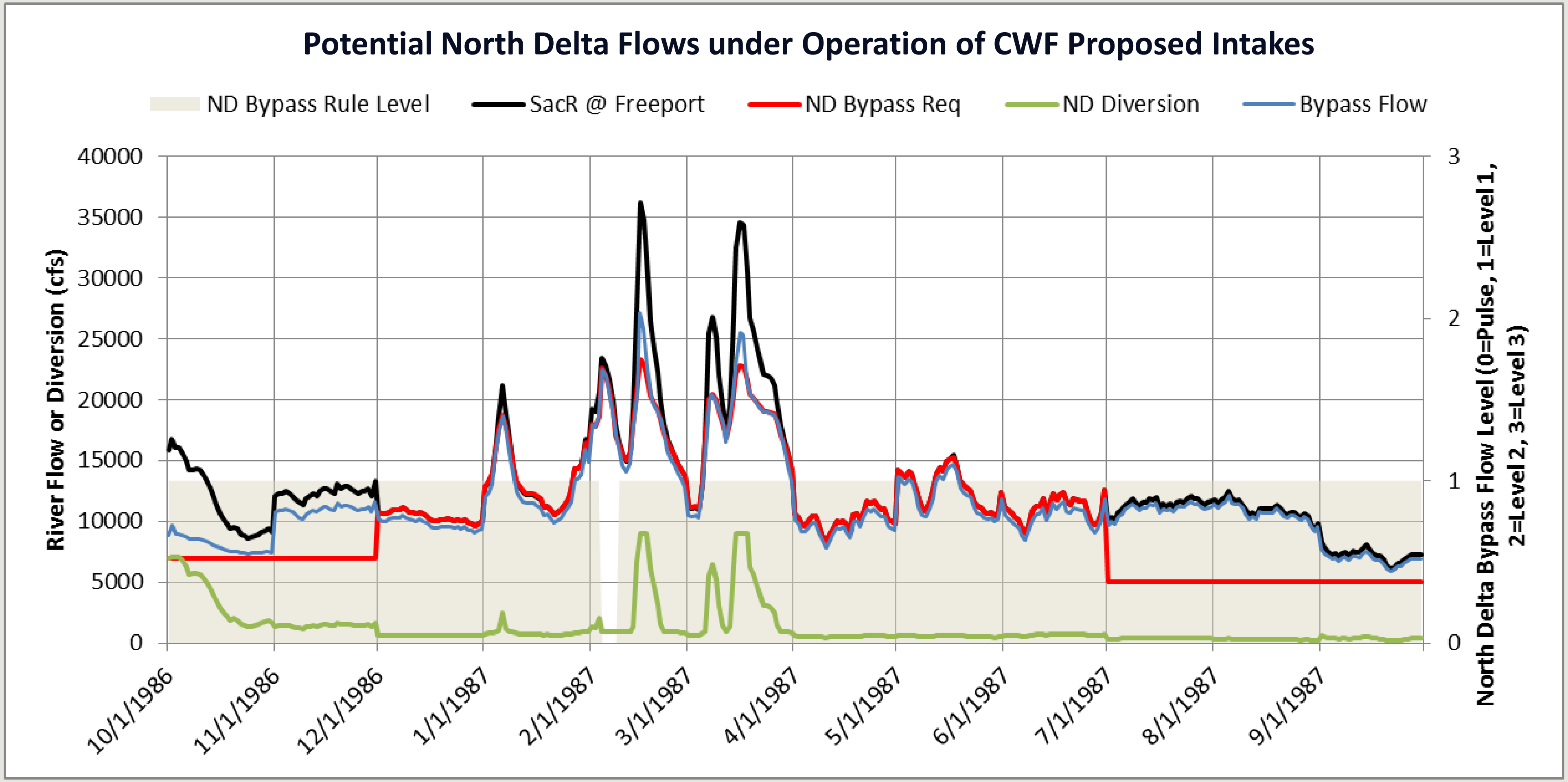
NORTH DELTA DIVERSION INTAKE OPERATIONS

- **Bypass flow requirements**
  - Govern flow required to remain in the river downstream of intakes
  - Initial pulse protection, and low level pumping at each intake during Sacramento River pulse flow period
  - Following pulse protection, post-pulse operations through June
  - Three levels of post-pulse protections (Level I, II and III)
  - Transitioning between post-pulse levels subject to hydrologic and fishery conditions
- **Approach and sweeping velocity requirements at the NDD fish screens**

SACRAMENTO RIVER PROPOSED DEC- APR NDD BYPASS FLOW RULES

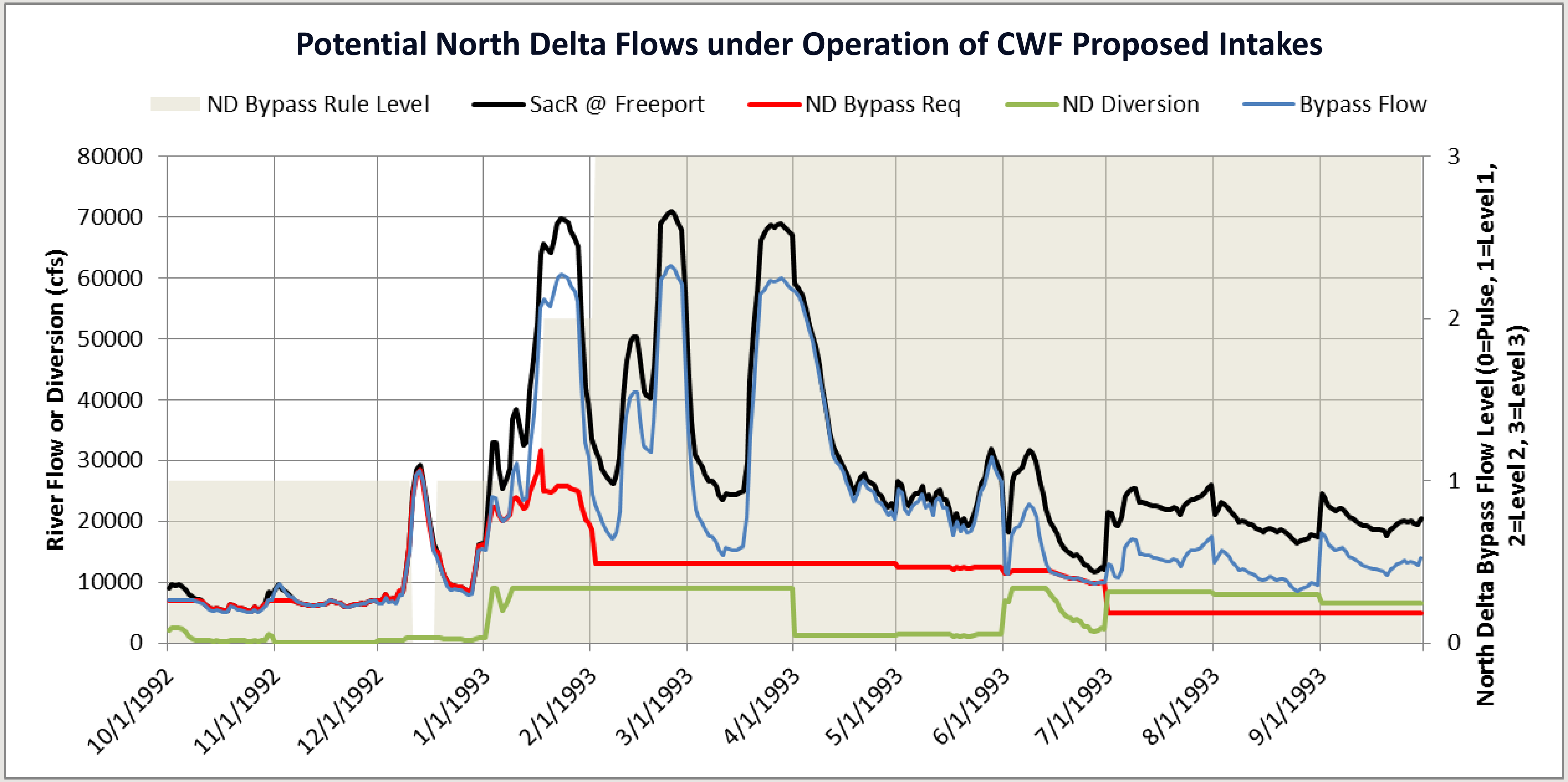


NDD BYPASS FLOW REQUIREMENTS EXAMPLE - DRY YEAR (1987)



*Model results are used for comparative purposes and not for predictive purposes

NDD BYPASS FLOW REQUIREMENTS EXAMPLE - ABOVE NORMAL YEAR (1993)



*Model results are used for comparative purposes and not for predictive purposes

DELTA OUTFLOW ASSUMPTIONS

NAA and H3 (D-1641 and BiOps)

	W	AN	BN	D	C
Oct	4000/Fall X2	4000/Fall X2	4000	4000	3000
Nov	4500/Fall X2	4500/Fall X2	4500	4500	3500
Dec	4500	4500	4500	4500	3500
Jan	4500	4500	4500	4500	4500
Feb	4000	4000	4000	4000	4000
Mar	4000	4000	4000	4000	4000
Apr	4000	4000	4000	4000	4000
May	4000	4000	4000	4000	4000
Jun	4000	4000	4000	4000	4000
Jul	8000	8000	6500	5000	4000
Aug	4000	4000	4000	3500	3000
Sep	3000/Fall X2	3000/Fall X2	3000	3000	3000

- **D-1641 Feb – Jun X2**
- **USFWS BiOp Fall X2 in W (74 km), AN (81 km) years**

Boundary 2

	W	AN	BN	D	C
Oct	11400	11400	7100	7100	7100
Nov	11400	11400	7100	7100	7100
Dec	11400	11400	11400	11400	11400
Jan	35000	35000	35000	35000	35000
Feb	35000	35000	35000	35000	35000
Mar	44500	44500	44500	25000	25000
Apr	44500	44500	44500	25000	25000
May	44500	44500	44500	25000	25000
Jun	11400	11400	7100	7100	7100
Jul	7100	7100	7100	7100	7100
Aug	7100	7100	7100	7100	7100
Sep	11400	11400	7100	7100	7100

- **Greater of D-1641/BiOps, or above**
- **Delta outflow goals above current regulatory requirements achieved through Delta export curtailments**
- **Upstream releases allowed in Jul – Sep months in all water year types, except Critical.**

- **Boundary 1 – Same as NAA, but no Fall X2**
- **Scenario H4 – Same as NAA, but increased flows beyond NAA spring delta outflow conditions**

OMR SOUTH DELTA ASSUMPTIONS

Scenarios H3 and H4

OMR Flows

WY	W	AN	BN	D	C
Oct[a]	-3500	-3500	-3500	-3500	-3500
Nov	-5000	-5000	-5000	-5000	-5000
Dec[b,c]	-5000	-5000	-5000	-5000	-5000
Jan[b]	0	-3500	-5000	-5000	-5000
Feb[b]	0	-3500	-5000	-5000	-5000
Mar[b]	0	0	-3500	-3500	-3500
Apr[b]	Qvern, Qomr: (<5000,-2000), (6000,1000), (10000, 2000), (15000, 3000), (>=30000,6000)				
May[b]					
Jun[b]	Qv, Qo: (<3500,-3500), (>=3500,0), (>=10000, 1000), (>15000, 2000				
Jul					
Aug					
Sep					

[a] Avg of -2000 cfs during SJR pulse period and -5000 cfs for non-pulse

[b] Or FWS RPA, whichever provides higher OMR

[c] When ND pulse is triggered, -2000 when delta smelt RPA triggered

Boundary 2

OMR Flows

WY	W	AN	BN	D	C
Oct[a,d]	-3500	-3500	-5000	-5000	-5000
Nov[a,d]	-3500	-3500	-5000	-5000	-5000
Dec[c,d]	-3500	-3500	-5000	-5000	-5000
Jan	0	0	-2500	-2500	-2500
Feb	0	0	-2500	-2500	-2500
Mar[b]	Qv, Qo: (<3500,-2500), (>=3500,0), (>=10000, 1000), (>15000, 2000) **or** -2000				
Apr	Qvern, Qomr: (<5000,-2000), (6000,1000), (10000, 2000), (15000, 3000), (>=30000,6000) **or** -2000				
May					
Jun[b]	Qv, Qo: (<3500,-2500), (>=3500,0), (>=10000, 1000), (>15000, 2000) **or** -2000				
Jul[d]	-5000	-5000	-5000	-5000	-5000
Aug[d]	-5000	-5000	-5000	-5000	-5000
Sep[d]	-5000	-5000	-5000	-5000	-5000

[a] For before and after D-1641 fall pulse; No exports during D-1641 pulse (2 weeks)

[b] SJR based OMR per Scen 6 for Jun, with lowest OMR at -2500 cfs

[c] -2000 when Delta smelt RPA triggered

[d] -5,000 cfs for WET years and year following WET years

- **Boundary 1 – Same as NAA fall operations**

HORG SOUTH DELTA ASSUMPTIONS

Scenarios H3 and H4

Head of Old River Gate Operations

WY	W	AN	BN	D	C
Oct	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Nov	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Dec	OUT	OUT	OUT	OUT	OUT
Jan	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Feb	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
March	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
April	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
May	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Jun	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Jul	OUT	OUT	OUT	OUT	OUT
Aug	OUT	OUT	OUT	OUT	OUT
Sep	OUT	OUT	OUT	OUT	OUT

Boundary 2

Head of Old River Gate Operations

WY	W	AN	BN	D	C
Oct	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Nov	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Dec	OUT	OUT	OUT	OUT	OUT
Jan	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
Feb	IN/OUT	IN/OUT	IN/OUT	IN/OUT	IN/OUT
March	IN	IN	IN	IN	IN
April	IN	IN	IN	IN	IN
May	IN	IN	IN	IN	IN
Jun	IN	IN	IN	IN	IN
Jul	OUT	OUT	OUT	OUT	OUT
Aug	OUT	OUT	OUT	OUT	OUT
Sep	OUT	OUT	OUT	OUT	OUT

- **Boundary 1 – Same as NAA fall operations**

MODELING RESULTS

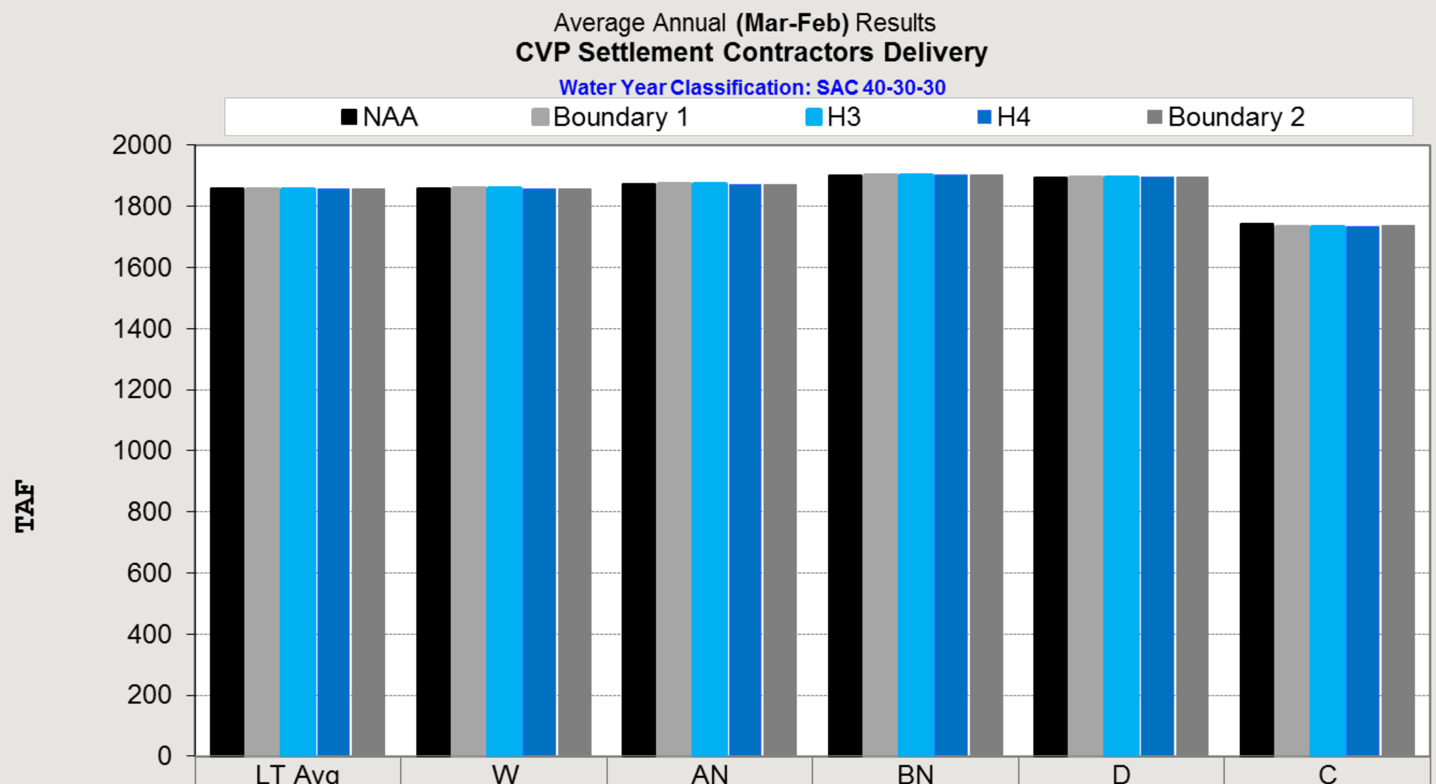
WATER SUPPLY ANALYSIS

- **Deliveries North and South of the Delta**
- **SWP/CVP Delta Diversions**
  - Existing and proposed intakes
- **End of September Upstream SWP/CVP Reservoir Storage**

NORTH OF DELTA DELIVERIES

ANNUAL CVP SETTLEMENT CONTRACTORS DELIVERIES

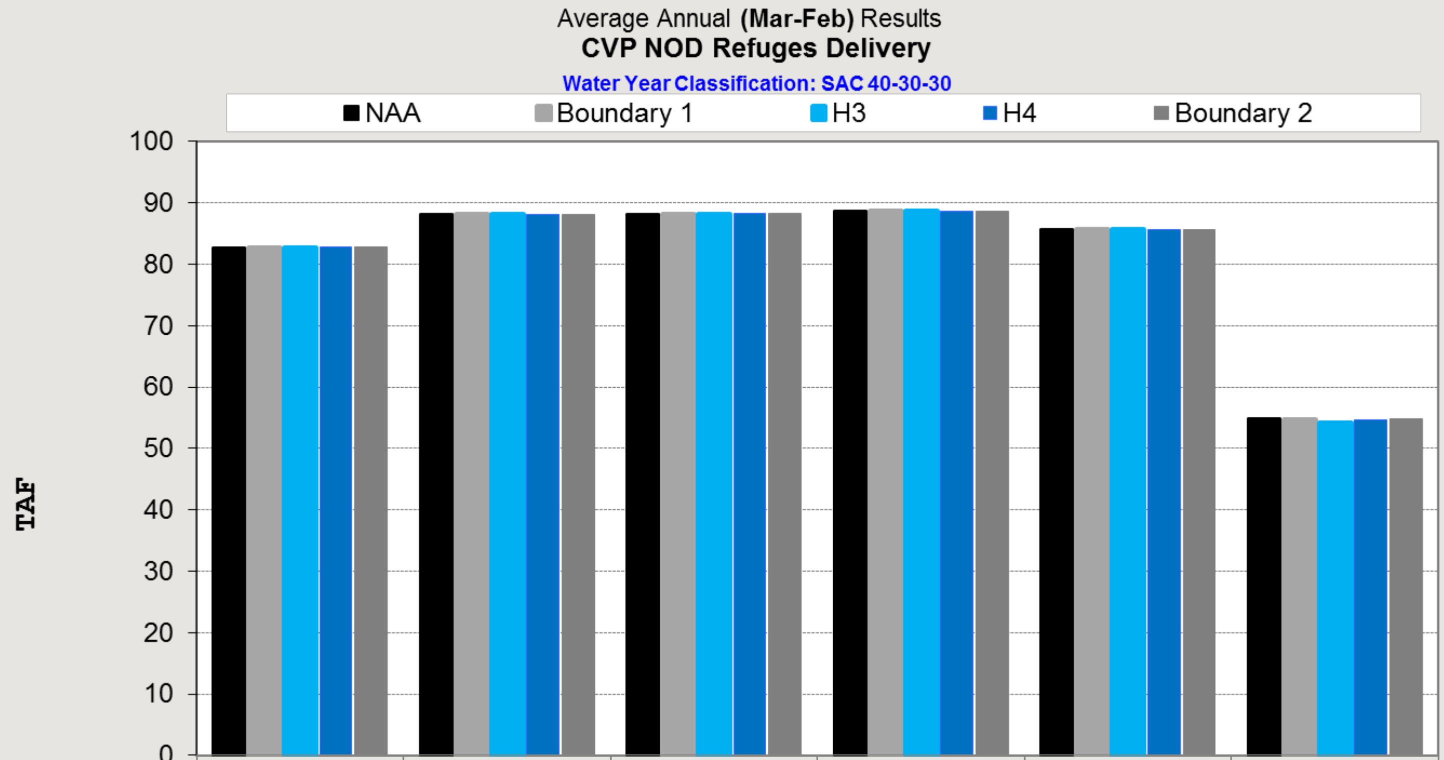
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	1858	1857	1873	1903	1894	1741
Boundary 1	1856	1857	1871	1901	1894	1732
H3	1857	1857	1872	1902	1894	1731
H4	1857	1857	1872	1902	1894	1734
Boundary 2	1857	1857	1872	1902	1894	1735

ANNUAL CVP NOD REFUGE WATER SUPPLY DELIVERIES

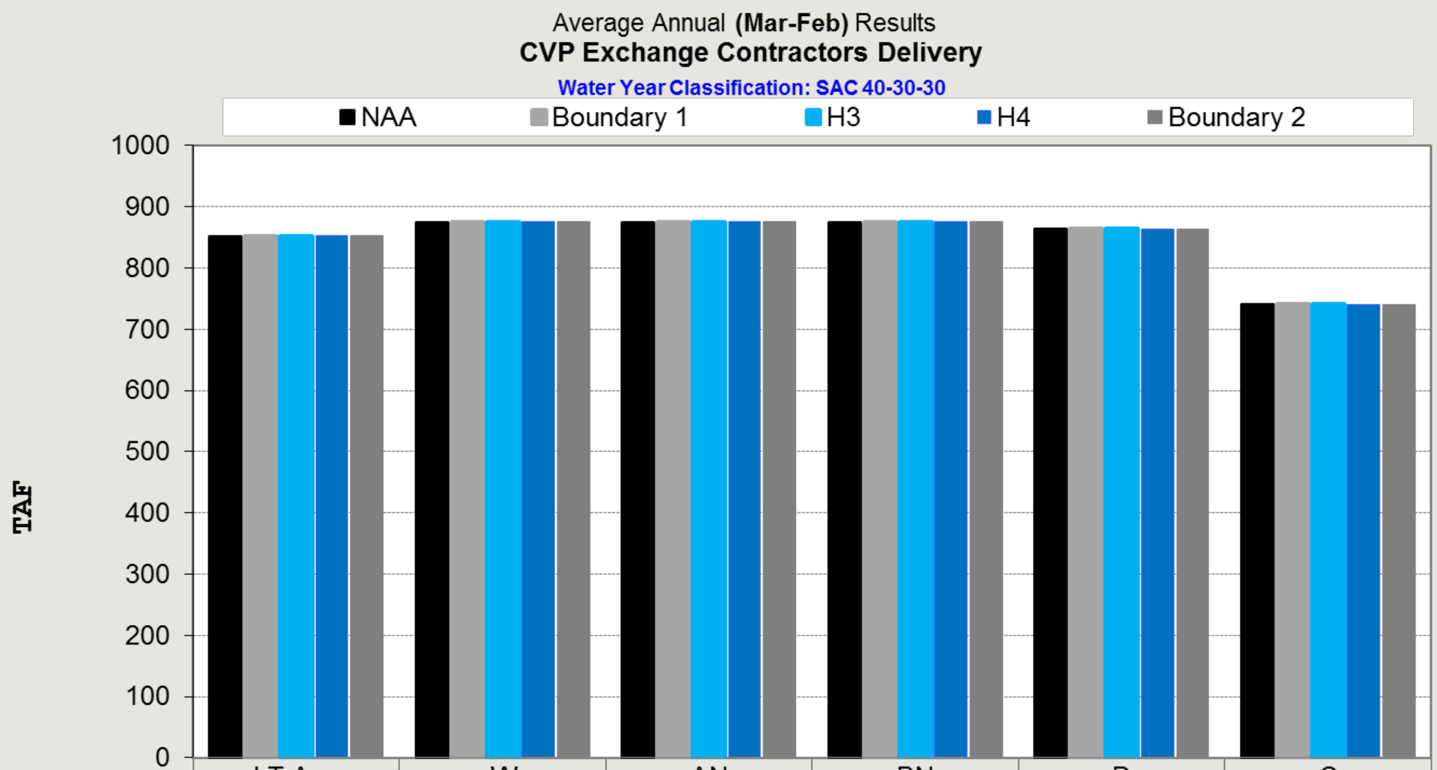
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	83	88	88	89	86	55
Boundary 1	83	88	88	89	86	55
H3	83	88	88	89	86	54
H4	83	88	88	89	86	55
Boundary 2	83	88	88	89	86	55

ANNUAL CVP EXCHANGE CONTRACTORS DELIVERIES

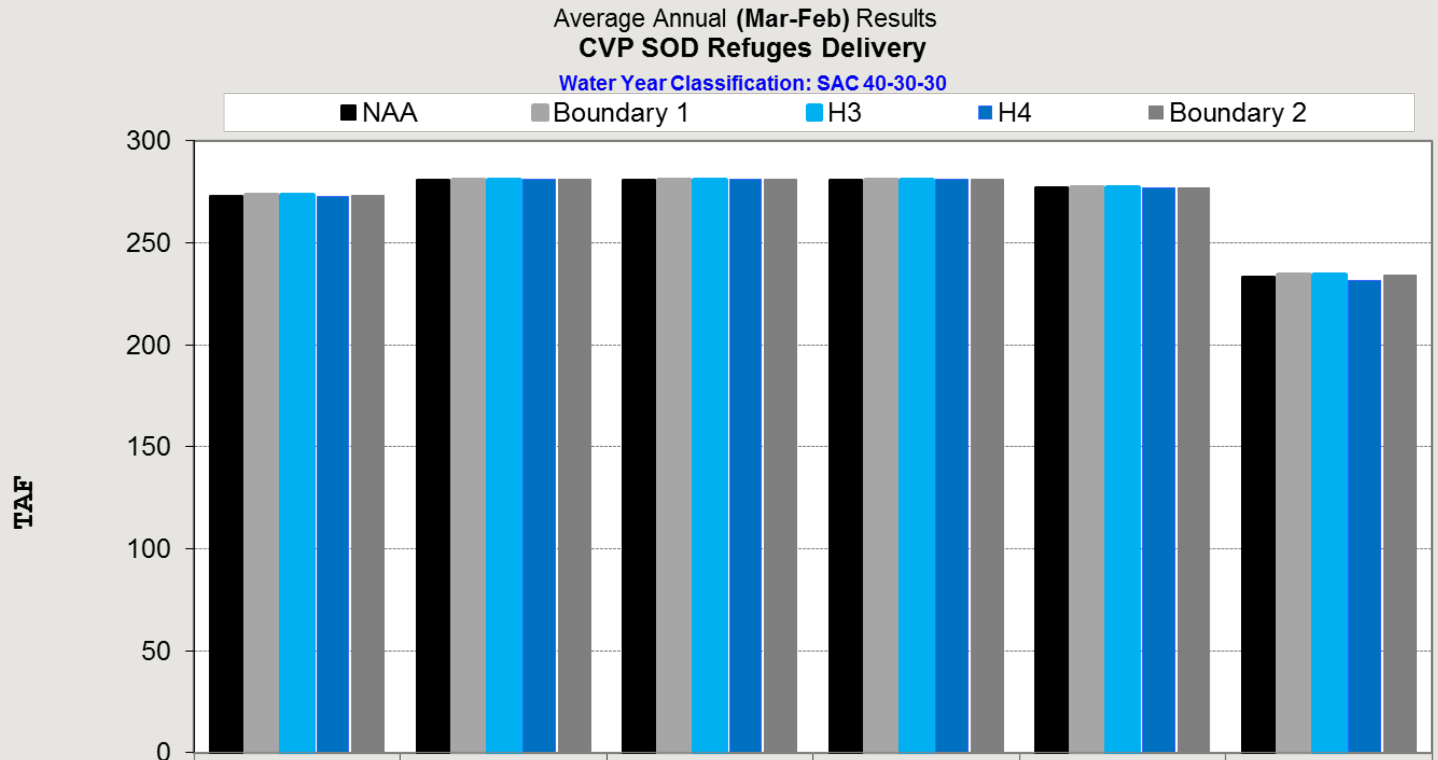
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	852	875	875	875	864	741
Boundary 1	852	875	875	875	864	741
H3	852	875	875	875	864	741
H4	852	875	875	875	864	741
Boundary 2	852	875	875	875	864	741

ANNUAL CVP SOD REFUGE WATER SUPPLY (LEVEL 2) DELIVERIES

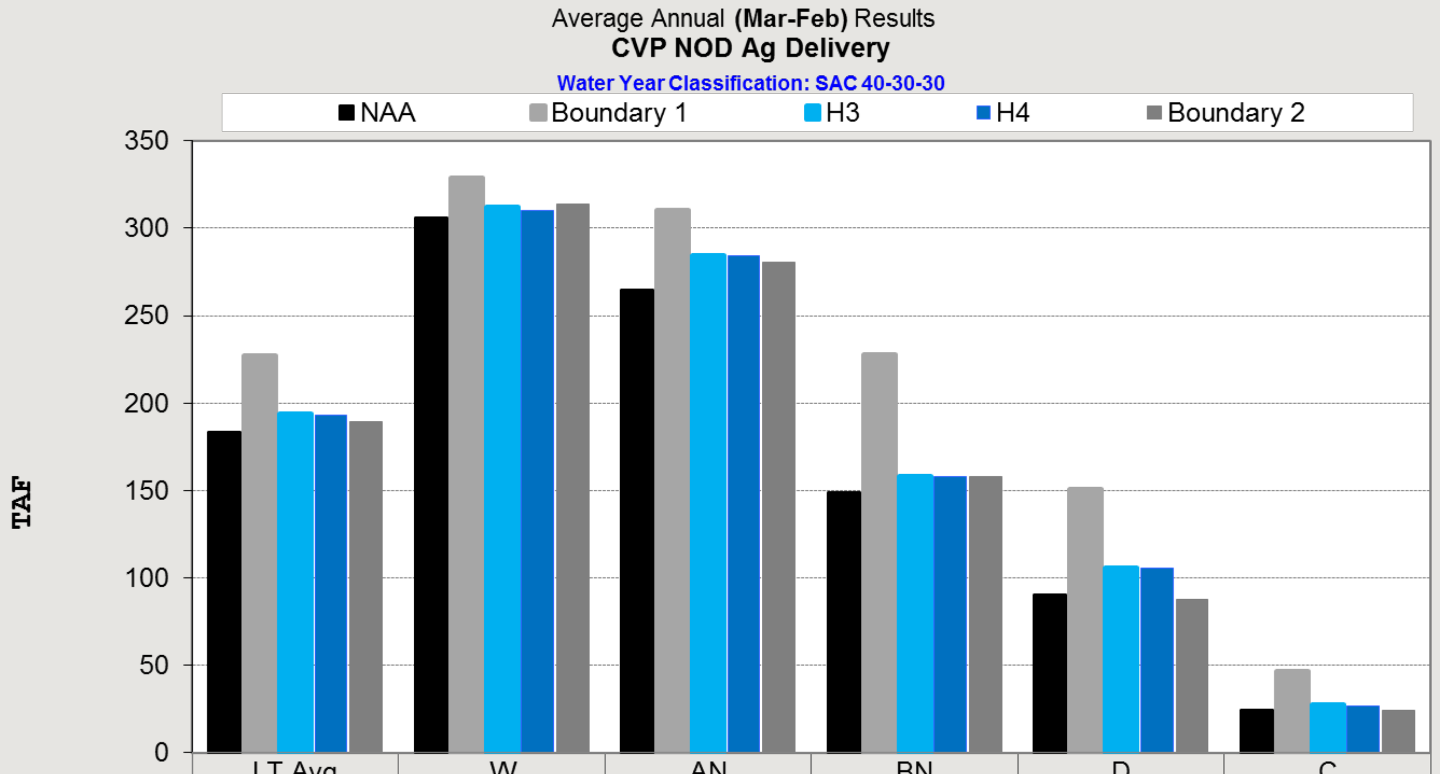
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	273	281	281	281	277	233
Boundary 1	273	281	281	281	277	234
H3	273	281	281	281	277	234
H4	273	281	281	281	277	232
Boundary 2	273	281	281	281	277	234

ANNUAL CVP NOD AGRICULTURAL WATER SERVICE CONTRACTORS DELIVERIES

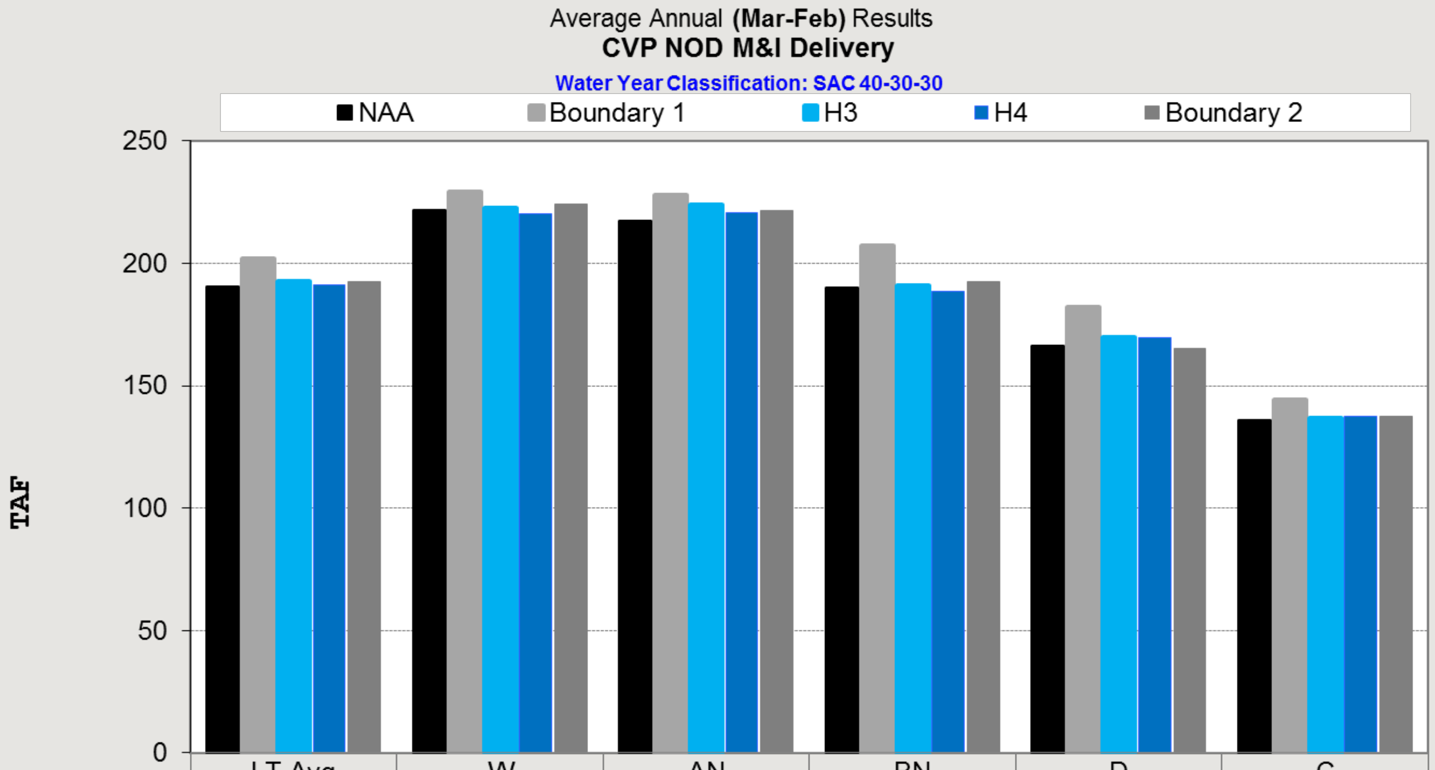
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	184	306	265	149	91	25
Boundary 1	227	329	311	228	151	47
H3	194	312	285	158	106	27
H4	193	310	284	158	106	27
Boundary 2	189	314	281	158	88	24

ANNUAL CVP NOD MUNICIPAL & INDUSTRIAL WATER SERVICE CONTRACTORS DELIVERIES

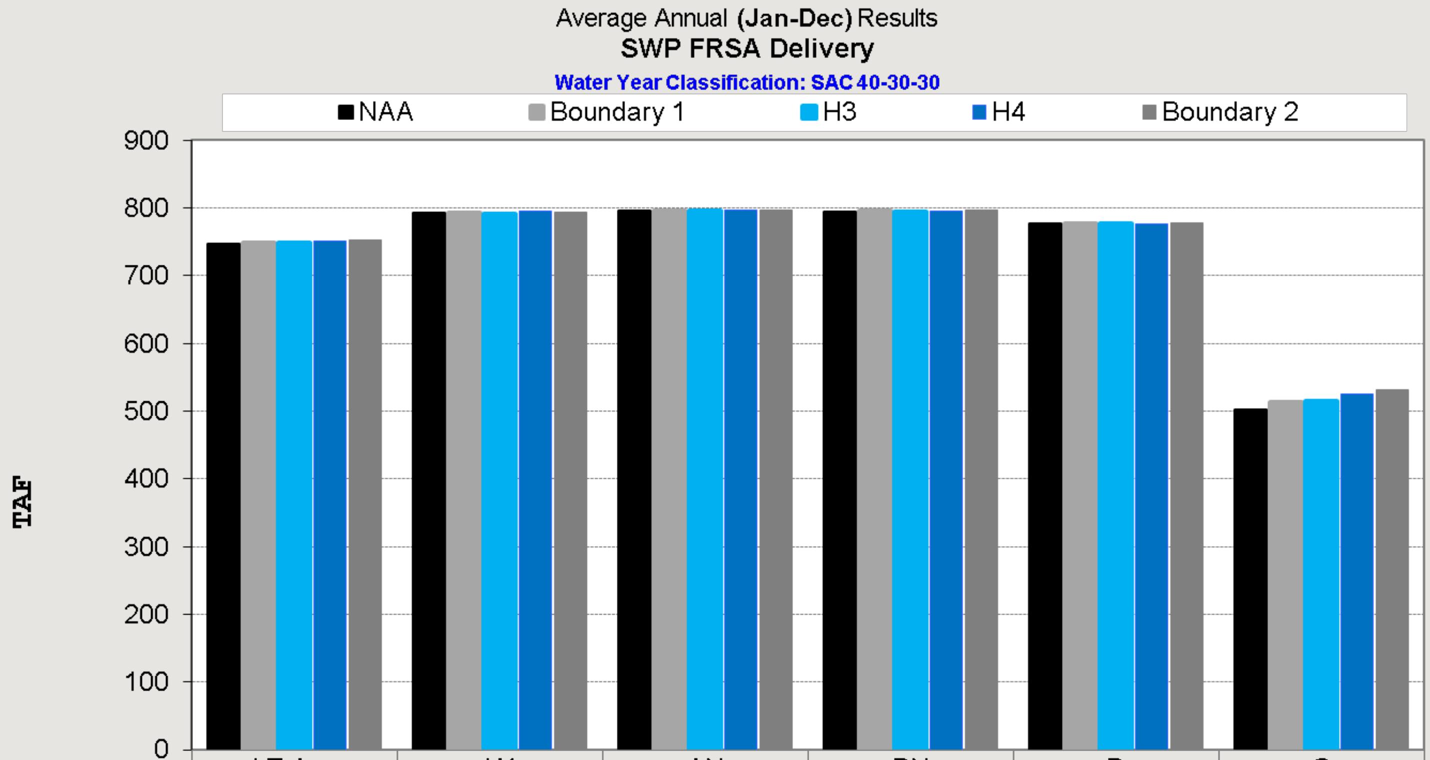
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	191	222	218	190	166	136
Boundary 1	202	229	228	207	182	144
H3	193	222	224	191	170	137
H4	191	220	221	188	169	137
Boundary 2	192	224	221	193	165	138

ANNUAL SWP FEATHER RIVER SERVICE AREA CONTRACTOR DELIVERIES

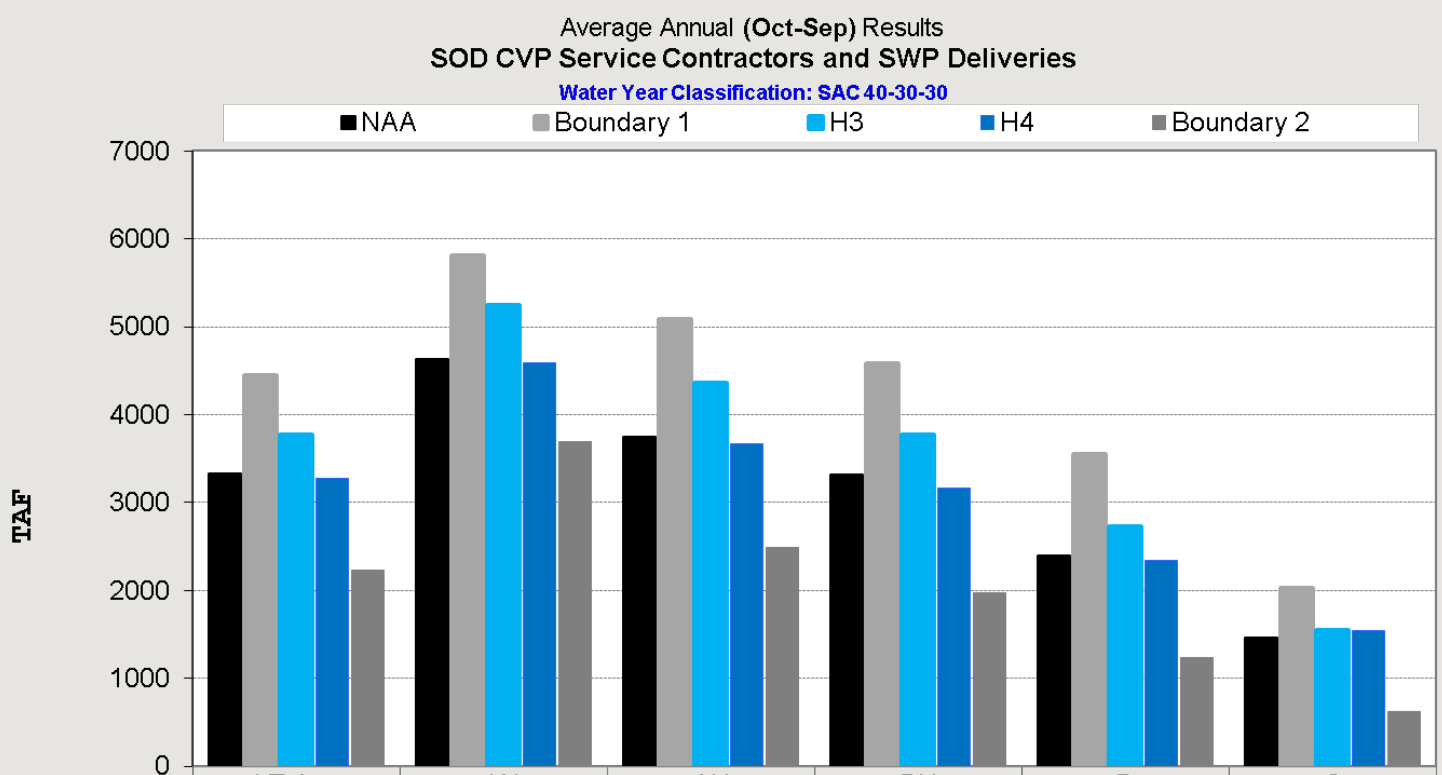
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



	LT Avg	W	AN	BN	D	C
NAA	747	793	796	795	777	502
Boundary 1	749	793	796	796	777	514
H3	749	792	796	795	777	515
H4	751	795	796	796	777	526
Boundary 2	752	794	796	796	778	532

ANNUAL COMBINED SWP AND CVP SOD WATER SERVICE CONTRACTOR DELIVERIES

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise

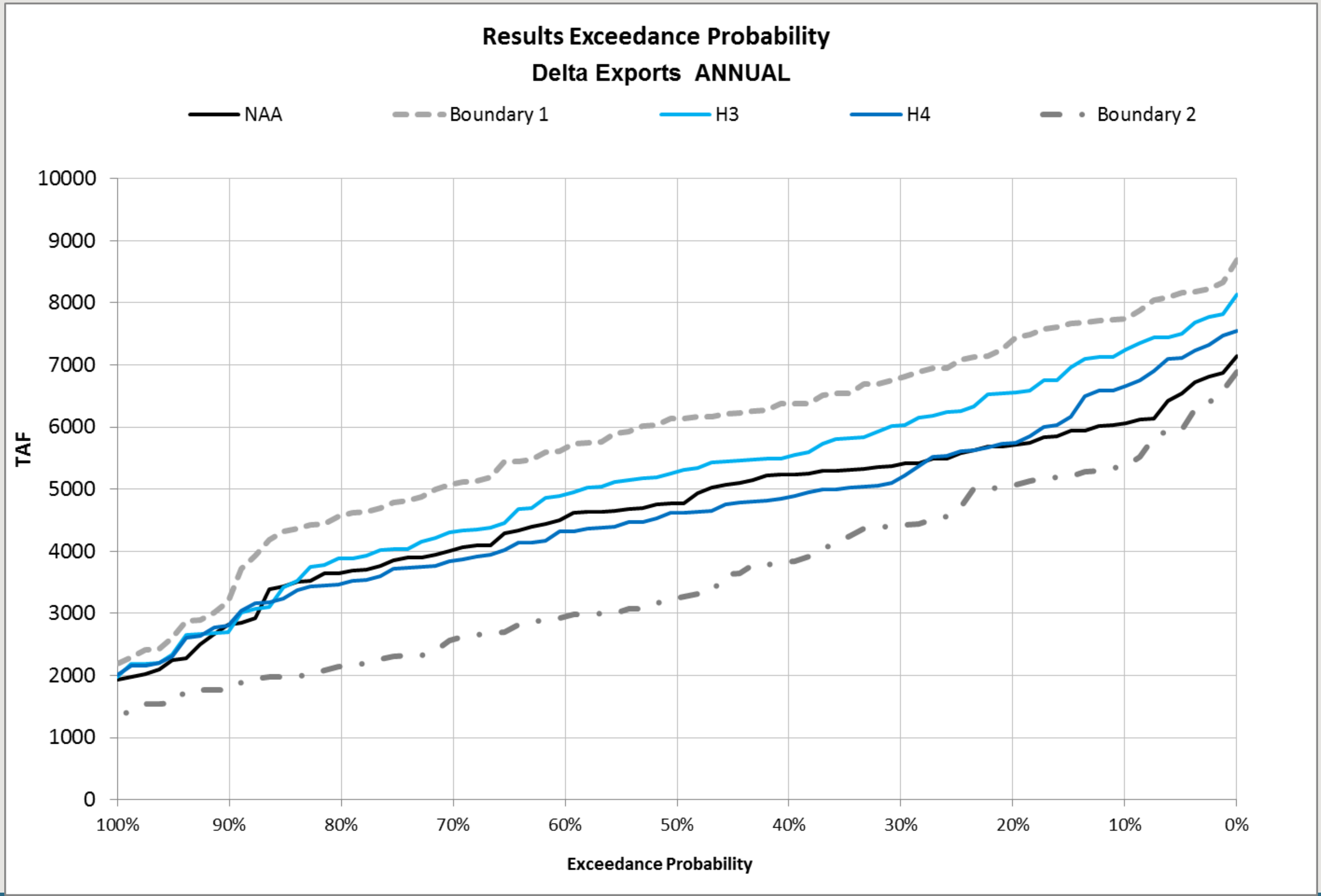


	LT Avg	W	AN	BN	D	C
NAA	3326	4636	3749	3322	2391	1468
Boundary 1	4443	5806	5084	4582	3550	2026
H3	3772	5246	4365	3771	2728	1552
H4	3276	4593	3672	3164	2346	1548
Boundary 2	2236	3697	2493	1976	1236	618

CVP AND SWP DIVERSIONS

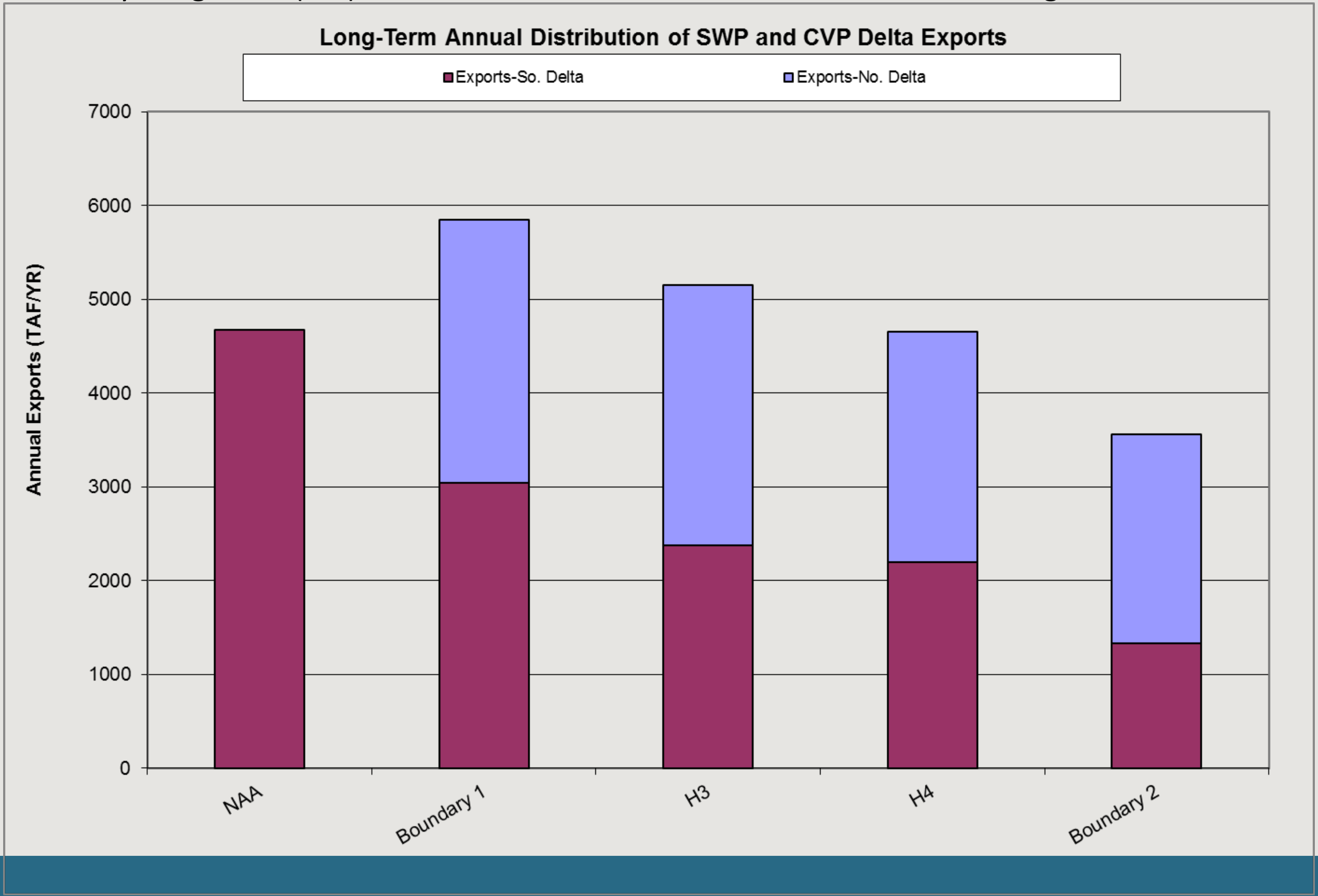
ANNUAL TOTAL DELTA CVP/SWP DIVERSIONS FROM JONES AND BANKS PUMPING PLANTS

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



LONG-TERM AVERAGE ANNUAL TOTAL NORTH AND SOUTH DELTA COMBINED CVP/SWP DIVERSIONS

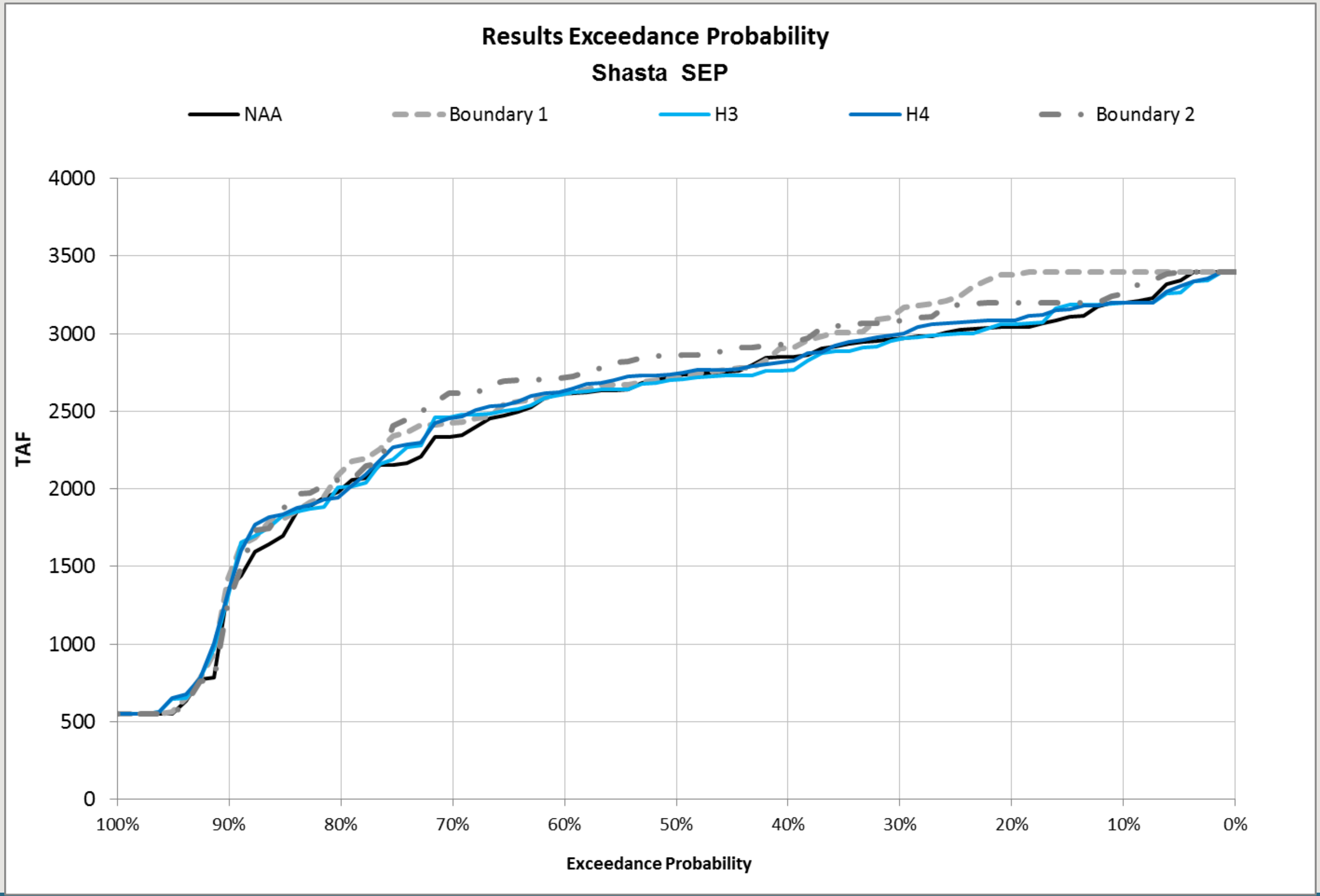
Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



END OF SEPTEMBER RESERVOIR STORAGE

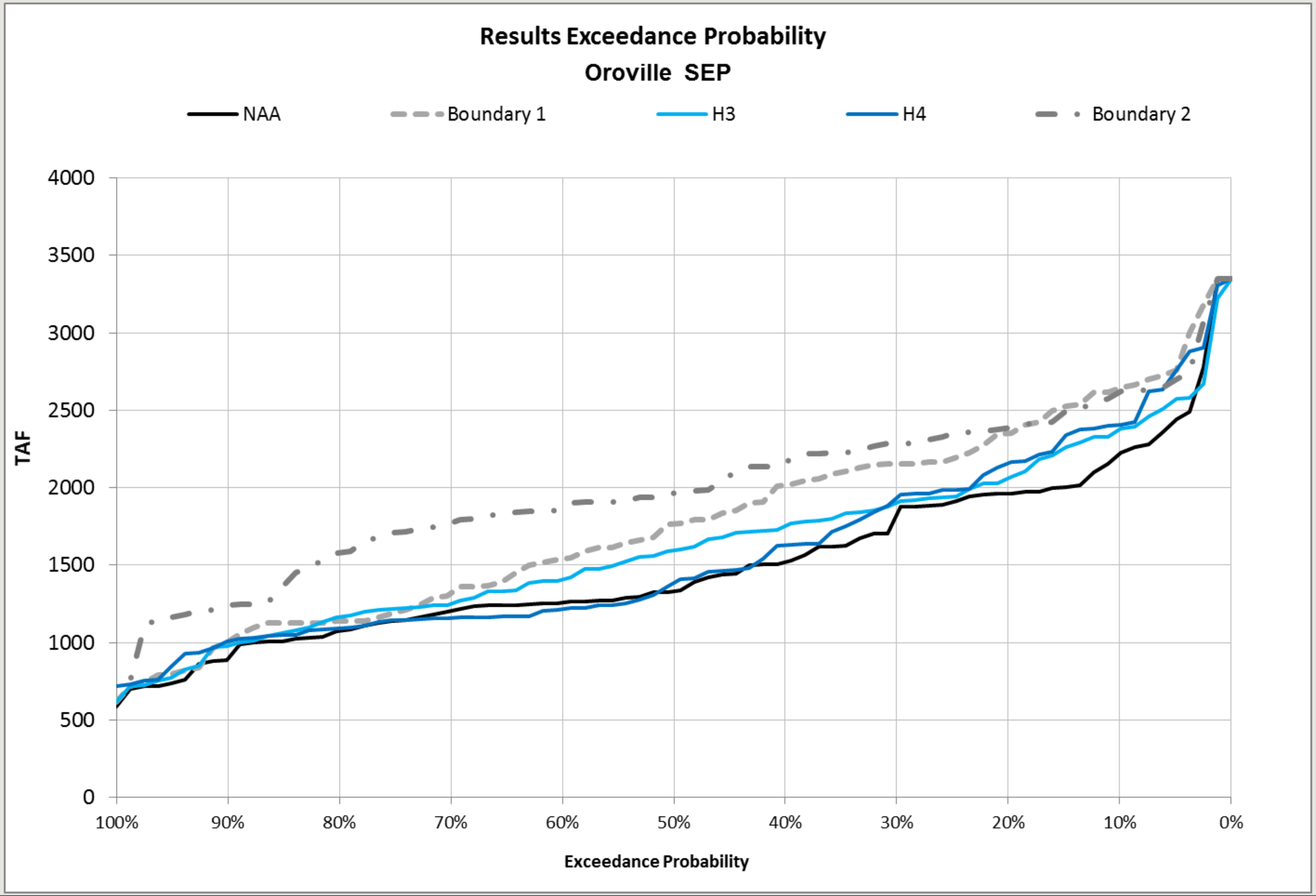
SHASTA LAKE END OF SEPTEMBER STORAGE

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



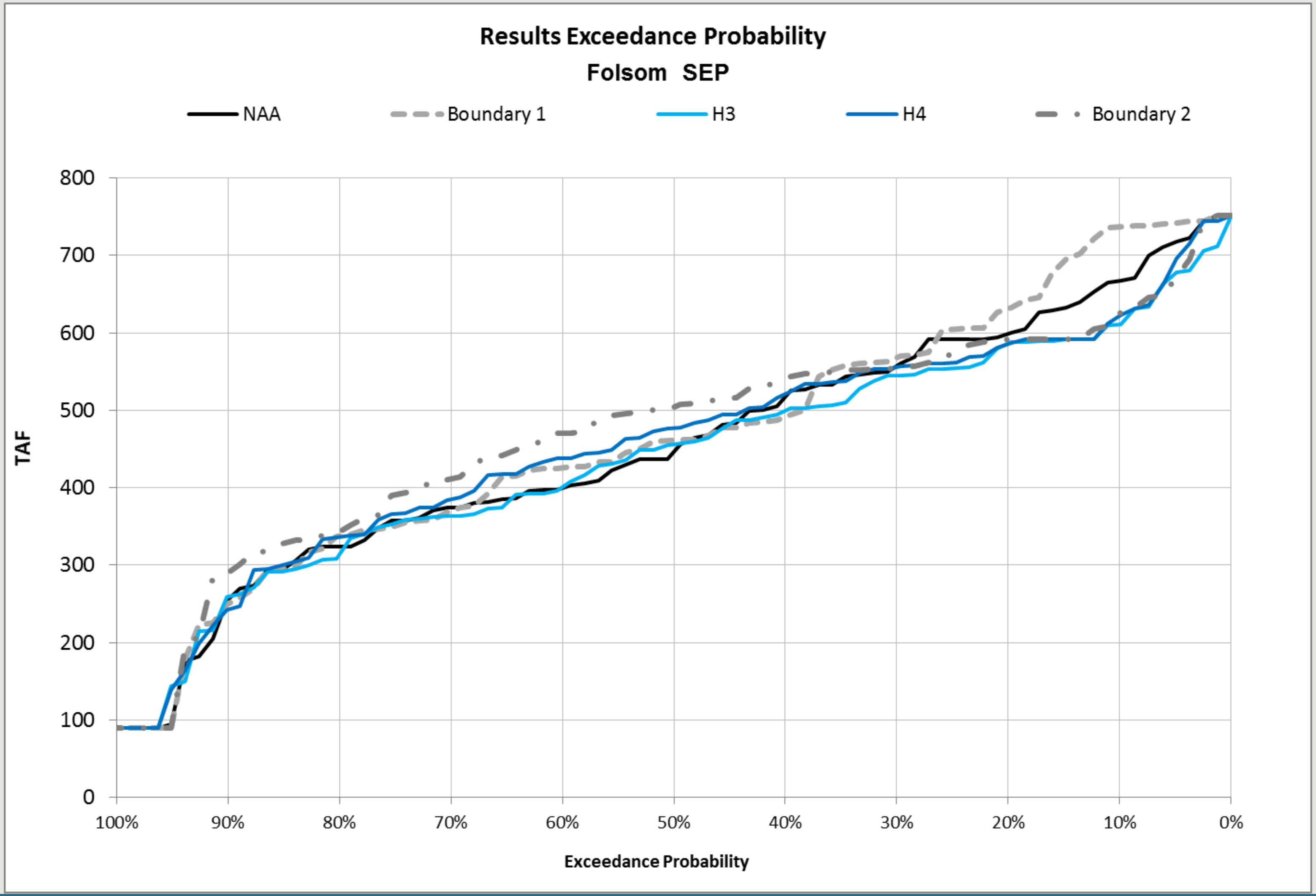
LAKE OROVILLE END OF SEPTEMBER STORAGE

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



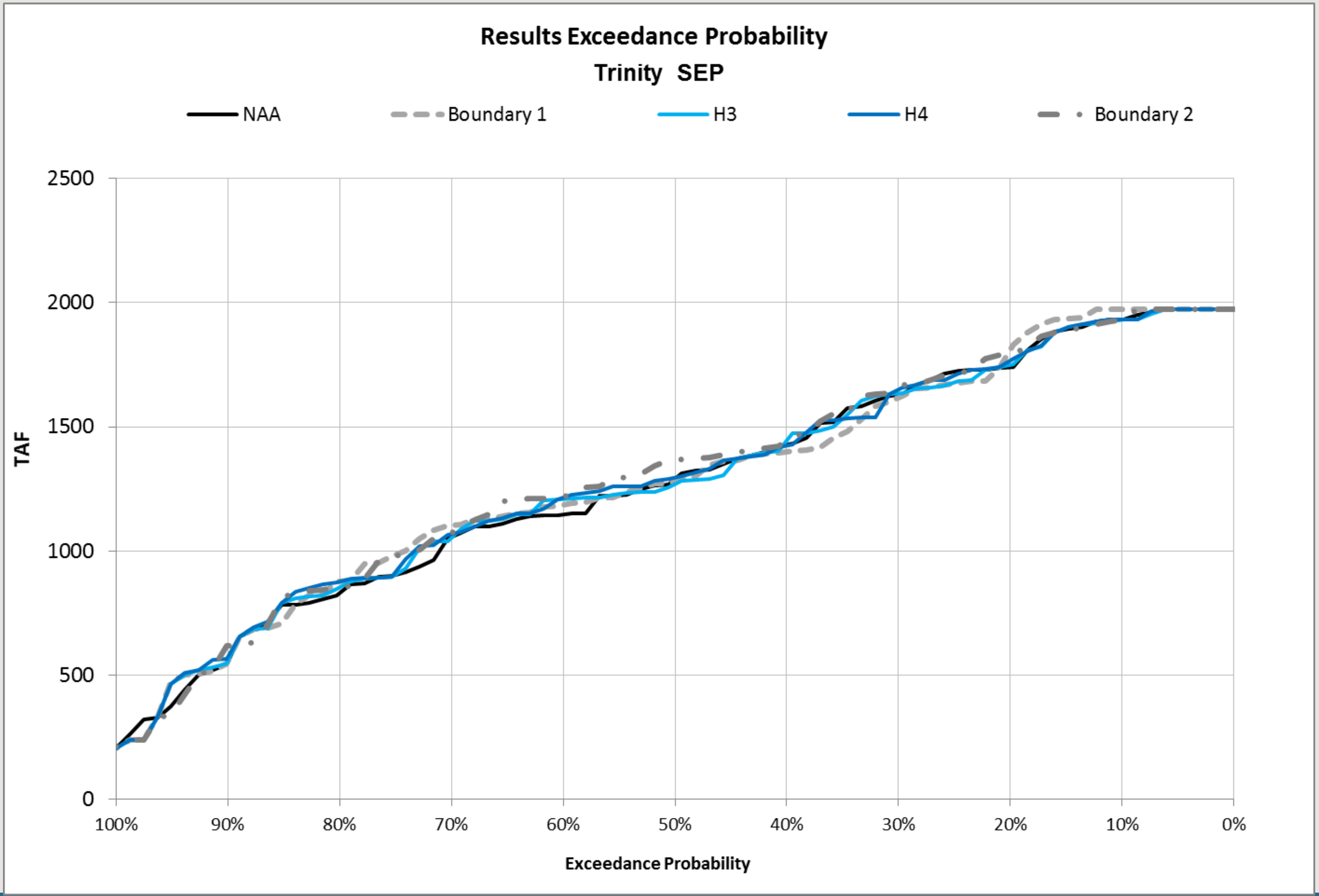
FOLSOM LAKE END OF SEPTEMBER STORAGE

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



TRINITY LAKE END OF SEPTEMBER STORAGE

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



SUMMARY OF WATER SUPPLY CHANGES UNDER CWF

- **CVP and SWP Water Contractor Deliveries**
  - No substantial differences to CVP Exchange and settlement contractors and refuges
  - No substantial differences to SWP Feather River Settlement contractors
  - Increased deliveries to CVP NOD in some scenarios, small decreases in dry and critical year types in Boundary 2 scenario (<5%)
  - Significant changes to SWP/CVP water service contractor deliveries south of the Delta largely tied to assumed outflow and export restrictions (increase of 34% to reduction of 33%)

SUMMARY OF WATER SUPPLY CHANGES UNDER CWF

- **SWP and CVP Delta Diversions**
  - Boundary scenarios result in substantial changes in diversion (from +1,200,000 AFY to -1,100,000 AFY) depending on outflow and south delta assumptions
  - SWP/CVP delta diversion under CWF Proposed Operational Range scenarios range from essentially no change to a 10% increase compared to NAA

SUMMARY OF WATER SUPPLY CHANGES UNDER CWF

- **Carryover Storage in SWP and CVP Reservoirs**
  - No substantial differences to reservoir storage
  - Small changes that do occur are at high storage levels

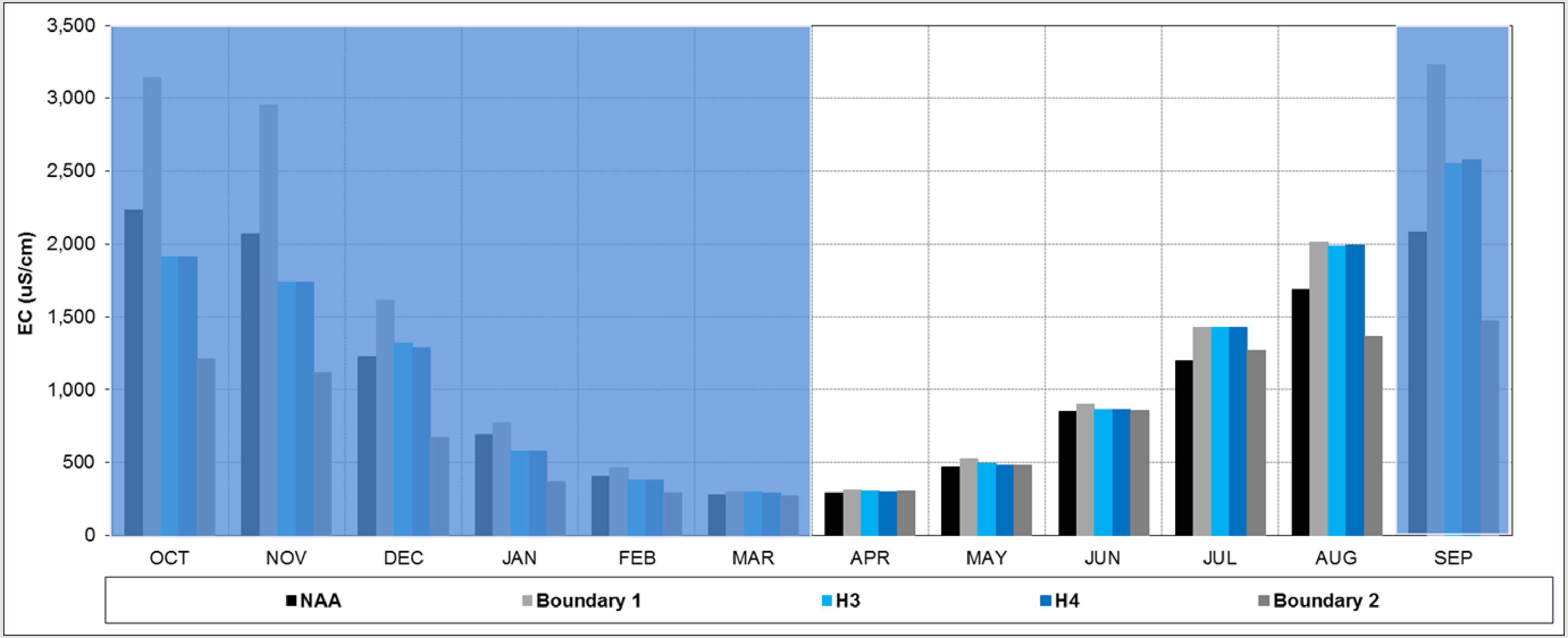
OVERVIEW

- **Delta Water Quality**
- **Water Levels**

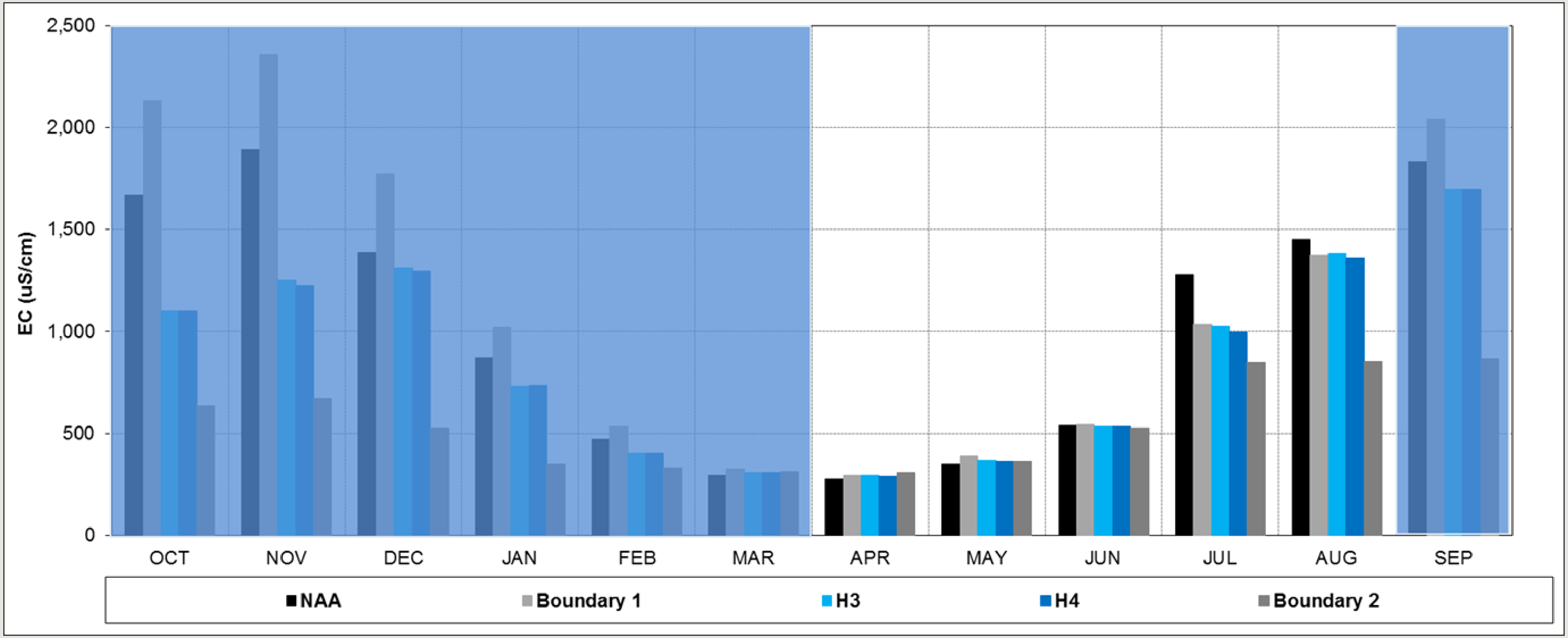
WATER QUALITY ANALYSIS

- **Monthly average EC at selected Delta locations**
- **Monthly average chloride at selected Delta locations**
- **D-1641 water quality SWP/CVP compliance**

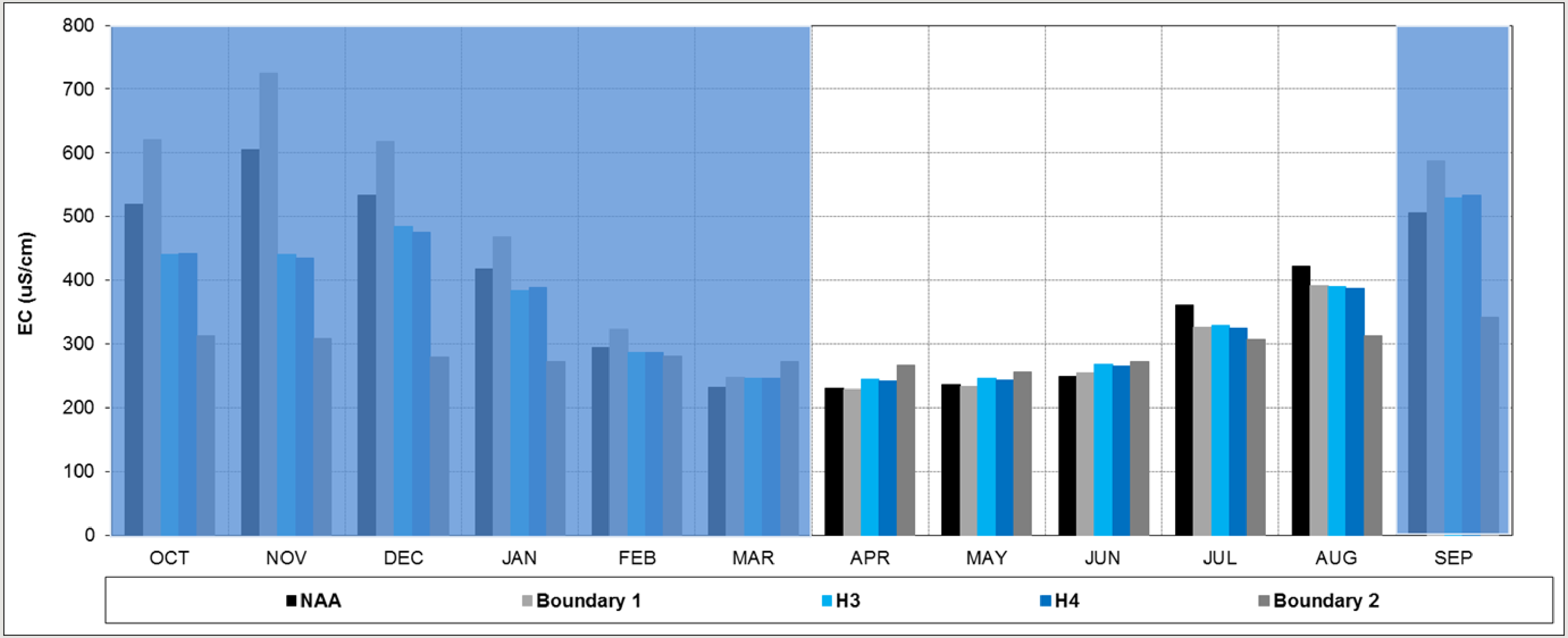
WATER QUALITY SACRAMENTO RIVER AT EMMATON



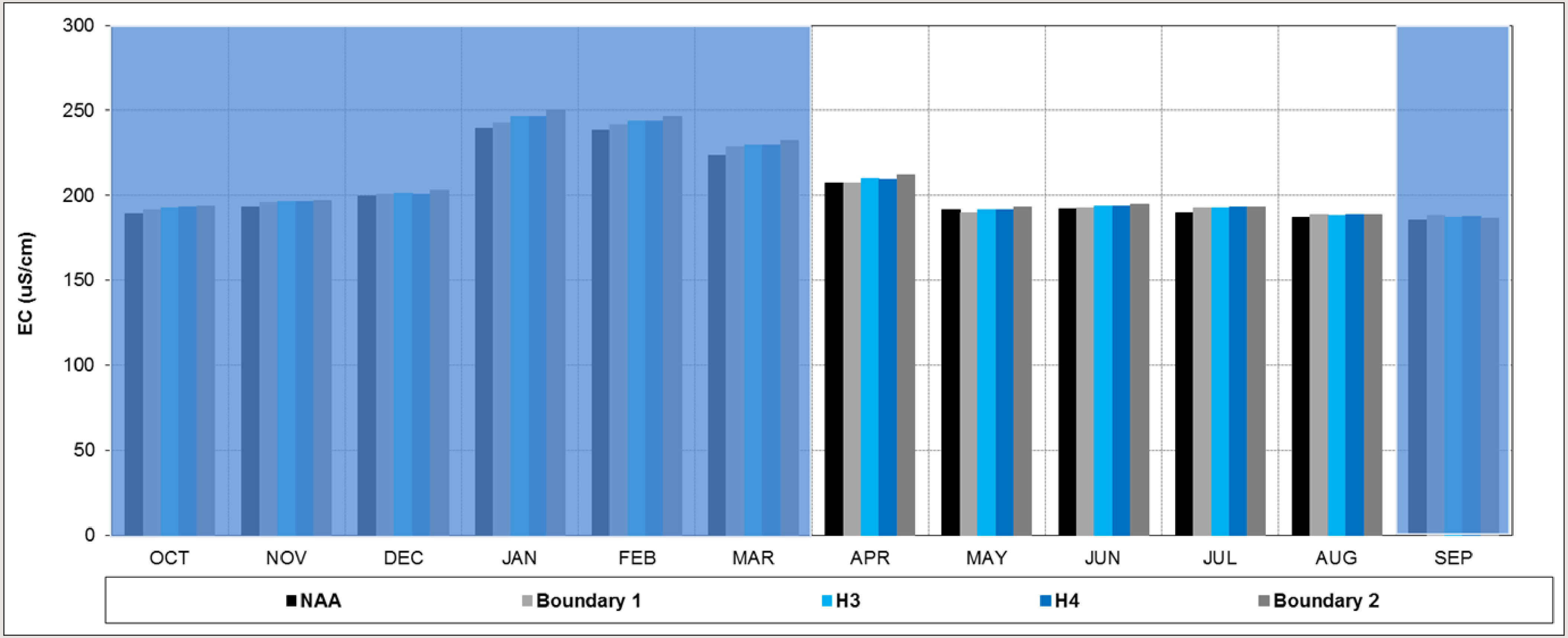
WATER QUALITY SAN JOAQUIN RIVER AT JERSEY POINT



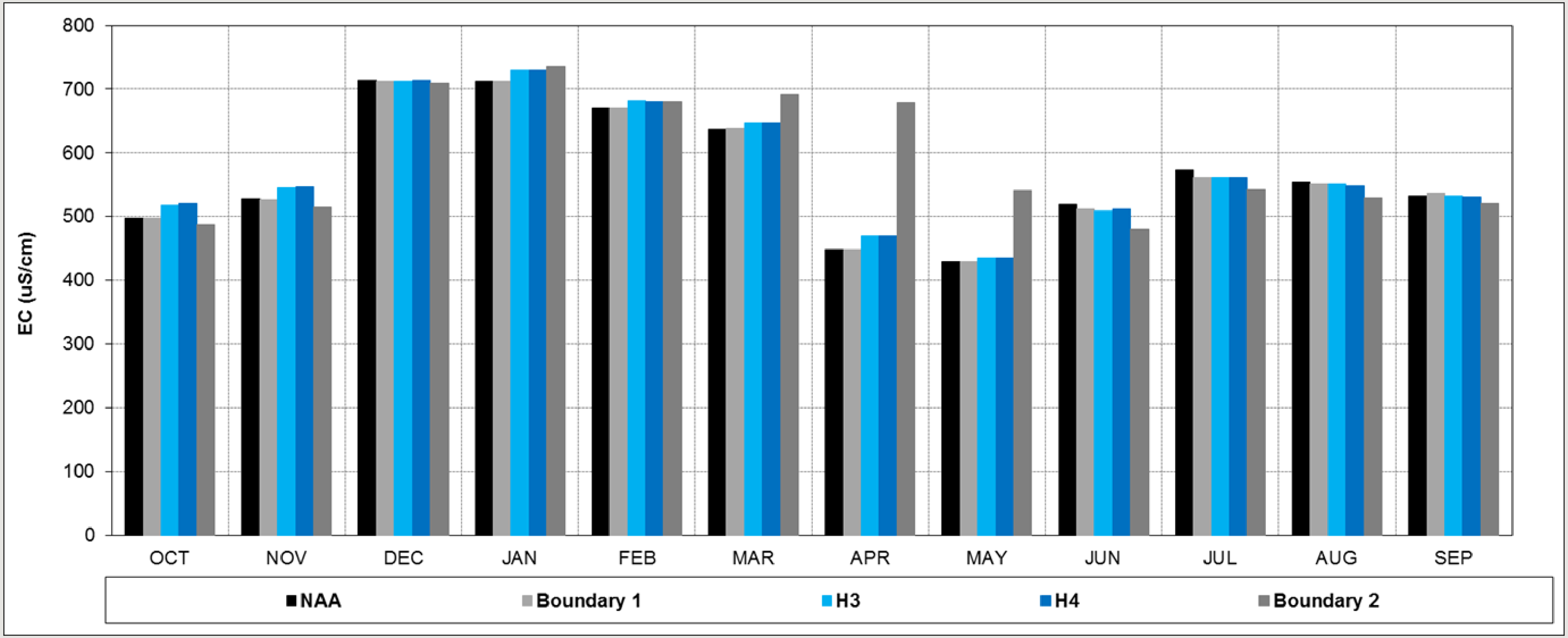
WATER QUALITY SAN JOAQUIN RIVER AT SAN ANDREAS LANDING



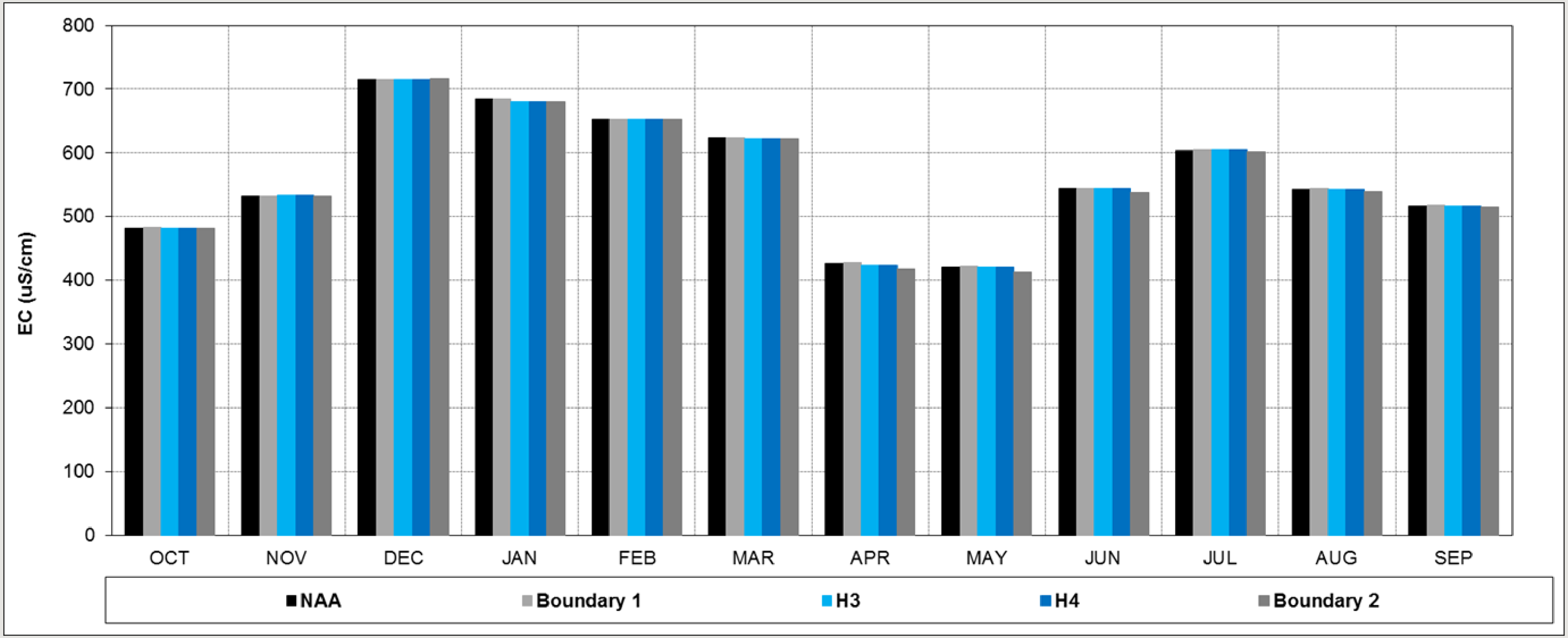
WATER QUALITY SOUTH FORK MOKELUMNE (TERMINOUS)



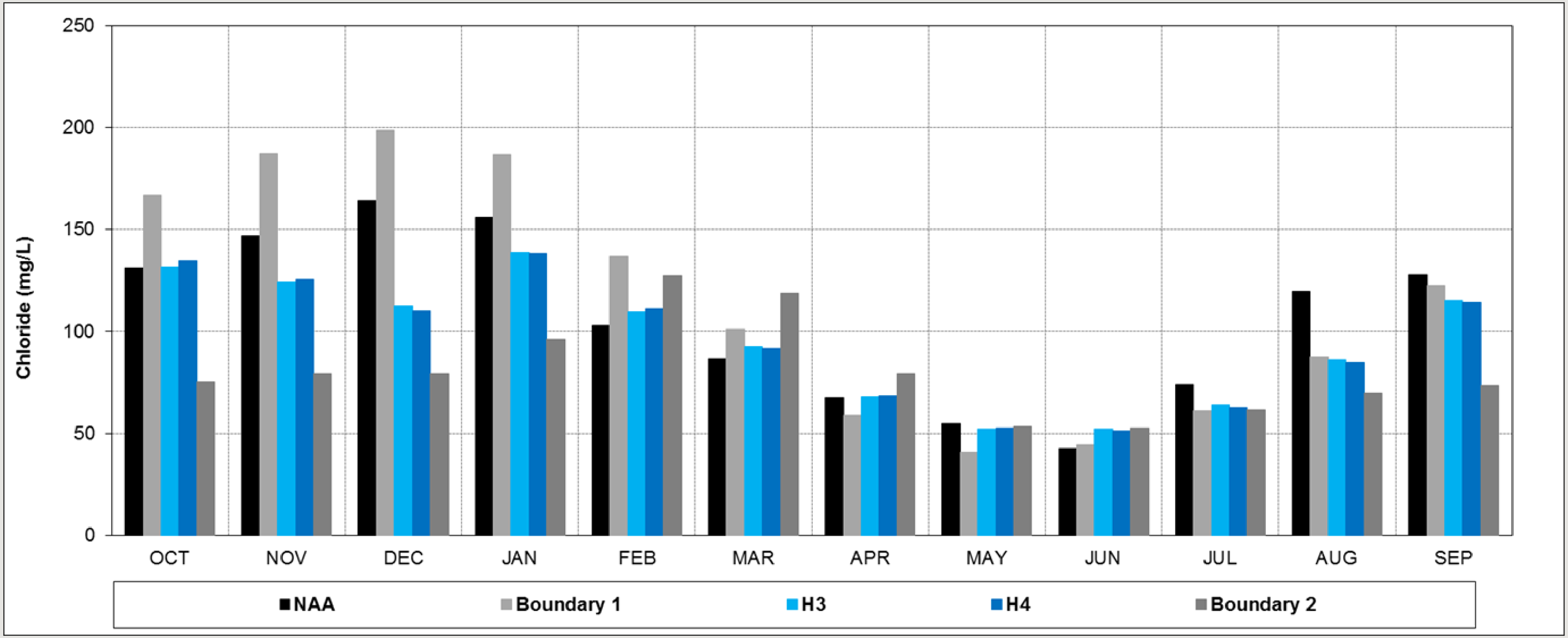
WATER QUALITY OLD RIVER AT TRACY ROAD



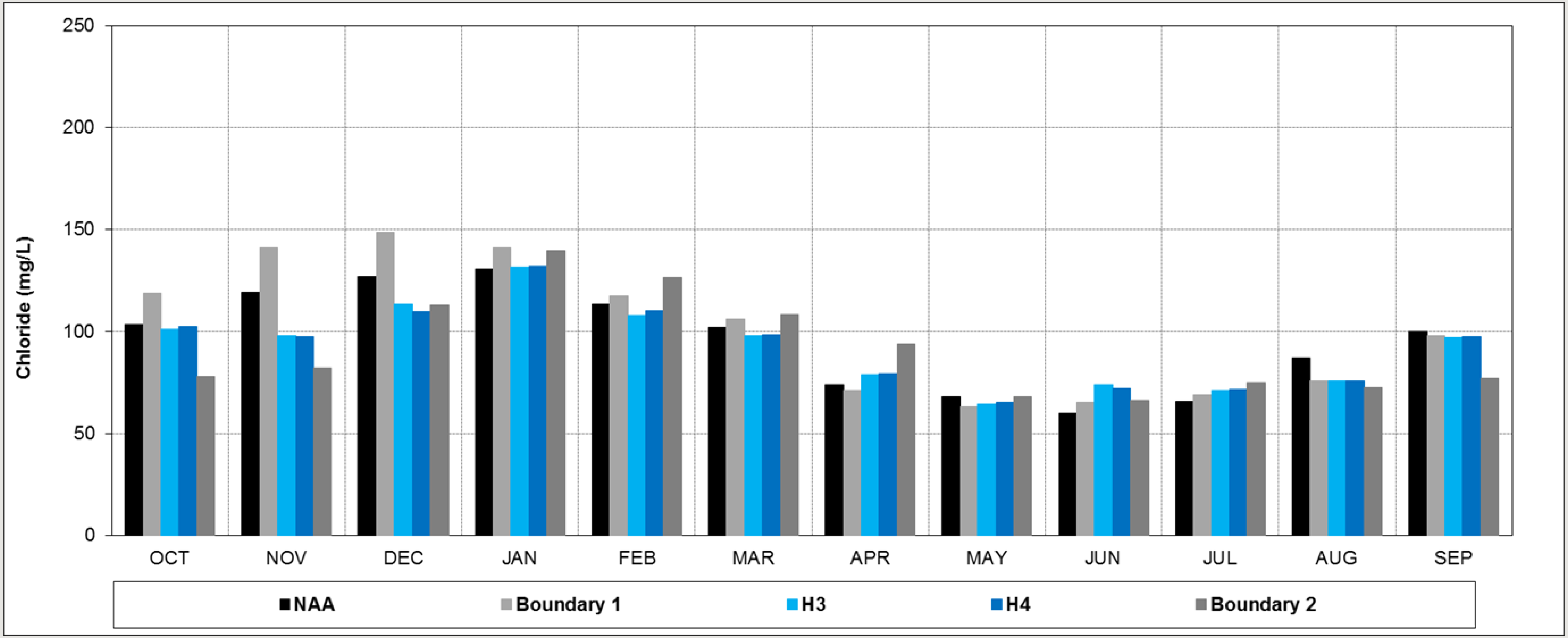
WATER QUALITY SAN JOAQUIN RIVER AT BRANDT BRIDGE



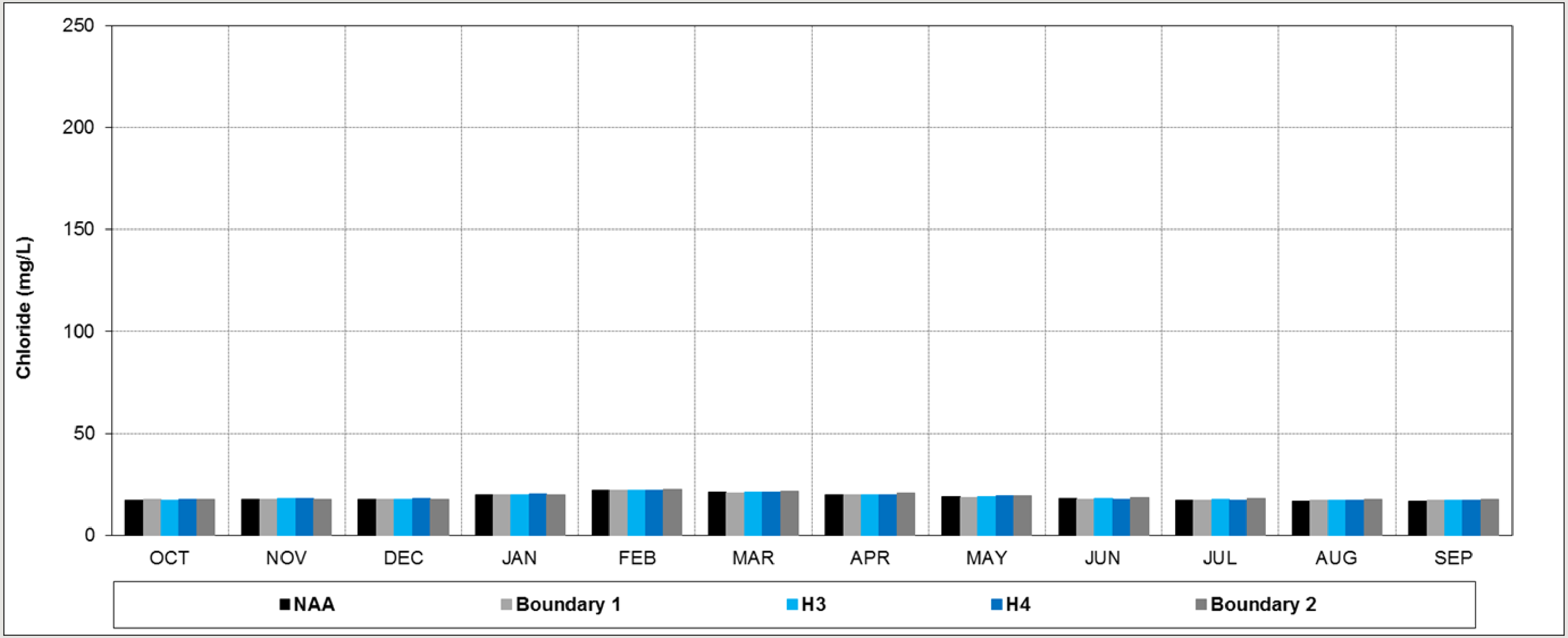
CHLORIDE AT CONTRA COSTA CANAL



CHLORIDE AT OLD RIVER AT CLIFTON COURT FOREBAY



CHLORIDE AT BARKER SLOUGH/NORTH BAY AQUEDUCT



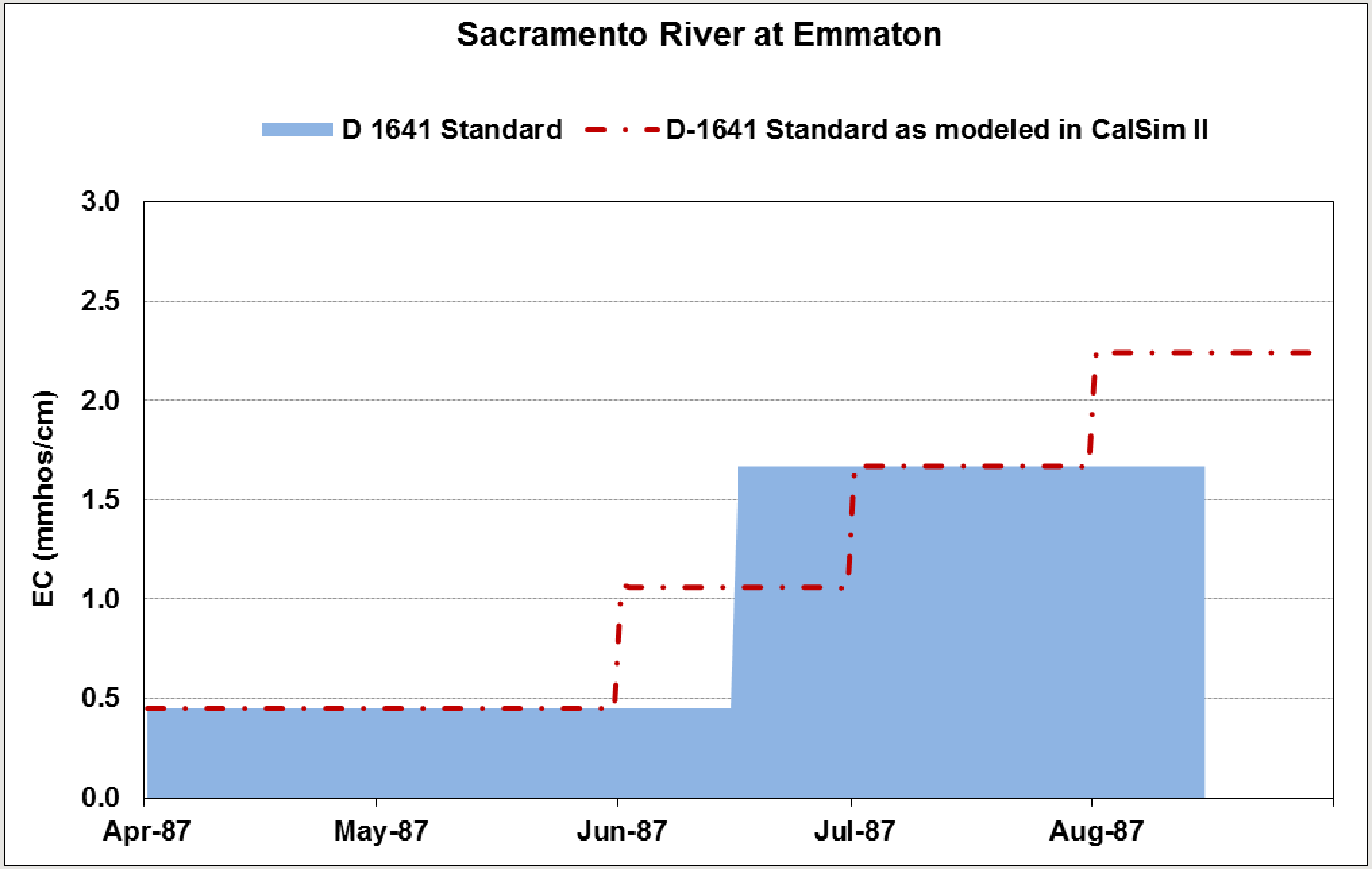
D-1641 WATER QUALITY OBJECTIVES MODELING APPROACH

- **CalSim II –**
  - Delta flows for regulatory and operational criteria assumed on a monthly time step
  - Simulates compliance with Delta salinity objectives
  - Relies on "Artificial Neural Network" for monthly averaged Delta flow-salinity relationships
- **DSM2 –**
  - Uses CalSim II results, and simulates Delta hydrodynamics and salinity on a 15-min time step
  - Monthly CalSim II flows converted to daily flows using historical patterns
  - DSM2 daily EC output was used to evaluate compliance with D-1641 water quality objectives

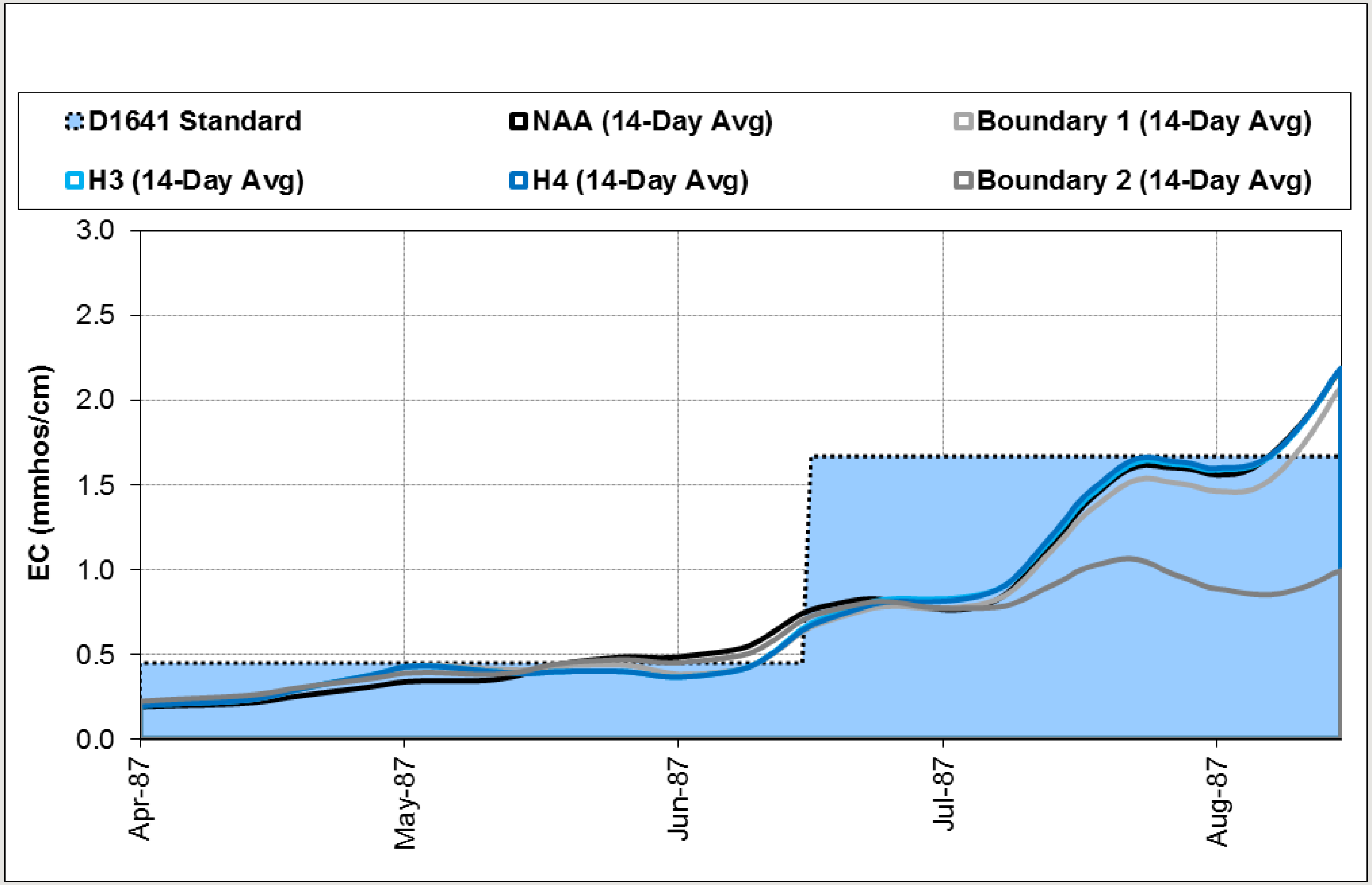
MODEL REPRESENTATION OF STANDARDS

D-1641 WATER QUALITY OBJECTIVE AT EMMATON

(EXAMPLE - 1987 DRY YEAR)

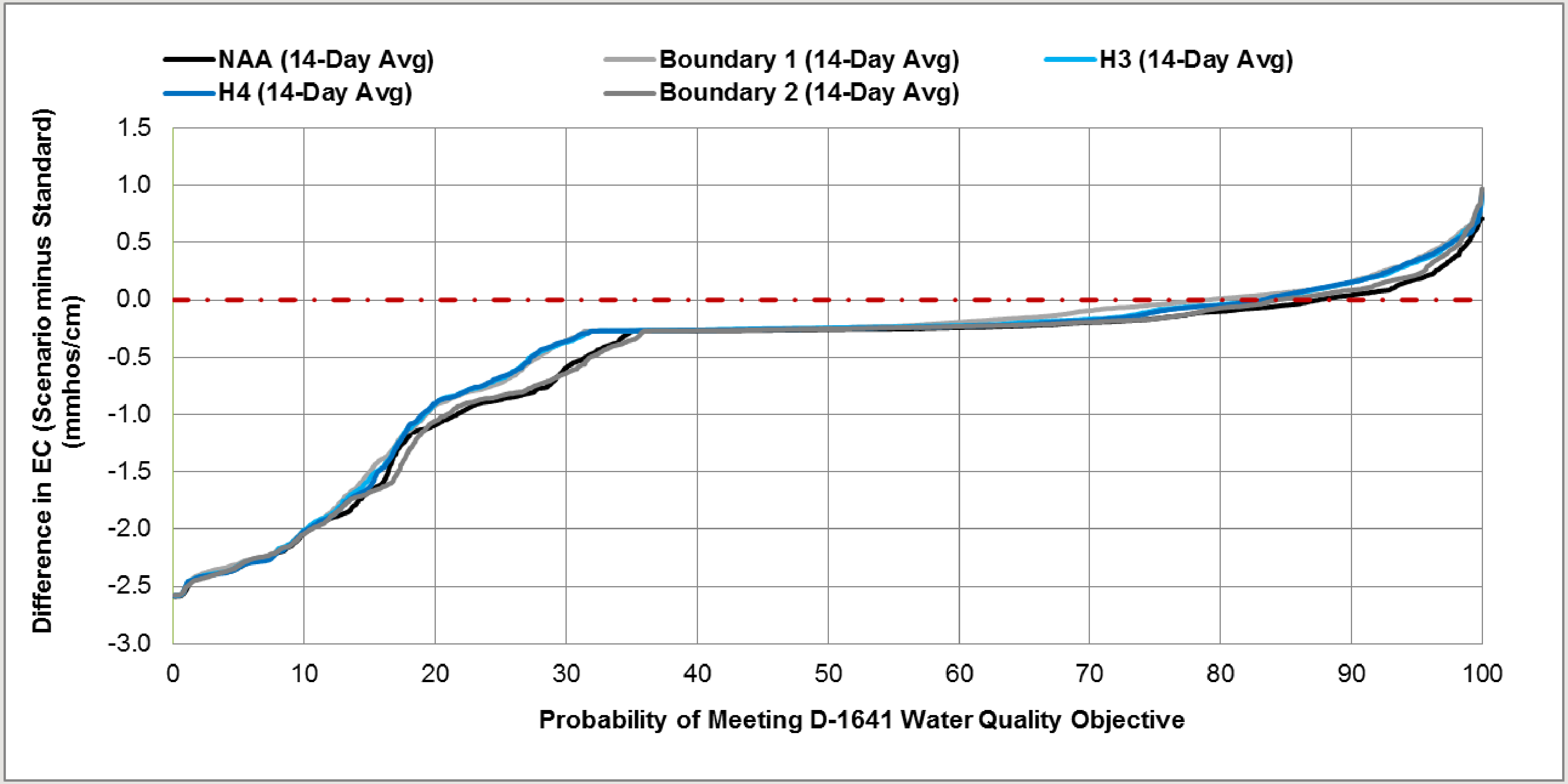


MODEL EVALUATION OF STANDARDS
DSM2 SIMULATED EC AT EMMATON – EXAMPLE 1987 (DRY)



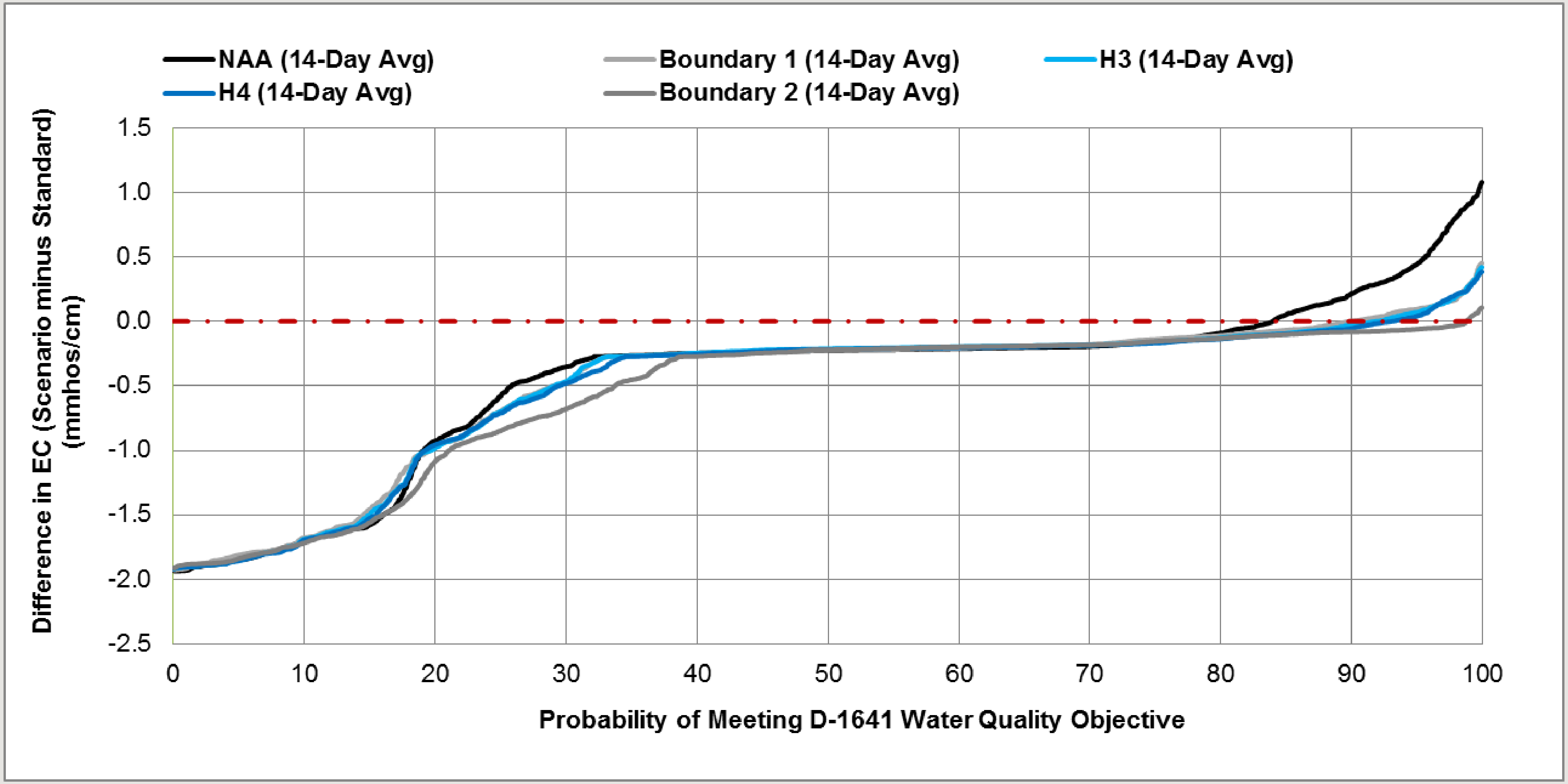
D-1641 EC OBJECTIVE AT EMMATON

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



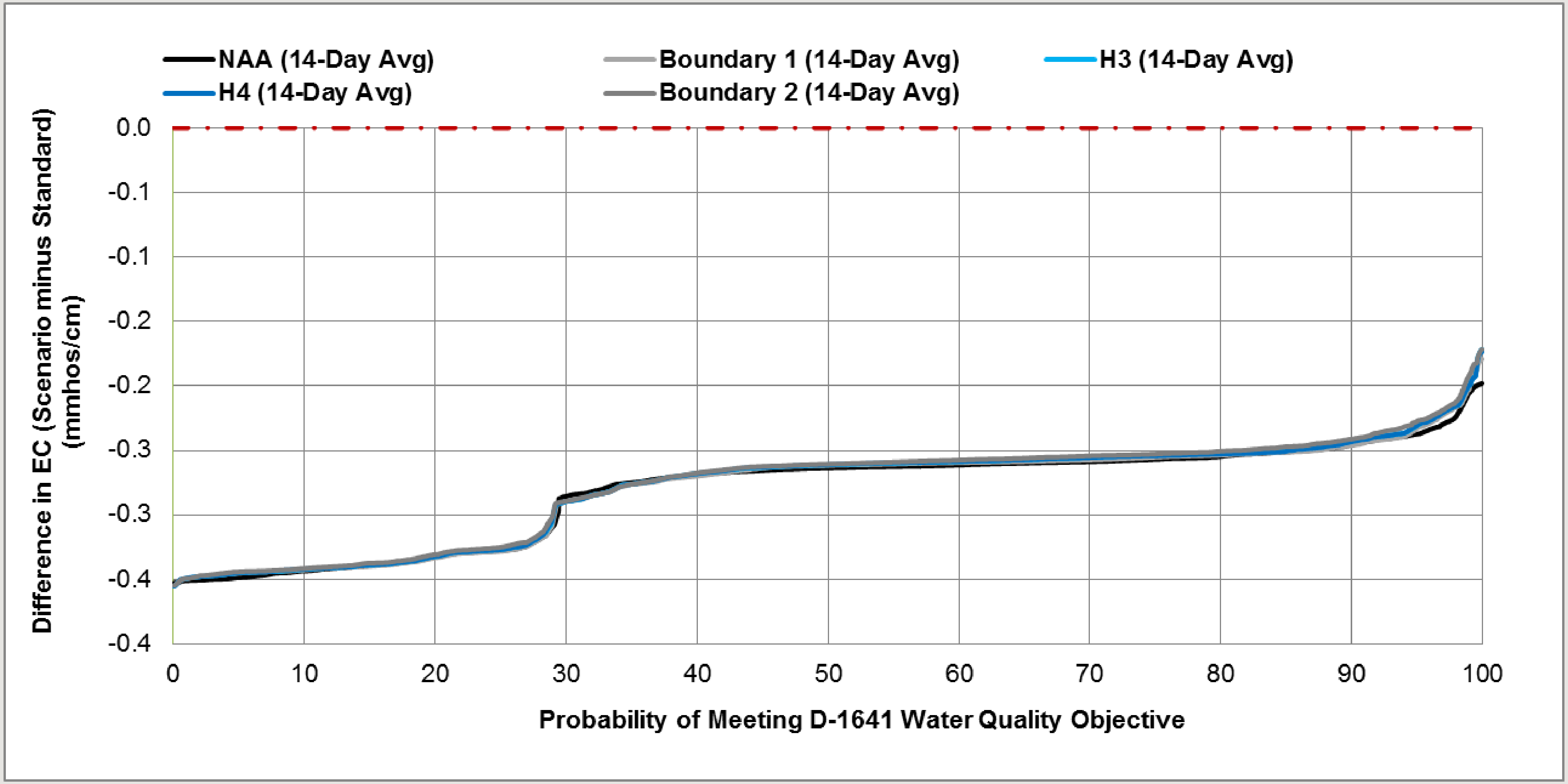
D-1641 EC OBJECTIVE AT JERSEY POINT

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



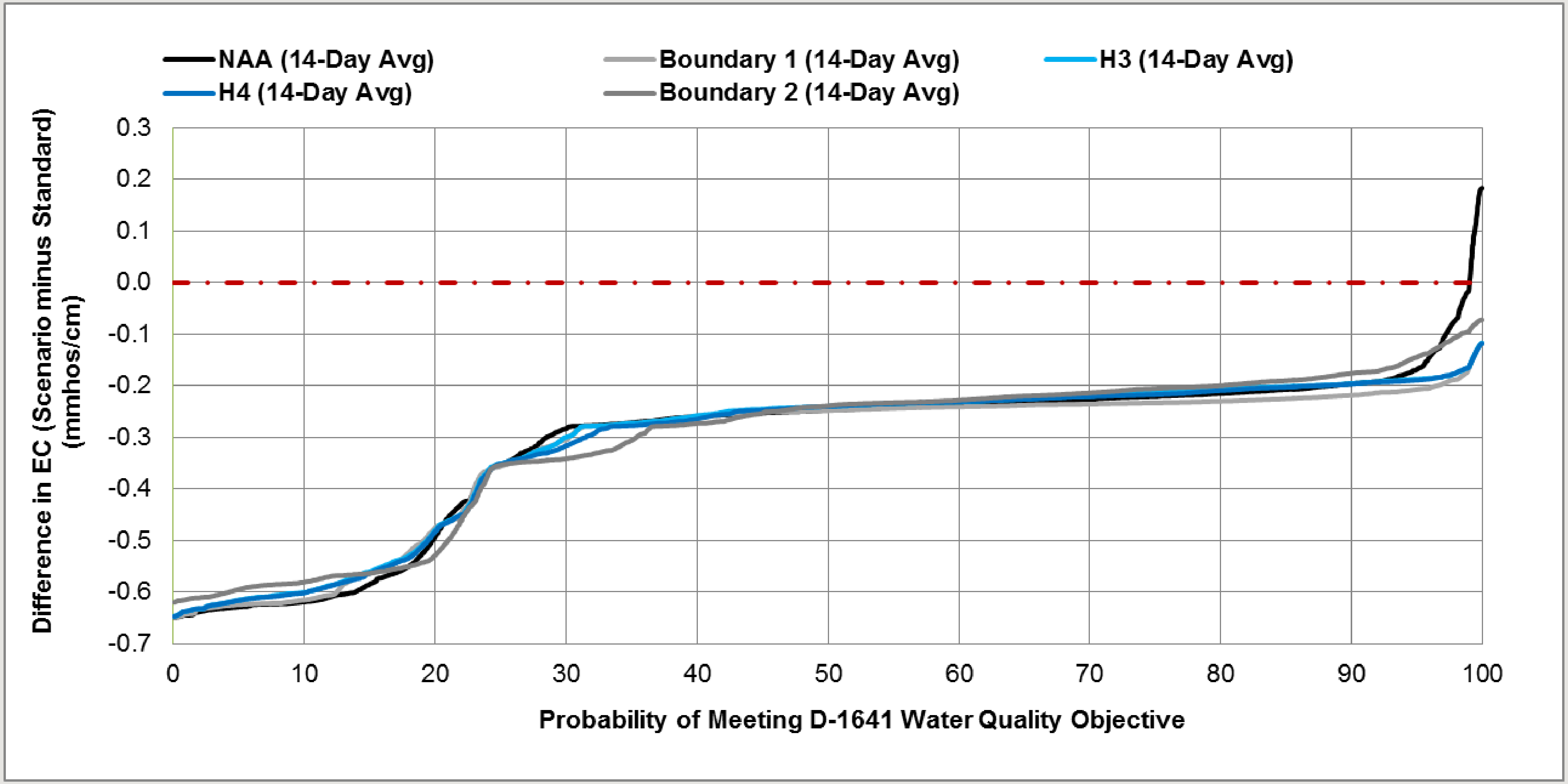
D-1641 EC OBJECTIVE AT SOUTH FORK MOKELUMNE AT (TERMINOUS)

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



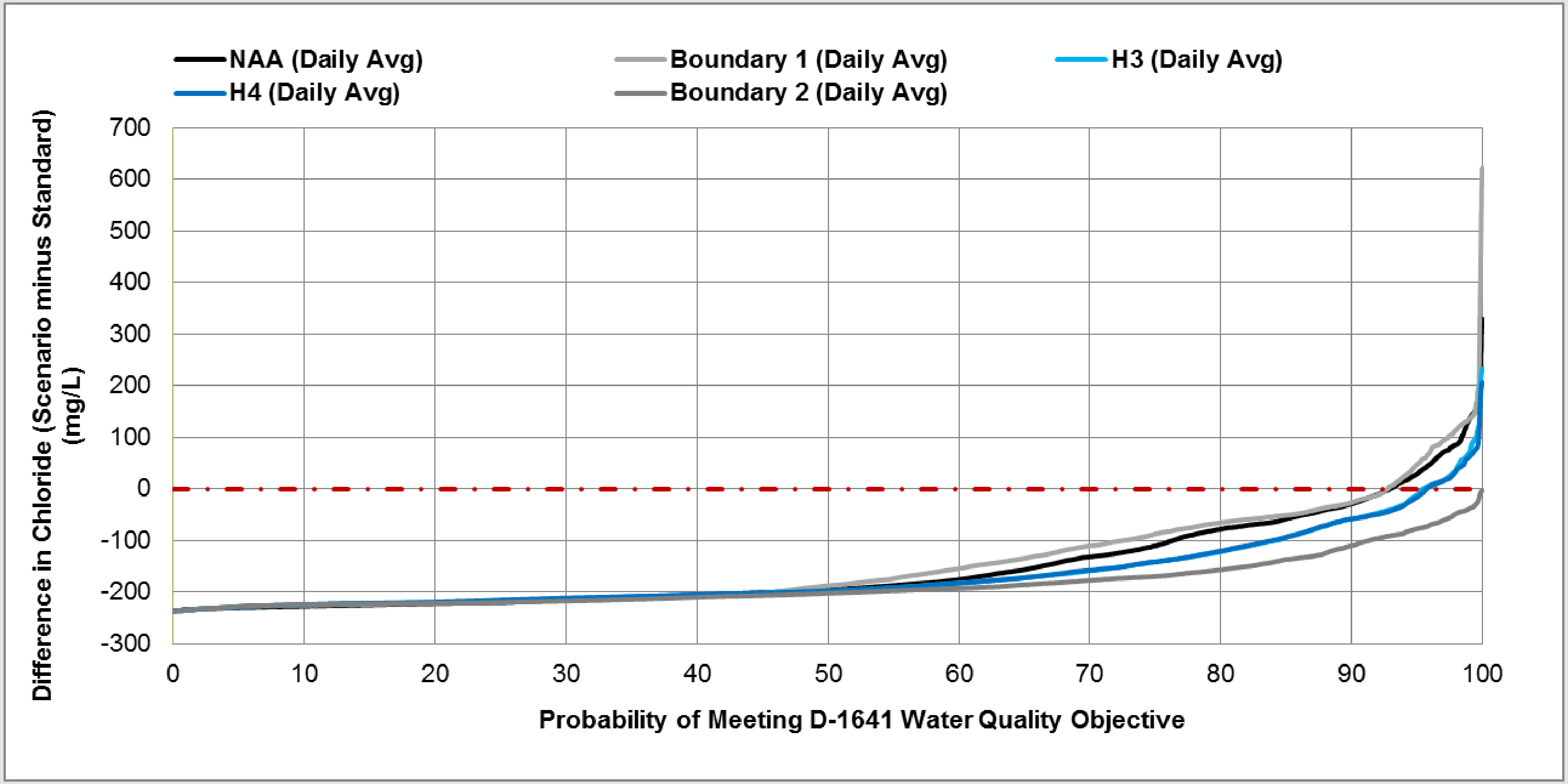
D-1641 EC OBJECTIVE AT SAN ANDREAS LANDING

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise

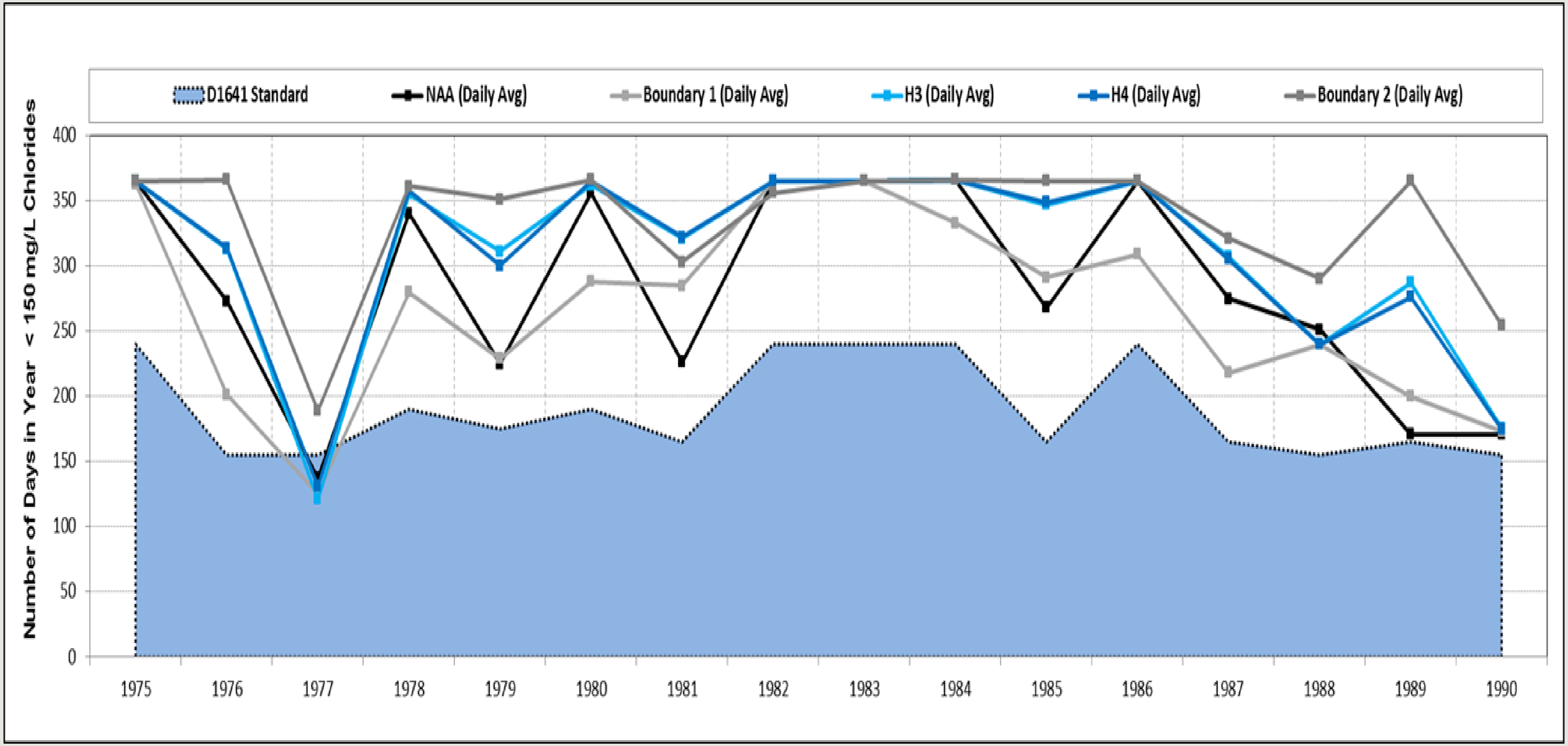


D-1641 CHLORIDE OBJECTIVE (250 MG/L) AT CONTRA COSTA CANAL

Early Long-Term (ELT) alternatives are simulated with 2025 climate change & sea level rise



D-1641 150 MG/L CHLORIDE OBJECTIVE AT CONTRA COSTA CANAL (REQUIRED NUMBER OF DAYS)



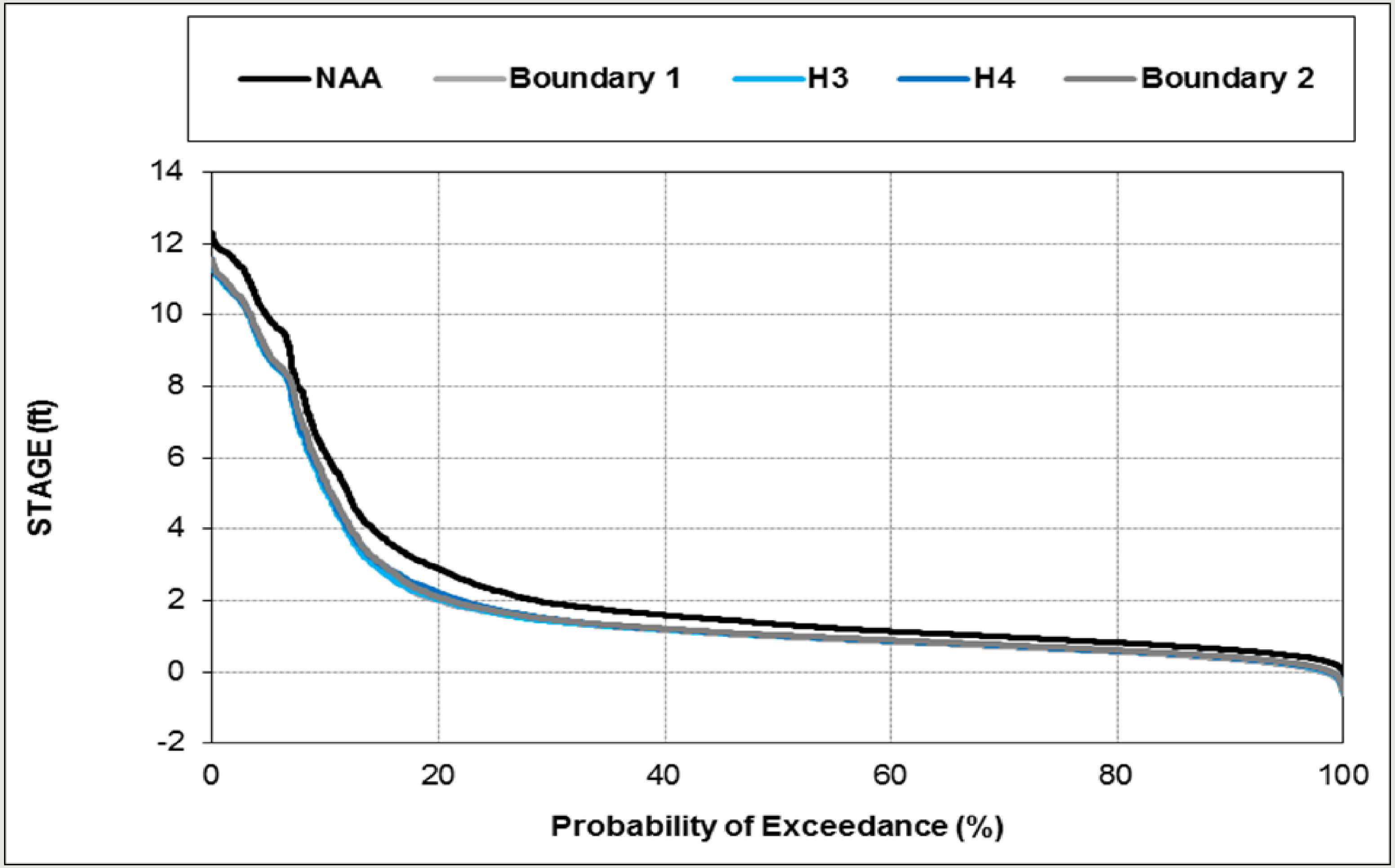
MOST OF THE D-1641 WATER QUALITY OBJECTIVE EXCEEDANCES SHOWN IN THE MODEL RESULTS ARE DUE TO THE DIFFERENCE IN THE MODEL ASSUMPTIONS

DELTA WATER LEVEL ANALYSIS

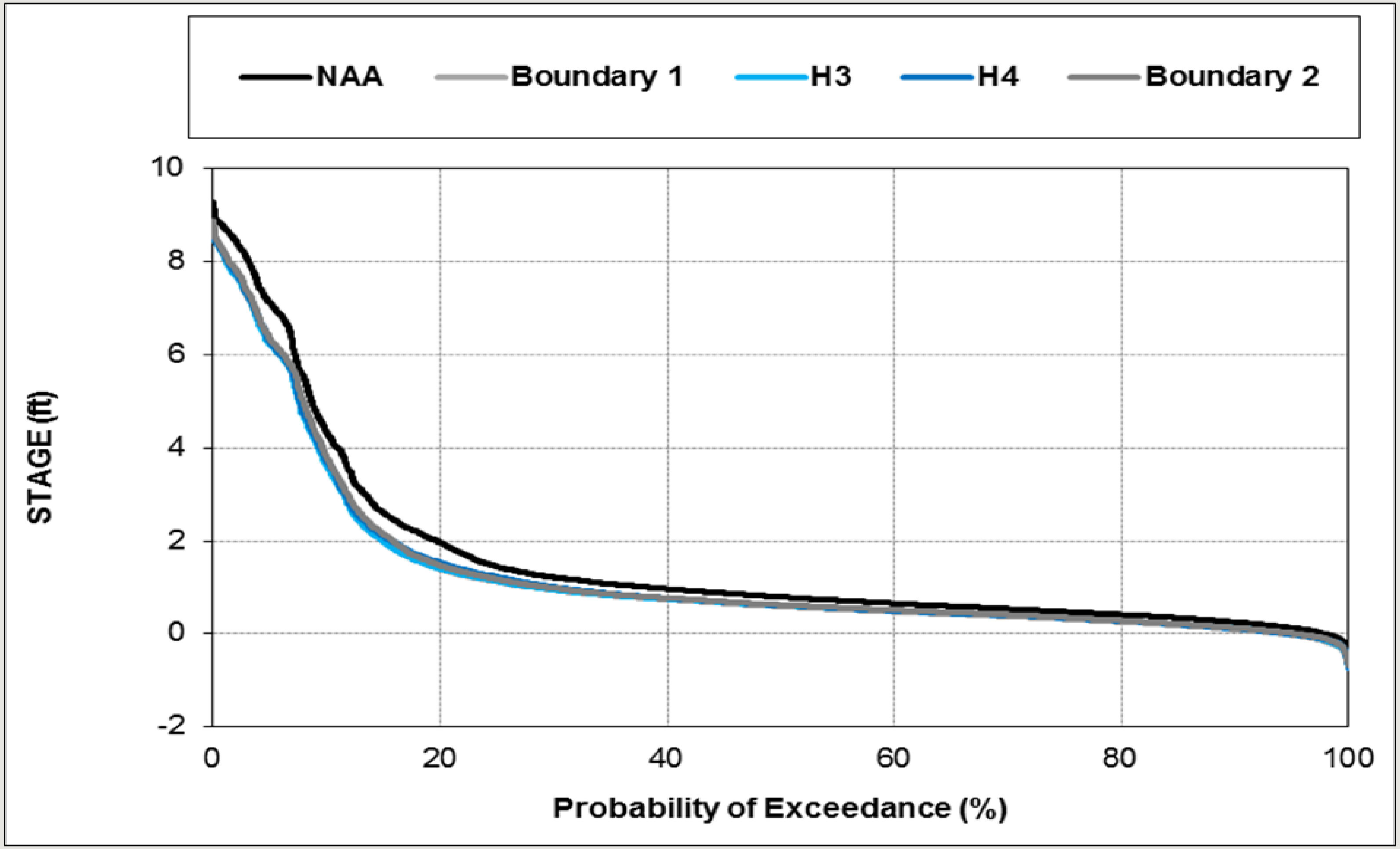
- **Probability of exceedance daily minimum water levels**
- **Largest reductions are expected in and around the three proposed North Delta Diversions**

WATER LEVEL RESULTS LOCATIONS

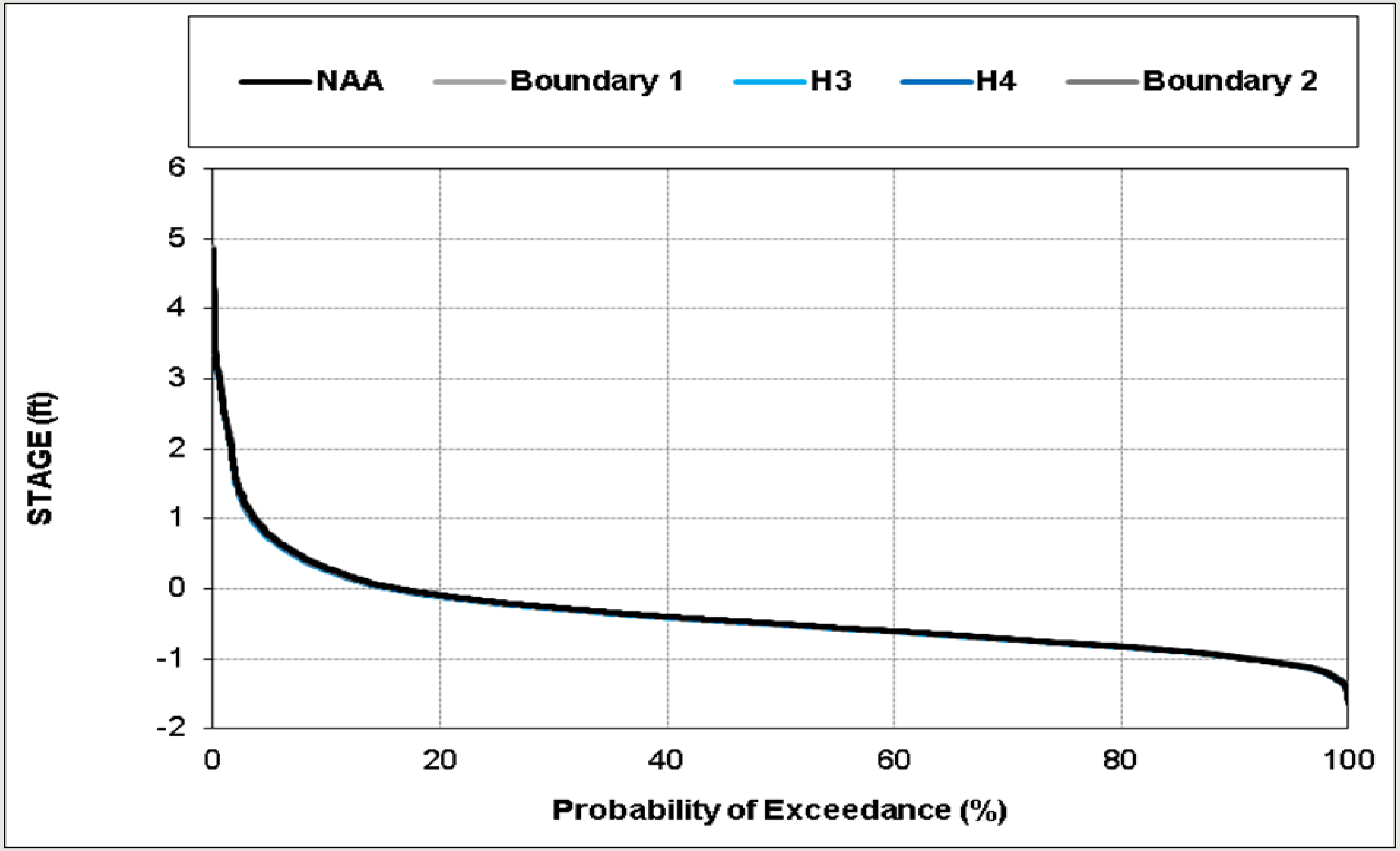
PROBABILITY OF EXCEEDANCE FOR DAILY MINIMUM STAGE SACRAMENTO RIVER DOWNSTREAM FROM THE THREE PROPOSED INTAKES.



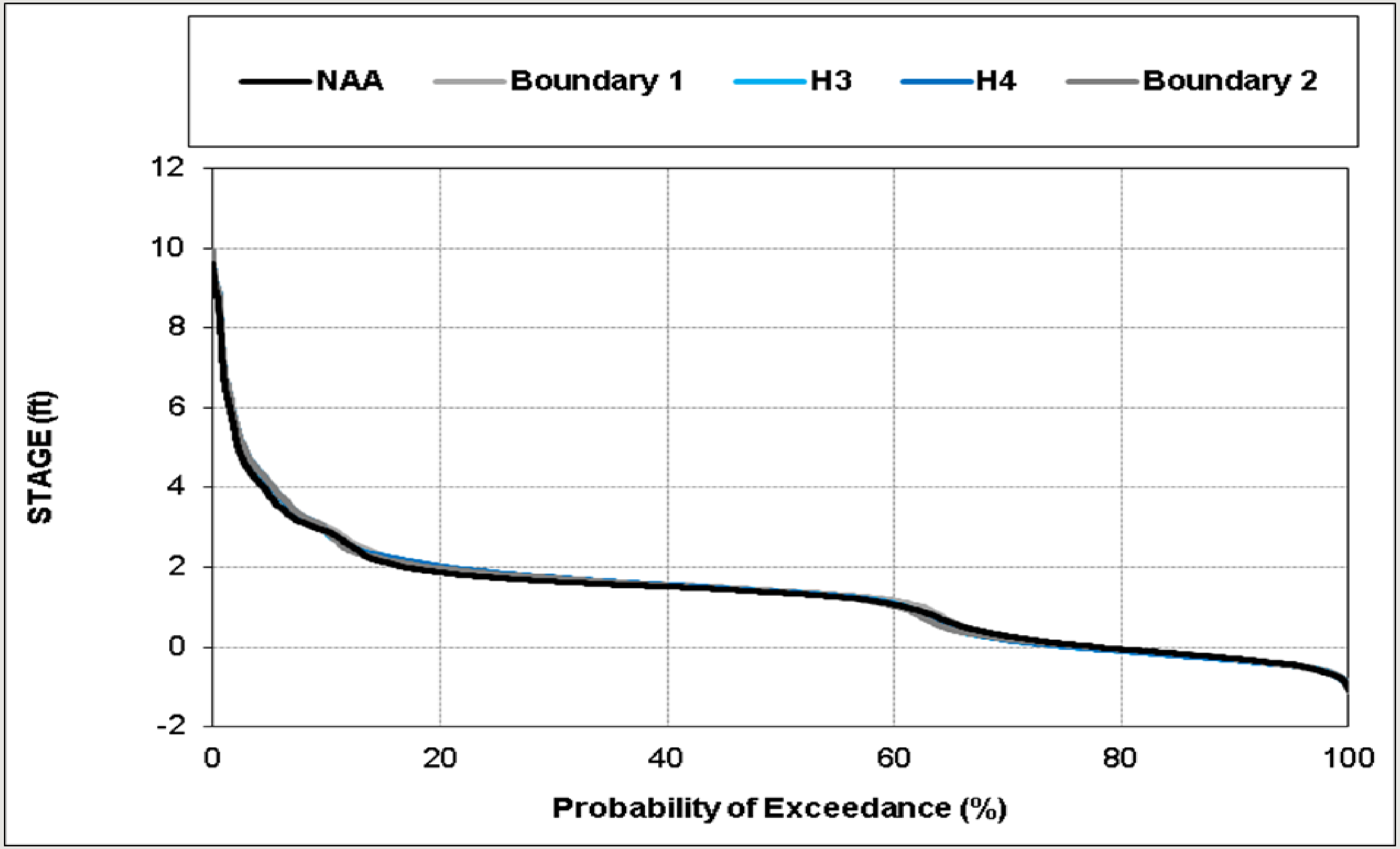
PROBABILITY OF EXCEEDANCE FOR DAILY MINIMUM STAGE SACRAMENTO RIVER DOWNSTREAM OF GEORGIANA SLOUGH



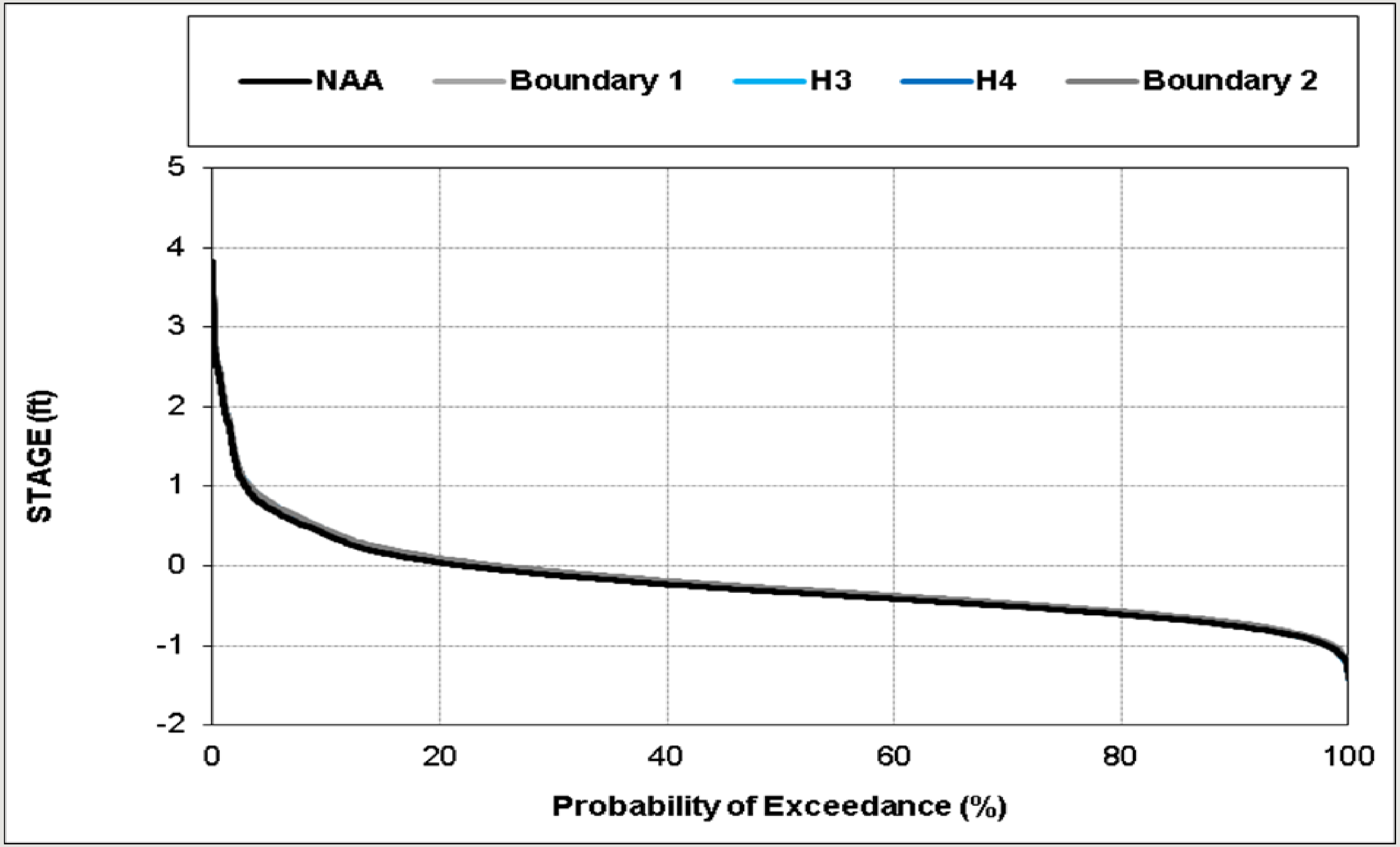
PROBABILITY OF EXCEEDANCE FOR DAILY MINIMUM STAGE SACRAMENTO RIVER AT RIO VISTA



PROBABILITY OF EXCEEDANCE FOR DAILY MINIMUM STAGE OLD RIVER AT TRACY ROAD



PROBABILITY OF EXCEEDANCE FOR DAILY MINIMUM STAGE SOUTH FORK MOKELUMNE (TERMINOUS)



SUMMARY OF CHANGES

- **Water Quality (Ag and M&I)**
  - Model analysis of EC and Chloride
  - Water quality results are mixed
  - There are seasonal variations
  - Small overall increase in EC at Emmaton
  - DSM2 shows exceedances in D-1641 water quality objectives for all alternatives including the NAA
  - Most exceedances are due to difference in the assumptions in the models (CalSim II and DSM2)

SUMMARY OF CHANGES (CONT'D)

- **Water Levels in the Delta**
  - – Largest reduction in water levels near the proposed NDD
  - – Largest reduction in water levels during high flow events
  - – Maximum water level reduction of about 0.5 ft during low flow events near the NDD
    - Low water level occurs for only short period during tidal cycle
  - – Locations far from the NDD show negligible reduction in water level