

The History of the California Water and Environmental Modeling Forum



CWEMF Ad hoc History Committee

August 28, 2024

Acknowledgements

On June 2, 2023, the California Water and Environmental Modeling Forum (formerly the Bay-Delta Modeling Forum) Steering Committee authorized the formation of an Ad hoc History Committee whose objective is to document the formation of the Bay-Delta Modeling Forum along with its major accomplishments since its formation 30 years ago. The Ad hoc History Committee consists of the following members: Rich Satkowski (State Water Resources Control Board, retired; Committee Chair), Dr. Ben Bray (East Bay Municipal Utility District), Dr. Tariq Kadir (California Department of Water Resources), and Anne Huber (ICF, Jones and Stokes). Additional reviewers of portions of the report were as follows: Dr. Richard Denton (Contra Costa Water District, retired), Dr. Greg Gartrell (Contra Costa Water District, retired), Dr. Jay Lund (Distinguished Professor Emeritus, U.C. Davis), and Dr. George Nichol (State Water Resources Control Board, retired). This document is the Ad hoc History Committee’s response to its objective.

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Introduction and Context

Water is one of California's most valuable and coveted natural resources. Competition among user groups (urban, agricultural, environmental, and recreational) coupled with the ongoing need to ensure water quality has made water management an increasingly complicated, controversial task. Stakeholders and policy makers seek quantitative analyses based on data and computer-generated analytical tools (models) to better understand and help resolve water resource and environmental problems.

In the past, stakeholders often developed their own models independently, with little input from policy managers, the end-users of modeling results. At the same time, there was little discussion between modelers and technical experts to resolve methodology differences or to address discrepancies in model results analyses. Consequently, conflicting results presented in water rights hearings, such as the State Water Resources Control Board's (SWRCB) 1992 Draft Water Right Decision 1630, and other proceedings have been difficult to resolve.

Recognizing that credible technical analysis is vital to successful collaboration and consensus, a group of water industry professionals teamed up in 1994 to establish the Bay-Delta Modeling Forum (BDMF). BDMF began as an effort to organize informal discussions and technical activities among modelers housed in diverse and sometimes conflicting water institutions in California's Bay-Delta system, and now California more generally. This broadening of CWEMF's geographic scope came with a name change in 2004 to the California Water and Environmental Modeling Forum (CWEMF). The formation and development of BDMF and CWEMF have been shaped by ever-evolving discussions among those working on water modeling from a wide variety of water projects, regulatory, consulting, academic, and non-governmental institutions.

Executive Summary

Water is key to the economy and environment of the State of California. In the late 1980s to the early 1990s, coincident with the advancement of the personal computer, water resource managers, policy makers, and stakeholders increasingly needed to rely upon more detailed, complex, quantitative information to perform their work. Stakeholder experts were becoming entrenched on the scientific methods and data used to form their opinions. As a result, competing models and conflicting results presented in water right hearings, such as the California State Water Resources Control Board's 1992 Draft Water Right Decision 1630, and other regulatory proceedings became increasingly difficult to resolve.

The Bay-Delta Coordination Group was established in 1993 because of a growing need to resolve technical disagreements in a non-adversarial setting, allow an open exchange of technical information, and help ensure that technical analyses were focused on addressing the challenges facing California's resource managers as well as stakeholder groups. On March 11, 1994, the Bay-Delta Modeling Forum (BDMF) was formally established. BDMF was the direct precursor to the California Water and Environmental Modeling Forum (CWEMF). BDMF members adopted organizational bylaws, established the steering committee and rules governing membership, elected the first set of organization officers, and established the first of many standing and ad hoc committees. BDMF formulated its mission statement that has remained largely unchanged since adoption, "to increase the usefulness of models for analyzing California's water and environment related problems." BDMF also formulated the tagline, "Promoting Excellence and Consensus in Water and Environmental Modeling."

In 2004, BDMF celebrated 10 years since its founding and agreed upon a name change to CWEMF along with adoption of a new logo that reflected a broadened geographic focus of the organization to encompass efforts throughout all of California with emphasis on the San Francisco Bay, Sacramento-San Joaquin Delta, and the Central Valley.

One of CWEMF's key functions is dissemination of modeling-related information through technical workshops and annual meetings. Workshops generally fall into two general categories: educational workshops where the audience learns from subject matter experts and training workshops where the audience uses computers to learn a new modeling-related skill. Even before BDMF was officially formed, the Bay-Delta Coordination group organized a salinity-outflow technical workshop in February 1994. Soon after, additional workshops were held to start addressing complex Bay-Delta challenges. Since then, CWEMF has conducted over 100 educational and training workshops, often partnering with other organizations.

From 1995 through 2011, annual meetings were held at the Asilomar Conference Center near Pacific Grove, California. CWEMF annual meetings have been held in Folsom, California since 2012, with growing attendance each year.

CWEMF recognizes high achievement through three awards. In 1994, the Hugo B. Fischer Award, named in honor of Dr. Fischer's pioneering work on water quality modeling, was established to honor outstanding use or development of water/environmental models to

understand or solve California water problems. Then, in 2004, CWEMF established the Career Achievement Award to honor members that made significant contributions over their career in developing, using, or promoting computer modeling to analyze California's water-related issues. In 2010, the Distinguished Life Member Award was established to honor the service of active or past members who, through long and distinguished service, made a major contribution to CWEMF and to the California water and environmental modeling profession.

Peer reviews have been another important function of CWEMF. In 1996, BDMF published guidance for organizations that would like to partner with BDMF to conduct peer reviews of models or modeling approaches. Consistent with the organizational mission, peer review efforts are framed not for providing strict approval or disapproval of a model or technical approach, rather they document strengths and weaknesses, suggest improvements, and assess model suitability for a range of potential intended uses or applications. Several peer reviews of models, modeling approaches, and/or model applications in California were completed in 2001. In 2006, CWEMF oversaw the formation of a peer review panel that produced a consequential report documenting their review of the San Joaquin River Valley CalSim II Model. In July 2013 CWEMF partnered with USBR to complete a peer review of three integrated surface water-ground water models.

In addition to conducting workshops and peer reviews, CWEMF has published reports to provide guidance and share expertise related to professional practices. In 2000, BDMF developed a best practices document titled, "Protocols for Water and Environmental Modeling" that provides guidance in the development and application of complex computer-based modeling tools used to address California's water and environmental problems. This document was updated in 2021. In 2005, CWEMF published, "A Strategic Analysis Framework for Managing Water in California" to provide integrated, broad-based guidance to support a variety of policy, planning, and management applications.

Throughout the years, CWEMF has facilitated various peer reviews, provided modeling guidance, awarded distinguished individuals, and conducted workshops and annual meetings to ensure a high standard of professional modeling practices for water and environmental management in California. The formation and development of BDMF and CWEMF have been shaped by ever-evolving volunteer engagement on behalf of its members and member organizations representing water project, regulatory, consulting, academic, and non-governmental institutions. CWEMF has improved modeling and modeling discussions by providing an informal discussion forum for "mixing and dispersion" of ideas and methods, and supporting development, testing, and acceptance of many modeling innovations for California water problems. In addition, CWEMF has established a safe, educational environment for modelers and model users within the community to share ideas, demonstrate their technical approaches, and share their insights as policy and science continue to evolve symbiotically.

History Timeline

1978

1978 Plan and Decision 1485

The California State Water Resources Control Board (SWRCB)¹ adopts the 1978 Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh (1978 Plan) and Water Right Decision 1485 (Decision 1485), which imposed Delta water quality and flow requirements on the U.S. Bureau of Reclamation's (USBR) Central Valley Project (CVP) and the California Department of Water Resources' (DWR) State Water Project (SWP). The CVP and SWP must meet the water quality and flow requirements either by reducing pumping in the Delta or releasing water from upstream reservoirs (SWRCB, 1978).

1986

Racanelli Decision

In a ruling by the State Court of Appeals, called the Racanelli Decision,² the Court declared Decision 1485 to be unlawful and directed the SWRCB to consider all beneficial uses of Delta water, including instream needs, when setting water quality standards. This decision explains and clarifies numerous points of water law, including the relationship between the SWRCB's Porter-Cologne Water Quality Control Act and the SWRCB's water right authority. This case also explains the SWRCB's authority under the public trust doctrine and the prohibition against waste or unreasonable diversion or use of water to reopen water rights to implement water quality objectives. The court did not enjoin enforcement of Decision 1485 because the SWRCB had announced that it would be expeditiously revising the Delta's water quality standards (U.S. vs. SWRCB, 1986).

Due to the Racanelli Decision, the SWRCB begins its work to revise the Delta water quality standards. As part of this effort, SWRCB staff hires economists Dr. Michael Hanneman and Mr. Larry Dale (Hanneman & Associates) and hydrodynamicist Dr. Greg Gartrell (FlowScience, Inc.) as technical experts.

1987

SWRCB's Hearing Process

In July 1987, the SWRCB begins a multi-year quasi-judicial hearing process to revise the 1978 Plan and Decision 1485. The evidentiary hearings, which took place over 68 hearing days, were

¹ The State Water Resources Control Board is a five-member board appointed by the Governor of the State of California whose mission is to protect water quality and allocate surface water rights.

² The Racanelli Decision was named after the court's presiding judge.

complex, adversarial, and contentious. For example, during the evidentiary phase of the hearing process (Phase 1):

- Approximately 200 witnesses from 85 parties testified on 14 Bay-Delta-related topics. In all, approximately 40,000 pages of exhibits were introduced as evidence. For a sense of scale, this evidence, when stacked, measured 14 feet in height,
- DWR and USBR introduced and testified on separate reservoir operation models of the Central Valley water system: DWRSIM (DWR) and PROSIM (USBR),
- DWR and Contra Costa Water District (CCWD) staff introduced and testified on separate hydrodynamic and salinity models of the Delta: The Fischer Delta Model (DWR) and DYNFLOW/SSALT/TVSALT (CCWD),
- Some hearing parties, such as CCWD, disagreed as to whether Delta carriage water³ exists and, if it does exist, how much carriage water is needed to repel seawater, and
- Three full days of testimony were held to discuss Delta evapotranspiration under natural, unimpaired and 1990 level-of-development conditions.

1988

SWRCB's 1988 Draft Plan

Based on the Phase 1 hearing evidence, the SWRCB releases (but does not finalize) the draft 1988 Water Quality Control Plan for Salinity for the San Francisco Bay/Sacramento – San Joaquin Delta Estuary (1988 Draft Plan). The 1988 Draft Plan discusses the interaction of salinity and flow and how upstream storage facilities, in-basin depletions and Delta exports have reduced winter and spring Delta outflows. In addition, it compares various estimates of average monthly Delta outflow under natural, unimpaired and 1990 level-of-development conditions. (SWRCB, 1988). Release of the 1988 Draft Plan was contentious because the municipal, industrial and agricultural interests believed the selected alternative (1) offered unreasonable water supply impacts and potential water conservation estimates and (2) was analyzed using inadequate models. Under pressure from municipal, industrial, and agricultural interests, the SWRCB decided to abandon the 1988 Draft Plan and start anew (SWRCB, 1988).

1989

Cooperative Workgroups

As an outgrowth of the contentious 1988 Draft Plan, the SWRCB recommended that interested parties participate in DWR-convened interagency, cooperative workgroup to develop additional information to present to the SWRCB during subsequent phases of the Bay-Delta hearing process. In all, the following nine interagency, cooperative workgroups were formed to analyze

³ Carriage water is the extra Delta Outflow required due to increased export pumping to maintain a controlling Delta water quality standard.

technical issues raised by the 1988 Draft Plan and to evaluate the effects of alternative Bay-Delta standards: (1) Operation Studies, (2) Agricultural Water Conservation, (3) Urban Water Demand and Supply, (4) Delta Municipal and Industrial Water Quality, (5) Delta Salinity for Agriculture, (6) Public Trust Resources, (7) Conjunctive Use of Groundwater and Surface Water, (8) Water Year-Types and (9) Economics. The workgroups' conclusions were documented in numerous written reports, which were introduced as evidence during the next phase of the SWRCB's hearing process. The workgroups were open to the public and SWRCB staff were active participants in the workgroups. The success of these workgroups provided strong indication of the value of collaboration in analyzing California's technical water and environmental issues (SWRCB, 1990).

1991

1991 Plan for Salinity

The SWRCB adopts the 1991 Water Quality Control Plan for Salinity for the San Francisco Bay/Sacramento – San Joaquin Delta Estuary (SWRCB, 1991). The 1991 Plan includes the following modeling-related wording (SWRCB, 1991):

“To facilitate the exchange of modeling information and to reduce the duplication of modeling work, some members of the modeling community have suggested that an Interagency Modeling Development and Use Committee should be formed. As envisioned, this committee would meet periodically to perform the following tasks:

- Work cooperatively to develop and improve computer models and data bases,
- Train new model users on the proper use of existing and new computer models,
- Inform others on the advances in computer technology, including geographic information systems (GIS), and
- Review various study modeling assumptions and ensure that, when assumptions are varied, they are clearly documented when reporting model outputs.

[More specifically, a]n Interagency Modeling Development and Use Committee should be formed to:

- Facilitate exchange of modeling information and to reduce duplication,
- Improve access of information to all interested parties,
- Simulate operations of major reservoirs in addition to the CVP and SWP,
- Consider the effects of antecedent conditions,
- Improve temperature modeling for the Sacramento and San Joaquin River basins,
- Improve Delta channel depletion estimates in DAYFLOW,⁴
- Improve both water quality and flow modeling for the San Joaquin River Basin, and

⁴ DAYFLOW is a mass balance model of daily average Delta outflow from the Delta.

- Update hydrology to reflect current land use and groundwater / surface water interactions.

1992

Draft Decision 1630

In November 1992, the SWRCB releases (but does not finalize) the draft Water Right Decision 1630 for the San Francisco Bay/Sacramento – San Joaquin Delta Estuary (Draft Decision 1630). Draft Decision 1630 proposed to establish terms and conditions for interim protection of public trust uses of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Its purpose was to implement the 1991 Plan and require reasonable measures that will stop the decline and begin the recovery of public trust resources in the Estuary during an interim 5-year period while long-term standards are prepared (SWRCB, 1992).

1993

CUWA Comments on Draft Decision 1630

In its comments on draft Decision 1630, the California Urban Water Agencies (CUWA) recommends the establishment of an “Interagency Modeling Development and Use Committee,” which would be chaired by the SWRCB. According to CUWA, “[f]unctions of the Committee shall include assurance of the development and ongoing support of broadly available and readily usable analytical tools describing effects of requirements such as those specified in this Decision.” CUWA goes on to state that “[t]he major urban water agencies are prepared to discuss technical and financial support for such an effort” (CUWA, 1993).

Governor Requests Abandonment of Draft Decision 1630

On April 1, 1993, Governor Wilson asks the SWRCB to abandon draft Decision 1630. According to the Contra Costa Times and the San Francisco Chronicle (both dated April 2, 1993), the draft decision had the support of environmental groups and CUWA, but not the agricultural communities. (Contra Costa Times, 1993; S.F. Chronicle, 1993). Shortly after, the SWRCB abandoned draft Decision 1630.

Panel Discussion on Water Modeling

On April 7, 1993, the Committee for Water Policy Consensus holds a panel discussion on water modeling. During the panel discussion, SWRCB staff discusses a proposed Interagency Modeling Management Program whose objective is to cooperatively develop broadly available and readily usable computer models and databases that adequately describe the Bay-Delta watershed’s physical, chemical and biological processes. Other panelists included representatives from DWR, USBR, and CCWD (McPeak, 1993).

Side-Bar Discussion on Forming a Modeling Group

During an early 1993 meeting of the Bay-Delta Oversight Council (which was later absorbed into the CALFED organization) at the Holiday Inn in downtown Sacramento, Lyle Hoag of CUWA and Rich Satkowski of the SWRCB staff have a side-discussion on how forming a dedicated cooperative modeling group could help address many of the Bay-Delta watershed's technical modeling issues. (R.S. Satkowski, Personal Communication, April 18, 2024)

Lyle Hoag Establishes Bay-Delta Coordination Group

Beginning in July 1993, CUWA's Lyle Hoag establishes and moderates a Bay-Delta Coordination Group whose purpose is to establish a dedicated cooperative modeling group. The modeling group, later named the Bay-Delta Modeling Forum, was established because of consensus from the modeling community that there was a need to:

- resolve technical disagreements in a non-adversarial setting,
- allow an open exchange of technical information, and
- help ensure that technical work addresses the needs of stakeholders and decision makers.

The Bay-Delta Coordination Group, which included approximately 50 members representing 35 different organizations, was comprised of the following three subgroups: (1) Organizational Issues, (2) Interaction with Stakeholders, and (3) Technical Issues, including peer review. (BDCG, 1993).

Key issues identified by the subgroups are as follows:

- Organizational Issues: e.g., Who should be the Steering Committee representatives? Should the Steering Committee be led by a "Convener" with coordination powers only and only for a specified time frame? Where should it be housed? What are the proposed bylaws?
- Interaction with Stakeholders: e.g., How do we solicit stakeholders' interests and needs? Should one-on-one meetings be held? Should we survey key stakeholders?
- Technical Issues: e.g., Should we hold one-day workshops on key topics? Should workshops be a mixture of presentation and discussions? How do we factor economics and policy into the modeling effort? What are the steps involved in peer reviews and how do we fund the reviews?

1994

Pre-Formation Technical Workshop

Even before the BDMF is officially formed, the Bay-Delta Coordination Group conducts a Salinity-Outflow (X2) technical workshop on February 15 and 16, 1994.

Bay-Delta Coordination Group Forms the Bay-Delta Modeling Forum

On March 11, 1994, the Bay-Delta Coordination Group holds a plenary meeting and officially forms the **Bay-Delta Modeling Forum**. The meeting agenda included:

- adoption of bylaws,
- seating of the Steering Committee,
- election of officers, and
- organization of standing and Ad hoc committees.

As stated in the bylaws, the original stated purposes of the BDMF are as follows:

- To increase the usefulness of models for analyzing water-related problems in the San Francisco Bay, Sacramento-San Joaquin Delta and Central Valley system, and other related areas, as needed,
- To provide an open forum for the exchange, improvement and pooling of water-related models and modeling information, and professional resources,
- To seek input from California water resource system stakeholders and decision makers to better meet their modeling needs,
- To mediate technical disputes involving modeling, and
- To conduct impartial peer reviews of models so that strengths and weaknesses can be documented, improvements can be suggested, and appropriate applications can be identified.

The charter BDMF officers, which were elected to one-year terms, were as follows:

- Convener: Dr. Greg Gartrell (CCWD),
- Vice-Convener: Dr. Jeff Lefkoff (Hydrologic Consultants, Inc.),
- Secretary: Janice Jennings (Tehama-Colusa Canal Authority),⁵
- Treasurer: Margaret Johnston (Aquatic Habitat Institute; AHI), and
- Past-Convener: Lyle Hoag (CUWA).

Activities of the BDMF are guided by a steering committee composed of five officers elected by the membership, representative from 13 designated governmental water organizations in California, and 15 members chosen by the membership to represent universities, environmental organizations, private consultants, water user agencies, and the general public.

Originally, the general administration of BDMF was located at the AHI, while peer review and related activities will be housed at the Lawrence Livermore National Laboratory. The BDMF

⁵ In 1995, Dr. Peter Baker (Stillwater Sciences) was elected to replace Janice Jennings as Secretary. In 1995, Dr. George Nichol (U.S. Corps of Engineers) replaced Peter Baker who resigned as Secretary.

develops the following tag line: “Promoting Excellence and Consensus in Water and Environmental Modeling.”

BJ Miller’s Letter

During the BDMF’s plenary Steering Committee meeting, Lyle Hoag hands out a letter from consulting engineer (and former SWRCB member), BJ Miller, which states “[m]any of us spend much of our time and energy on matters that are highly contentious and largely unproductive, so it is especially gratifying to experience such cooperation in the pursuit of true progress.” He goes on further to state: “I hope that as the [BDMF] moves ahead during this critical start-up period, we can hang on to this spirit, and remember that we are involved in something we can be proud of, something that we could look back on years from now, long after the carriage water dispute has been amicably resolved under the calm, beneficent auspices of the [BDMF], after all the computers are humming cooperatively, and [so we can] say that we were there at the beginning of something good” (Miller, 1994)

BDMF Technical Workshops

Technical workshops generally fall into two general categories: educational workshops where the audience learns from subject matter experts and training workshops where the audience uses computers to learn a new modeling-related skill. After the BDMF was formally established, BDMF holds its first workshop entitled “Development of Sliding Scales for Use in Future Bay-Delta Standards” on April 14, 1994 at the CCWD offices in Concord, California. The following month, in May 1995, the BDMF held a key workshop on the carriage water dispute. A listing of CWEMF workshops from 1994-2023 is presented in Attachment 1.

Endowment of the Hugo B. Fischer Award

On April 19, 1994, Lyle Hoag submits a letter to the BDMF Steering Committee proposing and endowing the Hugo B. Fischer Award, which is given for (1) the development, refinement, or innovative application of a computer model or (2) furtherance of the effective use of models in planning or regulatory functions. The Hugo B. Fischer Award is made in honor of the late Dr. Hugo B. Fischer’s pioneering work on San Francisco Bay-Delta water quality modeling. Dr. Fischer was a professor of civil engineering at the University of California, Berkeley from 1966 until his death in 1983. Dr. Fischer was a recognized authority on salt-water intrusion, water pollution, heat dispersion in waterways, and the mixing of rivers and oceans. He is also known for developing the deterministic hydrodynamic and salt transport model, FDM, for the Sacramento-San Joaquin Delta in 1976.⁶

⁶ The Fischer Delta Model (FDM) simulates flow and salinity variations due to changes in channel geometry, hydrologic variability, and operation of control structures in an estuarial environment.

Contacting Stakeholders

On April 26, 1994, Dr. Greg Gartrell, the newly elected BDMF Convener, appears before the SWRCB and informs them of the formation of the BDMF.

1995

Initial BDMF Annual Meeting

In conjunction with the Interagency Ecological Program),⁷ the BDMF holds its first Annual Meeting at the Asilomar Conference Center near Pacific Grove, California, on March 8-10, 1995. BDMF presents its new Hugo B. Fischer Award to Dr. Richard Denton of CCWD and Professor Alan Jassby of U.C. Davis on development and use of the X2 salinity-outflow objective.

1996

Jay Lund's Two Terms as Convener

In 1996, Jay Lund (U.C. Davis) is elected as the BDMF Convener and, in 1997, becomes the first Convener elected to more than one term.

Peer Review Document

In 1996, BDMF develops a peer review document to provide guidance for organizations that would like the BDMF to conduct a peer review of models or modeling approaches. These reviews assist in bolstering confidence in the use of specific models to analyze California's water management issues. Peer reviews are not intended to provide "stamps-of-approval" or to disapprove models. Rather, their purposes are to: (1) document strengths and weaknesses, (2) suggest improvement, and (3) assess the suitability for intended applications (BDMF, 1996).

1997

First Executive Director

John Williams is hired as CWEMF's first Executive Director and continued serving through 2002.

2000

Modeling Protocols Document

In 2000, the BDMF develops the document "Protocols for Water and Environmental Modeling," which provides guidance to water stakeholders and decision makers, and their technical staff as

⁷ The Interagency Ecological Program (IEP) is a consortium of State and federal agencies that has been conducting cooperative ecological investigations since the 1970s. They provide and integrate relevant and timely ecological information for management of the Bay-Delta ecosystem and the water that flows through it.

models are developed and used to solve California’s water and environmental problems. The document was significantly revised in 2021 (CWEMF, 2000).

2001

Peer Review of 1-D Hydrodynamic and Transport Models

CWEMF conducts a peer review of 1-D Hydrodynamic and Transport Models (Sobey, 2001).

2002

Dr. Nigel Quinn’s Third Term as Convener

Dr. Nigel Quinn of Lawrence Livermore National Laboratory and the U.S. Bureau of Reclamation is elected as the BDMF Convener and, in 2004, becomes the first Convener elected to a third term. In subsequent years, Conveners volunteered to serve for, at least, two consecutive one-year terms.

Peer Review of the Integrated Groundwater and Surface Water Model (IGSM)

In early 2002, CWEMF funded a peer review of the methods used in the IGSM. This review was completed in May 2002 by the University of California at Davis, Hydrologic Sciences Graduate Group.⁸ (LaBolle, 2002).

2003

CWEMF’s Second Executive Director

Rich Satkowski is hired as CWEMF’s second Executive Director and continued serving through 2010.

2004

BDMF at Ten Years

At the 2004 Annual Meeting, the BDMF celebrates its ten-year anniversary, changes its name to CWEMF, and adopts a new logo. The new name and logo reflect the organization’s wider geographical scope, which is “...California and related areas, with emphasis in the San Francisco Bay, Sacramento-San Joaquin Delta, and the Central Valley.” The Annual Meeting’s theme is “Ten Years of Promoting Excellence and Consensus in Water and Environmental Modeling.” CWEMF presents its new Career Achievement Award to Lyle Hoag, former Executive Director of CUWA and co-founder of BDMF. The Career Achievement Award, which is presented at the Annual Meeting, is given to individuals for significant contributions over their career in developing, using, or promoting computer modeling to analyze California’s water-related problems. The

⁸ During this time frame, DWR embarked on developing its own version of IGSM (IGSM2 and later renamed IWFM), and its own version of the application to the Central Valley (C2VSIM, formerly CVGSM).

2004 keynote speaker was Eldridge Moores of UC Davis who discussed “[t]he Tectonic Context and Evolution of the San Francisco Bay, Delta and Central Valley.”

2005

Strategic Analysis Framework

In September 2005, CWEMF publishes “A Strategic Analysis Framework for Managing Water in California.” This framework guides the development of databases and models to provide reliable quantitative information under a broad range of scenarios. The framework is broad-based and involves agencies and expertise from all levels. It is technically focused and designed to support a variety of policy, planning, and management applications (Lund, 2005).

2006

Peer Review of San Joaquin River Valley CalSim II Model

In January 2006, CWEMF and the CALFED Science Program jointly sponsored and oversaw a review process of the CalSim 2’s updated modeling approach of the San Joaquin River Valley. The panel was chaired by Dr. J.R. Lund (University of California, Davis), and panel members were Dr. David Ford (David Ford Consulting Engineers), Mr. Les Grober (Central Valley Regional Water Quality Control Board), Dr. Thomas Harmon (University of California, Merced), and Dr. Daene McKinney (University of Texas, Austin). The panel published the results of its review in report, titled: Review Panel Report San Joaquin River Valley CalSim II Model Review (Ford, 2006).

2010

Distinguished Life Membership Award

CWEMF establishes its new Distinguished Life Membership Award and awards it to Dr. K.T. Shum of the East Bay Municipal Utility District, and formerly with the CCWD. The Distinguished Life Membership Award is presented to active or past members who, through long and distinguished service, have made a major contribution to CWEMF and to the California water and environmental modeling profession. The award is presented at the Annual Meeting.

2011

CWEMF’s Third Executive Director

Elaine Archibald is hired as CWEMF’s third Executive Director and continued serving through 2017.

2013

Peer Review of Three Central Valley Groundwater Models

CWEMF facilitates a peer review of three Central Valley groundwater models, IWFM, MODFLOW and HGS, which was conducted by Dr. Thomas Harter (U.C. Davis) and Dr. Hubert Morel-Seytoux

(Hydroprose Consulting International). In short, the review concluded that HGS lacked the management simulation capabilities built into the other peer reviewed models: MODFLOW and IWFEM. Primarily based on this peer review, the USBR decides to stop using the HGS model in California water planning (Harter, 2013).

2014

CWEMF at 20 Years

During the 2014 Annual Meeting, CWEMF celebrates its 20-year anniversary at the Lake Natoma Inn in Folsom, California. The change in venue was primarily due to two reasons: (1) Asilomar Conference Grounds, the prior venue, decided to focus on larger, more revenue-producing conferences and (2) fiscal constraints on governmental agencies. The Annual Meeting's theme was "20 Years of Supporting the California Water Community." The keynote speaker is Gary Bardini of DWR who discussed "Sustainable Water Management in California."

2018

CWEMF's Fourth Executive Director

In 2018, Paul Hutton is hired as CWEMF's fourth Executive Director and is presently serving.

2020

George Nichol Retires

After 25 years as the CWEMF Secretary, George Nichol (SWRCB, retired) retires. In 2011, he was awarded the CWEMF Distinguished Life Membership Award in recognition of his outstanding leadership in various CWEMF activities including his service as Secretary.

2021

Technical Workshops Incentive Program

On March 2, 2021, CWEMF implemented a Technical Workshops Incentive Program (TWIP) where CWEMF is providing Annual Meeting scholarships (up to a \$400 value) to individuals and organizations that organize technical workshops. The purpose of this incentive is to increase educational opportunities for CWEMF members by conducting more workshops as well as more diverse workshops.⁹

Modeling Protocols Report Update

On September 2021, CWEMF significantly revises its 2000 report, "Protocols for Water and Environmental Modeling." The protocols are intended to serve modelers as well as the broader community of model sponsors and stakeholders who have an interest in the quality and reliability of models and modeling studies. The 2021 revisions reflect changes in the practice of

⁹ CWEMF membership is not required to organize a technical workshop via TWIP.

modeling, key technological developments, and applications addressing current problems. These protocols are intended to represent best practices and guidelines, but are not proposed to be a requirement for use in water and environmental modeling in California. Since the report is a “living document,” CWEMF will ascertain whether a document update is needed at least once every three years (CWEMF, 2021).

Tariq Kadir’s Second Two-Year Term as Convener

After serving as the CWEMF Convener during 2015 and 2016, Tariq Kadir (DWR) was again elected to a second two-year term as Convener from 2021 and 2022.

2023

Updated CWEMF Logo

In 2023, CWEMF updated its logo.

2024

CWEMF at 30 Years

On September 23-25, 2024, CWEMF plans to celebrate its 30-year anniversary at the Lake Natoma Inn in Folsom, California. The Annual Meeting’s theme is “CWEMF at 30: Looking to the Past, Recalibrating for the Future.” The keynote speaker is Dr. Jay Lund, Emeritus Distinguished Professor in Civil and Environmental Engineering at U.C. Davis.

Closing Notes

CWEMF has made a real improvement in modeling and modeling discussions by providing the following:

- An informal discussion forum for mixing and dispersion of ideas and methods, supporting development, texting, and acceptance of many modeling innovations for California water problems,
- A useful place for both newer and experienced modelers to see the breadth of the California water modeling landscape and its continuing evolution, and
- A fun place for model developers, model users and the public to interact.

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Appendix 1: List of CWEMF Technical Workshops, 1994-2023

1994

- Salinity-Outflow (X2)
- Development of Sliding Scales for Use in Future Bay-Delta Standards

1995

- Biological Models: Current Status and Possibilities
- Delta Modeling for End Users
- Drinking Water Quality from the Bay-Delta
- Statewide Operations Modeling
- Toxics and Water Quality Modeling in the Bay-Delta & Upstream Areas
- Bay-Delta Monitoring
- Economics Modeling Related to Bay-Delta Management
- Bay-Delta Standards Agreement
- Delta Carriage Water

1996

- Advances in Hydrodynamic Research in San Francisco Bay
- Review of Basic Estuarine Hydrodynamics
- San Joaquin River Agricultural Drainage
- Modeling the CALFED Bay-Delta Alternatives
- Water Reliability Economics
- Habitat Restoration Modeling
- Managing Water Resources in Real-Time
- Central Valley Groundwater Modeling

1997

- Statistical Analysis of Coded-Wire Tag Data
- Adaptive Management
- Modeling Implementation of the Anadromous Fish Restoration Plan (3 days)
- Water Data Availability and Accuracy
- Delta Simulation Model (DWRDSM) Hydrodynamics Training (5 days)
- Development of Modeling Protocols

1998

- Temperature Modeling
- Legal and Technical Issues Related to Surface and Groundwater Interaction (w/ the Groundwater Resources Association of California)
- Approaches and Problems for Long-Term Regional Water Use Planning

- Modeling X2 (co-sponsored with IEP)

1999

- Operation of Upstream Hydroelectric Projects
- Delta Simulation Model (DWRDSM 2) Hydrodynamics Training (4 days)
- Modeling Dam Removal: Tools for Decision-makers

2000

- Elements of a Surface-Ground Water Modeling for Conjunctive Management
- Model Integration
- Carriage Water Technical Review
- Real-Time Hydrodynamics
- Riparian Restoration Projects on the Flood Conveyance Capacity of Stream Channels

2001

- Optimization of California Water Supplies using the CALVIN Model
- Implications of Climate Change (for the CALFED Restoration Program)

2002

- Integrated Groundwater Surface Water Model (IGSM2) Basic Training
- Fish Bypass Flows for Coastal Watersheds
- Streamflow and Water Availability Estimates in Ungaged Streams (w/ SWRCB)

2003

- Integrated Groundwater Surface Water Model (IGSM2) Basic and Advanced Training
- Climate Change and Its Impacts on Water Supply and Water Quality in California
- CALSIM II Operations Model Training
- Analytical Tools for the California Water Plan
- DWR Hydrodynamic and Transport Model Developments
- Identifying and Managing Uncertainty in Ground and Surface Water Models

2004

- HydroGeoSphere Modeling for Conjunctive Simulations of Surface/Subsurface Flow and Transport
- Using Models in Endangered Species Act Recovery Planning
- U.S. EPA TMDL Modeling Toolbox Training
- Long-Term Analytical Tools and Data Development and Use
- Screening and Decision Support Tools (w/ DWR CA Water Plan)

2005

- Modeling for CEQA and NEPA

2006

- The Next DSM2 Calibration: Speak Out and Pitch In
- Flood Modeling

2007

- Watershed and Urban Hydrology Modeling
- Improving Access to California's Water and Environmental Data
- WARMF: Watershed Analysis Risk Management Framework

2008

- California Central Valley Groundwater Modeling
- CalLite (Reservoir Operations)
- Watershed Modeling with HEC-HMS
- Shared Vision Planning
- Overview of Delta Nutrient Water Quality Problems

2009

- DSM2 Training
- Water Quality and Temperature Forecasting with WARMF- SJR

2010

No workshops conducted.

2011

- Ammonia/Nutrient Issues and Regulatory Oversight in the Delta
- Background and Technical Basis for the Biological Opinions

2012

- Improving Modeling the Delta: Consumptive Use
- Scenario Modeling, Management and Planning with WEAP

2013

- IWFM Demand Calculator (IDC) Version 4.0 Training
- C2VSim – Introduction and Training (2013 Session 1)
- C2VSim – Introduction and Training (2013 Session 2)

2014

- SELFE Overview
- PEST: Introduction and Advanced Analysis

- Integrated Water Management: Putting the Pieces Together
- C2VSim Training
- Economic Modeling of Agricultural Water Use and Production
- IWFM Version 4.0 Training

2015

- National Hydrography Dataset (NHD)
- Flood Management Training
- Metric Evapotranspiration
- Demand Calculator (IDC) Version 2015 Training
- PEST Calibration, Uncertainty Analysis and Model-Based Decision-Making
- SELFE Training
- California Water Plan Update 2013 – Roll Out of Technical Information

2016

- Intensive 4-Day Hands-on Training on Applying METRIC
- PEST Training
- NHD Plus GIS Training
- MODFLOW: One Water Hydrologic Flow Model
- IWFM Version 2015 Training
- C2VSim: Introduction and Training
- IWFM Demand Calculator (IDC) Version 2015 Training

2017

- MODFLOW: One Water Hydrologic Flow Model
- IWFM Version 2015 Training
- IWFM Demand Calculator (IDC) Version 2015 Training
- California Water Plan Update 2018: Performance Assessment and Sustainability Indicators

2018

- CalSim 3.0 Training
- Flood Management Modeling Tools and Applications

2019

- IWFM Version 2015 Training
- IWFM Demand Calculator (IDC) Version 2015 Training

2020

No workshops conducted

2021

- Ethical Decision-making in Environmental and Water Resources Modeling

2022

- IWFM Demand Calculator (IDC) Version 2015 Training
- Water Supply Reliability Estimation and Protocols for Water and Environmental Modeling

2023

- Integrated Water Flow Model (IWFM) Version 2015 Training