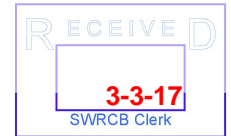




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3-7-17 Board Meeting-Item 7
Climate Change
Deadline: 3/3/17 12 noon



March 2, 2017

Chair Felicia Marcus and Board Members
c/o Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814
Sent via electronic mail to: commentletters@waterboards.ca.gov

RE: Support and Strengthen Climate Change Resolution

Dear Chair Marcus and Board Members:

Thank you for the opportunity to offer comment on the State Water Resources Control Board proposed Resolution Adopting a Comprehensive Response to Climate Change (Resolution). We strongly support the Board's development of this Resolution, an important first step to comprehensively integrate climate change mitigation and resiliency into the wide spectrum of Board management actions. However, the Resolution is just a first step, and recent events with California's drought, storms, and Oroville Dam crisis underscore the urgency of developing formal requirements that can be incorporated into Board permits, policies, and investments. We offer comments to ensure that the Resolution comprehensively addresses issues within its purview, and propose edits to strengthen language that sets the Board up for subsequent actions to address climate change.

I. The Resolution Should Recognize the Impact of Water Conservation and Seawater Desalination in Efforts to Reduce GHG Emissions.

As the Draft Resolution states, Water Boards issue permits, develop policies and regulations, and provide financing to promote water measures that mitigate greenhouse gas emissions and contribute to adaptation to the effects of climate change such as water recycling; water conservation and use efficiency; storm water capture; ecosystem protection, enhancement and restoration; drought response; and groundwater recharge. But not all water supplies are created equal when it comes to reducing greenhouse gas emissions. Seawater desalination, by increasing energy use, can cause an increase in greenhouse gas emissions, running counter to California's greenhouse gas reduction goals. Beyond the electricity required for the desalination facility itself, producing any new source of water, including through desalination, increases the amount of energy required to deliver and use the water produced, as well as to collect, treat, and dispose of the wastewater generated. Conservation and efficiency, by contrast, can help meet the anticipated needs associated with growth while maintaining, or even reducing, total energy use and greenhouse gas emissions. The Resolution should recognize how different water supplies that the Board has permitting authority over impact efforts to reduce greenhouse gas emissions.

While the Resolution recognizes the process underway to implement Executive Order B-37-16, it does not describe the significant greenhouse gas emissions reductions associated with water conservation. Data compiled by the University of California, Davis Center for Water-Energy Efficiency¹ shows that the state's nearly 25 percent reduction in water usage during the drought also reduced electricity usage in the state. Water conservation-related greenhouse gas savings over the entire period of the mandate represent the equivalent of taking nearly 50,000 cars off the road for a year.

¹ U.C. Davis Center for Water-Energy Efficiency. California H2Open Data Analysis Tool. University of California Davis: Davis, June 2016. Accessed January 2017 <<https://cwee.shinyapps.io/greengov/>>.

Water conservation is already recognized as a tool to mitigate greenhouse gas emissions in state guidance. The California Air Resources Board found that a 4.8 million metric ton reduction of carbon dioxide-equivalent emissions can be attained through reducing embedded energy in the water sector.² Further, the California Energy Commission finds that water conservation could save as much energy as some of the state's existing energy-efficiency programs — but at about half the cost — suggesting it is cheaper to save energy through water conservation and efficiency measures than through current and planned energy efficiency programs.³ In California's *20x20 Water Conservation Plan*, the Governor called on California to achieve a 20 percent reduction in per capita water use statewide by 2020 in the hopes of reducing greenhouse gas emissions.⁴ The *20x20 Plan* was also discussed in the *AB 32 Scoping Plan*, noting that reducing per capita water use by 20 percent would achieve a corresponding 1.4 million metric tons of carbon dioxide reductions.⁵

It will require steadfast commitment to conservation by state agencies, water agencies and the public to comprehensively and fully implement reforms described in the forthcoming Final Report Implementing Executive Order B-37-16. Recognizing the significant greenhouse gas emission benefits associated with conservation could help foster support for the new standards and practices. We urge the Board to add language to the Resolution explicitly recognizing the important role of water conservation in efforts to reduce greenhouse gas emissions.

The Resolution also fails to reference seawater desalination in the section regarding issues to be addressed to mitigate greenhouse gas emissions. This is a major oversight. The Los Angeles Economic Development Corporation found seawater desalination to emit more greenhouse gas emissions than any other water source,⁶ and the Inland Empire Utilities Agency similarly reported that desalination uses “over ten times more energy” in its service area than recycled water.⁷ A recent Pacific Institute analysis shows energy requirements for seawater desalination average about 15,000 kWh per million gal of water produced (3.96 kWh/m³).⁸ By comparison, the least energy-intensive options of local sources of groundwater and surface water require 0-3,400 kWh per million gal (0-0.90 kWh/m³); wastewater reuse, depending on treatment levels, may require 1,000-8,300 kWh per million gal (0.26-2.19 kWh/m³); and energy requirements for importing water through the State Water Project to Southern California range from 7,900-14,000 kWh per million gal (2.09-3.70 kWh/m³).⁹

² California Air Resources Board, *Water-Energy Sector Summary*, prepared for the AB 32 Scoping Plan, 17 (April 28, 2008).

³ Pacific Institute, *Water-Energy Synergies: Coordinating Efficiency Programs in California*, pg. 1 (2013). <<http://www.pacinst.org/wp-content/uploads/2013/09/pacinst-water-energy-synergies-full-report.pdf>>

⁴ Letter from Governor Arnold Schwarzenegger to Senators Don Perata, Darrell Steinberg Mike Machado (Feb. 28, 2008), <http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/docs/govltr_to_legislature022808.pdf> The Department of Water Resources' later plan to implement this goal limited the proposed 20% per capita reduction to urban water use only, despite the fact that the Governor's letter did not include the same limitation.

⁵ AB 32 Scoping Plan, Volume 1, at p. C-132.

⁶ L.A. Economic Development Corporation, *Where Will We Get the Water? Assessing Southern California's Future Water Strategies*, Draft Preliminary Findings (August 14, 2008), <http://www.laecd.org/reports/consulting/2008_SoCalWaterStrategies.pdf>

⁷ Martha Davis, Inland Empire Utilities Agency, Presentation to SWRCB (March 2009).

<http://www.swrcb.ca.gov/water_issues/programs/climate/docs/ieua_030409.pdf> See also California Energy Commission, “Life-cycle Energy Assessment of Alternative Water Supply Systems in California” (CEC-500-2005-101) <http://www.energy.ca.gov/research/environmental/project_summaries/PS_500-02-004_HORVATH.pdf> (evaluating the global warming potential of desalination versus recycling and import of water).

⁸ Pacific Institute, *Key Issues for Seawater Desalination in California: Energy and Greenhouse Gas Emissions* (May 2013); <<http://pacinst.org/app/uploads/2013/05/desal-energy-ghg-full-report.pdf>>

⁹ *Id.*

The State Water Board should recognize the greenhouse gas emission implications of seawater desalination in the Resolution, as it does with stormwater capture and water recycling. Further, the Resolution should direct Board staff to note the energy footprint of desalination plants in permitting processes and evaluation.

II. Improve Ecosystem Resilience.

Section 9.

We strongly support Section 9 of the proposed policy and urge the Board to adopt it. The last few years of severe drought, higher air temperatures, and extreme atmospheric rivers have provided a glimpse of the visceral impacts that climate change is likely to have on the hydrology of the San Francisco Bay-Delta Estuary, and associated impacts on water quality, ecosystem health, and water supply. California will simply be unable to achieve the co-equal goals for the Delta if the impacts of a changing climate are not incorporated into future water planning efforts.

Section 10.

Section 10 language could be strengthened to reflect statewide guidance, described in Section 71154 of the Public Resources Code, that agencies ensure that state investments promote the use of natural systems and natural infrastructure when developing physical infrastructure to address adaptation and utilize existing natural features and ecosystem processes, or the restoration of natural features and ecosystem processes, to meet the project's goals, where possible.¹⁰

We suggest the following edits to Section 10: *DWQ shall coordinate with the Regional Water Boards to identify actions the Water Boards could take to ~~incentivize~~ maximize, where applicable and feasible, the use of natural infrastructure ~~and for~~ shoreline protection.*

Section 10, or a subsequent section, should also explicitly reference research and recommendations of the West Coast Ocean Acidification and Hypoxia Panel,¹¹ which are currently being considered by Water Board staff and scientists to address water quality issues. Research regarding ocean acidification and ocean change continues, but we can and should undertake no-regrets policy actions to minimize pollution inputs to the ocean. For example, while ongoing research is calculating the extent to which nutrient pollution contributes to ocean acidification and hypoxia, we already know that the amount of nitrogen released in outfalls doubles the available nitrogen that comes from the natural upwelling in the ocean. The Board can amend policies and permits to reduce the amount of nutrients entering the ocean through public owned treatment works outfalls.

We offer the following language for inclusion in the Resolution: *The Board shall identify actions to minimize impacts associated with ocean acidification, hypoxia, increasing temperature, and nutrients, as described in the West Coast Ocean Acidification and Hypoxia report, and shall by December 15, 2017*

¹⁰ California State Legislature. (2015). Assembly Bill No. 1482: An act to amend section 75125 of, and to add Part 3.7 (commencing with Section 71150) to Division 34, of the Public Resources Code, relating to Climate Change. California Legislative Information. Accessed January 2017

https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB1482

¹¹ Chan, F., A.B Boehm, J.A. Barth, E.A. Chornesky, A.G. Dickson, R.A. Feely, B.Hales, T.M. Hill, G. Hoffman, D. Ianson, T. Klinger, J. Largier, J. Newton, T.F. Pedersen, G.N. Somero, M. Sutula, W.W. Wakefield, G.G. Waldbusser, S.B. Weisberg, and E.A. Whiteman. (2016). *The West Coast Ocean Acidification and Hypoxia Science Panel: Major Findings, Recommendations and Actions*. California Ocean Science Trust: Oakland, April 2016.

recommend no-regrets policies to reduce pollution inputs that exacerbate ocean change and create hotspots, as well as additional research needed to improve the Water Boards' ability to benefit ocean ecosystems.

III. Respond to Climate Change Impacts.

Section 15.

Section 15 states that the Division of Water Quality shall work with the Regional Water Boards to evaluate, and by July 1, 2018 make recommendations to the State Water Board on, the need to modify permits and other regulatory requirements to reduce water and wastewater treatment infrastructure vulnerability to flooding, storm surge, and sea level rise. However, the use of monitoring mechanisms to monitor inflow and the use backflow devices and other upgrades to address sea level rise impacts to water and wastewater infrastructure are well understood and have been in use throughout California for years. We urge the Board to immediately begin integrating sea level rise adaptation measures into infrastructure permitting and policies, parallel to the development of recommendations to reduce infrastructure vulnerability, as described.

It is also important to avoid approving upgrades to existing public works projects that are inconsistent with Coastal Commission sea level rise policies to avoid delaying important water quality improvements. The Resolution should be amended to direct State and Regional Boards to consult with the Coastal Commission on the Sea Level Rise Guidance Policy to ensure that any major capital investments to improve water quality are not in conflict with determinations by the Coastal Commission. Further, we urge the Board to investigate and prioritize nature-based adaptation approaches for State Water Board-mediated adaptation options, as described above.

Section 16.

We support Board use of the most current sea level rise data available through Cal-Adapt and consultation with Ocean Protection Council, Coastal Commission, State Lands Commission and Bay Conservation and Development Commission. However, we ask that the Board, in accordance with Coastal Commission guidance, direct their permitting actions to require an alternatives analysis for facilities in vulnerable areas to encourage retreat.

Missing Section on Drought Resiliency. As the Resolution recognizes, climate change is intensifying water management challenges.¹² Studies suggest California's droughts are becoming drier and longer in duration.¹³ Moreover, the state's hydrological regime is changing, with the timing of peak flows shifting and precipitation falling increasingly as rain instead of snow, stressing the operation of current water management systems.¹⁴ The National Climate Assessments stress that changes in precipitation and stream flow, due to climate change, will severely reduce water supply reliability in California.¹⁵ The Resolution

¹² Jiménez Cisneros, B.E., T. Oki, N.W. Arnell, G. Benito, J.G. Cogley, P. Döll, T. Jiang, and S.S. Mwakalila. 2014: Freshwater resources. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 229-269.

¹³ Diffenbaugh, N.S., D.L. Swain and D. Touma. 2015. Anthropogenic warming has increased drought risk in California. *PNAS* **112**(13): 3931-3936.

¹⁴ Willis, A.D., J.R. Lund, E.S. Townsley and B.A. Faber. 2011. Climate Change and Flood Operations in the Sacramento Basin, California. *San Francisco Estuary and Watershed Science* **9**(2).

¹⁵ Georgakakos, A., P. Fleming, M. Dettinger, C. Peters-Lidard, Terese (T.C.) Richmond, K. Reckhow, K. White, and D. Yates, 2014: Ch. 3: Water Resources. *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M.

fails to address the link between climate change and drought resiliency and preparedness, which is widely recognized as a best practice to address climate change impacts to our water system and create more sustainable water systems and reliable water supplies.

Missing Section on Recognition of Climate Change in Section 303(d) Listings.

Climate change is not only increasing the number and severity of existing waterway impairments, it is also driving new sources and causes of impairments. The most immediate impairments, and those with the strongest causal connection to global climate change, are driven by four principal dynamics: oceanic and estuarine carbon absorption, sea level rise, air and water temperature increases, and shifting precipitation patterns. In 2010, California Coastkeeper Alliance urged the State Water Board to ensure that the 303(d) list identifies ocean acidification and other climate change driven-impairments to waterway health. (see Attachment 1). Seven years later, we again urge the Water Board to address this issue in the Resolution. Climate change impairments include, but are not limited to:

Ocean Acidification:

- decreased pH of oceanic and estuarine waters
- acidification impacts to nearshore coastal waters, bays and estuaries

Sea level rise:

- salinity intrusion into groundwater basins hydrologically connected to surface waters
- salinity intrusion into estuaries, bays, and coastal rivers
- increased contaminant flows in waterways surrounding wastewater treatment plants and sewer outfalls
- habitat alterations

Air and water temperature increases:

- rivers, streams, and creeks climate change-driven temperature listings
- decrease in dissolved oxygen
- loss of temperature-dependent beneficial uses (e.g. cold freshwater habitat)

Shifting precipitation patterns:

- decreased reservoir levels and spring-fall flows (increased water temperature and decreased dilution of pollutants)
- increase in winter flows, flooding, and runoff (increase in sedimentation and pollutant runoff)

If the causes and sources of waterway impairments, including climate change, are not accurately addressed through the Section 303(d) listing process, then the management processes developed to address impairments will be flawed, wasting valuable public resources and time. We urge you to recognize this in the Resolution and immediately undertake work to address climate impairments through Section 303(d) processes.

IV. Rely on Sound Modeling and Analysis.

We strongly support Section IV, Items 17 to 19, of the proposed policy, which directs State and Regional Water Board staff to rely on the best available climate change data, models, and analysis services in decision-making regarding climate change adaptation and mitigation. This section calls for the State Water Board to work with partner agencies, including the Office of Information Management and

Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 69-112. doi:10.7930/J0G44N6T.

Analysis and the Department of Water Resources, to develop an open data platform and ensure all climate change efforts are guided by the best available science. This kind of explicit support for inter-agency collaboration and open data initiatives is critical for addressing a problem as complex as climate change.

AB 32, the California Global Warming Solutions Act of 2006, directed the State Air Resources Board to use the best available models and scientific methods in its analysis of greenhouse gas emissions.¹⁶ As such, the Air Resources Board has been a leader in the integration of science into policy making to address climate change. It is critical that the Water Boards make the same effort.

This Section is important for ensuring only the most relevant, up-to-date information is used, while still maintaining flexibility, which is critical in such a rapidly changing field. However, the State Water Board must ensure that that lack of specificity does not result in a lack of action, but rather encourages innovation and continued collaboration with partner agencies.

V. Utilize Funding Authority to Facilitate Climate Resiliency.

The Water Board could further strengthen agency practices to promote natural infrastructure by ensuring that any new guidelines for the clean water revolving fund and other funding sources require applicants to explain how they have examined the potential use of natural infrastructure to meet their objectives. We offer the below language for inclusion in the Resolution.

Section 21. *DFA shall, by July 1, 2017, ensure that applications and environmental reviews for potential projects account for impacts related to climate change, including potential effects of climate change on the viability of funded projects; and shall ensure that project scoping and environmental reviews include development and analysis of at least one project alternative that utilizes existing natural features and ecosystem processes or the restoration of natural features and ecosystem processes to meet the project's goals.*

We applaud the State Water Board for taking this important first step to enhance its capacity to address climate change and encourage adaptation and mitigation in the spectrum of Board management actions and programs. We look forward to continued work with the Water Board to develop and implement reforms to mitigate climate change and make our water systems and ecosystems more resilient.

Sincerely,



Sara Aminzadeh, Executive Director



Leah Campbell, Policy Analyst

¹⁶ California State Legislature. (2006). Assembly Bill No. 32: *California Global Warming Solutions Act of 2006*. California Legislative Information. Accessed January 2017
<https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32>.



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(510) 770 9764 www.cacoastkeeper.org

MEMORANDUM

To: Ms. Shakoor Azimi-Gaylon, State Water Resources Control Board
From: Sara Aminzadeh, California Coastkeeper Alliance
Date: May 13, 2011
RE: **Request for State Water Board Staff Guidance on Listing Waterways for Ocean Acidification and Other Climate Change-Driven Impairments**

I am writing to request that State Water Board staff issue guidance on listing waterways for climate change driven impairments under Section 303(d) of the Clean Water Act, including but not limited to ocean acidification, reduced flows and temperature impairments.

On November 15, 2010, U.S. EPA issued a memo that recognizes that carbon dioxide is a water pollutant and affirms that states should list coastal waters impaired by ocean acidification under the Clean Water Act. The memo says that states should begin to list bodies of water that suffer from ocean acidification as impaired as of 2012 where there is enough information to support such listings. Currently the state of California does not have any guidelines or information on what sort of data would suffice to support ocean acidification listings. As a result, research institutions such as the Ocean Acidification Research Network and Center for the Study of Ocean Acidification and Ocean Change are collecting data and studying ocean impacts to California waters without guidance as to what sort of data to collect, and how to present data to the State Water Board.

Board Staff guidance is needed as soon as possible so that ongoing data collection and monitoring efforts can feed into relevant policymaking processes. The current process to draft a Desalination Policy illustrates just one example of the need for Board guidance on incorporating climate change impacts to waterways. As California Coastal Commission scientist Tom Luster noted in his comments at the April 18, 2011 Desalination stakeholder meeting, discharges from desalination facilities decrease pH. The Desalination Policy must incorporate projected pH decreases associated with ocean acidification into discharge regulations. CCKA has presented climate change impairment information to the Board for inclusion in the 303(d) List, the Ocean Plan, and the Triennial Review Workplan (see attachments). Thus far, Board Staff has not indicated how data and information regarding climate change impacts to water quality will be integrated into the Board's regulatory processes. We respectfully request that Board Staff create this guidance to ensure that this massive and emerging category of threats to California water quality is addressed as expeditiously as possible.

Attachments: CCKA et al.'s August 30, 2010 Comment Letter on the Notice of Public Solicitation of Water Quality Data and Information for 2012 California Integrated Report [Clean Water Act Sections 305(b) and 303(d)] .

CCKA et al.'s March 10, 2011 Comment Letter on the California Draft Ocean Plan Triennial Review Workplan for 2011-2013, including Attachment: U.S. EPA November 15, 2010 Memorandum: Integrated Reporting and Listing Decisions Related to Ocean Acidification.

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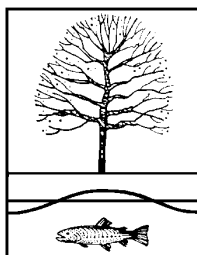
San Francisco
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San Luis Obispo
Coastkeeper

Santa Barbara
Channelkeeper

Santa Monica
Baykeeper

Ventura
Coastkeeper



August 30, 2010

Jeffrey Shu, State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-0100

VIA ELECTRONIC AND U.S. MAIL: jshu@waterboards.ca.gov

**RE: Notice of Public Solicitation of Water Quality Data and Information for 2012
California Integrated Report [Clean Water Act Sections 305(b) and 303(d)]**

Dear Mr. Shu:

The undersigned organizations have been active for many years on programs and issues affecting the quality and flow of the waters of the State. Our organizations have performed water monitoring and watershed surveys, and conducted outreach among a diverse group of citizens around California, to determine the most pressing issues for state waterway health. We welcome the opportunity to submit these comments in light of these significant and ongoing efforts.

We present in this letter two general themes of proposed listings. First, we highlight some examples of traditional “pollutant”-based “Category 5”¹ listings that are being proposed to you separately. This Category of listings has been the focus of the State Water Resources Control Board’s (State Board) 303(d) list to date. We urge the State Board’s careful attention to these and the other Category 5 listings proposed by the identified commenters as well as the undersigned organizations and others. The adoption of such proposed listings will help ensure clean, healthy waterways throughout the State.

Second, we highlight additional groups of listings that also identify impaired and threatened waters that should be listed under Category 4 (particularly 4C) or Category 5. Our analysis reveals three such groups that regularly impair designated beneficial uses but that have received inadequate attention in the state’s 303(d) process to date. These are: altered natural flows in surface waters, groundwater contamination and excessive groundwater withdrawals that impact surface water health, and anthropogenic climate change-caused impacts to surface waters. Impaired and threatened waterways from these groups of listings must be included in the 2012 303(d) list to ensure compliance with the Clean Water Act, and to achieve full restoration of the health of the waters of the state.

¹ Category references from U.S. EPA, “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act” (July 29, 2005), available at: <http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf> (2006 Guidance), and SWRCB, “Staff Report: 2010 Integrated Report Clean Water Act Sections 303(d) and 305(b)” (April 19, 2010) (2010 Integrated Report Staff Report), available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/2010ir0419.pdf.

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The State Water Board can and must ensure full compliance with Sections 303(d) and 305(b), and the 2006 Guidance, by listing these and other surface waters impaired by low flow caused by excessive groundwater withdrawals and pumping.¹⁸⁹

V. THE STATE WATER BOARD MUST INCLUDE IN ITS 2012 303(d) LIST ANTHROPOGENIC CLIMATE CHANGE-DRIVEN SOURCES AND IMPAIRMENTS OF CALIFORNIA WATERWAYS.

Global climate change is altering the biological, chemical, and physical properties of California waterways. Projected impacts in California provide an added impetus for the State Water Board to take swift action on flows and groundwater, as described above. For example, California's total water demand is projected to increase by up to 12% or more between 2000 and 2050, and the impacts of climate change will greatly increase the number of areas where water demands will exceed supplies.¹⁹⁰

Climate change will not only increase the number and severity of existing waterway impairments, it will also drive new sources and causes of impairments. Data and information in the California Climate Change Adaptation Strategy¹⁹¹ and other analyses generated by the state¹⁹² strongly suggest that climate change will have demonstrable impacts on beneficial uses of California waterways. The most immediate impairments, and those with the strongest causal connection to global climate change, are driven by four principal dynamics: oceanic and estuarine carbon absorption, sea level rise, air and water temperatures increases, and shifting precipitation patterns.

We respectfully request that the State Water Board ensure that the 303(d) list identifies climate change driven-impairments to waterway health, and consider including reference data and information contained herein in your pending "Guidance Document on Climate Change."¹⁹³ An initial identification of climate change-driven impairments is provided below as a starting point for the State Water Board's analysis of surface waters that should be included on the 2012 303(d) List as either threatened or impaired:

¹⁸⁹ Excessive groundwater withdrawals can also cause groundwater levels to decline below sea level, causing seawater to intrude into fresh water aquifers. Saltwater intrusion into groundwater aquifers is likely to become a pressing threat in many watersheds as sea level rises. (See AMEC Earth & Environmental (2005) Santa Clara River Enhancement and Management Plan. 260 p. Prepared for the Ventura County Watershed Protection District and Los Angeles Department of Public Works, Santa Barbara, Riverside, San Diego, California.) This threat is described in more detail in the climate change section below.

¹⁹⁰ Natural Resources Defense Council, *Water Facts: Climate Change, Water, and Risk: Current Water Demands Are Not Sustainable*, p. 2 (July 2010) ("NRDC Climate & Water Risk"). Available at <http://www.nrdc.org/global-warming/watersustainability/>.

¹⁹¹ The California Climate Adaptation Strategy, released in December 2009, summarizes the best known science on climate change impacts in California and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. California Natural Resources Agency, "2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2006," (CA Climate Adaptation Strategy), available at www.climatechange.ca.gov/adaptation.

¹⁹² See documents referenced in Section IV.A.

¹⁹³ See http://www.waterboards.ca.gov/water_issues/programs/climate/index.shtml#.

Ocean Acidification:

- decreased pH of oceanic and estuarine waters
- acidification impacts to nearshore coastal waters, bays and estuaries

Sea level rise:

- salinity intrusion into groundwaters hydrologically connected to surface waters
- salinity intrusion into estuaries, bays, and coastal rivers
- increased contaminant flows in waterways surrounding wastewater treatment plants and sewer outfalls
- habitat alterations

Air and water temperature increases:

- rivers, streams, and creeks: climate change-driven temperature listings
- decrease in dissolved oxygen
- loss of temperature-dependant beneficial uses (*e.g.* cold freshwater habitat)

Shifting precipitation patterns:

- decreased reservoir levels and spring-fall flows (increased water temperature, decreased dilution of pollutants)
- increase in winter flows, flooding, and runoff (increase in sedimentation and pollutant runoff)

These and other climate change-driven impacts are discussed in more detail below.

A. The State Must Use All Readily Available Data to Identify Climate Change-Driven Sources and Causes of Surface Waters Impairment.

As noted above, the State and Regional Water Boards must “actively solicit, assemble, and consider all readily available data and information,” including information reported by local, state, and federal agencies.¹⁹⁴ Given the global and quickly-evolving nature of climate change, the State Water Board should also consider information from international bodies, such as the Water Quality Section of the Intergovernmental Panel on Climate Change’s Assessment Report, which provides a useful overview of projected and already-occurring impacts to water quality. Additionally, local, state, and federal agencies have amassed a tremendous amount of regionally-scaled studies and analyses regarding climate change impacts to California water quality that have not yet been integrated into the State’s biennial 303(d) (or 305(b)) data collection. In particular, there is a significant amount of modeling and data on how climate change will impact the water quality and water supply of the San Francisco-San Joaquin Delta that should be considered.

More specifically, the State Water Board must examine and consider all readily available information that could inform 303(d) decisions related to climate change-driven impacts to California waterways, including but by no means limited to the following:

- Pertinent reports from the Department of Water Resources’ (DWR) Integrated Regional Water Management Climate Change Document Clearinghouse.¹⁹⁵ This Clearinghouse

¹⁹⁴ See CA Listing Policy, Section 6.1.1 Definition of Readily Available Data and Information.

¹⁹⁵ A complete list of climate change publications written by DWR is available at <http://www.water.ca.gov/climatechange/articles.cfm>.

references dozens of pertinent reports that detail projected climate impacts to water quality, flow and species, including several recent DWR reports on how impaired water bodies and water quality will be impacted by climate change, including sea level rise;

- Analysis in the *California Water Plan Update 2009*¹⁹⁶ on how impaired water bodies and water quality will be impacted by climate change;
- Information from DWR's *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water*¹⁹⁷ on waterways hydrologically connected to groundwater basins and on waterways vulnerable to sea level rise;
- Data and information in the Public Policy Institute of California's *Adapting Water Management to Climate Change*¹⁹⁸ on sea level rise and temperature impairments, as well as information on changes in the timing and amount of precipitation;
- Information regarding impairments stemming from salinity intrusion, inundation of wastewater treatment plants, and other impairments stemming from sea level rise in the Pacific Institute's *The Impacts of Sea-Level Rise on the California Coast*;¹⁹⁹
- Ocean carbon data from NOAA's Pacific Marine Environmental Laboratory²⁰⁰ and the U.S. Department of Energy's Carbon Dioxide Information Analysis Center;²⁰¹ and
- Data on changes in precipitation and temperature in the California Climate Tracker,²⁰² which is maintained by the Western Regional Climate Center, which would be extremely useful to identify related climate change-driven impairments as described below.

Information specific to the San Francisco-San Joaquin Delta includes, but is not limited to:

- Water quality monitoring data in the Central Valley Watershed Monitoring Directory, a joint effort by the San Francisco Estuary Institute (SFEI), the Central Valley Regional Water Quality Control Board Surface Water Ambient Monitoring Program (SWAMP) and the U.S. EPA;²⁰³
- Water quality and water supply studies from the CALFED Bay-Delta Program;²⁰⁴ including the Delta Regional Ecosystem Restoration Implementation Plan models;²⁰⁵
- Reports and resources from the Water Quality, Supply and Reliability Workgroup of the California Partnership for the San Joaquin Valley;²⁰⁶

¹⁹⁶ California Department of Water Resources (DWR), *California Water Plan Update 2009* (October 2009), available at <http://www.waterplan.water.ca.gov/cwpu2009/index.cfm>.

¹⁹⁷ DWR, *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water* (October 2008), available at <http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf>.

¹⁹⁸ Public Policy Institute of California, *Adapting Water Management to Climate Change* (November 2008), available at http://www.ppic.org/content/pubs/report/R_1108JLR.pdf.

¹⁹⁹ California Climate Change Center, *The Impacts of Sea-Level Rise on the California Coast* ("Impacts of Sea Level Rise on CA"), May 2009, available at www.pacinst.org/reports/sea_level_rise/report.pdf.

²⁰⁰ See Pacific Marine Environmental Laboratory homepage at <http://www.pmel.noaa.gov/co2/OA/>.

²⁰¹ Global Ocean Data Analysis Project, <http://cdiac.ornl.gov/oceans/>.

²⁰² See California Climate Tracker at <http://www.wrcc.dri.edu/monitor/cal-mon/>. Abatzoglou, J.T., K.T. Redmond, L.M. Edwards, "Classification of Regional Climate Variability in the State of California," *Journal of Applied Meteorology and Climatology*, 48, 1527-1541 (2009).

²⁰³ Central Valley Watershed Monitoring Directory: <http://www.centralvalleymonitoring.org/>.

²⁰⁴ CALFED Bay-Delta Program: http://www.science.calwater.ca.gov/science_index.html.

²⁰⁵ Delta Regional Ecosystem Restoration Implementation Plan at http://www.science.calwater.ca.gov/drerip/drerip_index.html.

²⁰⁶ California Partnership for the San Joaquin Valley Water Quality, Supply and Reliability Document Library http://www.sjvpartnership.org/wg_doc_lib.php?wg_id=10.

- The SWRCB's Final Report on Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem and studies supporting the recently-adopted Delta flow criteria;²⁰⁷ and
- DFG biological opinions on Delta smelt and other endangered species.

The State Water Board should solicit, assemble and consider all readily available data relating to climate change-driven impairments for the 2012 303(d) List, with a particular focus on developing appropriate 303(d) listings for which a large amount of data currently exists, such as for ocean acidification impairments and climate change-driven Delta waterway impairments. The Board should also use and consider data regarding potential sources and causes of impairment caused by climate change-driven sea level rise, warming and shifting precipitation. Finally, the Board should augment its "Climate Change and Water Resources" website with data and information regarding the aforementioned climate change-driven impairments.²⁰⁸

B. The State Water Board Must Take Immediate Action to Ensure That the 2012 303(d) List Reflects Data on Climate Change-Driven Impairments Related to Ocean Acidification.

There is a significant amount of data and information currently available with requisite specificity for assessing which waterways are impaired by ocean acidification for the 2012 303(d) List. The State must collect data regarding the pH of bays, estuaries, the ocean, near-coastal areas, and coastal shorelines, and list waterways impaired or threatened by ocean acidification. The State Board must take action to ensure that the 2012 303(d) List contains pertinent data and lists impaired waterways as appropriate. If the State declines to do so, it must submit a "rationale" for not doing so, as required by the Clean Water Act, though we urge the State to implement its responsibilities and authorities fully in ensuring comprehensive listings.

Ocean acidification, a decrease in ocean pH fueled by the ocean's absorption of carbon dioxide, threatens the seawater quality of California's bays and estuaries. The ocean absorbs about half of all anthropogenic carbon dioxide emissions, an estimated 22 million tons of carbon dioxide (CO₂) every day.²⁰⁹ When CO₂ dissolves in seawater it forms carbonic acid, which decreases ocean pH and causes "ocean acidification."²¹⁰ Global average surface pH has already decreased by approximately 0.1 units, and is expected to decrease by another 0.3-0.4 units by the end of the century, depending on future levels of atmospheric carbon dioxide.²¹¹

The latest science indicates that ocean acidification impacts to the seawater quality of California bays, estuaries and near coastal areas may already be occurring, and are projected to

²⁰⁷ http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/

²⁰⁸ See http://www.waterboards.ca.gov/water_issues/programs/climate/index.shtml.

²⁰⁹ Feely, R. A., C. L. Sabine, K. Lee, W. Berelson, J. Kleyvas, V. J. Fabry, and F. J. Millero. "Impact of anthropogenic CO₂ on the CaCO₃ system in the oceans," *Science* 305:362-366 (2004).

²¹⁰ Orr, J.C. *et al.* "Research Priorities for Understanding Ocean Acidification," *Oceanography*, 22(4): 182 (2009).

²¹¹ Hauri, Claudine, Gruber, N, Lachkar, Z., Plattner, G. Abstract. "Accelerated acidification in eastern boundary current systems," Goldschmidt Conference Abstracts (2009); citing Orr, J.C., V.J. Fabry, O. Aumont, L. Bopp, S.C. Doney, R.A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, et al, "Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms," 437 *Nature* 681-86 (2005), <http://www.nature.com/nature/journal/v437/n7059/full/nature04095.html>.

accelerate.²¹² In 2008, scientists discovered high levels of acidified ocean water within 20 miles of the Pacific Coast.²¹³ Given that atmospheric levels of carbon dioxide have increased drastically in the last half century, and are likely to increase further, such acidification trends are projected to increase, a trend that should be considered in projecting “threatened” waterways in particular.²¹⁴ Natural upwelling in nearshore waters, coupled with oceanic uptake of anthropogenic CO₂, mean that “ocean acidification has already decreased mean surface water pH in the California Current System to a level that was not expected to happen for open-ocean surface waters for several decades.”²¹⁵ Projections indicate that the Humboldt Current System, another eastern boundary upwelling system that impacts ocean waters off of California, may be subject to the same conditions.²¹⁶

There is precedent both for listing waterways impaired or threatened by atmospheric sources of pollution and for listing waterways impaired for pH. U.S. EPA maintains a list of waterways impaired for pH under the 303(d) program, with more than 3,500 waterbodies so listed as of May 2010.²¹⁷ Section 303(d) of the Clean Water Act also has been interpreted by both U.S. EPA and states to cover waterways impaired by atmospheric sources of pollution (such as carbon deposits). Specifically, in March 2007, EPA issued information on listing waters impaired by mercury from atmospheric sources under Section 303(d) of the Clean Water Act.²¹⁸ Subsequent to EPA’s action, in October 2007, a group of Northeast states established the Northeast Regional Mercury TMDL, a regional cleanup plan to reduce mercury entering the states’ watershed from a range of pollution sources, including atmospheric deposition of mercury.²¹⁹

In response to legal action from the Center for Biological Diversity directly on the issue of climate change, the U.S. EPA solicited public comment on how to address listing of waters as threatened or impaired for ocean acidification under the 303(d) program.²²⁰ California need not wait for EPA’s issuance of guidance on listing waters impaired by ocean acidification. The State should immediately assemble and consider all readily available evidence regarding waters impaired by ocean acidification and list waters accordingly.

²¹² Byrne, R. H., S. Mecking, R. A. Feely, and X. Liu (2010), “Direct observations of basin-wide acidification of the North Pacific Ocean,” 37 *Geophys. Res. Lett.* (2010), L02601, doi:10.1029/2009GL040999, <http://www.agu.org/journals/ABS/2010/2009GL040999.shtml>.

²¹³ Feely, R. A., C. L. Sabine, J. M. Hernandez-Ayon, D. Ianson, and B. Hales, “Evidence for upwelling of corrosive “acidified” water onto the continental shelf,” *Science* 320:1490-1492 (2008), <http://www.sciencemag.org/cgi/content/abstract/sci;320/5882/1490>. See also Hauri *et al.* at p. 66.

²¹⁴ *Id.* See also <http://www.sciencedaily.com/releases/2008/05/080522181511.htm>.

²¹⁵ Hauri *et al.* at p. 69.

²¹⁶ *Id.*

²¹⁷ See Environmental Protection Agency Watershed Assessment, Tracking & Environmental Results webpage, Specific State Causes of Impairment That Make up the National pH/Acidity/Caustic Conditions Cause of Impairment, available at: http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.cause_detail_303d?p_cause_group_id=1188.

²¹⁸ Hooks, Craig, EPA Office of Wetlands, Oceans, and Watersheds, “Memorandum: Listing Waters Impaired by Atmospheric Mercury Under Clean Water Act Section 303(d): Voluntary Subcategory 5m for States with Comprehensive Reduction Programs” (March 8, 2007).

²¹⁹ New England Interstate Water Pollution Control Commission, “Northeast Regional Mercury Total Maximum Daily Load,” p. 32 (October 24, 2007), available at <http://www.neiwpcc.org/mercury/mercurytmdl.asp>.

²²⁰ See EPA’s Federal Register Notice at http://www.epa.gov/owowwtr1/tmdl/oceanfrMarch_2010/.

C. The State Water Board Must Use and Consider Data on Sea Level Rise, Warming, and Precipitation Changes That Cause or Are Potential Sources of Impairments.

Projections of climate change-driven sea level rise, increased temperature, and shifting precipitation patterns will continue to have a major impact on California's water quality. The water quality impacts of climate change-driven sea level rise will be felt throughout California. In particular, a change in sea level will substantially alter San Francisco Bay-Delta conditions, where water surface elevations and associated fluctuations drive Bay-Delta hydrodynamics, which in turn dictate the location and nature of physical habitat and the quantity and quality of water.²²¹ Even under modest sea level rise and climate warming projections, an increase in the frequency, duration, and magnitude of water level extremes is expected in the Delta, to the detriment of numerous waterway beneficial uses.²²²

As for ocean acidification, we respectfully request that the State Water Board review and assess whether water bodies are impaired or threatened by climate change and also to list climate change as a potential source of impairment, where appropriate, on the 2012 303(d) List.²²³ As outlined at the beginning of this section, we bring the following impairments to the Board's attention, although review of climate change impairments should by no means be limited to the impairments described below.

1. Sea Level Rise

Climate change is projected to result in sea level rise in California of 16 inches by 2050 and 55 inches by the end of the century.²²⁴ In the Bay Area, 180,000 acres of shoreline are vulnerable to flooding by 2050, putting 21 wastewater treatment plants at risk of inundation.²²⁵ Sea level rise also will substantially impair California's waterways by causing saltwater intrusion into estuaries and hydrologically connected groundwaters, inundating or eroding habitats, altering species composition, changing freshwater inflow, and impairing water quality.

a. Saltwater intrusion of hydrologically connected groundwaters.

Saltwater intrusion into aquifers is a man-made problem in many places in California, resulting from over-pumping and excessive withdrawals from groundwater aquifers.²²⁶ Pumping coastal aquifers in excess of natural recharge rates draws down the surface of the aquifer, allowing surface water to move inland into a freshwater aquifer and contaminate it with salts.²²⁷ When the ocean has a higher water elevation, it causes the saltwater wedge to intrude further

²²¹ CALFED Bay-Delta Program Independent Science Board, Memorandum: *Sea Level Rise and Delta Planning* (September 6, 2007).

²²² *Id.* at 2.

²²³ See discussion in Section III. above regarding "causes" versus "sources" of impairment.

²²⁴ California Climate Change Center, "Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment (Draft Paper)," available at www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF.

²²⁵ *Id.*

²²⁶ *Impacts of Sea Level Rise on CA* at 80.

²²⁷ *Id.*

inland.²²⁸ Seawater intrusion is already problematic in California's coastal aquifers throughout Central and Southern California, including the Pajaro and Salinas Valleys and aquifers in Orange and Los Angeles Counties. Groundwater supplies in the Santa Clara Subbasin are also vulnerable to salinity intrusion.²²⁹

Overdraft and saltwater intrusion into groundwater aquifers will be accelerated and made worse by sea level rise. Where these groundwater aquifers are hydrologically connected to surface waters, and thus affect the water quality of those surface waters, the State Water Board should list climate change/sea level rise as a source or cause of impairment so that appropriate remedial action can be taken.

b. Salinity intrusion into estuaries

Sea-level rise and changes in the intensity of storm events will impact low-lying coastal areas and result in the loss or inundation of coastal wetlands and dune habitat, resulting in salt water intrusion and loss of freshwater habitat for fish and wildlife.²³⁰ Changes in salinity from reduced freshwater inflow will affect fish, wildlife and other aquatic organisms in intertidal and subtidal habitats. Increasing rates of saltwater intrusion into groundwater that impacts the beneficial uses of connected surface waters will need to be addressed in water quality management decisions, including the 303(d) List.²³¹

c. Increased contamination from inundation of wastewater treatment facilities and sewer outfalls.

A recent Pacific Institute study found that a 1.4 meter sea level rise makes 28 wastewater treatment plants vulnerable to inundation: 21 plants around the San Francisco Bay and 7 other plants on the Pacific coast.²³² The combined capacity of these plants is 530 million gallons per day.²³³ Some wastewater treatment plants are preparing for projected inundation,²³⁴ but many more are not taking any action. Inundation from sea level rise, as well as an increased number of extreme weather events, could damage pumps and other treatment plant equipment and interfere with discharges from outfalls sited on coast and bay shorelines.²³⁵ This will lead to an increased

²²⁸ *Id.*

²²⁹ Santa Clara Valley Water District, "Groundwater Quality Report," p. 19 (2008) ("Saltwater intrusion of the Santa Clara Subbasin shallow aquifer zone adjacent to the southern shore of the San Francisco Bay has been studied and monitored for many years by the District. Although the contamination has been somewhat widespread in the shallow aquifer zone, fortunately, the lower aquifer has not been affected significantly.")

²³⁰ *CA Climate Adaptation Strategy* at 73.

²³¹ *Id.* at 70.

²³² *Impacts of Sea Level Rise on CA* at 62-63, see Figure 24: Wastewater treatment plants on the Pacific coast vulnerable to a 100-year flood with a 1.4m sea-level rise.

²³³ *Id.* at 63.

²³⁴ In 2009, the City of Morro Bay commissioned a *Wastewater Treatment Plant Flood Hazard Analysis* and concluded that the existing wastewater treatment plant (WWTP) was subject to inundation from the Morro Creek watershed. The City recommended that the new site for a WWTP be developed with the placement of engineered fill to raise the new site above the 100-year flood elevation. See City of Morro Bay and Cayucos Sanitary District Wastewater Treatment Plant Upgrade Project, Facility Master Plan Draft Amendment No. 2, p. 12 (July 2010).

²³⁵ *Id.* at 63.

number of untreated and partially treated sewage discharges and increased contamination and impairment of proximate waterways.

Discharges from sewage treatment plants already impair waterbodies throughout California. Pathogen impairments, which are linked to discharges from wastewater treatment plants among other sources, represent the second highest number of impairments for California waterways.²³⁶ High concentrations of bacteria such as fecal coliform and E. coli raise the risk of waterborne diseases and starve fish of the oxygen they require, destroying several beneficial uses for affected waterbodies.

d. Sea level rise-caused habitat alterations

EPA records show 699 waterbody-segments listed nationwide as impaired due to “habitat alteration.” This habitat alteration impairment group captures numerous impacts to waterways, including but not limited to alterations to wetland habitats, habitat barriers, degraded habitat and other forms of habitat alterations. Projected sea level rise similarly could result in a large number of habitat alteration impairments, both directly from sea level rise alteration to coastal wetland and other habitats, and indirectly by prompting construction of hard structures on the coastline such as seawalls and levees.

For example, according to the report *Impacts of Sea Level Rise on the California Coast* rising seas threaten to substantially modify or destroy wetland habitats.²³⁷ More specifically:

Vast areas of wetlands and other natural ecosystems are vulnerable to sea level rise. An estimated 550 square miles, or 350,000 acres, of wetlands exist along the California coast, but additional work is needed to evaluate the extent to which these wetlands would be destroyed, degraded, or modified over time. A sea level rise of 1.4 m would flood approximately 150 square miles of land immediately adjacent to current wetlands, potentially creating new wetland habitat if those lands are protected from further development.”²³⁸

2. Air and water temperature increases

a. Warming of streams and rivers

New research shows that water temperatures are increasing in many streams and rivers throughout the United States,²³⁹ with less water available for ecosystem flow and temperature needs in spring and summer.²⁴⁰ In many low- and middle-elevation streams today, summer temperatures often approach the upper tolerance limits for salmon and trout; higher air and water

²³⁶ http://iaspub.epa.gov/waters10/state_rept.control?p_state=CA&p_cycle=.

²³⁷ *Impacts of Sea Level Rise on CA* at 27.

²³⁸ *Id.* at 17.

²³⁹ Kaushal et al., “Rising stream and river temperatures in the United States,” *Frontiers in Ecology and the Environment*, 2010; 100323112848094 DOI: [10.1890/090037](https://doi.org/10.1890/090037); University of Maryland Center for Environmental Science, “Rising water temperatures found in US streams and rivers” (April 7, 2010), available at: <http://www.sciencedaily.com/releases/2010/04/100406101444.htm>.

²⁴⁰ *CA Climate Adaptation Strategy* at 80.

temperatures will exacerbate this problem.²⁴¹ Thus, climate change might require dedication of more water, especially cold water stored behind reservoirs, to simply maintain existing fish habitat.²⁴² The 303(d) List should reflect instances where scientific evidence suggests that climate change is a cause or source of temperature impairments. Doing so would ensure that appropriate mitigating and prevention measures can be taken.

b. Decrease in dissolved oxygen

An inverse correlation between water temperature and the amount of dissolved oxygen in a waterbody is well-known and understood by water quality managers. Many California waterbodies that are impaired for temperature are also impaired because of low dissolved oxygen. Where waterbodies experience unnaturally high temperatures, the amount of dissolved oxygen can drop to levels that negatively impact water quality and aquatic species. Studies suggest that climate change-driven warming of streams, rivers, and other waterways could similarly decrease dissolved oxygen levels.²⁴³ This is a phenomena the State Water Board must track and address in its 303(d) list, as appropriate.

3. Shifting precipitation patterns

Observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change.²⁴⁴ The decrease in precipitation and increase in potential evapotranspiration will have a significant affect on California's "available precipitation," which means water falling as rain or snow.²⁴⁵ Projections suggest that precipitation will decline five inches per year by 2050 in California.²⁴⁶ The Department of Water Resources projects that the Sierra Nevada snowpack may be reduced from its mid-20th century average by 25 to 40 percent by 2050.²⁴⁷

a. Longer low flow conditions

Climate change should be specifically identified as the source of low flow conditions where data so indicate. For example, projected declines in summer stream flows may impair Delta waterways through low-flow conditions and higher stream water temperatures.²⁴⁸ As freshwater inputs decrease, Delta water quality may also be degraded as saltwater intrudes further upstream from the Pacific Ocean.²⁴⁹ Salinity intrusion, low-flow conditions and higher

²⁴¹ *Id.*

²⁴² *Id.*

²⁴³ See IPCC Assessment Report, Working Group II: "Impacts, Adaptation and Vulnerability," Section 4.3.10 available at <http://www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=173>; B. A. Cox and P. G. Whitehead, "Impacts of climate change scenarios on dissolved oxygen in the River Thames, UK, Hydrology Research," 40(2-3): 138-152 © IWA Publishing 2009 doi:10.2166/nh.2009.096.

²⁴⁴ Climate Change and Water: Intergovernmental Panel on Climate Change Technical Report VI – June 2008, available at:

http://www.ipcc.ch/publications_and_data/publications_and_data_technical_papers_climate_change_and_water.htm.

²⁴⁵ NRDC *Climate & Water Risk* at 2.

²⁴⁶ *Id.*

²⁴⁷ CA Climate Adaptation Strategy at 82.

²⁴⁸ *Id.* at 86.

²⁴⁹ *Id.*

stream water temperatures are all sources and causes of waterway impairment that could and should be addressed under the State Water Board's 2012 303(d) process.

The California Natural Resources Agency made an initial determination that mitigating these impacts requires more freshwater releases from upstream reservoirs.²⁵⁰ The State Water Board should work with the Central Valley Regional Water Quality Control Board to examine data on climate change-driven impairments of Delta waterways and tributaries so that impaired waterways can be correctly identified and appropriate mitigating actions can be implemented to restore waterway health.

b. Increased contamination from stormwater runoff

Many models project higher contaminant concentrations in waterways as less frequent but more intense rainfall patterns change water quality.²⁵¹ An increased number and severity of extreme weather events and storm surges are also predicted. These climate change-driven phenomena will increase runoff and flooding, thus exacerbating levels of storm water pollution and sediment runoff.

* * *

Thank you for the opportunity to provide this information in support of a comprehensive 2012 Section 303(d) list that meets the mandates of the Clean Water Act. California's 303(s) list cannot be limited to "traditional" Category 5 listings. To comply with the Act, and to help lead the state to achieving its goals of clean waters with healthy flows and biodiverse aquatic ecosystem, the 2012 303(d) list must also include waterways impaired or threatened by: altered natural flows in surface waters, groundwater contamination and excessive groundwater withdrawals that impact surface water health, and anthropogenic climate change-caused impacts to surface waters. The data and information contained and referenced in this letter, as well as extensive other databases and peer-reviewed reports that are readily available to the State and Regional Water Boards, should provide more than adequate support for the listing of numerous waterways that are impaired and threatened and that therefore require the state's attention under the Clean Water Act and Porter-Cologne.

If you have any questions, please do not hesitate to contact us.

²⁵⁰ *Id.*

²⁵¹ *CA Climate Adaptation Strategy* at 82.

Sincerely,



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March 10, 2011

Charles Hoppin, Chair and Members
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c/o Jeanine Townsend, Clerk to the Board
Via Electronic Mail: commentletters@waterboards.ca.gov

Re: Comments on the California Draft Ocean Plan Triennial Review Workplan for 2011-2013

Dear Chair Hoppin and Board Members:

On behalf of the California Coastkeeper Alliance (CCKA), which represents 12 Waterkeeper organizations spanning the coast from the Oregon border to San Diego, Heal the Bay, and Center for Biological Diversity, we welcome this opportunity to provide comments regarding the March 1, 2011 Draft California Ocean Plan Triennial Review Workplan for 2011-2013 ("Workplan").

As described in this letter, we support the immediate prioritization of work to address Issue 3 (Controlling Commercial Vessel Discharges and Invasive species), Issue 4 (Ocean Desalination and Brine Disposal), and Issue 8 (Plastic Debris and Trash Regulation). However, we must register our opposition to the Board's indication in the Workplan that it will not begin work on Issue 13 (Update Biological Objectives and Chemical Characteristics Sections to Account for Climate Change Impacts) until the next Triennial Review Period. In addition, there are items discussed in Heal the Bay's comment letter dated September 9, 2010 that have not been deemed priority issues in the Workplan. We urge the State Water Resources Control Board ("Board") to reconsider this prioritization, and to incorporate the previous Ocean Plan comments submitted by our collective organizations.

Issue 3: Controlling Commercial Vessel Discharges and Invasive Species.

We are pleased to see that amendments are in progress for controlling commercial vessel discharges and invasive species. We strongly support the Board's designation of this issue as a "Very High" priority slotted for completion in the coming year. As discussed in our September 10, 2010 letter to the Board, CCKA and other environmental groups have raised the issue of managing vessel waste through the Ocean Plan for over a decade.¹ U.S. Environmental Protection Agency (U.S. EPA) has urged the Board to give high priority attention to this issue, because of its ecological and economic significance, and in particular, "to review the U.S. Coast Guard's proposed voluntary national guidelines for ballast water exchange to determine whether they are likely to be adequate to protect California's ocean waters."²

¹ See Letter from Linda Sheehan, Center for Marine Conservation and Ann Notthoff, NRDC to Dr. Francis Palmer, SWRCB, Comments on Triennial Review of the California Ocean Plan (Oct. 15, 1998), Attachment 1 to Letter from The Ocean Conservancy, NRDC and Defenders of Wildlife to SWRCB (May 17, 2004); Letter from Heal the Bay, California Coastkeeper Alliance and Defenders of Wildlife to SWRCB, "Comments on the Amendments to the California Ocean Plan Scoping Document" (July 19, 2007).

² 2011 Triennial Review Workplan for 2011-2013 (March 1, 2011), p. 5, (2011 Draft Triennial Review Workplan), available at http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/trirev/wrkpln2011_13.pdf.

The Workplan states that “staff plans to propose Ocean Plan amendments to align it with requirements in existing law and regulation.”³ In crafting these amendments, we urge the Board to delete the exclusion for vessel waste discharges, and encourage the Board to refer to our previous comment letter⁴ for more information.

Issue 4: Ocean Desalination and Brine Disposal.

We strongly support the Board’s designation of desalination facilities as a “Very High” priority. The question of applying water quality objectives to desalination discharges has been raised in Triennial Reviews since 1998.⁵ The pace with which desalination projects are now being proposed and planned makes it imperative that the Board take action now. As the Board recognizes in its Workplan, there are currently no Ocean Plan Water Quality Objectives that apply specifically to brine waste discharges from desalination plants or groundwater desalting facilities. Accordingly, we urge the Board to prioritize work on the issue for completion in 2011, instead of 2012, as indicated in the Workplan.

The Workplan indicates that Ocean Plan amendments will utilize a narrative objective for salinity.⁶ In doing so, we urge the Board to ensure that salinity levels are not above background levels outside of the zone of initial dilution. If the Board crafts a narrative objective for salinity based on a percentage of natural background—an approach that was considered in 2007—we urge the Board to review the best available science to calculate a percentage of background levels that will protect marine species, with an added margin of safety. We support the Board’s inclusion of strong limits on impingement and entrainment from desalination intakes, and a strong implementation policy.

Issue 8: Plastic Debris and Trash Regulation.

Given the magnitude of California’s trash and marine debris problem, we urge the Board to upgrade its designation of the issue from “High” to “Very High,” and to prioritize the establishment of a trash objective for 2011. The timely establishment of a trash objective would inform the Board’s parallel process to craft a Statewide Trash Policy for all California waters. As previously indicated by environmental groups, a numeric water quality objective of “zero” for trash is the appropriate standard. This is the only standard that complies with water quality standards in the Clean Water Act, and would guarantee protection of the beneficial uses of the ocean environment.

Issue 13: Update Biological Objectives and Chemical Characteristics Sections to Account for Climate Change.

We respectfully disagree with the Board’s conclusion that the existing Ocean Plan narrative pH objectives and biological objectives are sufficiently protective of ocean water quality and marine species.⁷ Accordingly, we also object to the Board’s assessment that an evaluation of climate change impacts to ocean water quality can wait until the next Triennial Workplan, beginning in 2014.

- 1. The Board should update its pH criteria and make other Ocean Plan amendments to reflect current science and law on ocean acidification.*

As discussed in CCKA’s September 10, 2010 Letter, we believe that staff should update the decades-old pH standard in Ocean Plan Section II.D.2, which states that “the pH shall not be changed at

³ 2011 Draft Triennial Review Workplan at p. 5.

⁴ Letter from Heal the Bay, California Coastkeeper Alliance and Defenders of Wildlife to SWRCB, “Comments on the Amendments to the California Ocean Plan Scoping Document” (July 19, 2007) (attached to these comments).

⁵ *Supra* note 1.

⁶ 2011 Draft Triennial Review Workplan at p. 6.

⁷ 2011 Draft Triennial Review Workplan at p. 15.

any time more than 0.2 units from that which occurs naturally.”⁸ This standard fails to reflect modern scientific knowledge, as is required by the Clean Water Act.⁹ Mounting ocean acidification science indicates that a 0.2 change in pH will, in fact, adversely impact sea water quality.¹⁰

On November 15, 2010, U.S. EPA released a memo (see attached) that recognizes that carbon dioxide is a water pollutant and affirms that states should address coastal waters impaired by ocean acidification under the Clean Water Act.¹¹ EPA’s memo specifies that states should begin to list bodies of water impacted by ocean acidification as impaired starting in 2012. This EPA memo, which was released after we submitted our letter requesting that the Board address ocean acidification in the Ocean Plan, but well before the Board released its Triennial Workplan for 2011-2013, warrants the Board’s reconsideration of whether and when to address climate change impacts to ocean water quality in the Ocean Plan.

An ever-growing body of scientific literature and data regarding ocean acidification compounds EPA’s clarification about the legality of addressing ocean acidification through water quality regulations. The Board should adopt a more stringent water quality criteria, and standards that gauge ocean acidification. The U.S. Ocean Carbon and Biogeochemistry community of scientists provided useful comments to EPA about how such standards could be developed by looking at a variety of parameters to measure ocean acidification and carbonate saturation states.¹² Relevant water quality parameters include: pH, dissolved inorganic carbon, total alkalinity, partial pressure of CO₂, and saturation state with respect to calcite and aragonite.¹³

Since the Board has indicated it does not want to craft a new numeric standard at this time, it may consider adding a clause in the interim: “The pH shall not be changed at any time more than 0.2 units from that which occurs naturally, *or change in excess of amounts that adversely affect biological responses of marine organisms.*” Biological criteria can provide a measure against which to evaluate ocean acidification and its impacts on aquatic life, and should be considered as a supplement to numeric criteria. Existing and ongoing biological assessments in California should be used to identify threatened and impaired waters due to ocean acidification.

2. *The Board must immediately commence data collection and analysis of ocean acidification research and begin work on a framework for ocean acidification monitoring.*

We agree with the Board’s assessment that “more research, monitoring and assessment should take place ... to address and understand decreases of pH (trends and effects).”¹⁴ However, this fact does not justify a three year delay, but rather requires the Board’s immediate leadership and action.

⁸ State Water Resources Control Board, Water Quality Control Plan, Ocean Waters of California (2009), p. 6, available at http://www.swrcb.ca.gov/water_issues/programs/ocean/docs/oplans/2009oceanplan.pdf.

⁹ 33 U.S.C. § 1314(a)(1).

¹⁰ Center for Biological Diversity, “Petition for Revised pH Water Quality Criteria under Section 304 of the Clean Water Act, 33 U.S.C. Section 1314, to Address Ocean Acidification” (December 18, 2007), p. 14, available at: http://www.biologicaldiversity.org/campaigns/ocean_acidification/pdfs/section-304-petition-12-18-07.pdf (citing Caldiera, K. and 25 others, Comment on “Modern-age buildup of CO₂ and its effects on seawater acidity and salinity” by Hugo A. Loáiciga, *Geophysical Research Letters* 34: L18608 (2007)).

¹¹ United States Environmental Protection Agency, Memo: Integrated Reporting and Listing Decisions Related to Ocean Acidification (November 15, 2010) (EPA Ocean Acidification Memo), available at: http://water.epa.gov/lawsregs/lawguidance/cwa/tmdl/upload/oa_memo_nov2010.pdf.

¹² See Ocean Carbon and Biogeochemistry (2009) Responses to EPA Notice of Data Availability From Ocean Carbon and Biogeochemistry Program.

¹³ *Id.*

¹⁴ Draft Triennial Review Workplan at p. 15.

The Board should immediately begin to “solicit existing and readily available information on ocean acidification”¹⁵ and environmental baselines, and identify data gaps and research needs. Information is needed about (1) historic water quality, the marine environment, and biological communities; (2) trends in seawater chemistry, including but not limited to acidification; and (3) historic and projected levels and sources of carbon dioxide emissions.

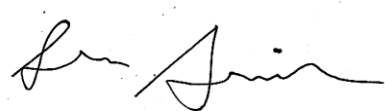
The Board should collect information and data in conjunction with the Southern California Coastal Water Research Program, North Coast Surface Water Ambient Monitoring Program, Central Coast Ambient Monitoring Program, Southern California Coastal Ocean Observing System, Ocean Science Trust, Multi-Agency Rocky Intertidal Network, and Marine Monitoring Enterprise in order to provide a basis for determining the impacts of ocean acidification. Once research priorities and data gaps are identified, then the Board can provide informed guidance on how research institutions and private and public entities can help fill those gaps.

In addition to collecting existing studies and data, the Board should begin crafting a framework for monitoring ocean acidification, including physical and biological indicators, ecosystem changes and carbon dioxide sources in conjunction with U.S. EPA, and other cooperating federal agencies and research institutions. The Board can require monitoring of parameters relevant to ocean acidification by permit holders in coastal and ocean areas. The NOAA National Estuarine Research Reserve System and national and state marine protected areas can also play an important role and should be encouraged to share relevant data and information. Additionally, EPA should coordinate with National Marine Fisheries to promote fisheries data, which could be extremely relevant in monitoring the impacts of ocean acidification.

We respectfully request that the Board schedule for completion before 2013—the end of this Triennial Review Period—an amendment to establish protective water quality standards and biological objectives for ocean acidification impacts to the ocean. In the interim, we request that the Board include in its Workplan a commitment to gather and analyze ocean acidification data to identify research priorities and data gaps.

Thank you for your consideration of these and previous comments to the Ocean Plan.

Sincerely,



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Attachment: United States Environmental Protection Agency, Memo: Integrated Reporting and Listing Decisions Related to Ocean Acidification (November 15, 2010)

¹⁵ EPA Ocean Acidification Memo at p. 4.