

Item 8 LATE ADDITION

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
LAHONTAN REGION**

**MEETING OF MAY 10-11, 2017**

**SOUTH LAKE TAHOE**

**CLIMATE CHANGE STAFF REPORT**

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1. Please insert Enclosure Nos. 1 and 2 behind Item 8 Green Sheet.

<b>ENCLOSURE</b>	<b>ITEM</b>	<b>BATES NUMBERS</b>
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# **ENCLOSURE 1**

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**STAFF REPORT ON DEVELOPING A  
CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGY  
FOR THE LAHONTAN REGION**

**May 2017**

**Report to the Lahontan Regional Water Quality Control Board  
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Executive Officer**



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## Executive Summary

California has placed itself at the forefront of addressing climate change and its increasing impacts upon people and the environment. The signing of [Assembly Bill 32, the California Warming Solutions Act of 2006](#), clearly established California's global leadership role, and a pathway to reducing greenhouse gas (GHG) emissions in an effort to minimize adverse climate change impacts. California is also taking the lead in establishing and implementing strategies for adapting to climate change impacts. California, through a combination of State laws and Executive Orders, has placed the California Air Resources Board (ARB), Natural Resources Agency (Resources Agency), and California Environmental Protection Agency (CalEPA) as the lead state agencies for developing and implementing the State's climate change laws, policies, and strategies.

The Lahontan Regional Water Quality Control Board (Water Board) also has a role to play in California's extensive and comprehensive response to climate change. Trying to understand what that role is critical in developing the Water Board's Climate Change Mitigation and Adaptation Strategy for the Lahontan Region. It also raises several questions, which include:

- What policies, plans, and general orders will the State Water Board initiate/adopt in response to climate change?
- What role or roles does the Water Board, as a regional state agency responsible for protecting water quality to maintain, restore, and enhance the beneficial uses of the region's waters, play in California's climate change efforts?
- What are the Water Board's current and future responsibilities/obligations, as established by California's climate change laws and policies?
- What can the Water Board do beyond its established responsibilities/obligations with current resources?
- Where should the Water Board direct its limited resources for climate change?

Below, Water Board staff describes the State's climate change framework and requirements for all state agencies, including the Water Board. The framework combined with the Water Board's limited resources, requires thoughtful consideration of key actions that can be achieved by the Water Board within our existing authority and expertise. Given these conditions, the Water Board and its staff will need to continue to incorporate significant collaboration with stakeholders in an effort to effectively respond to climate change.

## Introduction

The State of California is at the forefront of addressing the significant and growing challenges that climate change presents to its citizens, environment, and infrastructure. Climate change is the result of the emission of greenhouse gases (GHGs), primarily: carbon dioxide and methane, which are causing an overall increase in temperatures, reduced snowpack, greater fluctuations in temperature



and precipitation, changes in timing and volume of peak runoff, and more frequent, extreme weather events. All of these climate change effects have impacts on the availability and quality of the state's water. Although California is actively working to reduce GHGs, research shows these impacts will increase in the future even with reduced GHGs emissions. Therefore, it is imperative that California develop climate change mitigation and adaptation strategies, as well as continue to reduce GHGs.

The 2015 Governor's Environmental Goals and Policy Report, which presents a comprehensive approach for climate change, includes the goals of reducing GHGs and providing clean air and water for the state's citizens. It is the Lahontan Regional Water Quality Control Board's (Water Board) responsibility to protect and restore the quality of its water resources and, thus, ensure that clean water is available. The Water Board must develop an effective climate change strategy to mitigate and adapt to the impacts of climate change stresses to meet its mandate to ensure the availability of clean water in the Lahontan Region.

This report will outline the framework for California's climate change efforts; provide a better understanding of how the State Water Board and Water Board can support and implement the State's climate change laws, policies, and strategies within California's framework; summarize the Water Board's climate change efforts and findings to date; and provide a pathway forward for developing an effective strategy to mitigate and adapt to the adverse impacts of climate change on water resources within the Lahontan Region.

## **Framework –Key State Climate Change Laws and Policies**

California's international leadership in climate change mitigation and adaption is based on comprehensive research that has culminated in aggressive goals that are being defined and focused by the following legislation, policies, and strategies.

### **Assembly Bill 32 (AB 32)-The Global Warming Solution Act of 2006**

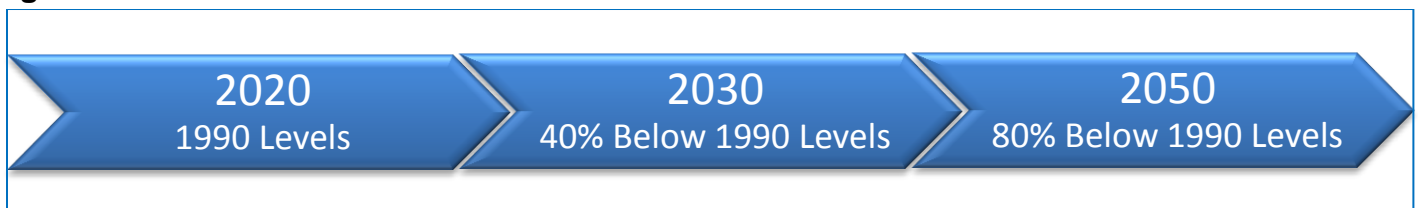
AB 32 charged the California Air Resource Board (ARB) with leading California's efforts to reduce GHGs and was the first program in the country to comprehensively address climate change. AB 32 established the goal of reducing GHGs to 1990 levels by 2020. AB 32 also mandated that the ARB coordinate with state agencies in developing and implementing strategies to reduce GHGs, and has been successful in establishing effective policies that reduce GHGs emissions.

In 2008, the ARB adopted a Scoping Plan, which was subsequently updated in 2014 (Executive Summary available in Appendix A). The 2008 Scoping Plan and [2014 Updated Scoping Plan](#) focus California's primary GHG reduction efforts on six key economic sectors that include: Energy, Industry, Transportation, Natural and Working Lands Including Agriculture, and Waste Management, and Water. The Scoping Plans identify specific GHG reduction goals, in terms of tons of CO2 equivalents reduced, for each sector. To assist in achieving these goals, roles and responsibilities have already been established for the State and Regional Water Boards for these sectors, where applicable.

## Executive Order B-30-15 and Senate Bill 32 (Chapter 249, Statutes of 2016)

Executive Order B-30-15 (Appendix B) in coordination with SB 32 established an interim goal of reducing GHG levels to 40 percent below 1990 levels by 2030. The intent was to bridge the gap between the short-term 2020 goal (reduce GHGs to 1990 levels) and the long-term 2050 goal (reduce GHGs to 80 percent of 1990 levels). Bridging the gap with the 2030 interim goal is necessary to continue guiding regulatory policy and investment during the 30-year gap, and to continue setting California on cost-effective pathway to achieving long-term GHG reductions.<sup>1</sup> California’s short-term (2020), interim (2030), and long-term (2050) GHG reduction goals are currently established as illustrated, below.

**Figure 1- California’s Greenhouse Gas Reduction Goals**



## Executive Order S-3-05 and Senate Bill 1107 (Chapter 230, Statutes of 2004)

[Executive Order S-3-05](#) in coordination with SB 1107 (Chapter 230, Statutes of 2004), established that the California Environmental Protection Agency (CalEPA) would be the lead agency for coordinating all GHG emission reduction and climate change activities in state government (Government Code section 12812.6). Executive Order S-3-05 established the Climate Action Team (CAT) to facilitate CalEPA’s interagency coordination. Current CAT members include:

**Table 1: Climate Action Team Members**

California Environmental Protection Agency	California Air Resources Board
California State Transportation Agency	California Department of Fish and Wildlife
California Department of Food and Agriculture	Department of Forestry and Fire Protection
CalRecycle	California Department of Transportation
California Department of Water Resources	California Energy Commission
California Health and Human Services Agency	Natural Resources Agency
Office of Planning and Research	California Public Utilities Commission

<sup>1</sup> Executive Order B-30-15

California Government Operations Agency	Business, Consumer Services, and Housing Agency
*State Water Resources Control Board	Strategic Growth Council
California Department of Public Health	Governor's Office of Business and Economic Development
Office of Emergency Services	

Several workgroups have subsequently been created to support the CAT. Those workgroups, and how the State Water Board and Regional Water Boards interact with them, will be discussed later in this report.

## The Short-Lived Pollutants Act

Short-lived climate pollutants (SLCPs), consisting of black carbon (soot), methane, and fluorinated gases, are estimated to be responsible for about 40 percent of current climate change forcings in California. SLCPs are the most potent short-termed GHGs and significant and immediate reductions are needed to minimize the impact of these climate forcings. Senate Bill 605 (Chapter 523, Statutes of 2014) requires that ARB develop a plan to reduce SLCPs emissions. Senate Bill 1383 (Chapter 395, Statutes of 2016) requires plan implementation to begin by January 2018. The ARB adopted the SLCP Reduction Strategy in March 2017 to implement these laws and support the State's GHG reduction goals for 2030 and 2050. Findings and recommendations from [SLCP Reduction Strategy](#) (Executive Summary available in Appendix C) that are relevant to the Water Board include the following:

- **Dairies.** As shown in the figure below, dairies account for 45 percent of methane emissions in California and landfills account for 20 percent. The SLCP Strategy proposes not only reducing the emissions from these sources, but capturing the methane to provide fuel for power and replace the use of fossil fuels. SB 1383 mandates that ARB, CDFG, and State and Regional Water Boards work with the dairy industry to establish a dairy workgroup to identify and address barriers to the collection and utilization of biomethane by first Quarter 2017 and thereafter.
- **Landfills.** Landfills are the second largest contributor of SLCPs in California. The 2017 Scoping Plan Update calls for eliminating the disposal of organic material at landfills, which would potentially eliminate future methane emissions from landfills. Assembly Bill 1045 (Chapter 596, Statutes of 2015) directs CalEPA and CalRecycle to coordinate with ARB and the State and Regional Water Boards to promote composting and use of compost to divert organic waste from landfills.
- **Wastewater.** Methane production from wastewater treatment combined with other miscellaneous sources (industrial operations, rice cultivation, septic tanks) accounts for nine percent of the

state's methane inventory.<sup>2</sup> Wastewater treatment facilities provide an opportunity to reduce organic waste (e.g., biosolids, food wastes, grease) currently going to landfills, and to produce beneficial products such as biofuels, electricity, and soil amendments/fertilizers. The pathway to realizing these benefits is through expanding the use of anaerobic digestion, both in the number of facilities using it and by modifying existing facilities to accept food waste, fats, oils, and greases (FOG) into the co-digestion process. Many of the larger wastewater treatment facilities already incorporate anaerobic digestion into their treatment and produce methane that is using for heating buildings, producing electricity, or is simply burned off (flaring). The 2017 Scoping Plan calls for the ARB to coordinate with CalRecycle and the State and Regional Water Boards to identify and support opportunities for co-digestion of food wastes at existing and new digester facilities, including those located at wastewater treatment facilities; and to develop a program of financial incentives and regulatory actions that ensure that existing and new wastewater treatment facilities have full methane capture and maximize organic waste digestions. The Regional Water Boards are expected to develop permit terms and other regulatory tools that support such efforts.

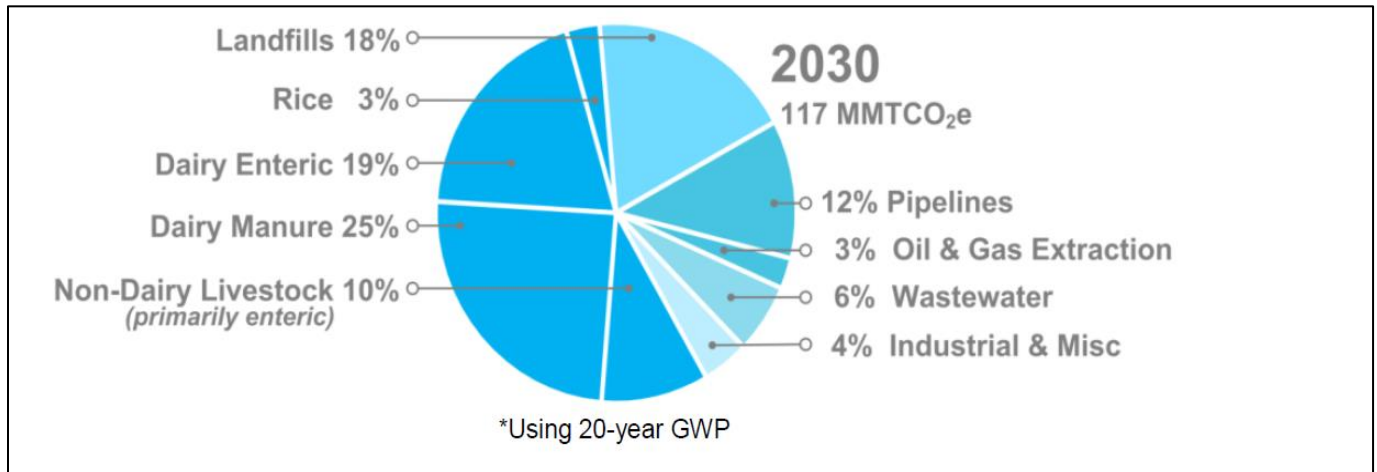
- **Natural and Working Lands.** Wildfire is the largest source of black carbon in California. However, the SLCP legislation only addresses anthropogenic, non-forest sources of black carbon. Under AB 32, the [2017 Climate Change Scoping Plan Update \(Proposed\)](#) does discuss how ARB is working on developing a Natural and Working Lands Inventory that will include an inventory of carbon stocks, stock-change (and by extension GHG flux associated with stock-change) with some attribution by disturbance process for the analysis period 2001-2010. Disturbance processes will include conversion from one land category to a different land category, fire, and harvest.<sup>3</sup> Information from this effort will help identify opportunities to further reduce GHGs, including CO<sub>2</sub> and black carbon emissions. It is likely that high-elevation meadow/wetlands restoration and forestry practices will be identified as presenting opportunities to reduce GHGs and the State and Regional Water Board's regulatory and other programs will likely be involved with making the opportunities realities.

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<sup>2</sup> California Air Resources Board, Short-Lived Pollutant Reduction Strategy, 2017

<sup>3</sup> 2017 Climate Change Scoping Plan Update (Proposed)

**Figure 2: California 2013 Methane Emission Sources (20-Year Global Warming Potential)**



SLCP Reduction Strategy, ARB, 2017  
 MMTCO<sub>2</sub>e = Million metric ton of carbon dioxide-equivalent  
 GWP = Global Warming Potential

## California Climate Change Adaptation Strategy

Executive Order S-13-08 (Appendix D) signed in 2008, identified the Natural Resources Agency as the lead agency for developing California’s climate change adaptation policies and strategy. In 2009, California adopted its Climate Adaptation Strategy, which was subsequently updated in 2014 ([2014 Safeguarding California: Reducing Climate Risk](#)). Both documents recommend adaptation strategies for various sectors including: water, biodiversity and habitat, agriculture, and forestry. Some of the strategies relevant to the Lahontan Region include:

- (1) Fully develop the potential of integrated regional water management, including developing Integrated Regional Water Management (IRWM) Plans that identify strategies to improve coordination of groundwater storage and banking with surface storage, and other water sources, such as recycled water, flood flows, and storm water;
- (2) Practice and promote integrated flood management to reduce flood peaks, reduce sedimentation, store flood waters, recharge aquifers, and restore environmental flows;
- (3) Enhance and sustain ecosystems for species migration, floodplain corridors, and upper watershed forests and meadow functions; and
- (4) Expand water storage and conjunctive management of surface and groundwater resources, including integrated floodplain management, groundwater banking and surface storage, and development of groundwater management plans.

## California Water Action Plan

The 2014 California Water Action Plan puts forth actions to build resiliency and sustainability into California’s management of water resources, addressing water supply, water quality, flood protection, and environment. These actions include conservation, integrated management, ecosystem protection, drought planning, expanded water storage, recycled water use, and financing to support

these efforts. Efforts to support sustainability of water supply include promoting the use of recycled water and streamlining the permitting process for reuse and enhancement projects. Stream restoration efforts improve water quality and restore natural system functions, including restoration of key mountain meadows and managing headwaters for multiple benefits. Sustainable groundwater management and groundwater recharge and storage, accelerate cleanup of contaminated groundwater and prevent future contamination. Flood control projects are beginning to be viewed as an opportunity to mitigate climate change impacts by increasing groundwater recharge, restoring and enhancing riparian and wetland habitats, while providing for infrastructure protection. State and Regional Water Board programs are involved at multiple levels with these efforts including technical assistance, financial assistance, and regulatory oversight.

### **State Water Resources Control Board's Resolution No. 2007-0059**

State Water Board Resolution No. 2007-0059 (available in Appendix E) specifies that, in partnership with the Department of Water Resources, the State Water Board will work to reduce GHG emissions and demonstrate the effectiveness of climate change adaption strategies. The Resolution encourages the Regional Water Boards to work with local stakeholders to achieve these goals.

### **State Water Resources Control Board Resolution No. 2017-0012**

State Water Board Resolution No. 2017-0012 (available in Appendix F) lays the ground work for a comprehensive and integrated response to climate change by the State and Regional Water Boards, in coordination with federal, state, and local partners. The Resolution captures and better defines many of the roles and responsibilities that are established through the plans and strategies that have been developed in response to many of the Executive Orders and laws discussed, above. The Resolution aligns many of the State Water Board's and Regional Water Boards' roles and responsibilities with many of the existing programs that the Regional Water Boards routinely work with. These include recycled water use, storm water capture and use, improved ecosystem resilience, groundwater storage, and reporting results. The Resolution also establishes a schedule for completing multiple tasks beginning in 2017, and continuing annually for most. These responsibilities are discussed in greater detail later in this report.

## **Chronology of Water Board Climate Change Strategy**

The Water Board in response to the laws and policies, above, and on its own initiative has made climate change mitigation and adaptation one of its top priorities. In response, Water Board staff has been busy and starting in late 2014, embarked upon a concerted effort to develop a climate change mitigation and adaptation strategy. The Water Board has wanted this to be an inclusive and transparent effort, which is reflected in the activities listed, below. The following table contains a

chronology of the events intended to gather and process information/ideas as part of the Water Board’s effort to develop its climate change strategy.

**Table 2: Water Board Climate Change Strategy Development Activities**

<b>CHRONOLOGY</b>	
<b>November 2014</b>	Water Board hosted first Climate Change Adaptation Public Workshop in Barstow, California. Climate change experts presented the latest research regarding anticipated climate change effects in the Lahontan Region to over 100 attendees. Attendees provided ideas regarding potential Water Board adaptations/responses (regulatory, policy, coordination with stakeholders, education, etc.) to climate change.
<b>January 2015</b>	Water Board hosted its second Climate Change Adaptation Public Workshop in South Lake Tahoe, California, which was similar in format, content, attendance, and participation to November 2014 workshop.
<b>May 2015</b>	Staff presented summary of public ideas generated from the Public Workshops to the Water Board.
<b>July 2015</b>	Staff presented Climate Change Conceptual Model and strategy development approach to the Water Board.
<b>December 2015</b>	Water Board staff create three Climate Change Working Groups to work on outreach and developing a Water Board-specific climate change adaptation strategy. The working groups are Infrastructure, Storm Water and Low Impact Development, and Wetlands and Floodplains. The groups have initially focused on outreach to stakeholders through a Climate Change Adaptation Survey and meetings.
<b>August 2016</b>	The Climate Change Adaptation Survey is distributed to email subscription lists and other interested persons. The survey is posted on the Water Board’s web site.
<b>August – October 2016</b>	Staff attends outreach meetings with a variety of stakeholder groups to encourage stakeholder participation with the Climate Change Adaptation Survey.
<b>November 9, 2016</b>	The Climate Change Survey was presented to the Water Board, in addition to possible criteria for prioritizing potential climate change-related actions, and recommended next steps. Water Board provided direction.

<p><b>January 12, 2017</b></p>	<p>A brief updated overview of survey results and a revised schedule for developing a strategy were presented to the Water Board. The Water Board recognized the schedule was ambitious and may be subject to revision based on the limited resources to address climate change. The Water Board established a subcommittee to work with staff on Climate Change Adaptation.</p>
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The complex and extensive nature of addressing the causes and impacts of climate change is reflected in the Water Board’s pathway towards developing its Climate Change Mitigation and Adaptation Strategy, as depicted in the chronology, above. The impacts of climate change are and will continue to be wide and varied, cutting across political boundaries, socio-economic boundaries, and watershed and ecosystem boundaries. This increases the complexity of responding to climate change, and to most effectively move climate change mitigation and adaptation forward in the Lahontan Region, Water Board staff acknowledges that our efforts will be optimized if and only if we collaborate with others who are also planning for climate change. That is one reason why the Water Board started its strategy development process with two workshops that invited all stakeholders to participate.

**Workshops.** The Water Board’s strategy development process started with two workshops where scientific and technical information based upon the latest research on climate change impacts was presented by Dan Cayan, PhD and Michael Dettinger, PhD. Both are with the Scripps Institute of Oceanography and United States Geological Survey. They shared with workshop participants that the Lahontan Region could expect warmer air and water temperatures, more severe flood events, and a decreasing snowpack in the Sierra Nevada Mountains, all supported with data and analysis. All of these conditions have the ability to adversely affect the quality and quantity of water within the Lahontan Region.

Following the informational portion of the workshop, small working groups were created, and workshop participants were asked to respond to the following:

- List the policies and tools, including changes to organizations and applicable law, the Water Board should have to address climate change by the year 2040. Identify top 3-5 ideas.
- Identify the key steps to get the Water Board from its current state to desired state in 2040.

This was a valuable event as over 400 ideas/responses were generated by more than 100 workshop participants during the two workshops. The participants represented a broad spectrum of different backgrounds, experiences, opinion, and interests, but all had in common, an interest in climate change, its impacts, and how the Water Board and others should respond. Water Board staff analyzed the results and observed that many of the ideas initially trended towards four primary themes that were then further consolidated into the following three primary themes:



- Protect surface and groundwater quality and quantity by ensuring protection of floodplains, wetlands, and critical recharge areas, as well as maintaining/improving vital infrastructure and improving storm water management.
- Improve water quality and supply by requiring low impact development (LID) best management practices (BMPs).
- Increase communication with the public, continue collaboration with partner agencies, and continue streamlining regulatory process to help implementers on climate change adaptation projects.

Staff continued to analyze the responses and created a conceptual model for moving forward in mitigating and adapting to climate change impacts. Staff presented this information to the Water Board during two different Board meetings in 2015, and received input and direction from Water Board members, who strongly supported the idea of developing a strategy that identified specifically how the Water Board should proceed in this field. The Water Board also continued to express its strong support for including stakeholders in the process, recognizing that the Water Board and its staff would be working with and relying upon many of the stakeholders to effectively implement its Climate Change Mitigation and Adaptation Strategy.

To continue making progress in strategy development, Water Board staff created three Climate Change Working Groups: Infrastructure, Storm Water and Low Impact Development, and Wetlands and Floodplains. These three working groups were significantly based upon the three themes that came out of the 400-plus ideas that were shared at the workshops. The working groups and other Water Board staff recognized that under the three themes, above, there was further coalescing of ideas regarding more specific concepts and actions that the Water Board could pursue, totaling approximately 25. This observation was the beginning of the process of starting to focus in on a limited number of actions the Water Board could implement either on its own, or in coordination with others.

**Climate Change Adaptation Survey** .The staff working groups believed that additional information was still needed before it could begin the process of identifying a more limited number of actions to pursue. The working groups thought using a survey would be an effective method to learn what others were doing to adapt to and prepare for climate change, and the challenges or obstacles others were encountering in doing so, and their level of support for and ideas regarding the approximately 25 concepts/actions the Water Board could take in response to climate change. Staff publicized and released its online Climate Change Adaptation Survey in August 2016, and accepted responses through the end of December 2016.

Water Board staff received over 150 responses from a wide variety of stakeholders within and outside the Lahontan Region. Staff recognizes that this was not a scientific survey that provided results fully representing those living and working within the Lahontan Region. However, the survey was in staff's opinion successful in reaching out and keeping a substantial group of the region's stakeholders

involved. Staff also sees a few trends in the results that may be helpful in guiding the Water Board's future actions.

A more in depth review and analysis of the survey results is provided in Appendix G. Below is a summary of staff's analysis that is divided into four categories.

Ongoing and Planned Efforts – The primary activities that survey respondents in the Lahontan Region are currently doing or are planning to do center on water conservation, and education and outreach. To a lesser, but still significant level, others are also working on groundwater monitoring, requiring low impact development design and BMPS, developing aquatic habitat protection programs and conducting infrastructure risk analysis.

Challenges/Obstacles – Economics/costs was the most frequently selected challenge respondents selected. Water rights and state regulations to a lesser, but still significant level (greater than 40 percent of respondents), were also identified as key obstacles.

Level of Support for the Range of Options – This was the portion of the survey that received the most attention. The number of respondents that indicated their level of support, in addition to submitting comments was the highest for this survey section. Overall, there is strong support for the concepts of protecting water quality, water supplies, aquatic habitat, etc. However, the support decreases when a regulatory approach is proposed. This is not surprising and further supports working collaboratively with others, especially when it involves a regulatory response.

Partners – The Water Board's and its staff's research and outreach regarding climate change mitigation and adaptation, current and future responsibilities, and available resources, continues to strengthen the role that partnering will play in Water Board's strategy. Fortunately, the survey results identify a significant number (greater than 50) of stakeholders that express their willingness to more actively participate in developing and implementing the Water Board's Climate Change Mitigation and Adaptation Strategy.

Overall Utility of the Survey – Upon reflection, Water Board staff acknowledges the survey was limited value given the limited response, and nature of some of the questions. Staff acknowledges that the survey may not have been the best tool to gather information representative of stakeholders throughout the Lahontan Region. It is likely that staff will receive more poignant input upon proposing direct, specific actions to stakeholders during upcoming stakeholder workshops.

Water Board staff do believe the survey provided the public, stakeholders, and dischargers throughout the Lahontan Region an opportunity to comment and provide input on actions that the Water Board may pursue in responding to climate change. Staff believes that the survey was effective at keeping stakeholders and others engaged, providing view into and another opportunity to participate in the Water Board's strategy development process. It is likely that some, possibly many, of the respondents will be our future partners in responding to climate change in the Lahontan Region.

## Water Board’s Role in California’s Climate Change Efforts

Through state law and Executive Orders, the California Air Resources Board (ARB), CalEPA, and the Natural Resources Agency (Resources Agency) have been identified as the leads for developing and overseeing implementation of California’s policies and strategies responding to climate change. Executive Order S-3-05 established the Climate Action Team (CAT), under the leadership of CalEPA, to facilitate this interagency coordination, which includes the State Water Board. The current CAT working groups include:

**Table 3: Climate Action Team Working Groups**

Agriculture (Ag-CAT) *	Biodiversity	Coastal and Ocean Climate Adaptation (CO-CAT) *
Interagency Forestry	Intergovernmental	Land Use and Infrastructure
Public Health	Research *	State Government *
Water Energy (WET-CAT) *		

\*State Water Board is a member.

The Water Board has two primary pathways to participate in California’s climate change efforts. The first is working through the State Water Board, the Water Board’s conduit into the CAT and CAT working groups. Working with the State Water Board, the Water Board can develop proposals/requests for action that the State Water Board would then carry up and through the CAT Coordination System. It is also through this pathway that task associated with California’s climate change policies and strategies are delegated or distributed to CAT members and their boards, departments, and agencies.

The second pathway is to effect change through the Water Board’s planning and regulatory programs. Such efforts could include requiring permittees vulnerable to climate change impacts, such as flooding, to conduct infrastructure risk assessments and develop and implement risk abatement programs. Doing so would likely result in better protecting vital infrastructure, such as sewer collection systems, from flooding, thus better protecting water quality by reducing the number and severity of sewage spills that typically increase with flooding events. Another example involves the permitting process for renewable energy projects (wind and solar). The Water Board modified its permitting process, so that it could be incorporated into the state-wide permitting program for such projects overseen by the California Energy Commission. Water Board staff has further refined its project review/permitting process for such projects, to decrease the time it takes to get such projects operational and reducing California’s reliance upon other energy sources that contribute GHGs. Such actions assist in reducing GHGs and achieving compliance with the State’s Renewable Energy Portfolio Standard and the California’s GHG reduction goals.

## Current and Near-Future Water Board Responsibilities

There has been a lot of effort and results in developing California's response to climate change since the mid-2000's. The Governor's Office, State Legislature, CalEPA and the Resources Agency and their boards, departments, and agencies have all been very busy developing and implementing California's laws, policies, and strategies targeting climate change. Implementing California's climate change policies and strategies is largely being carried out by CalEPA's and Natural Resource's boards, departments, and agencies, and the State and Regional Water Boards have been receiving their assignments. State Water Board Resolution No. 2017-0012 brings together in a single document the State and Regional Water Boards' responsibilities regarding climate changes as they currently stand. The Resolution draws upon the multiple plans (e.g., ARB 2014 Updated Scoping Plan, ARB 2017 Short-Lived Climate Pollutant Reduction Strategy) and identifies the State and Regional Water Board's current responsibilities, as established by the State's climate change laws, policies, and strategies. Below is a listing of key Regional Water Board responsibilities and directives that could affect Regional Water Board workload, as identified in State Water Board Resolution No. 2017-0012.

1. Reduce GHG Emissions
  - a. Short-Lived Climate Pollutants
    - i. State Water Board Division of Water Quality (DWQ) shall collaborate with Regional Water Boards, ARB, CalRecycle, and California Department of Food and Agriculture to reduce methane emissions from landfills through organic waste diversion, and co-digestion with existing or new anaerobic digesters at wastewater treatment facilities, or through composting, while achieving water quality objectives. **(Direct effect on WB workload)**
    - ii. Identify opportunities to reduce methane emissions from dairies and concentrated animal feeding operations while achieving water quality objectives. **(Direct effect on WB workload)**
    - iii. Regional Water Boards should provide information on their activities to reduce methane emissions in the Water Boards' 2017-18 Annual Performance Report. **(Direct effect on WB workload)**
  - b. Recycled Water
    - i. DWQ shall coordinate with the Regional Water Boards to make annual reporting of recycled water data a requirement of waste discharge permits and water reclamation requirements. Starting with the 2017-18 Annual Performance Report, begin reporting information regarding volume of recycled water used, and types of uses. **(Potential effect on WB workload)**
  - c. Storm Water
    - i. DWQ shall collaborate with the Department of Water Resources, and other State and local land use agencies to prioritize storm water detention and infiltration. **(Potential effect on WB workload)**
  - d. Energy Efficiency and Renewable Energy

- i. Division of Financial Assistance and Division of Drinking Water, as part of existing technical assistance programs for disadvantaged communities, shall include assistance to finance, construct, upgrade, and operate energy-efficient drinking water and wastewater treatment systems, and to power those systems with zero-carbon and low-carbon renewable energy technologies. **(Direct effect on WB workload)**
2. Improve Ecosystem Resilience
    - a. Regional Water Boards update plans, permits, and policies, and coordinate with other agencies to enhance ecosystem resilience to the impacts of climate change, including but not limited to actions that protect headwaters, facilitate restoration, enhance carbon sequestration, build and enhance healthy soils, and reduce vulnerability to and impacts from fires. **(Direct effect on WB workload)**
    - b. Document climate resilience benefits of ecosystem protection and restoration actions. **(Direct effect of WB workload)**
    - c. State Water Board to work with USEPA to address climate change impacts that contribute to or exacerbate degradation of water quality, including but not limited to increased surface water temperatures, decreased surface water flows, changes in water chemistry (such as increases in salinity, bacteria, and nutrient concentrations), hydrology, and ecology. **(Potential effect on WB workload)**
3. Respond to Climate Change Impacts
    - a. Office of Information Management and Analysis (OIMA), shall by July 1, 2018 evaluate criteria for siting of new drinking water systems using climate change projections, and shall recommend adjustments to siting criteria and standards as needed.
      - i. Work with Division of Drinking Water to evaluate water quality in public water supplies, including investigating sources of pollution. **(Direct effect on WB workload)**
    - b. State Water Board to coordinate with Regional Water Board to identify actions for effective permitting of projects to develop new and underutilized water resources, and expand surface water and groundwater storage, where appropriate. **(Direct effect on WB workload)**
    - c. State and Regional Water Boards will work with California Department of Forestry and Fire Protection, federal land management, and other agencies to restore and maintain healthy watersheds, reduce vulnerability to catastrophic fires, and support resilience in recovery efforts. **(Direct effect on WB workload)**
    - d. DWQ works with 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. **(Direct effect on WB workload)**
4. Rely on Sound Modeling and Analyses
    - a. Office of Information Management and Analysis (OIMA) shall work with the State and Regional Water Boards in selecting and using climate change data, model outputs and data evaluation

services, as needed to account for and address impacts of climate change in permits, plans, policies, and decisions. **(Direct effect on WB workload)**

5. Outreach

- a. Office of Public Participation (OPP) shall work with Regional Water Boards, and the USEPA to offer consultation to Tribes and solicit feedback on Tribal needs for addressing climate change and related impacts pertaining to the Water Boards' core functions. Reporting on these efforts shall begin with the 2017-18 Annual Performance Report **(Direct effect on WB workload)**

The State Water Board's Resolution presents a significant workload for all the Regional Water Board's, including the Water Board. In some instances, the Water Board was already engaged in climate change activities prior to the Resolution being adopted (e.g., coordinating with other agencies on forest and watershed health). However, many of the tasks noted, above, represent new assignments and that do not come with new resources.

## Overall Picture for the Lahontan Region

It is clear from the information provided, that California is fully engaged in its response to climate change, on both the GHG reduction and mitigation/adaptation fronts. These efforts have already produced an extensive list of responsibilities and actions for state agencies, including the State and Regional Water Boards. The ARB, Resources Agency, and CalEPA are the state agencies that have been charged with coordination, development, and implementation of California's climate change efforts. The actions of these agencies are largely driving the majority of State Water Board and Water Board responsibilities and actions. Additionally, the Water Board is in the process of identifying specific climate change mitigation/adaptation actions targeting conditions in the Lahontan Region. Water Board staff in coordination with the Water Board and its Climate Change Subcommittee has been soliciting information and input from the scientific community and stakeholders across the region. The overall process is illustrated in the figure, below.

**Figure 3: Water Board Climate Change Inputs**



As stated earlier, the Water Board initially received approximately 400 stakeholder ideas/recommendations regarding how the Water Board should respond to climate change. Staff subsequently observed that the 400 ideas generally fell into three themes (water quality/quantity protection, low impact development, and collaboration), under which, were approximately 25 specific concepts/actions. Water Board staff, following the Climate Change Adaptation Survey, continued to analyze potential outcomes in light of available resources and existing and future responsibilities established through State law, policies, and strategies. Staff began to further refine the list of potential actions into the following list:

**Table 4: Focused List of Potential Climate Change Actions for the Lahontan Region**

Increase Storm Water Collection and Reuse	Increase Low Impact Development Implementation
Increase Wetland and Floodplain Protection and Restoration	Increase Headwaters and Riparian Corridor Protection
Update Regulation and Protection for Waters of the State not Subject to Federal Clean Water Act	Adopt Policies to Protect Critical Groundwater Recharge Areas
Improve Protection of Infrastructure to Reduce Threat to Water Resources	Assess Infrastructure Vulnerability
Increase Recycled Water Reuse	Expand and Improve Partnering/Collaboration

Water Board staff is continuing to assess what specific activities would fall under these general activities. Staff also continues to explore if there are other areas, outside of the 400 stakeholder ideas, that should receive the Water Board’s attention and resources. Finally, staff continues to evaluate what the Water Board can do within our limited resources and authority in response to

climate change. Below is a table that presents the actions currently being implemented or to be implemented, as required by law, the State Water Board, or through the Water Board, with respect to Water Board programs and activities (e.g., permitting). The table also identifies in the last column some potential activities that the Water Board could do, provided there are available resources to dedicate to such activities.

**Table 5: Climate Change Responsibilities/Responses for the Lahontan Region**

	Law	SWRCB	Lahontan RWQCB Pre-Existing Activity	Lahontan RWQCB Potential Activity
Permitting and Basin Planning	Global Warming Solutions Act of 2006	<ul style="list-style-type: none"> <li>• Coordination through CAT and CAT Working Groups</li> <li>• Recycled Water Policy</li> <li>• Recycle Water General Permit (GPs)</li> </ul>	<ul style="list-style-type: none"> <li>• Revised permitting process for renewable energy projects</li> <li>• Revised Basin Plan Truckee prohibitions to facilitate water quality improvement projects</li> <li>• Lahontan Supplemental Environmental Project Program</li> <li>• Federal Agency GP</li> <li>• LADWP Owens Valley Operations GP</li> </ul>	<ul style="list-style-type: none"> <li>• Streamline habitat restoration permit process</li> <li>• Develop Riparian Protection Policy</li> <li>• Increase aquatic habitat protections/ reduce hydromodification</li> <li>• Require infrastructure risk assessment and risk abatement programs</li> <li>• Increase storm water collection and reuse</li> </ul>
	Short-Lived Climate Pollutant Act	<ul style="list-style-type: none"> <li>• Compost Facilities GP</li> </ul>	<ul style="list-style-type: none"> <li>• Dairy GP</li> <li>• Timber Waiver</li> <li>• Federal Agency GP</li> </ul>	<ul style="list-style-type: none"> <li>• Provide technical assistance to wastewater facilities for co-digestion facilities</li> </ul>
Monitoring		<ul style="list-style-type: none"> <li>• Surface Water Ambient Monitoring Program (SWAMP)</li> <li>• Groundwater Ambient Monitoring and Assessment</li> <li>• California Environmental Data Exchange Network</li> </ul>	<ul style="list-style-type: none"> <li>• Surface water sample collection across the region</li> <li>• Lake Tahoe Nearshore Study</li> <li>• Bishop Creek Bacteria Study</li> </ul>	<ul style="list-style-type: none"> <li>• Modify program to increase support of climate change activities</li> </ul>



	Law	SWRCB	Lahontan RWQCB Pre-Existing Activity	Lahontan RWQCB Potential Activity
Emergency Preparedness			<ul style="list-style-type: none"> <li>• Waiver for Debris Disposal due to Emergencies</li> <li>• Aquatic Pesticide Exemption for Emergency Situations</li> </ul>	<ul style="list-style-type: none"> <li>• Participate in Emergency Preparedness Activities (e.g., Inyo County 2017 Spring Runoff Operations)</li> <li>• Threat analysis permit requirement</li> </ul>
Groundwater Basin Protection	California Water Code	<ul style="list-style-type: none"> <li>• Recycled Water Policy</li> <li>• Anti-Degradation Policy</li> </ul>	<ul style="list-style-type: none"> <li>• Salt and Nutrient Management Plans</li> <li>• Mojave water quality objectives</li> <li>• Establish in-stream flow requirements for Squaw Creek</li> <li>• Monitored Natural Attenuation Report and Guidance</li> </ul>	<ul style="list-style-type: none"> <li>• Establish in-stream flow requirements for other streams subject to impacts from groundwater withdrawals</li> <li>• Increase protection for critical groundwater recharge areas</li> </ul>
	Sustainable Groundwater Management Act	Intervention		<ul style="list-style-type: none"> <li>• Develop objectives for ground water basins</li> </ul>

RBs – Regional Boards      LADWP – Los Angeles Department of Water and Power

GP – General Permit      LID – Low Impact Development

The information in Table 5 combined with the discussion of the Water Board’s current and future responsibilities, as established by State law, policies, and strategies, shows that the Water Board has already completed or is scheduled to complete a significant number of climate change activities under its own initiative. Additionally, it also shows that the Water Board’s plate is nearly full with future obligations. The Water Board will need to be very strategic in identifying a few select actions for the near future (3 – 5 year horizon), given that additional resources do not appear to be forthcoming. This situation also supports staff improving its existing partnerships and developing new partnerships to promote and support the work of others and to be able to work in priority areas that currently are receiving little attention.

## Recommended Pathway Forward

At the Water Board’s May 2017 meeting, Water Board staff will be looking for Board direction regarding where to focus the Water Board’s limited resources and narrow authority to best mitigate and adapt to climate change impacts in the Lahontan Region. The potential actions continue to fall

under two distinct categories: 1) actions directly under Water Board authority (e.g., permitting, Basin Plan amendments to expand prohibitions, establish water quality objectives, etc.), and 2) actions other agencies or organizations could implement.

Water Board staff will also be looking for direction regarding the next steps staff is proposing to take following the May 2017 Board meeting. Staff is proposing taking the direction the Water Board provides, and in coordination with the Water Board's Climate Change Subcommittee, identifying a limited number of specific actions for consideration by stakeholders, primarily those that would be directly affected by such actions. In addition, staff will work with the Subcommittee to identify partnership opportunities with local governments and organizations to develop a Climate Change Mitigation and Adaptation Strategy.

Staff is anticipating scheduling three workshops (north, central, and south) during the late summer months. Staff proposes providing pre-workshop materials that will include a limited number of specific actions, and questions staff would like stakeholders to answer regarding these specific actions. For example, staff may proposed developing permit requirements for expanding use of low impact development design principles for future development and redevelopment projects. Staff would also provide questions intended to evaluate how much cooperation/acceptance there may be for such requirements, the ability to comply with such requirements, and other options for achieving the requirements' objectives. Taking this approach will allow participants to be prepared for focused workshop discussions and clear feedback. Staff also anticipates providing breakout sessions, likely based upon the three general themes (water quality/quantity protection, low impact development, and collaboration), discussed, above. Staff believes these workshops will provide specific and focused information that will play a significant role in establishing effective partnerships, and identifying the limited actions the Water Board should pursue as part of its Climate Change Mitigation and Adaptation Strategy.

Following the workshops, Water Board staff would develop a Draft Strategy Report that incorporates much of the information and input that has been received over the past two-plus years, and presents a specific strategy of actions for Water Board consideration. Staff is tentatively scheduling the Draft Strategy Report for Water Board review at the Water Board's November 2017 meeting. Following the November 2017 meeting, staff anticipates conducting two technical workshops that would be the venues for discussing potential action items with the regulated community and stakeholders. Again, this additional interaction is intended to strengthen partnerships that the Water Board will be relying upon to successfully implement its Climate Change Mitigation and Adaptation Strategy. Staff is considering scheduling the two workshops in January 2018, which would then be followed by developing the draft strategy for the Water Board's consideration and adoption at a spring 2018 Board meeting.

## Closing Ideas

The Water Board is facing another challenge in climate change without any additional resources and limited sphere of influence compared to the extensive nature of climate change. Even under these conditions, Water Board staff sees that the Water Board has an opportunity to determine how to best use its limited resources to implement California's requirements within our existing authority and expertise. Staff sees some flexibility in meeting its responsibilities, as identified in State Water Board Resolution No. 2017-0012, that can be used to address conditions unique to the Lahontan Region. The flexibility also potentially could allow the Water Board to respond in a way that supports and promotes the efforts of its stakeholders, as they respond to climate change. However, the reality is that the flexibility combined with continuing collaboration with our stakeholders will only improve the efficiency of implementing a few select actions beyond what has already been assigned to us.

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# APPENDIX A

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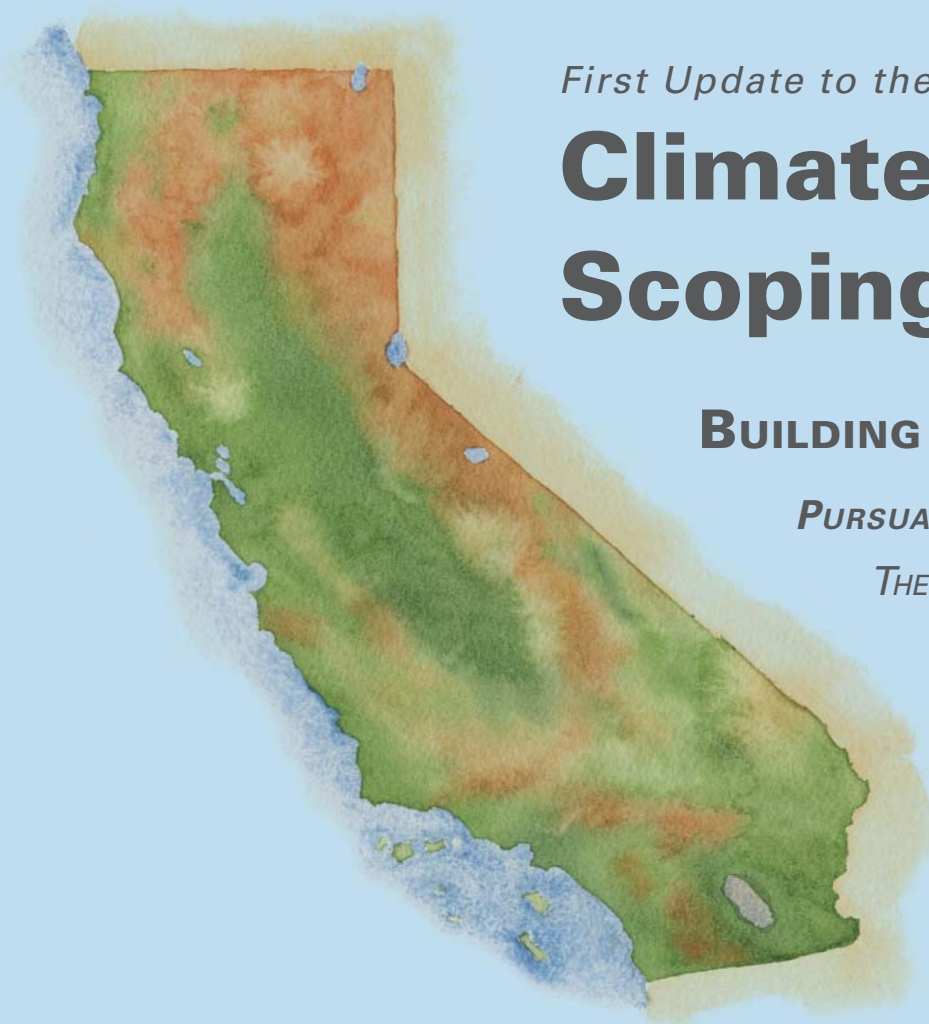
*First Update to the*

# **Climate Change Scoping Plan**

**BUILDING ON THE FRAMEWORK**

*PURSUANT TO AB 32*

*THE CALIFORNIA GLOBAL WARMING  
SOLUTIONS ACT OF 2006*



# Executive Summary

*California is a collection of farmers, surfers, factory workers, outdoor enthusiasts, tech geeks, truckers, world-class researchers, celebrity actors, and many more—who come from all around the world to live and work in one of the most beautiful, vibrant, and ecologically and culturally diverse places on Earth. We are sustained, in more ways than one, by the mountains, deserts, rivers, streams, forests, farmlands, rangelands, coastline, and temperate climate that form our natural environment and characterize our great State.*

These resources, and their natural beauty, enable our continued economic and cultural growth. They attract a wide array of businesses and workers who want to live here. They are a primary reason that California is: the eighth largest economy in the world; home to the most small businesses, Fortune 500 companies, and fastest-growing businesses in the United States; the national leader in global trade and direct investment; and tops in the United States in many economic sectors, including agriculture, biotech, clean energy, entertainment, high-tech, manufacturing, tourism, and more.

Accordingly, Californians of all backgrounds and political persuasions have supported policies and planning to protect our natural environment and the high quality of life it provides. The result is a decades-long, broad commitment to ensuring clean air and water, an efficient and productive use of energy and resources, a healthy workforce, and vital cities and towns. Our collective will to protect the environment is a valuable resource in itself, whose benefits enhance economic growth and prosperity in our state and help shape California's distinct identity.

With climate change threatening our resources, economy, and quality of life, California is squarely focused on addressing it and protecting our natural and built environments. Just as California has done dozens of times before on other environmental issues, it is leading on climate change, with an approach that will enable better, lasting economic growth and allow the California lifestyle to endure.

The 2006 adoption of Assembly Bill 32 propelled California further into an international leadership role in the fight against global climate change. By building on decades of successful actions to cut pollution and promote cleaner and more efficient energy, AB 32 solidified California's commitment to tackling climate change in a comprehensive way.

Since 2006, the State has continued to steadily implement a set of actions that are driving down greenhouse gas (GHG) emissions, cleaning the air, diversifying the energy and fuels that power our society, and spurring innovation in a range of advanced technologies. These efforts have put California on course to achieve the near-term 2020 emissions limit, and have created a framework for ongoing climate action that can be built upon to maintain and continue reductions beyond 2020 as required by AB 32.



California's approach to climate change is not simply about reducing greenhouse gas emissions. It is built upon the principle that economic prosperity and environmental sustainability are one and the same. And it continues the State's long and successful legacy of building a world-class economy in concert with some of the most effective environmental and public health policies on the planet.

By remaining steadfastly committed to this approach, we can not only do our part to tackle climate change, we can also forge a cleaner, healthier, and more sustainable future for all Californians.

In the words of Governor Brown, our collective challenge is to "build for the future, not steal from it." That is what this Plan is designed to do.

## **First Update to the Climate Change Scoping Plan**

This First Update to California's Climate Change Scoping Plan (Update) was developed by the Air Resources Board (ARB) in collaboration with the Climate Action Team and reflects the input and expertise of a range of state and local government agencies. The Update reflects public input and recommendations from business, environmental, environmental justice, and community-based organizations provided in response to the release of prior drafts of the Update, a Discussion Draft in October 2013 and a draft Proposed Update in February 2014.

## **Progress to Date**

California is on track to meet the near-term 2020 greenhouse gas limit and is well positioned to maintain and continue reductions beyond 2020 as required by AB 32. The set of actions the State is taking is driving down greenhouse emissions and moving us steadily in the direction of a cleaner energy economy. Many of these actions have been bold, ambitious, and truly trail-blazing. Some are more recent, while others precede the passage of AB 32.

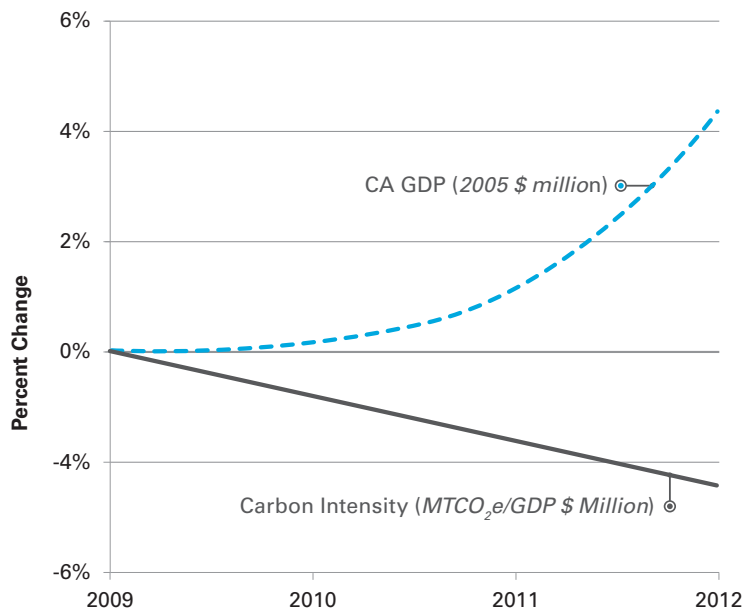
Collectively, these actions are evidence of California's ability to show that it is possible to break the historical connection between economic growth and associated increases in energy demand, combustion of carbon-intensive resources, and pollution. We have shown it is possible to break this chain by relying on cleaner technologies, more efficiency, and more renewable energy sources. And we know that preventing the worst impacts of climate change will require accelerated development and diffusion of these technologies across the world. Stable, flexible, yet durable policies like those developed under AB 32 are key.

## **Cleaner and More Efficient Energy**

California continues to be a global leader in energy efficiency. Since energy efficiency efforts began 40 years ago, Californians have saved \$74 billion in reduced electricity costs. As the State's first priority for providing for its energy needs, ongoing efficiency efforts—like new green building standards now in effect for homes and businesses and new standards for appliances, televisions, and other "plug loads"—continue to reduce energy use and emissions, make our businesses and economy more efficient, and cut energy costs.

California has also made tremendous strides in harnessing its abundant renewable energy resources. Currently, about 23 percent of the State's electricity comes from renewable power. This will increase to at least 33 percent by 2020 under new requirements set in place by Governor Brown and the Legislature in 2011. Renewable energy is rapidly coming down in cost and is already cost-effective in California for millions of homes and businesses, and in certain utility applications. Once thought of as exotic and alternative, renewable energy technologies have now become an integral part of California's energy mix.

**Figure ES1: 2009-2012 CA GDP & Carbon Intensity Trends**



'Carbon Intensity,' the amount of carbon pollution related to the State's economy, has fallen steadily over the last three years. California is getting more economic growth for each ton of greenhouse gases emitted overall.

Source: DOF & 2012 GHG Inventory

## Cleaner Transportation

California has taken a number of innovative actions to cut emissions from the transportation sector. Collectively, the State's set of vehicle, fuels, and land use policies will cut in half emissions from passenger transportation and drivers' fuel costs over the next 20 years.

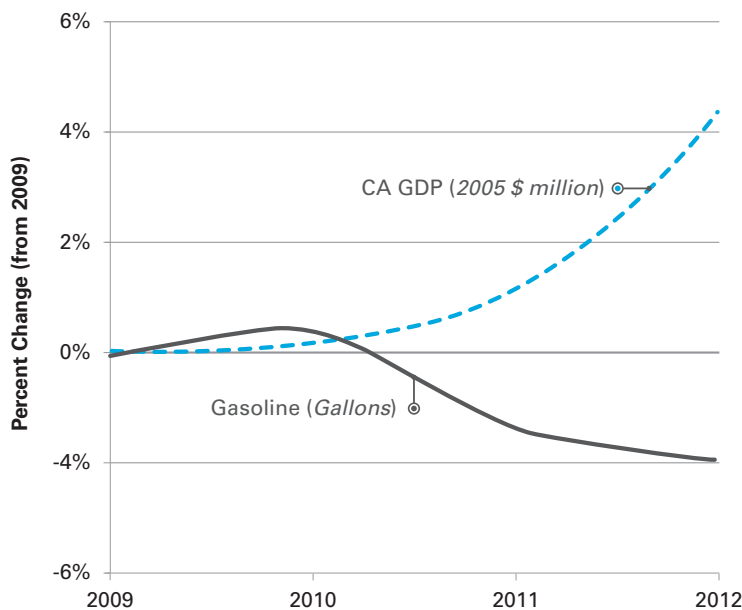
California's Low Carbon Fuel Standard (LCFS) is beginning to drive the production of a broad array of cleaner fuels. Since its launch in 2011, the regulation has generated a multitude of unique approaches for cleaner fuels. The LCFS is driving the necessary transition to cleaner fuels and is providing California businesses and consumers with more choices for the fuels they use. Companies in California and elsewhere are rising to the challenge by finding innovative ways to produce cleaner, low carbon fuels.

The cars on California's roads are also undergoing a transformation. California's vehicle GHG standards—authorized by AB 1493 (Pavley) in 2002, first approved in 2004, and extended in 2012—are delivering both carbon dioxide (CO<sub>2</sub>) reductions and savings at the pump. These standards are now federal law and the benefits of California's policies will be realized nationwide, dramatically scaling up emission reductions. The transition to a fleet of lower-emitting, more-efficient vehicles in California will continue beyond 2020, as these rules cover model years through 2025, and turnover of the fleet will deliver additional benefits from these rules for many more years. Most recently, ARB is working with the U.S. EPA and the U.S. Department of Transportation's National Highway Traffic and Safety Administration (NHTSA) on national GHG standards and corresponding fuel efficiency standards for medium- and heavy-duty trucks.

California's pioneering zero emission vehicle (ZEV) regulation is also driving a transformation of the fleet. As a result of ARB's ZEV program and Governor Brown's Executive Order B-16-12, California will see 1.5 million zero emission vehicles on the State's roads by 2025. Each day, more and more zero emission vehicles and cleaner, more efficient cars are driving on our streets and highways—visible signs of the transformation of California's transportation sector.

California is also making major strides toward reducing the number of miles people drive, through more sustainable local and regional housing, land use, and transportation planning. To date, seven Metropolitan Planning Organizations have adopted Sustainable Community Strategies. In addition to helping drive GHG emission reductions, these plans will help create more livable communities that offer greater housing and transportation options; improved access to resources and services; safer, more vibrant neighborhoods; and healthier lifestyles where people can live, work, and play without having to travel long distances or sit through congestion.

**Figure ES2: 2009-2012 CA GDP & ON-Road Gasoline Use Trends**



The amount of gasoline used in California has steadily declined since 2009 while the the State's economy grew by five percent over the same time period.

Source: DOF & BOE

## Cap-and-Trade Program

Last year, California successfully launched the most comprehensive greenhouse gas Cap-and-Trade Program in the world. As the emissions cap is gradually reduced over time, and as additional sources are brought under the cap to include the vast majority of emissions in the State, the program will ensure that California remains on track to continually reduce emissions and meet the 2020 limit. Looking out into the future, the Cap-and-Trade Program will play a critical role in keeping California on the right emissions reduction trajectory to meet ongoing reduction targets at the lowest possible cost. The program is also sending a clear signal that investment in clean, low carbon technologies will pay off. This includes the millions of households and small business customers of the State's largest electric utilities who will see a twice a year "Climate Credit" on their electricity bills. In April 2014, this credit averaged \$35 throughout the State. Investing this credit in simple items that improve energy efficiency, such as energy efficient LED light bulbs, can help customers save even more.

On January 1, 2014, California linked its Cap-and-Trade Program with Québec's. By successfully linking cap-and-trade programs across jurisdictions and increasing opportunities for emission reductions, this linkage represents another important step in California's efforts to collaborate with other partners around the globe to address climate change.

## **Building on the Framework**

Through AB 32, California has established an effective framework for climate action. This Update includes an in-depth discussion of climate change science, reflecting the Intergovernmental Panel on Climate Change's recently released Fifth Assessment and input from a distinguished team of scientific expert reviewers. The science clearly highlights the need for action—greenhouse gas emissions must be cut 80 percent below 1990 levels by mid-century to stave off the worst impacts of climate change. Setting a mid-term target and sector-specific targets will help guide our path.

Reaching our ultimate objective—reducing California's greenhouse gas emissions to the scientifically recognized level necessary for climate stabilization— will require California to keep building on the framework by continuing to pursue the maximum technologically feasible and cost-effective actions that will steadily drive down greenhouse gas emissions over the coming decades. It is also clear that many of these same actions are needed to reduce emissions of smog-forming and toxic pollutants to meet federal air quality requirements and ensure that all Californians have healthful air.

This Update lays out a set of new actions that will move the State further along the path to a low-carbon, sustainable future, including specific recommended actions with lead agency assignments and anticipated due dates. Some of the actions are near-term, while others are focused on longer-term efforts that will provide major benefits well into the future.

Every major economic sector in the State will need to play an increasing role in this effort. Success will require the creation of new policies in some sectors, and expanding and refining existing policies in others. We must continue working to find the right combination of policy-based "push" and incentive-based "pull" to accelerate commercial markets for clean energy and efficiency. And we have to coordinate and align public investments in ways that most effectively leverage private resources.

## **The Great Unifier**

Climate change presents an unprecedented set of challenges for California. We are already experiencing its impacts and know that they will only increase. But it can also be a great unifier. It gives us the opportunity to focus on doing more with less; to work across programmatic, policy and political boundaries; and to figure out ways to achieve various goals more quickly and more effectively. The task is to continue building on the steps we have already taken by further integrating climate thinking and sustainability programming into the range of actions we take to grow the economy, protect the environment and public health, and plan for the future.

The strategies we pursue to cut greenhouse gas emissions from our cars, trucks, buses, trains and industries can support ongoing efforts to improve air quality up and down the State, especially in our most heavily impacted communities. Efficiency and conservation programs in the water sector needed to cut emissions will also drive critically needed efforts to enhance supply and reliability priorities. We can cut emissions from our waste stream while also increasing home-grown sources of low-carbon energy and fuels. And we can manage our natural lands and valuable agricultural resources in ways that both achieve climate objectives and enhance their long-term sustainability.

With strategic investment and coordinated policy-making, California can slash emissions from trucks and trains while at the same time building a world-class goods movement and freight-delivery system. We can modernize our rail and passenger transportation systems to move people in ways that both reduce greenhouse gases and increase mobility options and safety. We can take actions to cut emissions of potent short-lived climate pollutants that will also deliver key public health benefits. And we can align strategies that both support reduction goals and bolster our ability to deal with the impacts of climate change already underway.

The reality is that while climate change demands it, these and myriad other examples described in this Update are exactly the types of actions California must take in any case to build for our future.

## **Mid-Term Target**

As supported by many of California's climate scientists and economists, a key step needed to build on California's framework for climate action is to establish a mid-term statewide emission reduction target. Cumulative emissions drive climate change, and a continuum of action is needed to reduce emissions not just to stated limits in 2020 or 2050, but also every year in between. The target will ensure that the State stays on course and expands upon the successes we have achieved to date so that we can achieve our long-term objective of reducing California's greenhouse gas emissions to the scientifically recognized level necessary for climate stabilization. A mid-term target, informed by climate science, will be critical in helping to frame the additional suite of policy measures, regulations, planning efforts, and investments in clean technologies that are needed to continue driving down emissions. It will also send a clear signal that California is solidifying its commitment to a low-carbon future, giving businesses the long-term certainty they need to plan for the future.

Each of the major sectors highlighted in this Update must play a role in supporting the statewide effort to continue reducing emissions. As steps are taken to develop a statewide target, sector targets will also be developed that reflect the opportunities for reductions that can be achieved through existing and new actions, policies, regulations and investments.

## **Sector-Specific Actions**

### ***Energy***

The actions outlined in this Update support California's efforts to build a state-of-the-art energy generation, supply and distribution system that is clean, affordable and reliable. Many of the actions expand upon existing policy frameworks that have made our State a global leader in areas like energy efficiency, demand response, and renewable energy generation. Others reflect the need to incorporate new and rapidly evolving technologies like energy storage, demand response, and a smarter grid into the fabric of California's energy system.

A core element of the Update is the development of a comprehensive greenhouse gas reduction program for the State's electric and energy utilities by 2016. This approach will enable California to pull together and coordinate a range of policies, technologies, and investments needed to achieve the most cost-effective emission reductions across the sector, in line with meeting mid-term and long-term statewide targets. It also will give utilities, electricity providers and a range of other businesses the flexibility and the right incentives to pursue the most innovative strategies to cut emissions.

### ***Transportation, Land Use, Fuels, and Infrastructure***

Over the past several decades, California has pioneered a host of innovative policies in the transportation sector that have cut air pollution and greenhouse emissions. This Update builds on a set of existing policies and lays out new strategies that will continue to push down emissions and scale up clean, advanced technologies across the entire transportation sector. It calls for targeted investment in critical infrastructure projects that will be necessary to keep California on track to meet our ongoing climate objectives. And it recognizes the need to closely integrate climate planning with efforts to meet California's air quality goals.

Meeting California's long-term air quality and climate objectives will require the State to continue building on efforts underway to put more low and zero-emission vehicles on the road. These efforts also need to be expanded to include an increasing focus on cleaner medium- and heavy-duty vehicles. At the same time, we must continue working to figure out the right mix of policies and incentives for increasing reductions in the carbon content of transportation fuels. And we must invest in building the cleanest, most advanced systems and infrastructure to move people and goods in the State. Key approaches to this include high speed rail and the Sustainable Freight Initiative.

### ***Agriculture***

California's agricultural industry provides hundreds of thousands of jobs and tens of billions of dollars in economic value to the State each year. The long-term sustainability of the sector is vital to California's economic future. This Update describes a set of actions to ensure California's agricultural sector continues to thrive in the face of a changing climate and plays a key role in the State's efforts to continue reducing greenhouse emissions.

There is a range of opportunities for greenhouse gas emission reductions and sequestration in the agriculture sector. Technological advancements allow for more precise irrigation techniques, which cut energy costs and preserve valuable water resources. Strategic approaches to conservation will keep valuable agricultural lands in operation and help eliminate greenhouse gas emissions that result from conversion. And capturing methane from agriculture operations will provide climate benefits while also affording opportunities to produce bioenergy and biofuels. The coordinated effort to develop the right mix of policies and incentives described in this Update will help keep California's agriculture sector thriving into the future.

### ***Water***

Water is the lifeblood of our State and economy, and integrally connected to our food supply and energy systems. With the declaration of a drought emergency, the State needs to employ a range of approaches that will cut emissions, maximize efficiency and conservation, and enhance water quality and supply reliability, while also addressing growing climate resiliency requirements.

A greater focus on integrated policy design in the water sector is needed as California implements strategies that will support our State's longer-term climate objectives. State policy and regulatory frameworks must be developed that allow for, and incentivize, effective regional integrated planning and implementation. We need to employ pricing policies that will maximize efficiency and conservation efforts in the water sector, and put in place mandatory conservation measures to reduce greenhouse gas emissions and maintain water supply reliability during drought periods.

## **Waste**

California's goal of reaching 75 percent recycling and composting by 2020 provides an opportunity to achieve substantial GHG emission reductions across the waste sector, while providing other significant economic and environmental co-benefits. Much of what is traditionally considered "waste" can be a resource for other uses. California must take advantage of waste materials to generate energy to power our homes and cars, and to improve our working lands.

Compostable organics represent over a third of California's disposed waste, and are the primary source of fugitive methane emissions at landfills. A new organics management approach for California that will divert this material to minimize emissions at landfills and provide feedstock for critically needed alternatives to agricultural amendments and for low carbon fuel manufacturing.

Achieving the 75 percent waste diversion goal will require substantial expansion of the collection, recycling, and manufacturing industries within California. This Update sets forth a series of actions to support this industrial growth and calls on California to manage its waste at home in ways that will support greenhouse gas emission reductions, environmental co-benefits, and job growth.

## **Natural and Working Lands**

Three-quarters of California's landmass comprises biologically diverse landscapes such as forests, woodlands, shrublands, grasslands and wetlands. These natural and working lands provide a multitude of economic and environmental benefits, and must play an increasingly important role in California's efforts to prepare for and adapt to the impacts of climate change. Natural and working lands must also play a key role to help achieve California's long-term climate objectives. We have to start investing now in strategies that ensure these lands are managed in ways that maximize their carbon benefits while also ensuring landscape resilience; protecting and enhancing the State's water supplies; safeguarding the State's wildlife, fish, and plants; and promoting sustainable rural communities.

This Update describes a series of policies, actions, and strategic investments to enhance, protect, and conserve California's natural and working lands in ways that will provide important climate benefits as well as a more resilient California that is better prepared for climate risks such as more frequent and severe wildfires, varying and unpredictable water availability, and stressors on species and natural communities. A key element of this approach is the development of a "Forest Carbon Plan" by 2016 that will set mid and long-term greenhouse gas reduction planning targets, and identify funding and investment needs.

## **Short-Lived Climate Pollutants**

Over the past several decades, California's actions to improve air quality and protect public health have resulted in significant reductions in potent short-lived climate pollutants, which include black carbon, methane, and hydrofluorocarbons. These pollutants remain in the atmosphere for shorter periods of time and have much larger global warming potentials compared to CO<sub>2</sub>.

While we must continue taking steps to rapidly reduce CO<sub>2</sub> emissions, additional efforts to cut emissions of short-lived climate pollutants can yield immediate climate benefits. In addition, fast and sustainable actions to reduce these emissions can help to achieve other benefits though avoided impacts on agriculture, water availability, ecosystems, and human health. The reduction of methane would reduce background tropospheric ozone concentrations, which would help with progress towards healthy air quality and avoid crop yield losses and forest damage due to the direct action of ozone on plant growth. Black carbon impacts cloud formation and precipitation, and black carbon deposits on glaciers and snowpack accelerate melting. Reducing black carbon and methane emissions will help reduce the risk for premature deaths, air pollution-related hospitalizations, and associated medical expenses each year.

California is committed to continuing to reduce emissions of short-lived climate pollutants, particularly where efforts will result in air quality and public health co-benefits. ARB will develop a short-lived climate pollutant strategy by 2015 that will include an inventory of sources and emissions, the identification of additional research needs, and a plan for developing necessary control measures.

### ***Green Buildings***

Buildings in California represent a significant source of greenhouse gas emissions. Over the past five years, California has solidified its commitment to green building; leading the way with State buildings, improving building standards, continuing to raise the bar with voluntary programs at the local level, and greening existing buildings. We must continue to build on this approach by ensuring successful implementation of current initiatives and expanding the long term focus towards zero-carbon buildings.

This Update describes a set of actions to continue cutting emissions from California’s building sector including the development of a comprehensive greenhouse gas emission reduction program for new construction, existing building retrofits, and operation and maintenance. This Update describes a set of actions to continue cutting emissions from California’s building sector including the development of a comprehensive greenhouse gas emission reduction program for new construction, existing building retrofits, and operation and maintenance of certified green buildings.

## **Courage, Creativity, and Boldness**

Climate change has presented us with unprecedented challenges—challenges that cannot be met with traditional ways of thinking or conventional solutions. As Governor Brown has recognized, meeting these challenges will require “courage, creativity, and boldness.”

It will require California to continue to lead the world in pioneering effective strategies toward a cleaner, more sustainable economy. It will require us to continue sharing our successful approaches to climate policy with others, including continuing to partner and collaborate with other state, national, and global leaders as we work toward common goals. And it will require further engaging California’s citizens, businesses, and its most creative minds to continue building a state that provides low carbon, high-quality lifestyles.

As we take these steps, we understand that we don’t have all of the answers today. But, we are on the right path. We have a framework for action in place that is driving down emissions, spurring innovation across a range of clean and advanced technology sectors, improving the air Californians breathe, and creating more livable communities. By building on this framework with the set of actions outlined in this Update, we can do our part to meet the challenge of global climate change, and in the process, continue to build the clean, sustainable future that all Californians deserve.



# APPENDIX B

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**WHEREAS** climate change poses an ever-growing threat to the well-being, public health, natural resources, economy, and the environment of California, including loss of snowpack, drought, sea level rise, more frequent and intense wildfires, heat waves, more severe smog, and harm to natural and working lands, and these effects are already being felt in the state; and

**WHEREAS** the Intergovernmental Panel on Climate Change concluded in its Fifth Assessment Report, issued in 2014, that "warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia" and that "continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems;" and

**WHEREAS** projections of climate change show that, even under the best-case scenario for global emission reductions, additional climate change impacts are inevitable, and these impacts pose tremendous risks to the state's people, agriculture, economy, infrastructure and the environment; and

**WHEREAS** climate change will disproportionately affect the state's most vulnerable citizens; and

**WHEREAS** building on decades of successful actions to reduce pollution and increase energy efficiency the California Global Warming Solutions Act of 2006 placed California at the forefront of global and national efforts to reduce the threat of climate change; and

**WHEREAS** the Intergovernmental Panel on Climate Change has identified limiting global warming to 2 degrees Celsius or less by 2050 as necessary to avoid potentially catastrophic climate change impacts, and remaining below this threshold requires accelerated reductions of greenhouse gas emissions; and

**WHEREAS** California has established greenhouse gas emission reduction targets to reduce greenhouse gas emissions to 1990 levels by 2020 and further reduce such emissions to 80 percent below 1990 levels by 2050; and

**WHEREAS** setting an interim target of emission reductions for 2030 is necessary to guide regulatory policy and investments in California in the midterm, and put California on the most cost-effective path for long term emission reductions; and

**WHEREAS** all agencies with jurisdiction over sources of greenhouse gas emissions will need to continue to develop and implement emissions reduction programs to reach the state's 2050 target and attain a level of emissions necessary to avoid dangerous climate change; and

**WHEREAS** taking climate change into account in planning and decision making will help the state make more informed decisions and avoid high costs in the future.

**NOW, THEREFORE, I, EDMUND G. BROWN JR.**, Governor of the State of California, in accordance with the authority vested in me by the Constitution and statutes of the State of California, in particular Government Code sections 8567 and 8571 of the California Government Code, do hereby issue this Executive Order, effective immediately

**IT IS HEREBY ORDERED THAT:**

1.A new interim statewide greenhouse gas emission reduction target to reduce greenhouse gas emissions to 40 percent below 1990 levels by 2030 is established in order to ensure California meets its target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050.

2.All state agencies with jurisdiction over sources of greenhouse gas emissions shall implement measures, pursuant to statutory authority, to achieve reductions of greenhouse gas emissions to meet the 2030 and 2050 greenhouse gas emissions reductions targets.

3.The California Air Resources Board shall update the Climate Change Scoping Plan to express the 2030 target in terms of million metric tons of carbon dioxide equivalent.

4.The California Natural Resources Agency shall update every three years the state's climate adaptation strategy, Safeguarding California, and ensure that its provisions are fully implemented. The Safeguarding California plan will:

- Identify vulnerabilities to climate change by sector and regions, including, at a minimum, the following sectors: water, energy, transportation, public health, agriculture, emergency services, forestry, biodiversity and habitat, and ocean and coastal resources;
- Outline primary risks to residents, property, communities and natural systems from these vulnerabilities, and identify priority actions needed to reduce these risks; and
- Identify a lead agency or group of agencies to lead adaptation efforts in each sector.

5.Each sector lead will be responsible to:

- Prepare an implementation plan by September 2015 to outline the actions that will be taken as identified in Safeguarding California, and
- Report back to the California Natural Resources Agency by June 2016 on actions taken.

6.State agencies shall take climate change into account in their planning and investment decisions, and employ full life-cycle cost accounting to evaluate and compare infrastructure investments and alternatives.

7.State agencies' planning and investment shall be guided by the following principles

- Priority should be given to actions that both build climate preparedness and reduce greenhouse gas emissions;
- Where possible, flexible and adaptive approaches should be taken to prepare for uncertain climate impacts;
- Actions should protect the state's most vulnerable populations; and
- Natural infrastructure solutions should be prioritized.

8. The state's Five-Year Infrastructure Plan will take current and future climate change impacts into account in all infrastructure projects

9. The Governor's Office of Planning and Research will establish a technical, advisory group to help state agencies incorporate climate change impacts into planning and investment decisions.

10. The state will continue its rigorous climate change research program focused on understanding the impacts of climate change and how best to prepare and adapt to such impacts. This Executive Order is not intended to create, and does not, create any rights or benefits, whether substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

**I FURTHER DIRECT** that as soon as hereafter possible, this Order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this Order.

**IN WITNESS WHEREOF** I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 29th day of April 2015.

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EDMUND G. BROWN JR.  
Governor of California

ATTEST:

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ALEX PADILLA  
Secretary of State

# APPENDIX C

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# Short-Lived Climate Pollutant Reduction Strategy

March 2017



California Environmental Protection Agency  
 **Air Resources Board**

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.



## EXECUTIVE SUMMARY

California's dramatic landscapes—including deserts, mountains, valleys, and coastlines—and abundant natural resources, have drawn early explorers and settlers and today's residents. However, climate change is threatening Californian's way of life. The State suffers through historic temperatures, persistent droughts, and more intense and frequent wildfires. Each year seems to bring a new global temperature record, and new evidence suggests sea levels are rising much faster than predicted. What was once, and remains, a generational problem of greenhouse gas (GHG) balance in the atmosphere has now become an immediate threat to our California lifestyle.

The only practical way to rapidly reduce the impacts of climate change is to employ strategies built on the tremendous body of science. The science unequivocally underscores the

need to immediately reduce emissions of short-lived climate pollutants (SLCPs), which include black carbon (soot), methane (CH<sub>4</sub>), and fluorinated gases (F-gases, including hydrofluorocarbons, or HFCs). They are powerful climate forcers and harmful air pollutants that have an outsized impact on climate change in the near term, compared to longer-lived GHGs, such as carbon dioxide (CO<sub>2</sub>). SLCPs are estimated to be responsible for about 40 percent of current net climate forcing. Action to reduce these powerful “super pollutants” today will provide immediate benefits as the effects of our policies to reduce long-lived GHGs further unfold.

California's Global Warming Solutions Act, AB 32 (Nuñez, Chapter 488, Statutes of 2006), charges the California Air Resources Board (ARB or Board) with reducing statewide GHG emissions to 1990 emission levels by 2020 and maintaining a statewide GHG emission limit, while seeking continuing GHG emission reductions. In September 2016, Governor Brown signed SB 32 (Pavley, Chapter 249, Statutes of 2016), codifying a reductions target for statewide GHG emissions of 40 percent below 1990 emission levels by 2030. SLCP emission reductions will support achieving these targets. Indeed, specific to SLCP emission reductions, Senate Bill 605 (Lara, Chapter 523, Statutes of 2014) requires the ARB to develop a plan to reduce emissions of SLCPs, and Senate Bill 1383 (Lara, Chapter 395, Statutes of 2016) requires the Board to approve and begin implementing the plan by January 1, 2018. SB 1383 also sets targets for statewide reductions in SLCP emissions of 40 percent below 2013 levels by 2030 for methane and HFCs and 50 percent below 2013 levels by 2030 for anthropogenic black carbon,

### **The Need for an SLCP Strategy**

- SLCP's are the most potent short-term GHGs
- Significant reductions are needed to minimize the impact of these powerful climate forcers
- Viable opportunities exist to reduce emissions locally and globally
- Reduction measures would provide co-benefits (valuable energy and soil amendment products, reduced reliance on fossil fuel, public health benefits, co-pollutant benefits, etc.)

as well as provides specific direction for reductions from dairy and livestock operations and from landfills by diverting organic materials.

This final proposed SLCP Reduction Strategy (SLCP Strategy) was developed pursuant to SB 605 and SB 1383 and lays out a range of options to accelerate SLCP emission reductions in California, including regulations, incentives, and other market-supporting activities. The SLCP Strategy will inform and be integrated into the upcoming 2017 Climate Change Scoping Plan Update, which will incorporate input from a wide range of stakeholders to develop a comprehensive plan for achieving the SB 32 statewide 2030 GHG limit of 40 percent below 1990 levels. The process for updating the Scoping Plan

began in fall 2015 and is scheduled for completion in 2017.

**Achievable Goals through Implementing the SLCP Strategy:**

- Achieve the following reductions by 2030 (from 2013 levels): ...
  - 50% for anthropogenic Black Carbon
  - 40% for Methane, and
  - 40% for HFCs
- Convert manure and organic wastes into valuable energy and soil amendment products
- Reduce disposal of edible foods by diverting them to food banks and other outlets
- Reduce harmful emissions from residential wood stoves
- Accelerate the reductions of the fastest-growing source of GHG emissions by building on global HFC phasedown agreements.

Scientific research indicates that an increase in the global average temperature of 2°C (3.6°F) above pre-industrial levels, which is only 1.1°C (2.0°F) above present levels, poses severe risks to natural systems and human health and well-being. Deploying existing technologies and resource management strategies globally to reduce SLCP emissions can cut the expected rate of global warming in half and keep average warming below the dangerous 2°C threshold at least through 2050. We can slow sea level rise significantly, reduce disruption of historic

rainfall patterns, and boost agricultural productivity by reducing crop losses to air pollution. Cutting global SLCP emissions immediately will slow climate feedback mechanisms in the Arctic and elsewhere that would otherwise further accelerate global warming and make climate change far more difficult to solve and far more costly to live with—as more resources would be required for disaster relief, conflict management, and adaptation. Most importantly, we can dramatically reduce global air pollution, saving millions of lives each year. Many of these benefits will primarily accrue in regions and populations disproportionately impacted by climate change, including the developing world.

Using cost-effective and available technologies and strategies, worldwide anthropogenic sources of SLCP emissions can be largely controlled by 2030 and the global benefits of a collective commitment to substantially reduce SLCP emissions would be profound. Leading efforts by California, the United States, Mexico, Norway, Europe, the Arctic

Council, and several countries and non-governmental entities acting through the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) are already targeting SLCPs. Many other countries included SLCP emissions in their commitments made at the Paris climate conference, or are targeting them through separate policies to improve air quality and promote sustainable agriculture and transportation, among other efforts.



Glacial decline in the Glacier Peak Wilderness (Washington state) from 1973 to 2006.

Assembly Bill 1613 (Committee on Budget, Chapter 370, Statutes of 2016) and Senate Bill 859 (Committee on Budget and Fiscal Review, Chapter 368, Statutes of 2016) lays out a spending plan for Cap-and-Trade revenues which specifically target SLCP emission reductions. These include \$5 million for black carbon wood smoke reductions, \$40 million for waste reduction and management, \$7.5 million for Healthy Soils, and \$50 million for methane emission reductions from dairy and livestock operations.

### An Opportunity for California

In this SLCP Strategy, we outline SLCP emission reduction actions that provide a wide array of climate, health, and economic benefits throughout the State. The State's



Dairy gas cleanup system (gas scrubber)

organic waste should be put to beneficial use, such as for soil amendments/compost, electrical generation, transportation fuel, and pipeline-injected renewable natural gas. Organic wastes converted to biogas could supply enough renewable natural gas for about 2 million residential units.<sup>1</sup> Practical solutions must be developed and implemented to overcome barriers to waste gas utilization for pipeline injection and grid interconnection. Additional data on SLCP sources must be collected in order to improve California's SLCP emission inventory and better understand potential mitigation measures. Finally, the State should provide incentives to accelerate market transitions to cleaner technologies that foster significant system-wide solutions to cut emissions of SLCPs. Many of the sources and sectors responsible for SLCP emissions are concentrated in communities with high levels of pollution or unemployment, which could especially benefit from targeted investments to

<sup>1</sup> For illustrative purposes only. This SLCP Strategy calls for a variety of waste management approaches, some of which do not yield energy products.

improve public health and boost economic growth.

In the coming years, many billions of dollars in public and private investments are anticipated to support efforts to reduce SLCP and CO<sub>2</sub> emissions and support our agricultural and waste sectors, build sustainable freight systems, and encourage low-Global Warming Potential (GWP) refrigerants. These investments will strengthen the State as a whole and the communities where they occur. Many of the benefits will accrue in the Central Valley, rural parts of the State, or other areas disproportionately impacted by pollution, such as those along freight corridors.

Stubborn barriers remain, including connecting distributed electricity and biogas projects, which have slowed previous efforts to reduce emissions of SLCPs and capture a wide array of benefits. These barriers are not insurmountable, and now is the time to solve them. State agencies, utilities, and other stakeholders need to work immediately to identify and resolve remaining obstacles to connecting distributed electricity with the grid and injecting renewable natural gas into the pipeline, as called for in SB 1383. Supporting the use of the cleanest technologies with funding and strategies that maximize air quality, climate, and water quality benefits can accelerate their introduction. Building market certainty and value for the energy, soil amendment, and other products such as a uniform fertilizer that come from compost or anaerobic digestion facilities will help to secure financing to accelerate and scale project development.

### **Building on California Leadership**

This SLCP Strategy builds on California's ongoing leadership to address climate change and improve air quality. It has been developed with input from State and local agencies, academic experts, a working group of agricultural experts and farmers convened by the California Department of Food and Agriculture (CDFA), businesses, and other interested stakeholders in an open and public process. ARB and State agencies collaborated to identify reduction measures for specific sectors, including the dairy, wastewater, and waste sectors. In addition, ARB collaborated with the local air districts to identify SLCP emission reduction measures that could be implemented through district action. Throughout this process, ARB has sought advice from academic, industry, and environmental justice

#### **SLCP Guiding Principles**

Measures to reduce SLCP emissions should be:

- Commercially and technologically feasible
- Informed by sound science and best available information
- Designed to maximize air pollution reductions and other co-benefits, especially considering disadvantaged communities
- Leveraged with other market programs, incentives, and investments to maximize the measures' efficacy
- Developed in consultation with disadvantaged communities, affected industries, relevant local and State agencies, and other stakeholders

representatives. Additionally, ARB staff is working closely with manufacturers to determine the feasibility and cost of replacement products for high-GWP refrigerants, and with the dairy industry and academics to evaluate options and costs for reducing emissions of methane at dairies.

While reducing GHG emissions is a key objective for the State, California remains committed to further reducing emissions of criteria (smog-forming) pollutants and toxic air pollutants, as well. Many of the concepts described in this SLCP Strategy have already been discussed in the context of the California Sustainable Freight Action Plan, 2016 Mobile Source Strategy and other efforts related to developing State Implementation Plans for air quality, and plans for bioenergy, waste management, water management, healthy soils, and sustainable management of the state's natural resources.

State agencies and the air districts are committed to continuing to work together to ensure that the concepts outlined in this SLCP Strategy are implemented in a coordinated and synergistic way. The sections below describe goals, regulations, incentives, and other efforts that would:

- Encourage national and international deployment of California's well-established and proven measures to reduce black carbon emissions;
- Further reduce black carbon emissions from off-road and non-mobile sources;
- Significantly cut methane emissions from dairy and livestock operations while providing farmers with new, potentially lucrative revenue streams;
- Significantly reduce disposal of organics in landfills and create and expand industries to capture value from organic waste resources in California;
- Significantly reduce fugitive methane emissions from oil and gas systems and other sources; and
- Accelerate the transition to low-GWP refrigerants and more energy efficient refrigeration systems.

### **Achieving Significant Emission Reductions**

SB 1383 sets statewide emission reduction targets of 40 percent below 2013 levels by 2030 for methane and HFCs, and 50 percent below 2013 levels by 2030 for anthropogenic black carbon emissions, codifying the proposed targets included in earlier versions of this SLCP Strategy. These targets will assist the State in meeting its SB 32 goals and federal air quality standards for 2031 and beyond.

The emission reductions associated with these targets are summarized in Table 1. The goals and proposed measures included in this SLCP Strategy will reduce SLCP emissions to levels in line with these targets. Recognizing how damaging SLCPs can be over the short-term, 20-year GWPs are used in this report to quantify emissions of SLCPs, as opposed to 100-year GWPs, which are used in the State's official GHG inventory and for accounting for emissions in programs adopted under AB 32.

**Table 1: California SLCP Emissions and Emission Reduction Target Levels (MMTCO<sub>2e</sub>)\***

Pollutant	2013	2030 BAU**	2030 Emission Reduction Target (percent reduction from 2013)
Black carbon (anthropogenic)	38	26	19 (50%)
Methane	118	117	71 (40%)
Hydrofluorocarbons (HFCs)	40	65	24 (40%)

\*Using 20-year GWPs from the 4<sup>th</sup> Assessment report of the IPCC for methane and HFCs, and 5<sup>th</sup> Assessment report for black carbon (the first report to define a GWP for black carbon)

\*\*Business As Usual (BAU) forecasted inventory includes reductions from implementation of current regulations

### **Black Carbon**

Black carbon is not one of the climate pollutants originally included in international climate frameworks, and it is not included in California’s AB 32 inventory. However, recent studies have shown that black carbon plays a far greater role in global warming than previously believed. California has made tremendous progress in reducing black carbon emissions as part of its efforts to reduce carcinogenic diesel particulate matter emissions and improve air quality. California has already cut anthropogenic black carbon emissions by over 90 percent since the 1960s, and existing measures are projected to cut mobile source emissions by 75 percent and total anthropogenic emissions by nearly 60 percent between 2000 and 2020. Putting measures in place to achieve similar levels of reductions worldwide is the quickest way to reduce the impacts of climate change, and would save millions of lives per year.



These reductions have come from strong efforts to reduce on-road vehicle emissions, especially diesel particulate matter. Car and truck engines used to be the largest sources of anthropogenic black carbon emissions in California, but the State's existing air quality policies will virtually eliminate black carbon emissions from on-road diesel engines within 10 years. These policies are based on existing technologies, which could be deployed throughout the U.S. and the world.

With the large reduction in emissions of black carbon from vehicles, other sources of black carbon emissions will become more significant contributors to the State’s black carbon inventory over time. In particular, without additional actions, off-road mobile, fuel combustion in the industrial and power sectors, and woodstoves and fireplaces will account for more than three-quarters of anthropogenic black carbon emissions in

California in 2030. However, black carbon emissions from these sources have declined significantly as well, by almost 30 percent since 2000. Continued progress on these sectors—transitioning to cleaner and more efficient uses of energy, reducing emissions from woodstoves and fireplaces, taking steps to meet federal health-based air quality standards by 2031, and developing and implementing a sustainable freight system—will continue to reduce black carbon emissions and should allow us to meet the targets established in this SLCP Strategy. The State’s 2016 Mobile Source Strategy, 2017 Scoping Plan Update, and Sustainable Freight Action Plan, a multi-agency effort to deploy a sustainable and efficient system for goods movement, will build on these measures to reduce black carbon. Additionally, ARB will work with local air districts to further reduce particulate matter and black carbon emissions from woodstoves and fireplaces. Last year, Governor Brown signed legislation allocating \$5 million to reduce black carbon from wood smoke.

Wildfire is the largest source of black carbon in California, harmfully impacting both public health and the climate. In general, wildfires are occurring at increasing rates and at increasing levels of severity. This trend raises concern over the long-term resilience of these forests and their ability to sequester carbon, mitigate climate change, and provide resource amenities. Since the legislative direction and intent of SB 1383 is to include only anthropogenic, non-forest, sources of black carbon in the target, and in light of continued state research and policy development occurring in this area, a target for forest-derived black carbon emission reductions is not included in this SLCP Strategy. The Forest Carbon Plan, as well as the 2017 Scoping Plan Update, will continue to explore the interrelation of climate change and natural lands and lay out programmatic and scientific actions needed to increase carbon sequestration and decrease black carbon emissions from wildfire. Implementation of these plans is important to address emissions from California forest fires, and to address forest health generally, from both a public health and climate change perspective.

### ***Methane***

Methane is responsible for about 20 percent of current net climate forcing globally. In California, about half of methane emissions come from dairy and livestock manure or organic waste streams that are landfilled. These resources could be put to valuable use as sources of renewable energy or fuel, soil amendments, and other products. The other half mostly comes from enteric fermentation (burps) from dairy cows and livestock and fugitive emissions (leaks) from oil production, processing, and storage, gas pipeline system, or industrial operations. California can cut methane emissions by 40 percent below current levels in 2030 by capturing or altogether avoiding methane from manure at dairies, pursuing opportunities to reduce methane emissions from enteric fermentation, significantly reducing disposal of organics in landfills, and reducing fugitive methane emissions by 40-45 percent from all sources.

Strong market support and broad collaboration among State agencies, industry, and other stakeholders will be necessary to reduce landfill and manure methane emissions by putting organic waste streams to beneficial use. The State will support early action

to build infrastructure capacity and reduce emissions through existing incentives and accelerated efforts to overcome barriers and foster markets. Government agencies and stakeholders will work to foster market conditions to support private sector investment in expanded or new infrastructure, including building markets for compost, soil amendments, and low carbon transportation fuels; overcoming barriers to pipeline injection of biomethane, grid connection for electricity or another best-use alternative; and identifying effective financing mechanisms and levels to reach the goals in this SLCP Strategy.

Ultimately, a combination of incentives, State and private sector collaboration and investment, and regulations will be necessary to capture the value in organic waste streams and ensure lasting emission reductions in order to achieve an economy-wide 40 percent reduction in methane.

Manure is responsible for 25 percent of California's methane emissions and improved manure management offers significant, near-term potential to achieve deep reductions in the State's methane emissions. Before ARB regulates dairy and livestock manure emissions, as required by SB 1383, California agencies will encourage and support near-term actions by dairies to reduce manure emissions through financial incentives, collaboration to overcome barriers, development of policies to encourage renewable natural gas production, and other market support.

Enteric fermentation from all livestock is responsible for roughly 30 percent of the State's methane emissions and is a critical source to control, but development of effective control measures face a unique set of challenges. The State will support and monitor research and explore voluntary, incentive-based approaches to reduce enteric fermentation emissions from dairy and non-dairy livestock sectors until cost-effective and scientifically-proven methods to reducing these emissions are available and regulatory actions can be evaluated.

Any regulations will be developed according to the time frames and requirements set forth in SB 1383 and AB 32, and in coordination with CDFA, CPUC, and local air quality and water quality agencies. The development of measures to reduce methane will be done in close coordination with dairy industry and will consider public input; available financial incentives; technical, market, and regulatory barriers to the development of dairy methane emission reduction projects; research on dairy methane emission reduction projects; and the potential for emissions leakage. A key effort will include working with CPUC and the dairy industry to implement a series of pilot projects that will help to better inform the opportunities for economically viable methane reduction strategies as well as the barriers that must be addressed. SB 1383 stipulates that manure methane emission control regulations are to be implemented on or after January 1, 2024. However, the statute allows ARB to require monitoring and reporting of emissions from dairy and livestock operations before that date. Consistent with SB 1383, ARB, in consultation with CDFA, will analyze the progress dairies are making in achieving the goals in this SLCP Strategy by July 1, 2020, and may adjust those goals as necessary.



For organic waste currently landfilled, the California Department of Resources Recycling and Recovery (CalRecycle) will consult with ARB to develop regulations by late 2018 to reduce the level of the statewide disposal of organic waste by 50 percent of 2014 levels by 2020 and 75 percent of 2014 levels by 2025. These regulations will take effect on or after January 1, 2022. CalRecycle plans to consider the regulations for adoption by the end of 2018, which will: 1) allow jurisdictions that want to adopt early the ability to do so, thus contributing to the 2020 goal; and 2) provide clear direction to all jurisdictions, their service providers, and regulated businesses so that they can plan and budget for the required program changes that will need to take effect in 2022.

To support this, CalRecycle, with assistance from ARB, will build on its partnerships with local governments, industry, nonprofits, local air districts and water boards to support regional planning efforts and identify ways to increase recovery of organics and to safely and effectively develop necessary organics recycling capacity. Key issues associated with increasing actual recycling capacity include quantifying the co-benefits and the GHG emission reduction benefits of applying compost, addressing the cross-media regulatory tradeoffs between product use benefits relative to compost facility impacts, making beneficial use of biomethane generated from anaerobic digestion projects, and overcoming difficult issues associated with siting, social acceptance, CEQA mitigation, and other issues associated with new organics processing facilities.

Under SB 1383, 20 percent of the edible food destined for the organic waste stream is to be recovered to feed people in need by 2025. CalRecycle will explore new ways to foster food waste prevention and edible food recovery. Recovering and utilizing edible food that would otherwise be landfilled can help to reduce methane emissions and increase access to healthy foods for millions Californians lacking access to an adequate food supply. Additionally, CalRecycle and ARB will work with the State and regional Water Boards to assess the feasibility and benefits of actions to require capturing and effectively utilizing methane generated from wastewater treatment, and opportunities for co-digestion of food waste at existing or new anaerobic digesters at wastewater treatment plants.

This SLCP Strategy also establishes a goal of reducing fugitive methane emissions from oil and gas by 40 percent below current levels in 2025 and a minimum 45 percent in 2030, and from all other sources by 40 percent in 2030. This aligns with the federal government's goal of reducing methane emissions from oil and gas operations by 40–45 percent below 2012 levels by 2025.



California has a comprehensive and stringent emerging framework to reduce methane emissions from oil and gas systems. ARB is developing a regulation to reduce fugitive methane emissions from the oil and gas production, processing and storage sector,

which will be among the most stringent such regulations in the country. Additionally, pursuant to Senate Bill 1371 (Leno, Chapter 525, Statutes of 2014), the California Public Utilities Commission (CPUC) has launched a rulemaking to minimize methane leaks from natural gas transmission and distribution pipelines. Increases in energy efficiency and renewable energy, as well as more dense development patterns, will reduce oil and gas demand and fugitive emissions.

ARB and the California Energy Commission (CEC) have also conducted several research projects to improve methane emission monitoring and accounting, as well as identify emission “hotspots,” which are responsible for large fractions of total fugitive emissions. In addition, AB 1496 (Thurmond, Chapter 604, Statutes of 2015) requires ARB, in consultation with the local air districts, to monitor and measure high-emission methane hot spots in the State. These efforts will continue, and are critical to accelerating leak detection and fugitive methane emission reductions from all sectors, not just oil and gas. Ultimately, to eliminate fugitive methane emissions, the State needs to transition away from its use of oil and natural gas.

### ***HFCs***

Fluorinated gases, and in particular HFCs, are the fastest-growing source of GHG emissions in California and globally. More than three-quarters of HFC emissions in California come from the use of refrigerants in the commercial, industrial, residential, and transportation sectors. In many cases, alternatives with much lower GWPs are already available and the United States Environmental Protection Agency (U.S. EPA) is beginning to impose bans on the use of F-gases with the highest GWPs in certain applications and sectors.

The annual Montreal Protocol Meeting of Parties in October 2016 in Kigali, Rwanda, resulted in an historic international agreement, known as the “Kigali Amendment”, to phase down the production of HFCs globally. The agreement requires a reduction in the production and supply of HFCs for developed countries, including the U.S., from 2011-2013 levels, as follows: 10 percent reduction in 2019; 40 percent in 2024, 70 percent in 2029, 80 percent in 2034, and 85 percent in 2036. Developing countries will not have to begin the phasedown until 2029, and will be allowed until 2045 to reach the 85 percent reductions in HFC consumption. Although the HFC phasedown will eventually result in significant reductions, preliminary ARB analysis indicates that the phasedown alone is not sufficient to reach California’s HFC emission reduction goals by 2030 for the following reasons:

- 1) The current oversupply of HFCs in the U.S. (as a result of “dumping” imports of HFCs at less than fair market value) will ensure that the supply of HFCs is higher than demand at the beginning of the phasedown in 2019;

- 2) The initial cap on HFC production and consumption is estimated to be much higher than the demand, delaying the transition to lower-GWP alternatives, and therefore delaying emission reductions;<sup>2</sup>
- 3) Existing equipment using high-GWP HFCs has an average lifetime of 15-20 years, and can be expected to continue operating and emitting high-GWP HFCs well past 2030. The relatively long equipment life is responsible for a long lag time of 10-20 years between a production phase-out and an equivalent emission reduction;<sup>3</sup>
- 4) Without diligent national enforcement efforts by the U.S. EPA, illegal imports of high-GWP HFCs into the U.S. from developing countries may be a significant issue, as developing countries do not start an HFC phasedown until 2029, and imported HFCs are likely to be much less expensive. A similar problem occurred in the U.S. in the 1990s when ozone-depleting refrigerants were banned but continued to be illegally imported into the U.S.<sup>4</sup>

ARB will continue to work with industry representatives to evaluate the impact of the Kigali Amendment on HFC emissions and reductions in California, especially as they pertain to meeting the 40 percent emission reduction goal. The assessment will be available later in 2017 for public and scientific peer review. The results of the assessment will be considered in future rulemaking processes. ARB will focus on measures that can move low-GWP alternatives and technologies forward both nationally and internationally. For example, as effective alternatives become available, ARB will consider developing limitations on the use of high-GWP refrigerants in new refrigeration and air-conditioning equipment where lower-GWP alternatives are feasible and readily available. California's climate zones range from high alpine to hot desert environments. As such, California could be instrumental as a proving ground for low-GWP refrigeration and air-conditioning technologies that can be used in extreme environments around the world.

A summary of all proposed SLCP emission reduction measures and estimated reductions is presented in Table 2. These estimates may change as more information on emission sources becomes available and as programs or regulations are developed.

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<sup>2</sup> ARB analysis February 2017. The HFC cap baseline will be finalized by the U.S. EPA by Jan. 2018.

<sup>3</sup> Gallagher, et al., 2014. "High-global Warming Potential F-gas Emissions in California: Comparison of Ambient-based versus Inventory-based Emission Estimates, and Implications of Estimate Refinements". Glenn Gallagher, Tao Zhan, Ying-Kuang Hsu, Pamela Gupta, James Pederson, Bart Croes, Donald R. Blake, Barbara Barletta, Simone Meinardi, Paul Ashford, Arnie Vetter, Sabine Saba, Rayan Slim, Lionel Palandre, Denis Clodic, Pamela Mathis, Mark Wagner, Julia Forgie, Harry Dwyer, and Katy Wolf . Environmental Science and Technology 2014, 48, 1084–1093. Available at [dx.doi.org/10.1021/es403447v](https://doi.org/10.1021/es403447v) (accessed 28 January 2016).

<sup>4</sup> EIA, 2005. Environmental Investigation Agency (EIA). "Under the Counter – China's Booming Illegal Trade in Ozone-Depleting Substances", by Ezra Clark. December, 2005. Emerson Press, ISBN 0-9540768-2-6. Available at: <https://eia-international.org/wp-content/uploads/Under-The-Counter-Dec-05.pdf>.

**Table 2: Summary of Proposed New SLCP Measures and Estimated Emission Reductions (MMTCO<sub>2</sub>e)<sup>1</sup>**

Measure Name	2030 Annual Emission Reductions	2030 Annual Emissions
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**BLACK CARBON (ANTHROPOGENIC)**

2030 BAU <sup>2</sup>		<b>26</b>
Residential Fireplace and Woodstove Conversion	3	
State Implementation Plan Measures and Clean Energy Goals <sup>3</sup>	4	
2030 BAU with new measures		<b>19</b>

**METHANE**

2030 BAU <sup>2</sup>		<b>117</b>
Dairy and Other Livestock (Manure and Enteric Fermentation)	26	
Landfill	4	
Wastewater, industrial and Other Miscellaneous Sources	7	
Oil and Gas Sector	8	
2030 BAU with new measures		<b>71<sup>4</sup></b>

**HYDROFLUOROCARBONS**

2030 BAU <sup>2</sup>		<b>65</b>
Financial Incentive for Low-GWP Refrigeration Early Adoption	2	
HFC Supply Phasedown (to be achieved through the global HFC phasedown) <sup>5</sup>	19	
Prohibition on sales of very-high GWP refrigerants	5	
Prohibition on new equipment with high-GWP Refrigerants	15	
2030 BAU with new measures		<b>24</b>

<sup>1</sup>Using 20-year GWPs from the 4<sup>th</sup> Assessment report of the IPCC for methane and HFCs, and 5<sup>th</sup> Assessment report for black carbon (the first report to define a GWP for black carbon)

<sup>2</sup>Business As Usual (BAU) forecasted inventory includes reductions from implementation of current regulations

<sup>3</sup>Future emission reduction measures that will be developed to help the State meet its air quality and climate change goals are also expected to help the State meet the black carbon target by 2030

<sup>4</sup>The specific annual reduction values shown above do not sum exactly to the total shown due to rounding error.

<sup>5</sup>A global HFC production and consumption phasedown was agreed to on October 15, 2016, in Kigali, Rwanda. ARB is currently evaluating the impact upon HFC emission reductions in California and plans to utilize the results from the assessment to inform future updates to BAU projections for HFC emissions.

## **Cost-Effective Measures with Significant Health Benefits**

Significantly reducing SLCP emissions in line with the targets presented in this SLCP Strategy will continue California's long and successful legacy of implementing innovative and effective environmental and health policies while fostering the growth of a vibrant and sustainable economy. The proposed actions in this SLCP Strategy can contribute to health, environmental, and economic benefits that will positively impact Californian businesses and individuals. As California industry and households shift to cleaner technologies, many benefits will be concentrated in disadvantaged communities or other parts of the State most in need of economic development opportunities. The San Joaquin Valley, rural areas where wood smoke is a primary health concern, and communities along freight corridors are anticipated to see improvements in health as well as green job growth and environmental benefit.

Collectively, implementing these measures would bring thousands of jobs from several billion dollars of investment in clean technologies and strategies that would lead to significant reductions in SLCP emissions. Potential revenues and efficiency savings could also be significant—and potentially outweigh the costs of some measures. In particular, for projects that utilize organic waste to create transportation fuel, the value of Low Carbon Fuel Standard (LCFS) credits and RIN credits from the federal Renewable Fuel Standard can make these projects profitable. However, there remain market barriers that must be addressed, and continued incentives and State support can help to demonstrate and scale these strategies. In other cases, there may be net costs, but associated SLCP emission reductions may come at relatively low cost or provide other environmental and health benefits. For example, strategies at dairies that may not include energy production and associated revenues can still reduce emissions at low cost, and may deliver other environmental benefits, as well. And the collection of HFC measures identified in this SLCP Strategy could significantly reduce GHG emissions through 2030 at a very low cost per tonne.

Achieving the targets identified in this SLCP Strategy would help reduce ambient levels of ozone and particulate matter, and the cardiovascular and respiratory health effects associated with air pollution. These and other health benefits can be maximized as part of an integrated approach to ensure that strategies used to reduce SLCP emissions also help to improve air quality and water quality on a regional basis. Many of these benefits would accrue in disadvantaged communities, which are often located near sources of SLCP emissions.

The proposed actions are supported through an integrated set of air quality and climate policies in the State, including the LCFS, Bioenergy Feed-In-Tariff, utility investments to defray the costs of connecting renewable natural gas supplies to the pipeline, and direct investments from State funds. Together, and with additional targeted State support, we can meet the goals identified in this SLCP Strategy and capture additional economic, environmental and health benefits.

## Putting the Strategy into Action

SB 1383 requires ARB to begin implementing the SLCP Strategy by January 1, 2018, as well as stipulates timeframes for other requirements (Table 3). ARB staff, along with staff from other state agencies, have already begun efforts to implement most of these requirements.

All regulatory measures developed pursuant to the SLCP Strategy would undergo a complete, public rulemaking process including workshops, and economic and environmental evaluations. While this SLCP Strategy is intended to be comprehensive, it is not exhaustive. We will continue to pursue new cost-effective programs and measures as technology and research on SLCP emission sources and potential mitigation measures advances. Staff will track the progress of implementation of the SLCP measures and provide periodic updates to the Board. This information, as well as updates to the SLCP emission inventory, will be posted to ARB's SLCP website.

**Table 3: Timeline for SB 1383 Mandates**

Action	Deadline
ARB approves SLCP Strategy and begins Implementation Expected approval date..... Statutory deadline.....	First Quarter 2017 By January 1, 2018
ARB, CDFA, State Water Resources Control Board and Regional Water Quality Control Boards in coordination with the energy agencies, will work with the dairy industry to establish a dairy workgroup to identify and address barriers to the collection and utilization of biomethane.	First Quarter 2017 and ongoing
CPUC, in consultation with ARB and CDFA, directs utilities to develop at least 5 dairy biomethane pipeline injection projects	By January 1, 2018
ARB develops a pilot financial mechanism to reduce LCFS credit value uncertainty from dairy-related projects and makes recommendations to the Legislature to expand the mechanism to other biogas sources	By January 1, 2018
ARB provides guidance on the impact of regulations on LCFS credits and compliance offsets	By January 1, 2018
ARB, in consultation with CPUC and CEC, develops policies to encourage development of infrastructure and biomethane projects at dairy and livestock operations	By January 1, 2018
CEC develops recommendations for the development and use of renewable gas as part of its 2017 Integrated Energy Policy Report	By early 2018
PUC renewable gas policies based on CEC IEPR	Ongoing

Action	Deadline
ARB, in consultation with CDFA, evaluates the feasibility of enteric fermentation methane reduction incentives and regulations and develops regulations as appropriate	Ongoing
CalRecycle adopts an organics disposal reduction regulation	By end of 2018
ARB, in consultation with CDFA, analyzes and reports on the methane reduction progress of the dairy and livestock sector	By July 1, 2020
CalRecycle, in consultation with ARB, evaluates progress towards meeting the 2020 and 2025 organics waste reduction goals, the status of organics markets and barriers, and recommendations for additional incentives	By July 1, 2020
CalRecycle implements an organics disposal reduction regulation	On or after January 1, 2022
ARB begins developing and considers for adoption a manure management methane reduction regulation	Before January 1, 2024
ARB implements a manure management methane reduction regulation	On or after January 1, 2024

Effectively implementing this SLCP Strategy will require staff to continue working with local, regional, federal and international partners, while strategically investing time and money to overcome market barriers that hinder progress. As our efforts continue, our progress toward these goals will accelerate, leading to a wide range of significant economic and environmental benefits for California broadly, and many of the State's most disadvantaged communities, specifically.

Implementing the SLCP Strategy will also require continued efforts to overcome barriers to connecting distributed electricity, generated from renewable natural gas (RNG), to the grid and injecting renewable natural gas into the pipeline. To address these obstacles, SB 1383 calls for ARB to establish energy infrastructure development and procurement policies needed to encourage dairy biomethane projects and calls on the CPUC to direct gas companies to implement no fewer than five dairy biomethane pilot projects to demonstrate interconnection to the common carrier pipeline system. The same issues also apply to organic waste biomethane projects. On a broader scale, SB 1383 requires CEC to develop recommendations for the development and use of renewable gas as a part of its 2017 Integrated Energy Policy Report. Based on CEC's recommendations, State agencies will strive to meet the State's climate change, renewable energy, low carbon fuel, and SLCP goals by considering and adopting policies and incentives to significantly increase the sustainable production and use of renewable gas. CPUC will consider additional policies to support the development and use in-State of renewable gas that reduces SLCPs. These policies shall prioritize fuels with the greatest GHG emission benefits, taking into account RNG carbon intensity and reductions in SLCP emissions. In the coming months, the work already underway in these areas will continue to gain momentum.

Finally, the State will only realize the full benefits of strong action to reduce SLCP and CO<sub>2</sub> emissions if others take committed action, as well. Strong, near-term action to cut emissions of SLCPs, in conjunction with immediate and continuous reductions in emissions of CO<sub>2</sub>, is the only way to stabilize global warming below 2°C. Accordingly, California has signed a number of agreements to work together with other countries, including China and Mexico, to support actions to fight climate change and cut air pollution. Additionally, California is bringing together subnational jurisdictions under the Subnational Global Climate Leadership Memorandum of Understanding (the “Under 2 MOU”), which commits signatories to take steps to reduce SLCP and CO<sub>2</sub> emissions and meet the goal of keeping global average warming below the 2°C threshold by reducing their GHG emissions to under 2 metric tons per capita, or 80–95 percent below 1990 levels, by 2050. To date, a total of 167 jurisdictions have signed or endorsed the Under 2 MOU, collectively representing more than one billion people and nearly \$26 trillion in GDP, equivalent to 35 percent of the global economy.<sup>5</sup> As it implements the actions identified in this SLCP Strategy and other related climate change planning efforts, California will continue to share its successes and approach with others, to expand action to address climate change and deliver local and global benefits for the State.

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<sup>5</sup> <http://under2mou.org/>



# APPENDIX D

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**EXECUTIVE ORDER S-13-08**

**WHEREAS** climate change in California during the next century is expected to shift precipitation patterns, accelerate sea level rise and increase temperatures, thereby posing a serious threat to California's economy, to the health and welfare of its population and to its natural resources; and

**WHEREAS** California is a leader in mitigating and reducing its greenhouse gas emissions with the 2006 Global Warming Solutions Act (Assembly Bill 32), the Low Carbon Fuel Standard (Executive Order S-01-07), the 2008 Senate Bill 375 and the Renewable Portfolio Standard; and

**WHEREAS** these efforts, coupled with others around the world, will slow, but not stop all long-term climate impacts to California; and

**WHEREAS** California must begin now to adapt and build our resiliency to coming climate changes through a thoughtful and sensible approach with local, regional, state and federal government using the best available science; and

**WHEREAS** there is a need for statewide consistency in planning for sea level rise; and

**WHEREAS** California's water supply and coastal resources, including valuable natural habitat areas, are particularly vulnerable to sea level rise over the next century and could suffer devastating consequences if adaptive measures are not taken; and

**WHEREAS** the country's longest continuously operating gauge of sea level, at Fort Point in San Francisco Bay, recorded a seven-inch rise in sea level over the 20th century thereby demonstrating the vulnerability of infrastructure and resources within the Bay; and

**WHEREAS** global sea level rise for the next century is projected to rise faster than historical levels with the Intergovernmental Panel on Climate Change predicting that global sea levels will rise by between seven to 23 inches this century and some experts predicting even higher rises; and

**WHEREAS** while climate models predicting global sea level rise are generally understood and improving, less information is available for sea level rise projections specific to California that accounts for California's topography, coastal erosion rates, varying land subsidence levels and tidal variations; and

**WHEREAS** billions of dollars in state funding for infrastructure and resource management projects are currently being encumbered in areas that are potentially vulnerable to future sea level rise; and

**WHEREAS** safety, maintenance and operational efforts on existing infrastructure projects are critical to public safety and the economy of the state; and

**WHEREAS** the longer that California delays planning and adapting to sea level rise the more expensive and difficult adaptation will be; and

**WHEREAS** the California Resources Agency is a member of the California Climate Action Team and is leading efforts to develop and implement policy solutions related to climate change adaptation regarding current and projected effects of climate change; and

**WHEREAS** the Department of Water Resources (DWR) is responsible for managing the state's water resources to benefit the people of California, and to protect, restore and enhance the natural and human environments; and

**WHEREAS** California's coastal management agencies such as the California Coastal Commission, the California Ocean Protection Council (OPC) and California State Parks are charged with managing and protecting the ocean and coastal resources of the state; and

**WHEREAS** the California Energy Commission's (CEC) Public Interest Energy Research Program has funded research on climate change since 2001 including funding the development of preliminary sea level rise projections for the San Francisco Bay area by the Scripps Institution of Oceanography/University of California at San Diego.

**NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power vested in me by the Constitution and statutes of the State of California, do hereby order effective immediately:**

1. The California Resources Agency, in cooperation with DWR, CEC, California's coastal management agencies, and the OPC, shall request that the National Academy of Sciences (NAS) convene an independent panel to complete the first California Sea Level Rise Assessment Report and initiate, within 60 days after the signing of this Order, an independent sea level rise science and policy committee made up of state, national and international experts.
2. By March 31, 2009, the OPC, DWR and the CEC, in coordination with other state agencies, shall hold a public workshop to gather policy-relevant information specific to California for use in preparing the Sea Level Rise Assessment Report and to raise state awareness of sea level rise impacts.
3. The California Resources Agency shall request that the final Sea Level Rise Assessment Report be completed as soon as possible but no later than December 1, 2010. The final Sea Level Rise Assessment Report will advise how California should plan for future sea level rise. The report should include: (1) relative sea level rise projections specific to California, taking into account issues such as coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge and land subsidence rates; (2) the range of uncertainty in selected sea level rise projections; (3) a synthesis of existing information on projected sea level rise impacts to state infrastructure (such as roads, public facilities and beaches), natural areas, and coastal and marine ecosystems; and (4) a discussion of future research needs regarding sea level rise for California.

4. The OPC shall work with DWR, the CEC, California's coastal management agencies and the State Water Resources Control Board to conduct a review of the NAS assessment every two years or as necessary.

5. I direct that, prior to release of the final Sea Level Rise Assessment Report from the NAS, all state agencies within my administration that are planning construction projects in areas vulnerable to future sea level rise shall, for the purposes of planning, consider a range of sea level rise scenarios for the years 2050 and 2100 in order to assess project vulnerability and, to the extent feasible, reduce expected risks and increase resiliency to sea level rise. However, all projects that have filed a Notice of Preparation, and/or are programmed for construction funding the next five years, or are routine maintenance projects as of the date of this Order may, but are not required to, account for these planning guidelines. Sea level rise estimates should also be used in conjunction with appropriate local information regarding local uplift and subsidence, coastal erosion rates, predicted higher high water levels, storm surge and storm wave data.

6. The Business, Transportation, and Housing Agency shall work with the California Resources Agency and the Governor's Office of Planning and Research (OPR) to prepare a report within 90 days of release of this Order to assess vulnerability of transportation systems to sea level rise that will include provisions for investment critical to safety, maintenance and operational improvements of the system and economy of the state.

7. By June 30, 2009, the California Resources Agency, through the Climate Action Team, shall coordinate with local, regional, state and federal public and private entities to develop a state Climate Adaptation Strategy. The strategy will summarize the best known science on climate change impacts to California (led by CEC's PIER program), assess California's vulnerability to the identified impacts and then outline solutions that can be implemented within and across state agencies to promote resiliency. A water adaptation strategy will be coordinated by DWR with input from the State Water Resources Control Board, an ocean and coastal resources adaptation strategy will be coordinated by the OPC, an infrastructure adaptation strategy will be coordinated by the California Department of Transportation, a biodiversity adaptation strategy will be jointly coordinated by the California Department of Fish and Game and California State Parks, a working landscapes adaptation strategy will be jointly coordinated by the California Department of Forestry and Fire Protection and the California Department of Food and Agriculture, and a public health adaptation strategy will be jointly coordinated by the California Department of Public Health and the California Air Resources Board, all as part of the larger strategy. This strategy will be facilitated through the Climate Action Team and will be coordinated with California's climate change mitigation efforts.

8. By May 30, 2009, OPR, in cooperation with the California Resources Agency, shall provide state land-use planning guidance related to sea level rise and other climate change impacts.

This Order is not intended to, and does not, create any rights or benefits, substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

**I FURTHER DIRECT** that as soon as hereafter possible, this Order shall be filed with the Office of the Secretary of State and that widespread publicity and notice be given to this Order.

# APPENDIX E

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**STATE WATER RESOURCES CONTROL BOARD  
RESOLUTION NO. 2007-0059**

**APPROVAL TO DEVELOP ADDITIONAL INFORMATION AND CONSIDER ACTIONS  
PERTAINING TO CLIMATE CHANGE AND WATER RESOURCES**

**WHEREAS:**

1. Climate change is predicted to alter water availability with consequential adverse impacts to water quality, water temperature, and the ability to meet water right allocations.
2. The Water Boards recognize that their actions and the programs that they administer may contribute to future Greenhouse Gas emissions and/or may require adaptations to accommodate climate change.
3. The Water Boards are committed to careful consideration of climate change strategies to further our ability to preserve, enhance, and restore the quality of California's water resources, and to ensure their proper allocation and efficient use for the benefit of present and future generations.
4. Assembly Bill 32, The California Global Warming Solutions Act of 2006, signed by the Governor on September 27, 2006, states that all state agencies shall consider and implement strategies to reduce their greenhouse gas emissions.
5. On August 23, 2007, the State Water Board and the Department of Water Resources held a joint workshop soliciting suggestions to reduce Greenhouse Gas emissions and identify adaptations to accommodate changing climatic conditions.
6. Suggestions presented at the joint workshop were extensive, including but not limited to, water-energy relationships, water recycling and conservation, water quality regulation, basin planning, Best Management Practices, and land use policies.

**THEREFORE BE IT RESOLVED THAT:**

1. In partnership with the Department of Water Resources, State Water Board staff shall evaluate the input received from the August 23, 2007 joint meeting on Climate Change to identify.
  - Which specific strategies are primarily the responsibility of either the Water Boards or the Department of Water Resources for independent consideration;

- Which specific strategies are the responsibility of both agencies or cannot be considered without the input of both agencies.

For those strategies that are within the responsibilities of both agencies, staff shall jointly analyze the suggested strategies and determine their appropriateness for consideration as Climate Action Team initiatives.

2. Regional Water Boards are encouraged to work with local stakeholders to refine local actions to reduce greenhouse gas emissions and the impacts of climate change.
3. The State Water Board's Office of Research, Planning & Performance will convene an internal working group of staff participating on the Climate Action Team subgroups to facilitate communication and collaboration on climate action strategies being considered by the Water Board's programs.
4. State Water Board staff will develop approaches for evaluating the potential contribution of Greenhouse Gas emissions and potential adaptation strategies that should be considered as a component of the Water Boards' decisions or actions.
5. The Water Boards' Training Academy will develop, in consultation with the Air Resources Board and the Department of Water Resources, training on the potential impacts that climate change will have on Water Board programs and approaches for taking these impacts into consideration.
6. The State Water Board supports and encourages the development and implementation of regional pilot projects to reduce greenhouse gas emissions and demonstrate adaptation strategies that can be replicated statewide. To the extent practical, these projects should take advantage of initiatives where significant progress is already being made.
7. The State Water Board supports implementation of the Bio-energy Action Plan for California dated July 2006 and renews its commitments in this plan to:
  - Identify clear and consistent procedures that are used to protect water quality from the harvesting of biomass harvesting and biomass facilities.
  - Conduct prompt reviews of planning documents, environmental documents prepared under the California Environmental Quality Act, and monitoring proposals for biomass harvesting and biomass facilities.
  - Work in cooperation with the Department of Forestry and Department of Food and Agriculture to ensure that adequate criteria for water protection and water quality are put in place on agricultural and forest lands in California.



8. State Water Board staff shall provide a status report in January 2008, summarizing progress in implementing the actions contained in this resolution. The status report shall provide recommendations for near-term actions the State Water Board could take to address greenhouse gas emissions.
9. The State Water Board recognizes the importance of the 2008 Strategic Plan update and directs staff, as part of the update process, to review and recommend modification of actions under this resolution as appropriate to ensure that climate change and other board priorities are appropriately balanced and integrated.
10. Directs staff to continue work with Cal/EPA, the Climate Action Team, and the Air Resources Board too assist on early actions and AB32 scoping plan.

### CERTIFICATION

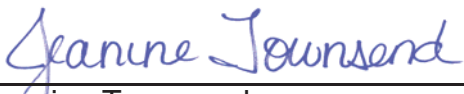
The undersigned, Acting Clerk to the Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on September 18, 2007.

AYE: Tam M. Doduc  
Gary Wolff, P.E., Ph.D.  
Arthur G. Baggett, Jr.  
Frances Spivy-Weber  
Charles R. Hoppin

NO: None

ABSTAIN: None

ABSENT: None

  
\_\_\_\_\_  
Jeanine Townsend  
Acting Clerk to the Board

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# APPENDIX F

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**STATE WATER RESOURCES CONTROL BOARD  
RESOLUTION NO. 2017-0012**

COMPREHENSIVE RESPONSE TO CLIMATE CHANGE

WHEREAS:

1. Sharp rises in the atmospheric concentration of greenhouse gases over the last century and a half, due to human activity, have led to an increase in global average temperature, and associated climate change.
2. Climate change is affecting and will affect different regions in different ways. Current and future impacts include increasing frequency of extreme weather events, prolonged fire seasons with larger and more intense fires, increased tree mortality, heat waves, sea-level rise and storm surges. Changes in hydrology include declining snowpack and more frequent and longer droughts, more frequent and more severe flooding, changes in the timing and volume of peak runoff, and consequent impacts on water quality and water availability. Vulnerabilities of water resources include, but are not limited to, changes to water supplies, subsidence, increased amounts of water pollution, erosion, flooding, and related risks to water and wastewater infrastructure and operations, degradation of watersheds, alteration of aquatic ecosystems and loss of habitat, multiple impacts in coastal areas, and ocean acidification.

Examples of water quality impacts include, but are not limited to: dry periods and drought lowering stream flow and reducing dilution of pollutant discharges, harmful algal blooms due to a combination of warm waters, reduced ability of warm water to hold dissolved oxygen, and nutrient pollution, more erosion and sedimentation caused by intense rainfall events, especially following wildfire, and increased velocity of stream flow, potential sewer overflows due to more intense precipitation and increased storm water runoff, rising sea levels inundating lowlands, displacing wetlands, and altering tidal ranges, and increasing areas subject to saltwater intrusion into groundwater, and water pollution and increased absorption of carbon dioxide creating coastal zone "hotspots" of acidification and hypoxia.

3. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases. The [Intergovernmental Panel on Climate Change](#) in its [Fifth Assessment Report](#) indicates that limiting global average temperature increase to below 2 degrees Celsius is necessary in order to minimize the most catastrophic climate disruptions. The [California Climate Change Assessments](#) have provided a strong foundation of research addressing the impacts of climate change on the state, as well as potential response strategies.
4. Mitigation, in the context of climate change, refers to actions taken to reduce concentration of greenhouse gases in the atmosphere. The most effective way to reduce greenhouse gas concentrations in the atmosphere is to reduce emission sources.

In the water sector, the principal source of greenhouse gas is the fossil fuel-based energy used to pump, convey, and treat water, and for end-uses of water. Therefore, mitigation can be accomplished through reducing the energy intensity of the water sector, replacing fossil fuels with renewable energy, improving efficiency, and reducing water consumption. Many water and wastewater agencies have already reduced their carbon footprint by deploying renewable energy. The potable and non-potable use of recycled water, the use of storm water, and the use of natural or green infrastructure for storage, movement and treatment, have the potential to reduce greenhouse gas emissions if replacing an existing or future, higher carbon water supplies. Other mitigation includes long-term carbon storage in the environment, and ecosystem management and restoration to ensure that the environmental carbon sink is resilient and grows over time.

5. Adaptation, in the context of climate change, refers to actions taken to build resilience, and to adjust to the impacts of climate change on society and the environment.
6. [Assembly Bill 32 \(AB 32\)](#), The California Global Warming Solutions Act of 2006, requires all state agencies to consider and implement strategies to reduce greenhouse gas emissions through 2020. Key components of AB 32 include establishment of a statewide greenhouse gas emissions cap, and development of a Scoping Plan to define how emissions reductions will be achieved. [Senate Bill 32](#) sets the state on the path for additional greenhouse gas emission reductions by 2030.
7. The AB 32 [Scoping Plan](#) is the core of California's climate mitigation efforts. Water-related AB 32 mitigation measures target reducing energy requirements associated with providing reliable water supplies (water use efficiency, water recycling, and reuse of urban runoff), and reducing the amount of non-renewable energy associated with conveying and treating water and providing adequate wastewater treatment (energy efficiency, and increased renewable energy production). The greenhouse gas emissions reductions from these measures may be indirectly realized through reduced energy requirements, and these actions often also have adaptation co-benefits of improving water quality and water supply reliability.
8. To help track, evaluate, and report on the climate change impacts the state is working to address, as well as outcomes of those efforts, the Office of Environmental Health Hazard Assessment has developed [indicators of climate change in California](#), including drivers, environmental changes, and impacts of climate change.
9. Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of greenhouse gases are reduced or stopped. Therefore, California is making efforts to adapt to a changing climate. A principle of the state's adaptation strategy document, [Safeguarding California](#), is to prioritize actions that not only mitigate greenhouse gas emissions, but also help the state prepare for climate change impacts. Improved coordination, implementation, and integration of adaptation planning efforts and funding of the state's climate policies can directly protect the state's natural and built infrastructure, communities, environmental quality, public health, safety and security, natural resources, and economy from the unavoidable impacts of climate change.

10. [Executive Order B-30-15](#) directs the state to continue its rigorous climate change research program focused on understanding the impacts of climate change and how best to prepare and adapt to such impacts. The Executive Order directs State agencies to integrate climate change into all planning and investment, and sets the following principles to guide planning and investment: prioritize actions that both build climate preparedness and reduce greenhouse gas emissions, take flexible and adaptive approaches to prepare for uncertain climate impacts, protect the state's most vulnerable populations, and prioritize natural infrastructure solutions.

Coordination and working collaboratively with state, regional, and local agencies will be vital to ensure effective planning and implementation. Local and regional agencies are critical partners in implementing on-the-ground adaptation, and have an important role to play in California achieving its long-term climate change mitigation and adaptation goals.

11. Sustainable groundwater management provides a buffer against drought and climate change. The [Sustainable Groundwater Management Act](#) of 2014 provides new authorities for local agencies to directly manage groundwater resources, and requires that local groundwater sustainability plans consider changing conditions over a 50-year planning and implementation period. [Regulations](#) require that sustainable groundwater management plans account for population growth, climate change, and sea level rise. When local groundwater management efforts are not successful, the State Water Resources Control Board (State Water Board) may step in to help protect local groundwater resources.
12. The [California Water Action Plan](#) is a suite of actions developed to build resiliency into California water management and the ecosystems it supports. The Water Action Plan directives include conservation, integrated management, ecosystem protection, drought planning, expanded water storage, recycled water use, and sustainable and integrated financing. The Water Action Plan also emphasizes diversified regional supply portfolios which provide resiliency to drought, flood, population growth, and climate change, and multiple-benefits projects, which are integral to climate mitigation and adaptation.
13. On September 18, 2007, the State Water Board adopted [Resolution No. 2007-0059](#), which identified initial actions for climate change response.
14. The State Water Board and Regional Water Quality Control Boards (collectively referred to as Water Boards) have played a collaborative and substantive leadership role in promoting water measures that mitigate greenhouse gas emissions and contribute to adaptation to the effects of climate change primarily through issuing permits, developing policies and regulations, and providing financing. These measures include water recycling, water conservation and use efficiency, storm water capture and use, ecosystem protection, enhancement and restoration, drought response, and groundwater recharge.
15. Since 2007, the State Water Board has taken on additional responsibilities and functions, including the addition of the Division of Drinking Water, implementation of the Sustainable Groundwater Management Act, and adoption of statewide drought response and water conservation regulations. The State Water Board has also [identified the human right to water as a top priority](#) and core value across all programs and activities, and has taken multiple implementation actions to provide safe, accessible and affordable drinking water for all Californians.

THEREFORE BE IT RESOLVED THAT

Given the magnitude of climate change impacts on California's hydrology and water systems, our response to climate change must be comprehensive and integrated into all Water Boards' actions. This resolution lays the groundwork for a robust response that will support California's ongoing climate leadership.

In order to mitigate greenhouse gases the following shall be addressed:

**I. Reduce Greenhouse Gas Emissions**

**A. Methane Capture/Short-lived Climate Pollutants**

1. Division of Water Quality (DWQ) shall, and Regional Water Quality Control Boards (Regional Water Boards) are encouraged to, support the development and implementation of the Air Resources Board's [Short-Lived Climate Pollutant \(SLCP\) Reduction Strategy](#). Specifically, DWQ shall collaborate with Regional Water Boards, Air Resources Board, CalRecycle, and California Department of Food and Agriculture, to assess opportunities for reducing methane emissions from landfills through organic waste diversion, and co-digestion at existing or new anaerobic digesters, or through composting, while achieving water quality objectives. As a part of the SLCP effort, DWQ and Regional Water Boards are also encouraged to identify opportunities to reduce methane emissions from dairies and concentrated animal feeding operations while achieving water quality objectives.

DWQ shall report on its progress supporting SLCP implementation by December 15, 2017. Regional Water Boards should provide information on their activities to reduce methane emissions in the Water Boards' 2017-18 [annual Performance Report](#).

**B. Water Conservation and Efficiency**

2. Office of Research, Planning, and Performance shall, in coordination with the Department of Water Resources, manage the development and implementation of the water efficiency and conservation regulations identified in [Executive Order B-37-16](#), which are critical to making conservation a California way of life.

**C. Recycled Water**

3. DWQ shall coordinate with the Regional Water Boards to make annual reporting of recycled water data a requirement of waste discharge permits and water reclamation requirements, and work with the Division of Information Technology to develop an online data entry system to track recycled water use. Starting with the 2017-18 annual Performance Report, DWQ shall include a summary on the volume of recycled water used, and types of use.

**D. Storm Water**

4. Storm water capture and use provides flood protection, augments local water supplies, and increases water supply reliability as a climate adaptation strategy, in addition to water quality benefits, and enhanced aquatic habitats. DWQ shall collaborate with the Department of Water Resources, and other state and local land use agencies to prioritize storm water detention and infiltration.



DWQ shall collaborate with the Office of Information Management and Analysis (OIMA), and the Department of Water Resources to establish a methodology to estimate the amount of storm water captured and used statewide. Starting with the 2017-18 annual Performance Report, DWQ shall include a summary of the information collected.

E. Energy Efficiency and Renewable Energy

5. Division of Financial Assistance, and Division of Drinking Water, as a part of existing technical assistance programs for disadvantaged communities, shall include assistance to finance, construct, upgrade, and operate energy-efficient drinking water and wastewater treatment systems, and to power those systems with zero-carbon and low-carbon renewable energy technologies.

THEREFORE BE IT FURTHER RESOLVED THAT

In order to prepare for and adapt to impacts of climate change the following shall be addressed:

**II. Improve Ecosystem Resilience**

6. Division of Water Quality (DWQ), Division of Water Rights, Division of Financial Assistance, and Office of the Delta Watermaster shall, and Regional Water Boards are encouraged to, update plans, permits, and policies, and coordinate with other agencies to enhance ecosystem resilience to the impacts of climate change, including but not limited to actions that protect headwaters, facilitate restoration, enhance carbon sequestration, build and enhance healthy soils, and reduce vulnerability to and impacts from fires. Staff shall also collaborate with the California Department of Food and Agriculture, CalRecycle, and other agencies to advance carbon sequestration.

DWQ, Division of Water Rights, and the Delta Watermaster shall, and Regional Water Boards are encouraged to, document climate resilience benefits of ecosystem protection and restoration actions.

7. The Executive Director shall engage in dialogue with the United States Environmental Protection Agency (U.S. EPA), external experts, and interested stakeholders on how best to address meeting water quality standards given climate change impacts that contribute to or exacerbate degradation of water quality, including but not limited to increased surface water temperatures, altered surface water flows, changes in water chemistry (such as increases in salinity, bacteria, and nutrient concentrations), hydrology, and ecology.
8. Office of Information Management and Analysis (OIMA) shall, by July 1, 2017, coordinate with the Surface Water Ambient Monitoring Program, the Water Quality Monitoring Council and other relevant entities to include climate change impacts as stressors in relevant future analyses and assessments of ecosystems.
9. To assist with implementation of the co-equal goals for protecting, restoring, and enhancing the Sacramento-San Joaquin Delta (Delta) ecosystem, development of a more reliable water supply, and implementation of state policy to reduce reliance on the Delta in meeting California's future water supply needs, the Delta Watermaster, Division of Water Rights, and Division of Water Quality shall maintain an ongoing consultation with the Delta Stewardship Council, which runs the Delta Science Program, and with the Delta Protection Commission. The Delta Watermaster shall

coordinate with OIMA to identify and obtain downscaled projections of climate and hydrology changes expected in the Delta.

10. DWQ shall coordinate with the Regional Water Boards to identify actions, including those recommended by the [West Coast Ocean Acidification and Hypoxia Science Panel](#), the Water Boards could take to minimize impacts associated with ocean acidification, hypoxia, increasing temperature and nutrients. By December 15, 2017 DWQ shall recommend areas of research needed to improve the Water Boards' ability to support resilient ocean and coastal ecosystems, and, where applicable and feasible, to maximize use of natural infrastructure for shoreline protection.

### **III. Respond to Climate Change Impacts**

11. By July 1, 2018, Division of Drinking Water (DDW) shall, in consultation with Office of Information Management and Analysis (OIMA) begin including climate change vulnerability assessments into community water system sanitary surveys, and shall encourage drinking water systems to use the U.S. EPA's Climate Resilience Evaluation and Awareness Tool or a comparable approach to identify vulnerabilities to climate change impacts. DDW shall work with Division of Information Technology to develop a publicly accessible reporting system for the results of these climate change vulnerability assessments.
12. DDW shall work with Division of Financial Assistance to provide technical assistance and financial support to protect drinking water systems that are highly vulnerable to climate change impacts, with emphasis on disadvantaged communities and vulnerable populations. In its reports to the State Water Board, DDW shall provide updates on how vulnerable communities are building resilience to climate change.  
  
DDW, in consultation with OIMA, shall by July 1, 2018 evaluate criteria for siting of new drinking water systems using climate change projections, and shall recommend adjustments to siting criteria and standards as needed.
13. State Water Board staff shall coordinate with the Regional Water Boards and relevant agencies to identify and recommend actions the Water Boards could take for effective permitting of projects to develop new and underutilized water resources, expand surface water and groundwater storage where appropriate, and add operational flexibility to build and enhance resilience to impacts of climate change.
14. State Water Board staff shall, and Regional Water Boards are encouraged to, work with California Department of Forestry and Fire Protection, federal land management, and other relevant agencies to restore and maintain healthy watersheds, reduce vulnerability to catastrophic fires, and support resilience in recovery efforts.
15. 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 vulnerability of water and wastewater infrastructure to flooding, storm surge, and sea level rise.

16. When making recommendations on permits and other decisions to protect coastal infrastructure, wetlands, and other near-shore ecosystems, all State Water Board staff shall, and all Regional Water Boards are encouraged to, refer to projections of sea level rise as directed in the most recent Ocean Protection Council Sea-level Rise Guidance Document, the most current data available through [Cal-Adapt](#), and the California Coastal Commission's Sea Level Rise Policy Guidance, and shall consult with the Ocean Protection Council, the Coastal Commission, Bay Conservation and Development Commission, State Lands Commission, and other relevant agencies.

#### **IV. Rely on Sound Modeling and Analyses**

17. Office of Information Management and Analysis (OIMA) shall work with the California Energy Commission, and the Department of Water Resources to obtain access to relevant climate change data, model outputs and data evaluation services, in part to inform subsequent decisions that will need to take account of extreme events. OIMA and Division of Information Technology shall collaborate on providing these climate change data and model outputs on an open data platform by December 15, 2017.
18. OIMA shall assist State Water Board divisions and offices, and Regional Water Boards in the selection and the use of climate change resources described above, as needed to account for and address impacts of climate change in permits, plans, policies, and decisions.
19. Division of Water Rights shall, by July 1, 2018, identify data needs, and evaluate and make recommendations on regulatory and policy changes regarding the use of models to account for projected impacts of climate change when conducting water availability analyses and shortage analyses.

#### THEREFORE BE IT FURTHER RESOLVED THAT

In order to support implementation, provide education, and public engagement the following shall be addressed:

#### **V. Funding**

20. Division of Financial Assistance (DFA) shall, by July 1, 2017, include climate change mitigation and adaptation objectives in the Clean Water State Revolving Fund (SRF) and Drinking Water SRF Intended Use Plans.
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.
22. DFA shall evaluate and make recommendations by July 1, 2017 regarding appropriate use of California Public Utilities Commission's Water Energy Cost Effectiveness Calculator, or comparable tools, to quantify and report on energy savings and greenhouse gas reductions from projects in any relevant funding programs.
23. The Executive Director shall, beginning in Fiscal Year 2017, to the extent feasible, prioritize and coordinate funding of studies that contribute to implementation of the climate change mitigation and adaptation actions.

## **VI. Outreach**

24. Office of Public Affairs shall include how Water Boards' actions support climate change mitigation and adaptation policy goals in media material, including press releases and fact sheets, and through media interviews.
25. Office of Public Participation (OPP) shall work with State Water Board divisions and offices, and with Regional Water Boards on the development of multi-lingual educational material for climate change-related actions and initiatives, and shall assist in providing, and support local agencies to provide, information and public outreach on potential climate change impacts to water quality, and options and funding opportunities for adapting to those impacts, including protecting source watersheds, drinking water and wastewater treatment infrastructure. OPP shall work with the Office of Environmental Health Hazard Assessment to identify communities most vulnerable to climate change impacts to ensure that those communities have access to information and technical assistance.
26. OPP shall work with State Water Board divisions and offices, Regional Water Boards, and the U.S. EPA to offer consultation to Tribes and solicit feedback on Tribal needs for addressing climate change and related impacts pertaining to the Water Boards' core functions. OPP shall report on its progress annually starting with the 2017-18 Performance Report.

## **VII. Administration**

27. Office of Research, Planning, and Performance (ORPP) shall track implementation of this Resolution, and annually report to the State Water Board on the actions taken by divisions, offices, and Regional Water Boards to mitigate greenhouse gas emissions, and prepare for and adapt to impacts of climate change. The annual updates shall include estimated water and energy savings and greenhouse gas emission benefits associated with Water Boards' regulatory actions, and financial assistance provision.
28. Office of Legislative Affairs (OLA) shall monitor and identify pending legislation that is related to climate change, including measures that may improve adaptation and mitigation, and ORPP shall provide technical support as needed. Where possible, OLA shall suggest modifications to address causes or impacts of climate change, and work collaboratively with the State Water Board divisions and offices, and Regional Water Boards to develop and sponsor legislation that supports mitigation of greenhouse gas emissions or advances potential for adaptation to projected climate change impacts.
29. Office of Information Management and Analysis (OIMA) shall work with relevant programs to identify and develop new performance measures for greenhouse gas emission mitigation, and actions that support adaptation to climate change to be included in the 2017-18 Water Boards' annual Performance Report.

30. ORPP shall identify specific training needs for Water Boards staff by December 15, 2017. ORPP shall work with OIMA to develop training on employing climate models and other relevant tools, data, knowledge, and learning from examples of local success to support Water Boards analyses and decision-making processes.

### CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on March 7, 2017.

AYE: Vice Chair Frances Spivy-Weber  
Board Member Steven Moore  
Board Member Dorene D'Adamo

NAY: None

ABSENT: Chair Felicia Marcus  
Board Member Tam M. Doduc

ABSTAIN: None



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Jeanine Townsend  
Clerk to the Board

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# APPENDIX G

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# Lahontan Regional Water Quality Control Board

## Climate Change Adaptation Survey Results

### May 2017

#### Introduction

To most effectively move climate change mitigation and adaptation forward in the Lahontan Region, Lahontan Regional Water Quality Control Board (Water Board) staff acknowledges that the Water Board's efforts will be optimized through collaboration with others who are also planning for climate change. To learn what others are doing to mitigate and adapt to climate change impacts, and the challenges or obstacles others are encountering in their attempts to do so, the Water Board's Climate Change Working Groups (Working Groups) developed a web-based survey. The survey presented 26 potential adaptation concepts/actions that the Water Board may consider as it develops its Climate Change Mitigation and Adaptation Strategy. Survey respondents were provided an opportunity to express their support or opposition for the potential actions, in addition to being able to provide specific comments. The survey and its results, including all comments received, can be viewed at:

[http://www.waterboards.ca.gov/lahontan/water\\_issues/programs/climate\\_change\\_adaptation/index.shtml](http://www.waterboards.ca.gov/lahontan/water_issues/programs/climate_change_adaptation/index.shtml). Note that all personal information has been redacted to protect the privacy of respondents.

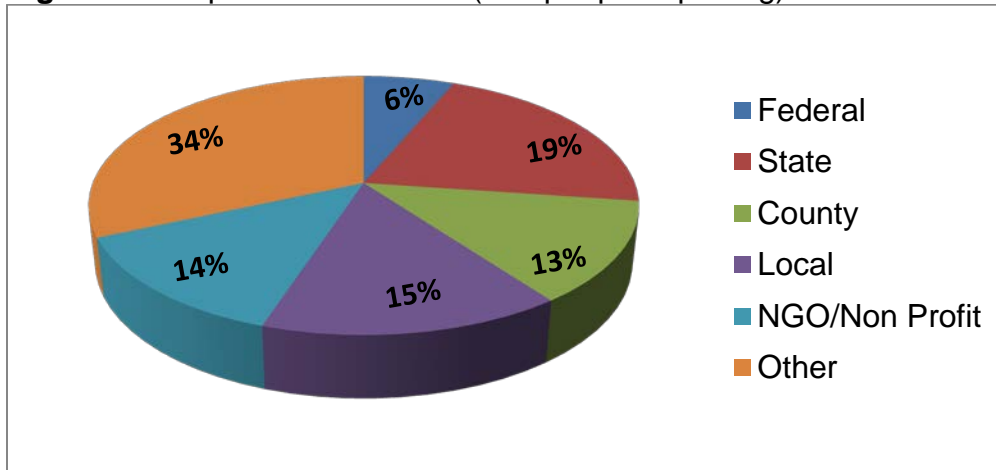
Following is a detailed summary of what Water Board staff learned from the survey. When reviewing the results, it is important to keep in mind that the survey was not a scientific survey, and the results are not fully representative of all in the Lahontan Region. The survey results do represent the ideas and opinions of those that did respond, and do provide valuable feedback regarding the following key elements:

- **Actions** others are taking to adapt to climate change.
- **Barriers** that may exist to implementing actions the Water Board is considering as it develops its Climate Change Mitigation and Adaptation Strategy.
- **Level of support** respondents have for areas of focus/options that the Water Board may include in its Climate Change Mitigation and Adaptation Strategy.
- **Partners** – Verification of stakeholders within the Lahontan Region interested in working with the Water Board as it develops its Climate Change Mitigation and Adaptation Strategy.

## Respondents

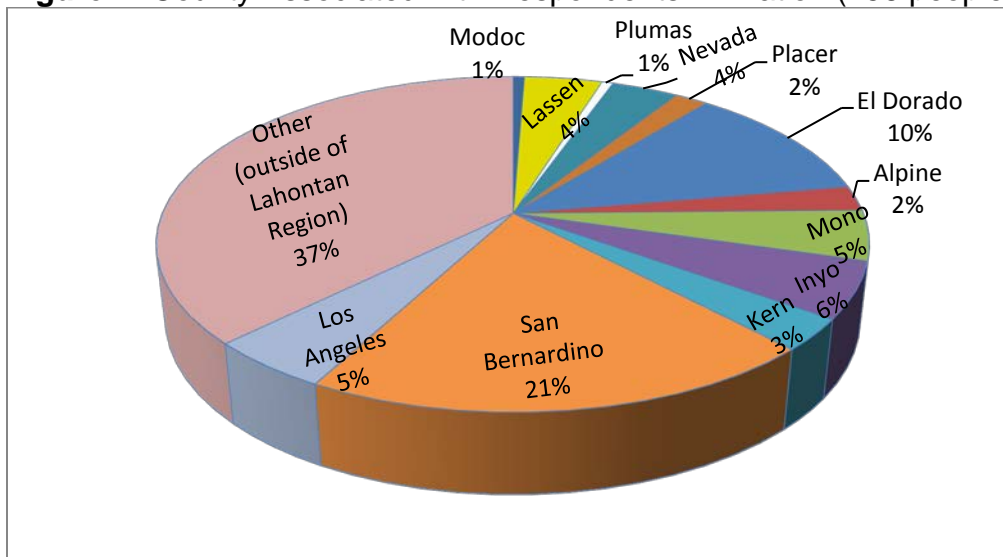
One hundred fifty-seven people completed the Climate Change Adaptation Survey. Respondents reported their affiliation, if any, and provided the county associated with their affiliation. Survey respondents had a broad spectrum of employers, with 25 percent having state or federal employers, 13 percent having county employers, 15 percent having local government, 14 percent having non-profit or non-governmental employers, and the remainder (34 percent) having some other type of employer (private, self, volunteer) or no employer (retired). Figure 1, below, illustrates respondents' affiliation distribution.

**Figure 1: Respondent Affiliation (157 people reporting)**



Each of the following counties accounted for less than five (5) percent of the total respondents who participated in the survey: Alpine, Kern, Modoc, Placer, Lassen, and Plumas. No one from Sierra County took the survey (See Figure 2).

**Figure 2: County Associated with Respondents' Affiliation (156 people reporting)**



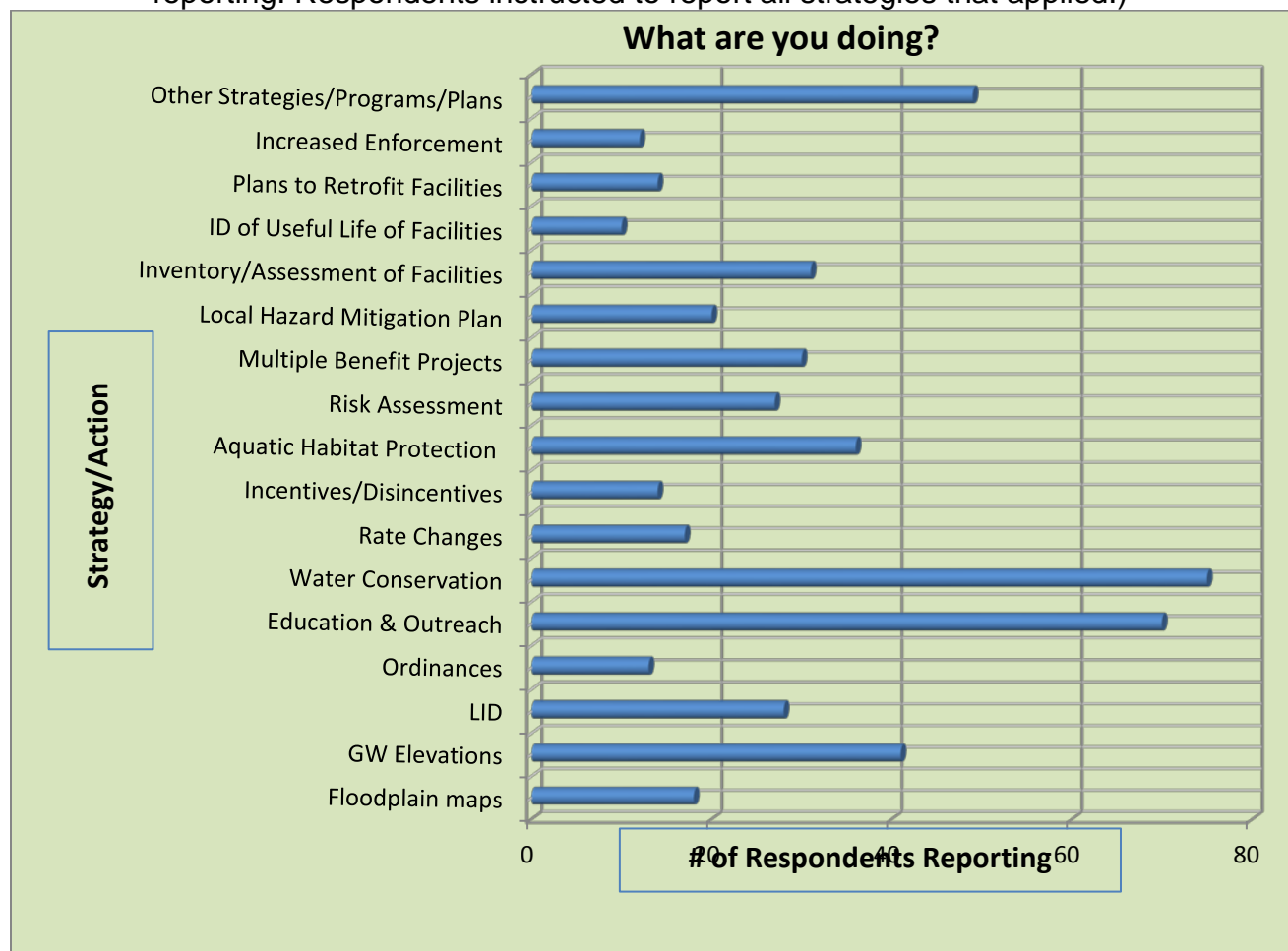
Staff concludes that the survey only provides a snapshot of interested persons within the Lahontan Region, and should not be considered fully representative of all Lahontan Region stakeholders. (See Figure 2.)

## **What Are Respondents Already Doing to Adapt to Climate Change**

As the Water Board develops its own strategies to mitigate and adapt to climate change impacts, it is useful to know what others are already doing as they plan for climate change. Knowing what others are doing, allows the Water Board to collaborate with the region's communities and stakeholders and support their efforts, which in turn will optimize the Water Board's efforts. Considering the Water Board's limited resources, the most efficient way the Water Board may respond to changing environmental conditions related to climate change may be to leverage the efforts of others and take on the role of providing technical assistance and support for our partners.

Survey respondents are currently conducting a variety of activities to respond to climate change, with more than 50 percent of respondents stating they are implementing water conservation and education and outreach as methods to adapt to climate change. Other activities respondents are doing to adapt to climate change include monitoring groundwater elevations, requiring low impact development, developing aquatic habitat protection programs, and conducting risk assessments for infrastructure. Figure 3 presents the results from all those responding to the question regarding ongoing or planned activities.

**Figure 3: Strategies/Programs/Plans Others are Implementing (130 Respondents reporting. Respondents instructed to report all strategies that applied.)**



### What Barriers or Challenges are Others Encountering?

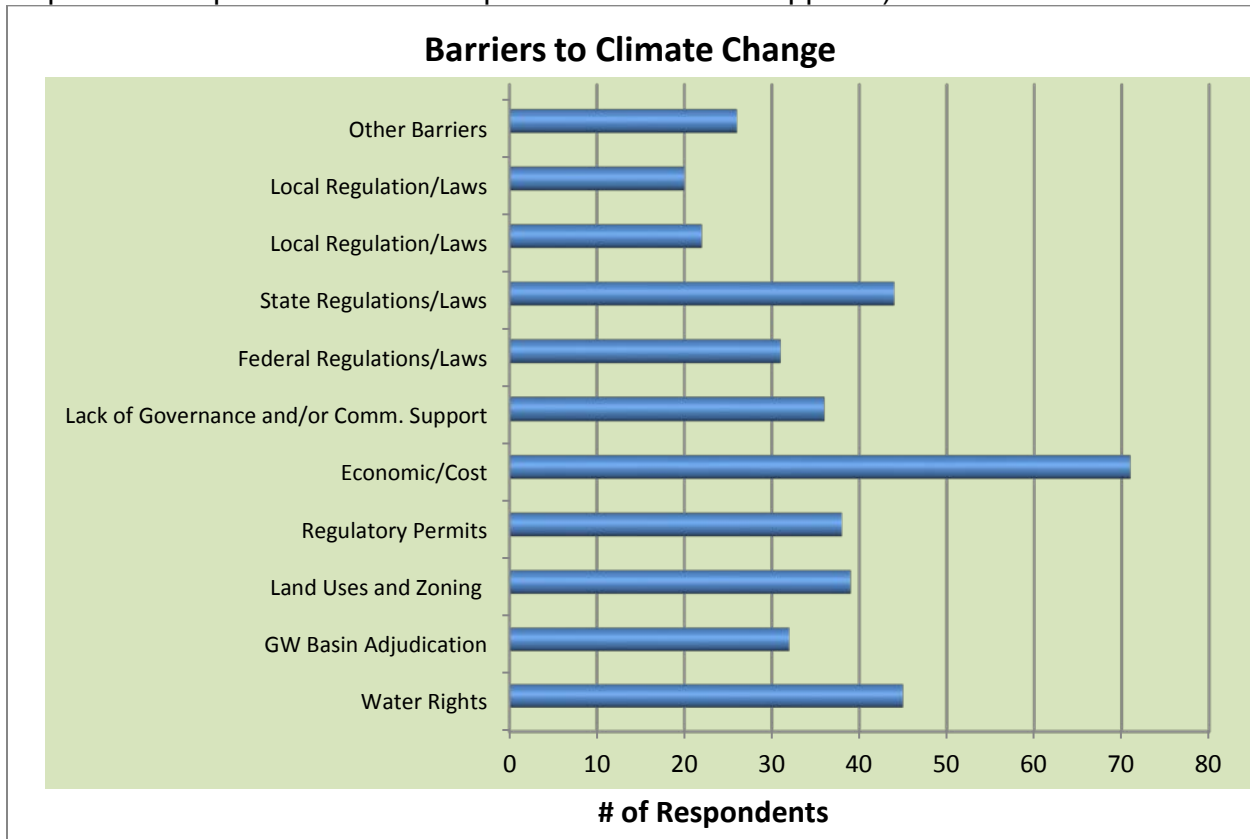
As work on developing the Water Board’s Climate Change Mitigation and Adaptation Strategy continues, knowing what barriers exist for others may help in better identifying limitations or advantages for potential Water Board actions. This information may also identify opportunities where the Water Board may be able to assist others in navigating their way through one or more barriers.

Agencies and organizations face many challenges when trying to adapt to climate change. Survey results show that the largest obstacle for all respondents is cost or economic considerations followed by water rights issues and state regulations. Respondents had the opportunity to provide written comments regarding impediments to their agency’s/organization’s progress toward climate change adaptation. A few comments pertaining to the economic barriers and regulatory process are shared below:

1. *Lack of financial resources to adequately highlight the climate change impacts from various development plans that include, vegetation removal, paving important areas preventing groundwater replenishment, and increasing runoff, damage to wetland and important high Alpine meadow areas, road building and other actions that impede native system survival as the changes in climate become more warmer.*
2. *The biggest concern is the dollars required to achieve what we really need to do. We have a great regulatory crew with the Lahontan Boards and SWRCB. However-we could always use a little more leeway on regulatory mandates.*
3. *Too much government intervention. Stop making new regulations.*
4. *There is a need for continued efficiencies in the regulatory process, so that actions needed to improve climate change resiliency can be implemented more cost effectively and at a greater pace and scale. Examples include: landscape level forest health, and forest fuels reduction work to get ahead of drought driven bark beetle mortality. And concurrently increase pace and scale of needed meadow/riparian area restoration within those landscapes. Need to increase capacity and efficiency for SNYLF surveys and consultation, so that critical restoration work in potential habitat can occur. Need to continue to grow and expand technical proficiency across multiple agencies, based on scientific study and assessment of complete work, in developing appropriate restoration approaches.*

Comments, such as those above, may be helpful in identifying specific activities that the Water Board can pursue and provide the region with significant benefits. Water Board staff with its knowledge of state and federal funding programs, could spend resources assisting stakeholders with pursuing financial assistance. Staff could also spend resources working with stakeholders to identify and address unnecessary regulatory hurdles that are under the Water Board's control. For instance, developing a general permit or Clean Water Act Section 401 Water Quality Certification in an effort to streamline the permitting process for aquatic habitat restoration projects may assist agencies and organizations conducting such work. Figure 4, below, shows all responses regarding barriers respondents are encountering when trying to implement climate change mitigation and adaptation strategies.

**Figure 4: Barriers to Climate Change That Your Agency Faces (122 Respondents Reported. Respondents asked to pick all barriers that applied.)**



## Level of Support for Range of Options

The Water Board hosted two climate change adaptation workshops in late 2014 and early 2015, where more than 100 participants provided 400-plus ideas/recommendations regarding actions the Water Board could pursue in response to climate change. The 26 concepts/actions presented in the survey for consideration capture the essence of those 400-plus ideas/recommendations. The 26 concepts/actions were broken into three survey categories: (1) Protecting Resources and Providing Resiliency, (2) Improving Water Supply and Water Quality, and (3) Communicating, Collaborating, and Streamlining Processes.

The survey allowed respondents to express their support or opposition for the 26 potential concepts/actions that were presented by choosing one of the following choices from a response scale: strongly support, support, neutral, oppose, or strongly oppose. Respondents were also provided an opportunity to submit comments on all of the 26 concepts/actions presented. All of the potential concepts/actions presented in the

survey were heavily supported (represented by those that expressed strong support or support). Support ranged from 49 percent to over 80 percent depending upon the the concept/action. Consistent with the survey findings presented at the January 2017 Water Board meeting, the five most highly supported concepts/actions by survey respondents were:

1. Adopt policies to protect critical groundwater recharge areas (81 percent).
2. Improve and protect water and wastewater infrastructure from failure (79 percent).
3. Provide incentives to improve protections for aging or vulnerable water and waste water infrastructure (82 percent).
4. Increase water recycling (82 percent).
5. Provide incentives to conserve water and capture/use storm water (84 percent).

Options that were supported in general, but received the least amount of support overall were:

1. Increase the required impact mitigation ratios (1.5:1) for wetland disturbance (49 percent).
2. Update regulation and protection for waters of the state (58 percent).
3. Require sewage collection systems to have backup systems to prevent spills (61 percent).

One possible takeaway from these results is that the Water Board will need to continue communicating and collaborating with its stakeholders for purposes of identifying partners that are willing to work on identifying one or more approaches that satisfy a concept's objective (e.g., protect critical groundwater recharge areas; expand use of low impact development design/practices). Such approaches may occur under the Water Board's traditional regulatory programs, but may not include "traditional" regulatory approaches. Given the Water Board'

## **Observations and Analysis of Survey Results**

Consistent with the findings presented at the January 2017 Water Board meeting, several themes emerged from the survey results. One theme that was supported by both results and through individual comments, was the need for financial support to effect change. Another theme was that broad concepts, such as protecting wetlands and floodplains and protecting critical infrastructure were highly supported, but the methods proposed to implement the concept (increased mitigation ratios, prohibitions, or placing additional requirements on infrastructure owners) received significantly less

support. Items that were less supported may be more difficult to implement due to a lack of public support or increased controversy. Another theme that emerged was that some actions clearly within Water Board authority (e.g., wetland and floodplain protection) received less support than actions that are further removed from Water Board authority, but not necessarily Water Board influence (e.g., recycled water). This type of information needs to be further evaluated through future discussions with stakeholders likely to be directly affected by specific Water Board actions. As stated, above, given the Water Board's limited resources, the Water Board is going to need to be very strategic in identifying where it can be most effective. In many cases, that may pursuing a very focused effort with a willing partner, as opposed to taking a broader, one-size-fits-all approach. The focused approach, if successful, may result in additional partners coming forward and willingly participating in a similar effort.

## **Partners**

Water Board staff understands that it can optimize Water Board efforts in mitigating and adapting to climate change impacts through partnerships and collaboration with stakeholders in the Lahontan Region. The survey provided staff with a list of 50-plus individuals that have expressed interest in playing a more active role in Water Board strategy development and implementation. They represent a variety of interest, experience, and potentially resources that can contribute to the Lahontan Region's efforts to mitigate and adapt to climate change impacts. Staff anticipates working with several of these stakeholders as it moves forward with developing and implementing the Water Board's Climate Change Mitigation and Adaptation Strategy.

## **Conclusions**

The survey, while not scientific or fully representative of all Lahontan Region stakeholders, is a valuable element of the Water Board's strategy development process. The survey was a mechanism for continuing to keep our stakeholders engaged. The survey produced results that will help shape some of the questions we ask our stakeholders in future workshops focused on specific actions. The survey results may have also identified opportunities where a less traditional Water Board approach may be more effective in both the short term and long term. These are all valuable aspects of a strategy development process.



# **ENCLOSURE 2**

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# Lahontan Water Board Climate Change Mitigation and Adaptation

## Climate Change Staff Report

May 10-11, 2017 Board Meeting



### Presentation

- Brief History
- Survey Results
- Staff Report
  - California's Response to Climate Change
  - Lahontan's Role
  - Proposed Pathway Forward
- Discussion

## Lahontan Climate Change History

- Two Workshops (2014/2015)
- Two Agenda Items (2015)
- Survey (2016)
- Two Agenda Items (2016/2017)



## Final Survey Results

- Stakeholder Efforts
  - Conservation and Outreach
  - Groundwater Monitoring
  - Low Impact Development\*
  - Aquatic Habitat Protection Program\*
  - Infrastructure Risk Assessment\*



## Final Survey Results

- Stakeholder Challenges
  - Economics/Financial\*
  - Water Rights
  - State Regulations\*



## Final Survey Results

- Stakeholder Support
  - Concepts of Water Quality, Water Supply, and Aquatic Habitat Protection\*
  - Reduced Support for Regulatory Approach\*
- Partners
  - Engaged



## Final Survey Results

- Non-Representative Snapshot
- Effective Engagement
- Provided Information
  - Stakeholder Activity
  - Stakeholder Challenges
- Potential Insights

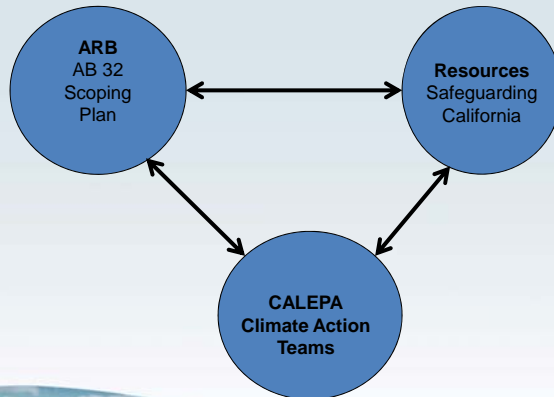


## Staff Report

- Purpose
  - California Climate Change Requirements
  - Lahontan Roles and Responsibilities
  - What is Already on the Plate
  - Opportunity and Limitations
  - Pathway to a Strategy



## CA Climate Change Requirements



9

## Lahontan's Role and Responsibilities

- State Water Resources Control Board Resolution No. 2017-0012
  - Implement Relevant Elements of
    - Scoping Plan
    - Safeguarding California
    - Short-Lived Climate Pollutant Strategy
  - Reporting

10

## Lahontan's Climate Change Plate

- Resolution No. 2017-0012
  - 12 Assignments
  - 3 Potential Assignments
- Lahontan Efforts
  - 17 Ongoing or Completed
  - 12(+) Potential/Additional

11

## Opportunity and Limitations

- Some Flexibility with Implementation
- Collaboration/Partnerships are Key
- The Lahontan Plate is Nearly Full
- Limited Resources/No New Resources

12



## Pathway to a Strategy

- Late-Summer Workshops (3)
  - Coordinate with Subcommittee
  - Identify Specific Actions
  - Craft Questions Tailored to Actions
  - Identify Next Steps/Plan

13

## Pathway to a Strategy

- November 2017 - Draft Strategy Report
- Early 2018 – Possible Workshops (2)
- Spring 2018 – Adopt Strategy

14

## Discussion

- Workshop Structure – Methods to Identify Actions and Enlist Support
- Partnership Opportunities
- Specific Actions for Water Board

15

## Thank You

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