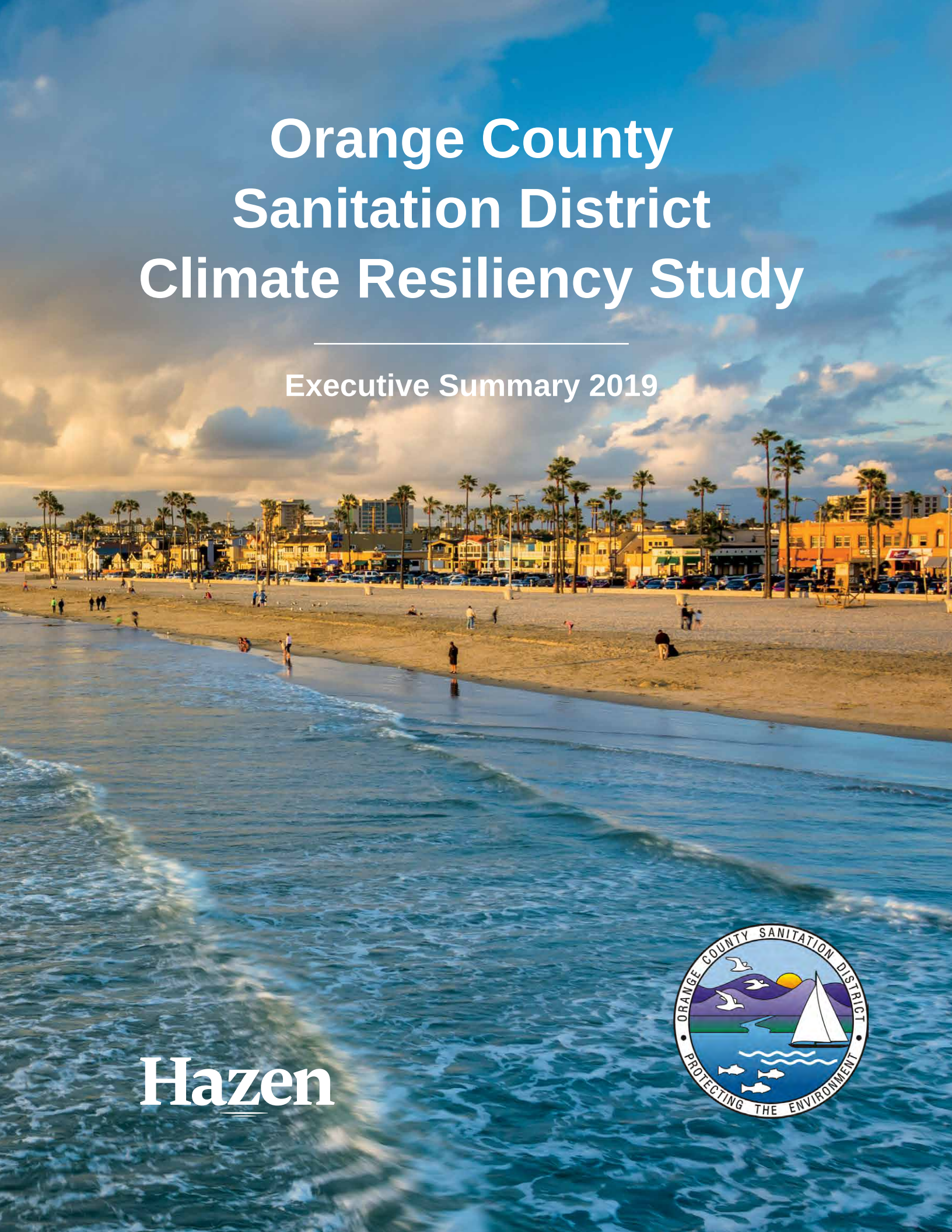
Orange County Sanitation District Climate Resiliency Study

Executive Summary 2019



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ORANGE COUNTY SANITATION DISTRICT
PROTECTING THE ENVIRONMENT

Message from Our Director of Engineering

Dear Orange County Residents,

For the past 65 years, the Orange County Sanitation District (OCSD) has protected public health and the environment for the coastal region of Southern California. We are responsible for collecting, treating, and recycling wastewater, and have become an acknowledged leader in resource recovery. This includes our partnership with the Orange County Water District on the Groundwater Replenishment System—the world's largest purification system for indirect potable reuse.

Our customers count on us around the clock and in every situation, including during extreme weather and climate conditions. We have operated through heavy storms that threatened to overflow our sewers. High tides have carried seawater into our coastal pump stations. And recent wildfires have affected the lands around our service area. Throughout these challenges we have remained resilient. We use each as an opportunity to analyze possible risks and vulnerabilities in our system, and better prepare for the next.

We pride ourselves on following the example of those who came before us, making forward-thinking decisions and investments to protect public health and the environment. To continue to look towards the future, OCSD has developed a Climate Resiliency Study. This study provides a comprehensive analysis of climate-related, site-specific risk assessments of OCSD's facilities using the best available climate predictions, industry standards, and geographical information systems. We worked alongside industry experts to develop practical solutions that can be incorporated immediately to improve the resiliency of our facilities or folded into the design and construction of future projects.

This Executive Summary provides an overview of the information obtained and generated during the preparation of the Climate Resiliency Study. Together, we will use what we have learned through this study to keep our facilities resilient, preserving Orange County's natural beauty and the communities we enjoy long into the future.

"Our infrastructure protects the environment and Orange County's quality of life. We need to make sure that these important facilities can withstand extreme events."

- Jim Herberg,
General Manager

Kathleen T. Millea

Kathleen T. Millea, P.E.
Director of Engineering

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Our Mission

To protect public health and the environment by providing effective wastewater collection, treatment, and recycling.

Introduction

The Orange County Sanitation District (OCSD) is a leader in regional wastewater collection, treatment, recycling, and disposal.

WHO WE SERVE

2.6
Million People

20
Cities

4
Special Districts

+
Parts of Unincorporated Orange County

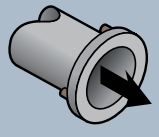
WHAT WE DO

185
Million Gallons of Wastewater Per Day Into

3
Valuable Resources: Recycled Water, Energy, and Reusable Solids

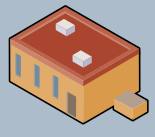
WHAT WE HAVE

389
Miles of Sewer Pipe



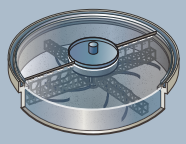
Sewer pipes are used to convey wastewater from cities and districts.

15
Pump Stations



Pump stations lift wastewater to elevations that enable gravity flow to the treatment plants.

2
Treatment Plants



Treatment plants breakdown wastes to recover resources.

Climate Resiliency

OCSD is constantly striving to be resilient, reliable, and forward-thinking. Recognizing the value of our infrastructure and the risks posed by different forces of nature, we have conducted a climate resiliency study to better prepare for the future.

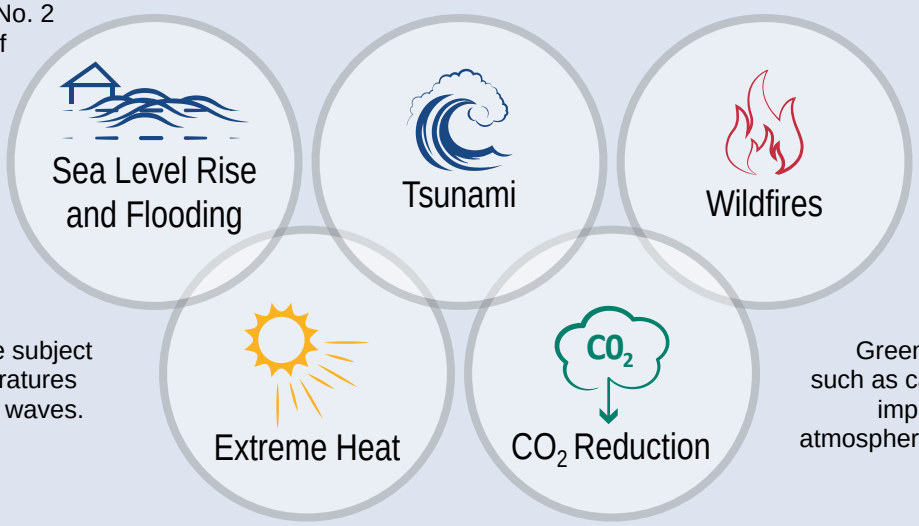
Due to the importance of climate conditions in future planning and capital investment, we reviewed and analyzed a variety of climate-related studies as part of this effort. The climate projections, including sea level rise, are based on the work of the Rising Seas Report and California's Fourth Climate Change Assessment as representing the "state of the science" for Southern California.

Climate forces considered as part of the study:

Flooding threatens infrastructure near the coast and major channels, including Plant No. 2 and a number of pump stations.

Coastal infrastructure is vulnerable to tsunamis.

Fire and flying embers are a risk to buildings near heavy vegetation.



Inland areas are subject to higher temperatures and longer heat waves.

Greenhouse gases, such as carbon dioxide, impact the earth's atmosphere and climate.

Vulnerabilities

Maintaining safe and continuous operation of wastewater conveyance and treatment processes during climate-related events is of high importance to OCSD. By focusing efforts on high priority infrastructure and understanding site-specific risks, OCSD can provide resiliency and adaptability within upgrades to infrastructure and facilities.

Toolbox of Adaptations

There are many adaptations that can be used to reduce the impacts of climate change related events. Generally these adaptations involve updates to design guidelines and practices, training and communication, and modifications or redundancies to operations.

Building-Level Adaptations for Flooding

At the building level, floodproofing seeks to prevent water from entering a facility or coming in contact with access points and infrastructure.


Watertight hatches


Floodproof/watertight electrical enclosures


Floodproof/watertight pump/motor enclosures


Stop logs over flood pathways (e.g., doors, windows, louvers)


Concrete barrier around facility (e.g., wall or hump)


Concrete barrier around facility with stop logs to cover opening


New doors and floors above flood level


Electric rooms above flood levels


Access routes above flood levels


Assets (e.g., pumps, motors, electrical equipment) elevated above flood levels

Asset-Level Adaptations for Flooding

At the asset level, floodproofing seeks to keep operations running when flood water is at risk of coming in contact with assets and infrastructure.


Sandbagging around assets and/or flood pathways


Securing tanks to floor to counter-act buoyancy forces during flooding


Floodproofing electrical conduit and wiring


Installing floodproof instrumentation (e.g., valves, flow meters)

Operation and Redundancy Adaptations


Training for flood, fire, and tsunami response


Automatic controls for remote operation in emergencies

Building-Level Adaptations for Wildfires

At the building level, wildfire protection is included in design guidelines and construction materials.


Fireproof roofs and buildings


Louvers that prevent embers and smoke from entering buildings


Clear fire barriers around buildings

Causes of Flooding in Orange County

Many of OCSD's facilities are located near the coast, enclosed bays, or rivers, making flooding a major risk to the services provided by OCSD.

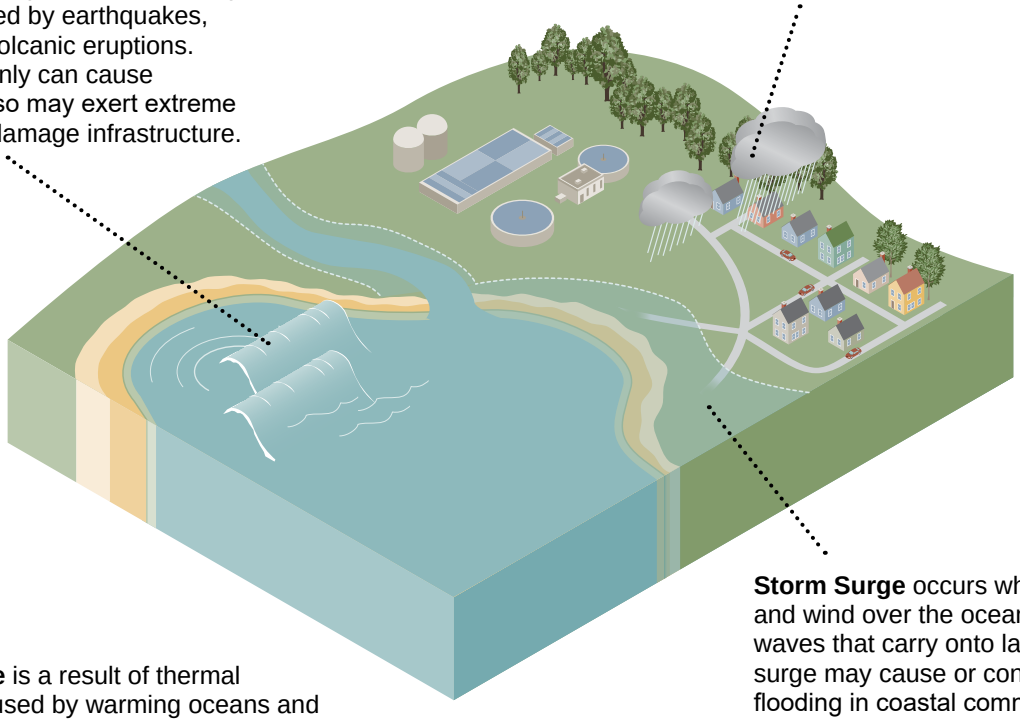
Flood risk is expected to increase with climate change. Climate change is expected to result in more extreme storms, increased flood depths, and raised sea levels. Tsunamis can cause extensive inland flooding, which is worsened by sea level rise.


Orange County Register, 2012

King Tide is the highest tide caused by the combined effects of the gravitational forces exerted by the moon, sun, and rotation of the earth. It can cause flooding in coastal communities.

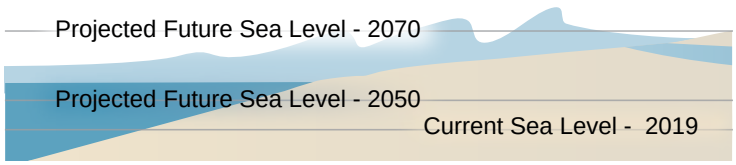
Storm Events exceeding intensity or duration of the design of local storm infrastructure may cause flooding in streets and communities.

Tsunamis are large and fast-moving waves generated by earthquakes, landslides, or volcanic eruptions. Tsunamis not only can cause flooding, but also may exert extreme force that can damage infrastructure.



Storm Surge occurs when rainfall and wind over the ocean create larger waves that carry onto land. Storm surge may cause or contribute to flooding in coastal communities.

Sea Level Rise is a result of thermal expansions caused by warming oceans and melting of land ice as temperatures rise due to climate change. Sea level rise increases flooding during storms and king tide events.



Orange County Register, 1983

Building Level Flood Protection

Simple adaptations can be incorporated into individual facilities to protect against flooding. Building level solutions generally protect a greater number of assets at a lower cost than asset level solutions by preventing flood water from entering the facility.

Hatches are one of the lowest entry points into a facility, making them the first vulnerability for flooding. Waterproofing access points prevents water from entering the facility.

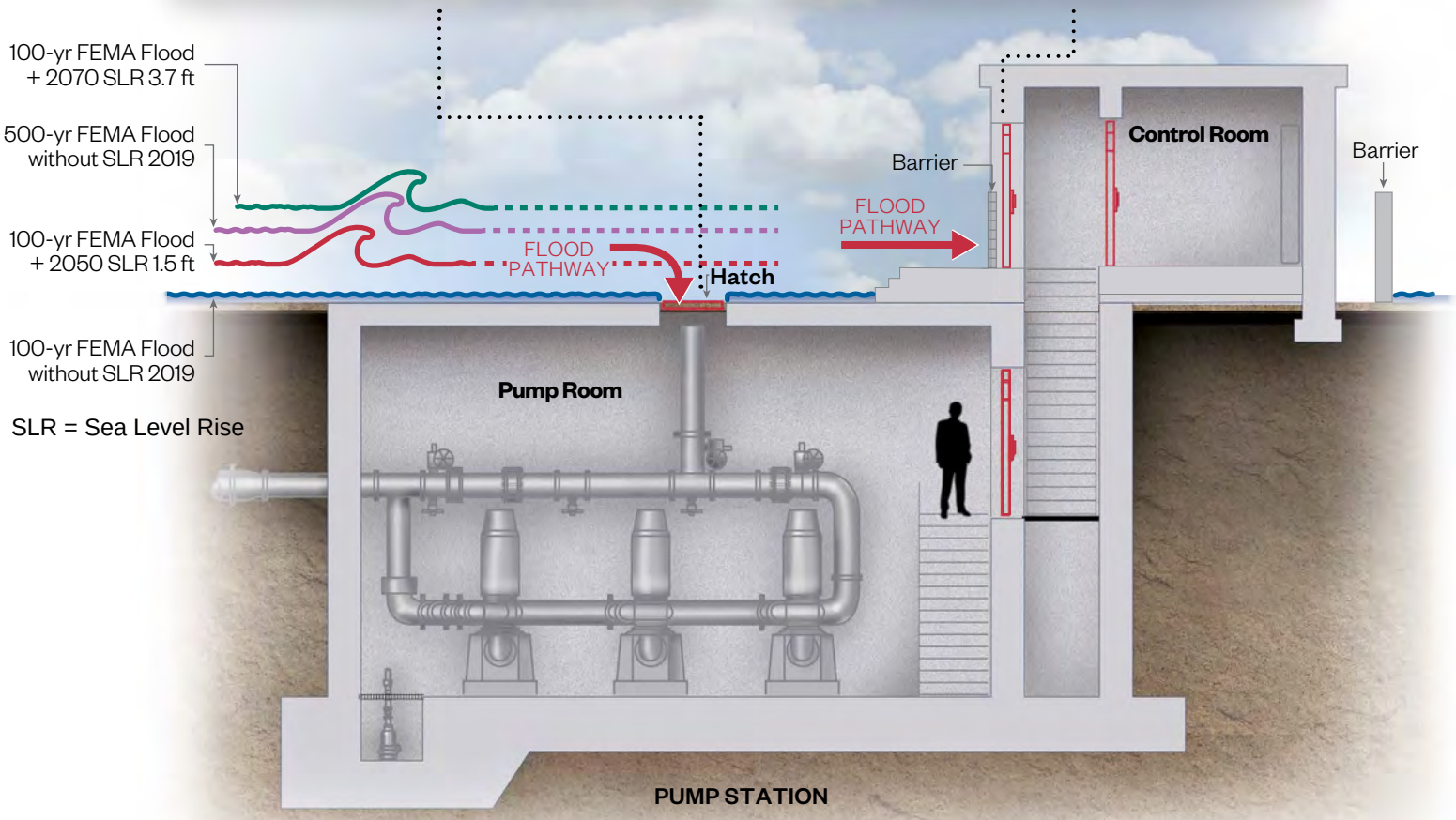
Existing Hatch

Waterproofed Hatch

Important access points include doors, louvers, and transformer enclosures. Waterproofing barriers protect access points and can be deployed when necessary.

Existing Door

Waterproofed Door



Flooding and Tsunami Impacts

Other impacts from flooding on OCSD infrastructure include electrical or mechanical failure and unsafe conditions for operators and facility staff. An impacted OCSD facility can cause issues upstream and downstream in the network and affect surrounding communities and neighborhoods.

Safety and Access

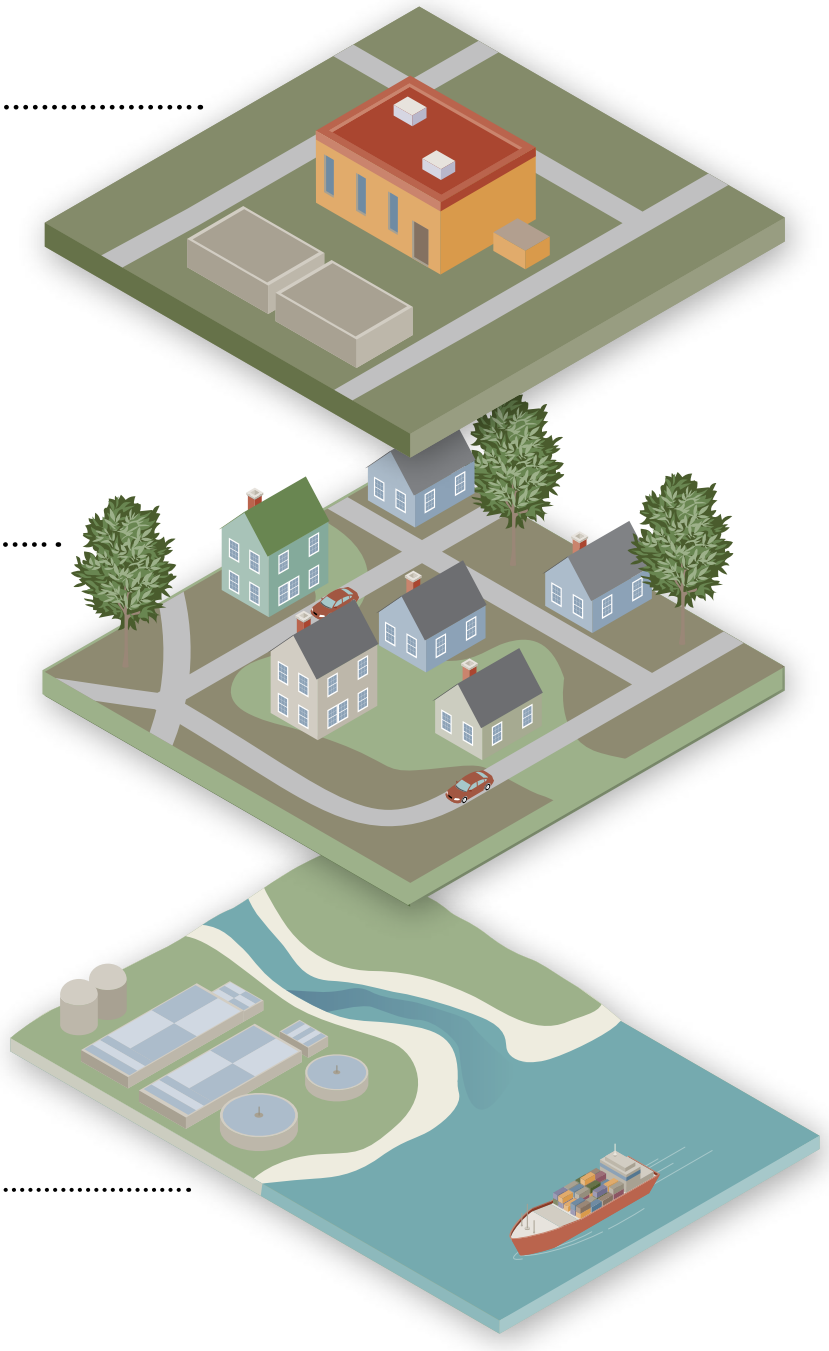
If OCSD staff are unable to safely drive or walk to flooded or non-flooded facilities due to flooded access roads, facilities would be inoperable and cause sewer backups or environmental damage to local waterways.

Possible Sewer Backups

If a pump station is unable to operate, flow to and from will be limited, and tributary neighborhoods may see sewer backups.

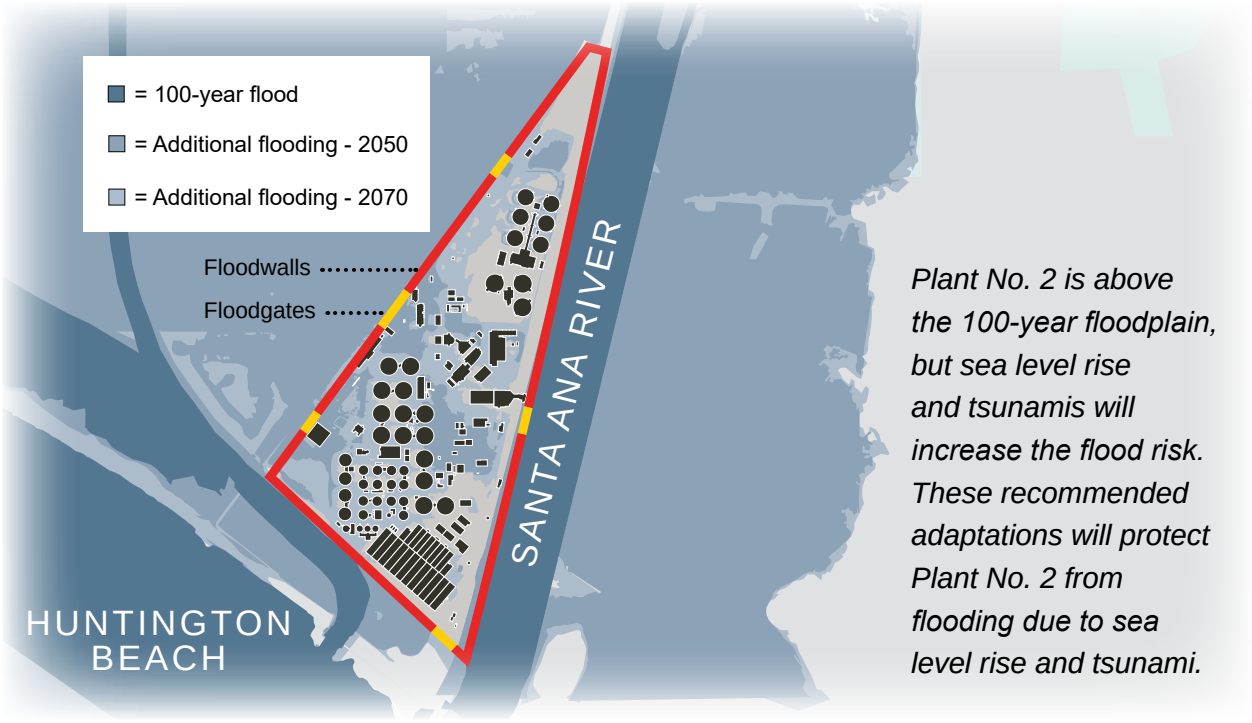
Water Quality Impacts and Environmental Damage

If a treatment plant is not able to operate, an emergency release of the raw or partially treated wastewater may be required. This would cause negative water quality impacts and damage to aquatic environments and nearby beaches.



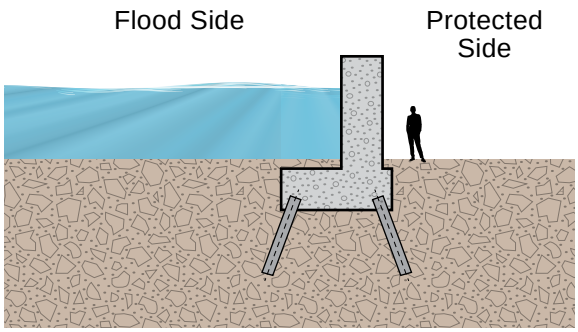
Boundary Level Flood Protection

Plant No. 2 can treat up to 150 million gallons of wastewater per day and is located in a low-lying area close to the Pacific Ocean coast of Orange County. Numerous facilities at Plant No. 2 are at risk of flooding caused by extreme events such as a 500-year coastal flood and tsunamis, and this risk is exacerbated by sea level rise. Floodgates and floodwalls are recommended to protect Plant No. 2 from these risks.



Plant No. 2 is above the 100-year floodplain, but sea level rise and tsunamis will increase the flood risk. These recommended adaptations will protect Plant No. 2 from flooding due to sea level rise and tsunami.

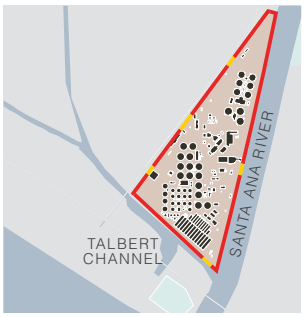
Floodwall



A typical floodwall design to withstand storm surge, waves, flooding, and tsunami.

A floodwall along Brookhurst Street is needed to prevent flooding with projected sea level rise for 2070.

Additional floodwalls along the Talbert Channel and Santa Ana River will protect Plant No. 2 from flooding due to maximum tsunami risk for the region.



Extreme Heat and Wildfire Risks in California

Extreme Heat

Temperatures across California have been consistently rising due to climate change. We've experienced higher average temperatures during summer months, more intense and longer heat waves, and an increased frequency of extreme heat days. Inland areas of Orange County and urbanized areas have seen the largest impacts of these rising temperatures. Higher temperatures also dry out vegetation and soil, creating fuel for wildfires.

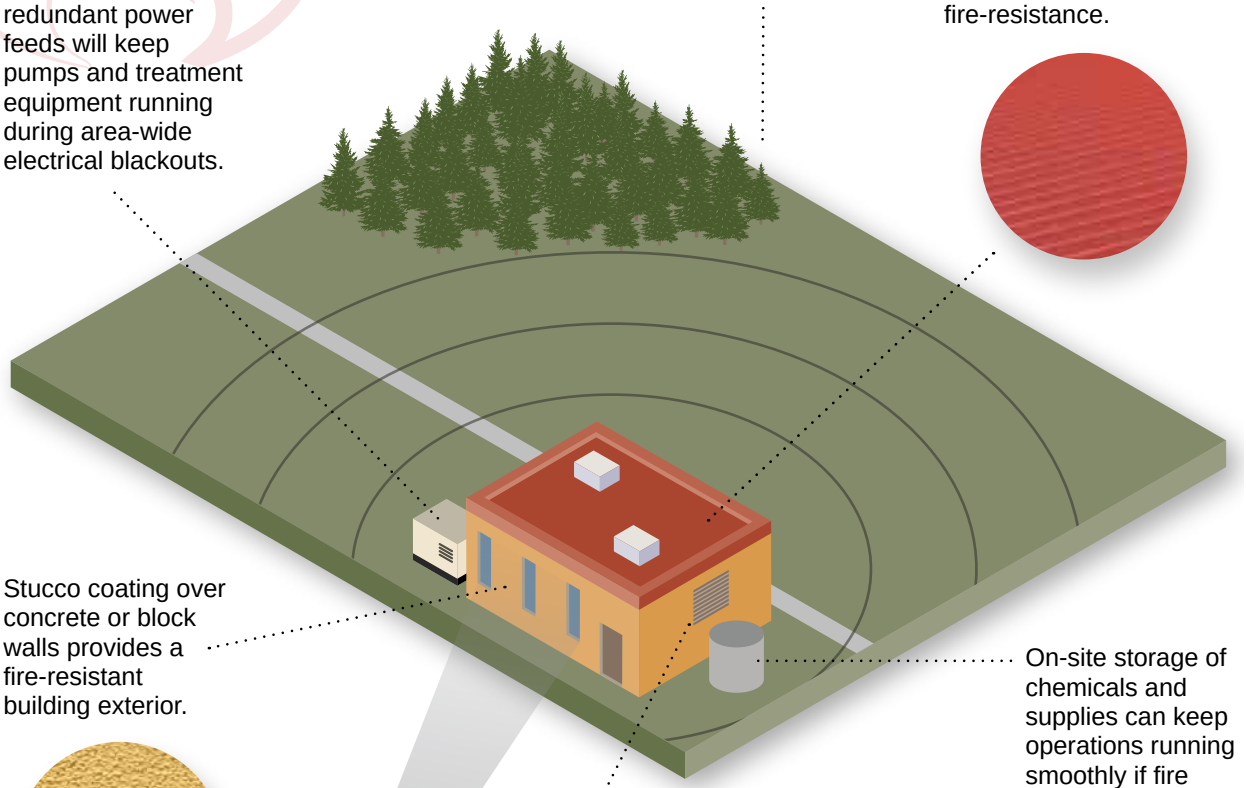
Wildfires

Wildfires are a common threat for California communities, exacerbated by climate and land use stressors. Fires that begin in dry areas spread rapidly, often carried by extreme Santa Ana winds. Changes in weather patterns reduce the frequency of storms that could bring much-needed moisture to slow the spread of fires.

** Map data provided by the California Public Utilities Commission*

Protection Against Heat and Fire

The location and construction of OCSD pump stations and treatment plants are designed to protect critical infrastructure from heat and fire.



OCSD facilities are located within low wildfire risk areas of Orange County.

Generators, fuel, and redundant power feeds will keep pumps and treatment equipment running during area-wide electrical blackouts.

Metal or tile roofs provide fire-resistance.

Stucco coating over concrete or block walls provides a fire-resistant building exterior.

On-site storage of chemicals and supplies can keep operations running smoothly if fire interrupts normal delivery routes.

Fire-safe louvers prevent embers and smoke carried by high winds from entering the building.

Design Guidelines for OCSD Equipment: 104°F (40°C)

Motors

Electrical Wiring

HVAC

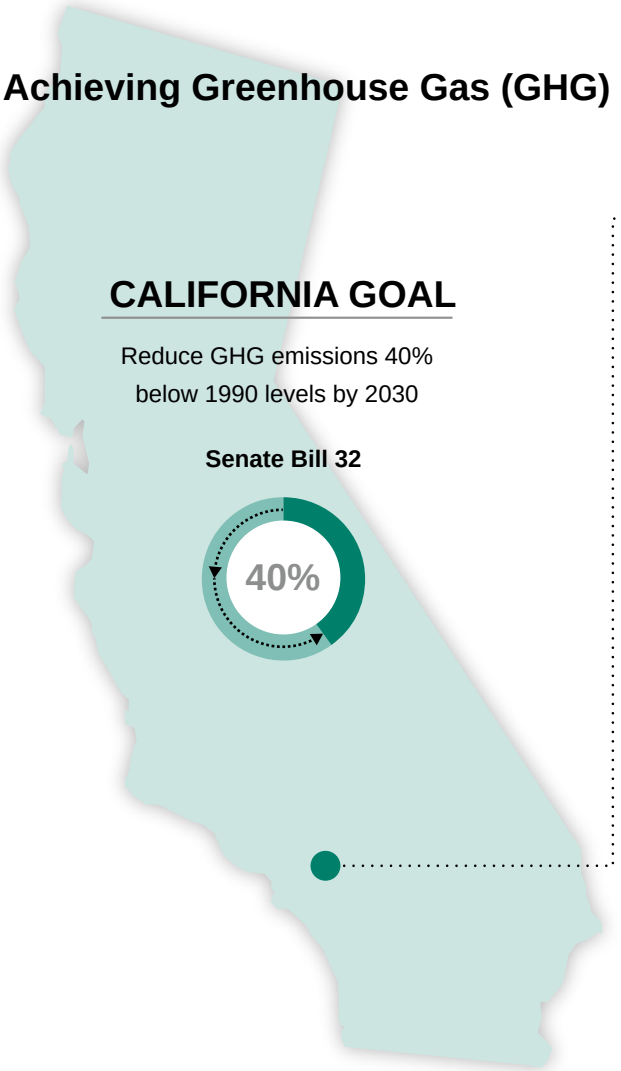
Extreme heat and increased temperatures can cause physical stress to materials and operational stress on equipment, such as electronics, electrical equipment, motors, and chemical handling facilities. OCSD systems are designed to withstand outdoor temperatures up to 104°F (40°C).

Thinking Globally: How OCSD is Reducing Greenhouse Gas Emissions

OCSD implements measures to reduce greenhouse gas emissions to minimize contribution to climate change and remain resilient in the face of potential future regulations.

The State of California aims to reduce greenhouse gas emissions in the state to 40% below 1990 levels by 2030. In an effort to accomplish this, the California Air Resources Board requires reporting of greenhouse gas emissions. Most of OCSD's emissions are biogenic, sustainably produced through on-site anaerobic digestion of wastewater sludge, electricity generation, and heating. The remainder are below the 25,000 CO_2 equivalent limit that would require participation in the Cap-and-Trade program. The many things that we do to reduce emissions also conserves natural resources and saves money for our ratepayers.

Achieving Greenhouse Gas (GHG) Emission Goals at OCSD



We have reduced GHG emissions using several different means

Water recycling
Avoid emissions from pumping imported water

Renewable energy sources
Solar panels designed for new headquarters building

Low-emissions transportation
Fuel-efficient and electric vehicles, compressed natural gas fueling

Energy and resource recovery
Methane produced during wastewater treatment used as an energy source

High-efficiency assets
Variable frequency drives on motors; occupancy sensors for lighting and HVAC

Battery storage system
Offset power demand during critical times

Looking to the Future

As infrastructure upgrades are planned and designed, there are opportunities to integrate resiliency measures and adaptations for flooding, sea level rise, tsunamis, extreme heat, and wildfires. Incorporating resiliency can also be applied program-wide through updates to design guidelines and emergency response plans.

Resiliency Toolbox

Updating design guidelines to build potential flood pathways of new facilities to be above identified flood elevations associated with sea level rise

Integrating deployment, operation, and maintenance of adaptation strategies into emergency response plan

Integrating climate resiliency into capital projects, even if resiliency is not the main goal of the project (e.g., a screening wall project that also provides flood protection)

Orange County Sanitation District Climate and Catastrophic Event Resilience Policy

The Sanitation District aims to design, maintain, and operate valuable wastewater assets that withstand or adapt to adverse conditions in a reasonable manner that is both cost-effective and sustainable for present and future generations. These adverse conditions include heavy rains, flooding, sea level rise, earthquakes, tsunamis, extreme heat, wildfires, and electrical grid interruptions.

Reclamation Plant No. 1 (Administration Offices)
10844 Ellis Avenue • Fountain Valley, California 92708 • 714.962.2411

Treatment Plant No. 2
22212 Brookhurst Street • Huntington Beach, California 92646

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