Climate Resiliency and Adaptation Planning

Orange County Sanitation District

Jim Herberg
General Manager
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Who is OCSD?

389 regional trunk sewer MILES

15 pump stations

479 service area SQUARE MILES
OCSD Facilities Near Major Water Ways

- Newport Harbor
- Santa Ana River
- Pump Station
- Treatment Plant
State agencies to plan for sea level rise and climate impacts through coordination of the state Climate Adaptation Strategy.

Assembly Bill 2800
State agencies shall consider impacts of climate change when planning, designing, building state infrastructure. (July 2020)

OCSD Strategic Plan

NPDES Permit
It is anticipated that a “Climate Change Effects Vulnerability Assessment and Mitigation Plan” is required as part of the NPDES Permit
Utilized Existing Climate Science References
Scope Elements

• Identify climate variables and future projections
• Prepare risk maps
• Identify facilities that will be impacted
• Site-specific risk assessment for at-risk facilities
• Provide adaptation strategies for facilities that are impacted
• Recommendations for design guidelines
Planning Horizons for Vulnerability Assessment

- Current (2020)
- 30-Year Horizon (2050): Planning Horizon for New/Retrofitted Infrastructure
- 50-Year Horizon (2070): Life-Cycle Planning Horizon for Most Assets
- 80-Year Horizon (2100): Planning Horizon for Assets with Extended Life-Cycle Horizon
Planning Horizons for Vulnerability Assessment

Current

2020
30-Year Horizon
Planning Horizon for New/Retrofitted Infrastructure

2050
50-Year Horizon
Life-Cycle Planning Horizon for Most Assets

2070
80-Year Horizon
Planning Horizon for Assets with Extended Life-Cycle Horizon

2100

There is time to adapt, and time to course-correct through successive update cycles of the Resiliency Plan
Climate Forces

- **Sea Level Rise and Flooding**: Flooding threatens Pump Stations and Plant 2 near the coast and major channels.
- **Tsunami**: Coastal infrastructure is vulnerable to tsunamis.
- **Wildfires**: Fire and flying embers are a risk to buildings near heavy vegetation.
- **Extreme Heat**: Inland areas are subject to higher temperatures and longer heat waves.
- **Reduce CO₂**: Greenhouse gasses, such as carbon dioxide, impact the earth's atmosphere and climate.
Wildfire and Extreme Heat

The Cocos Fire burns in San Marcos, California, in 2014. (theatlantic.com)

Ventura Fire, California, Dec 2017. (@aghakouchak)

Map data provided by the California Public Utilities Commission
Flooding in Orange County

Storm Event, Dec 2010, Balboa Island (www.scpr.org)

King Tide 2012, 8th St and Coast Hwy, Huntington Beach, (OCREGISTER)

Pacific Ocean

Flooded streets in Huntington Beach
1938 flood and Santa Ana Levee failure

Flooded streets in Newport Beach
Storm Event 1983, OCREGISTER
Extreme Flow Events

Average Monthly Flow (MGD) vs. Peak High Flow Events

- Total average flow
- Peak Flow
Flooding Risk

100-year FEMA Flood Maps (2019)
Relative Sea Level at NOAA Los Angeles Tide Gauge [ID:9410660]

Trend = 0.39 in/decade

(http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml)
Sea Level Rise (SLR) Projections

Blue: emissions continue to rise throughout the 21st century
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Orange: emissions peak around 2040, then decline
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Recommended range of sea level rise for future CIP projects

1.54 ft
3.71 ft
Sea Level Rise Projections

100-year Flood + 2070 SLR

Access to Pump Stations is Flooded

Sea Level Rise Projection of 3.71 ft is assumed in 2070
American Society of Civil Engineers (ASCE) 7-16
Current maximum extent inundation zones.
For every at-risk facility two different adaptation scenarios were considered:

1. Equipment Level Adaptation
2. Facility Level Adaptation

Based on the weighted criteria considering 4 different options (reliability, affordability, operability and ease of deployment) facility level adaptation was selected as the best adaptation plan for OCSD facilities.
Adaptation Example
Adaptation Example

100yr FEMA Flood + 2070 SLR 3.7ft
500-yr FEMA Flood without SLR 2019
100yr FEMA Flood + 2050 SLR 1.5ft
100yr FEMA Flood without SLR 2019

FLOOD PATHWAY

Control Room

Hatch

Pump Room

PUMP STATION
Adaptation Example

- 100yr FEMA Flood + 2070 SLR 3.7 ft
- 500-yr FEMA Flood without SLR 2019
- 100yr FEMA Flood + 2050 SLR 1.5 ft
- 100yr FEMA Flood without SLR 2019
Adaptation Example

Recommended Capital Improvements for Lido Pump Station

- 4 drywell hatches below flood level
- Watertight replacement of drywell hatches
- Flood pathway
- Stop logs over doors or sealed doors
Protecting the Treatment Plant

Recommendation: Plant No. 2 Boundary Wall

100-year FEMA Flood + 2070 SLR
- Flood Gate
- Flood Wall

Top of Wall 21.0 ft
Top of Wall 22.0 ft

T-WALL DETAIL DRAWING
Summary of Impacted Facilities
## Study Recommendations

<table>
<thead>
<tr>
<th>Facility</th>
<th>Construction Cost</th>
<th>Impacted Planning Horizon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slater Pump Station</td>
<td>$0.5 million</td>
<td>Current, 2050, 2070</td>
</tr>
<tr>
<td>Lido Pump Station</td>
<td>$0.5 million</td>
<td>Current, 2050, 2070</td>
</tr>
<tr>
<td>15th Street Pump Station</td>
<td>$0.1 million</td>
<td>2070</td>
</tr>
<tr>
<td>A Street Pump Station</td>
<td>$0.4 million</td>
<td>2070</td>
</tr>
<tr>
<td>Plant No. 2</td>
<td>$28 million</td>
<td>2050, 2070</td>
</tr>
</tbody>
</table>
Reducing Greenhouse Gas Emissions

Achieving Greenhouse Gas (GHG) Emission Goals at OCSD

**CALIFORNIA GOAL**
Reduce GHG emissions 40% below 1990 levels by 2030

**Senate Bill 32**

40%

**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
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