"Planning for climate change is not necessarily about being green. It really is about managing risk." - Lara Whitely Binder, Climate Impacts Group



Artwork by Russell Farrell (modified by staff)

Regulatory Affairs Division

CLIMATE RISK AND RESILIENCE ASSESSMENT

City of Los Angeles Sanitation Facilities and Infrastructure

Dec 01, 2017







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Source: Climate.NASA.gov



Source: National Academies of Sciences (http://nas-sites.org/americasclimatechoices//)



PLANNING FOR CLIMATE RESILIENCY

We must prepare Los Angeles for future earthquakes and increasing climate disruptions facing our city, including bigger wildfires, longer and hotter heat waves, and rising sea levels. Whether in the form of distributed water solutions to help increase local water supplies and fight fires post-earthquake, or the integration of grid-tied solar powered backup systems to keep fire stations running, it is immediately necessary to have proactive solutions to prepare the City.



TRANSFORMING LOS ANGELES



PLANNING FOR CLIMATE RESILIENCY

LASAN Strategic Plan Goal No. 8

- Complete a Climate Change Adaptation Plan
- Identify Projects for LASAN's 10-Yr CIP for 2016-17

Initial Risk Screening



Climate Resilience Evaluation and Awareness Tool (CREAT)

LASAN Climate Change Resiliency Assessment and Recommendations

Climate Change Adaptation and Resiliency Plan / CIP Projects Mayor's Sustainability pLAn

- Integrate natural disaster resiliency strategy with climate action and adaptation plans by 2017
- Prepare for future earthquakes and increasing climate disruptions



PHASE 1 SOLID RESOURCES ASSESSMENTS



REGULATORY AFFAIRS DIVISION



PHASE 1 AND 2 CLEAN WATER RESOURCES ASSESSMENTS



Facilities Assessed

- 4 Water Reclamation Plants (WRP)
- 43 Wastewater Pumping Plants (WWPP)
- 11 Stormwater Pumping Plants (SWPP)
- 22 Low-Flow Diversions (LFD)
- 3 Facilities in Design: Venice Auxiliary Pumping Plant Ballona Creek LFTF-1 Sepulveda Channel LFTF-2



PHASE 1 PROJECT CHRONOLOGY



REGULATORY AFFAIRS DIVISION



PHASE 2 PROJECT CHRONOLOGY





CLIMATE IMPACTS TO LOS ANGELES REGION

| No. of Hot Days | 6-22 days/year by 2060 Health, Safety, Power Outage, Transmission Problems |
|-------------------------------------|--|
| Flooding | More extreme precipitation events, river flows, flooding, depths Increase in spatial extent and depth of coastal storm surges |
| Landslide/ Liquefaction/Wildfire | More extreme variations in weather patterns (intense precipitation and temperatures; more hot days) |
| Tsunami | Submarine earthquakes and landslides, coastal inundation risks Amplified with coastal storms and sea-level rise |
| Sea Level Rise | CoSMoS 3.0 (2016) 0.5 meters mid-century, 1.5 meters in 2100 |



REPRESENTATIVE CLIMATE INFORMATION

| LOCATION | CLIMATE VARIABLE | HISTORICAL VALUE (OBSERVED) | PROJECTED VALUE FOR 2060 (OBSERVED + CHANGES) |
|--|----------------------------|---------------------------------|--|
| | Average Annual Temperature | 62.9°F | 66.0°F |
| Santa | Total Annual Precipitation | 18.5 inches | 22.4 inches |
| Monica | 100-Year Storm Event | 5.4 inches in 24 hours | 7.0 inches in 24 hours |
| вау | Hot days (over 95°F) 6 da | 6 days (1981-2000) ³ | 22 days |
| | Sea-Level Rise | 2 mm/year ⁴ | >0.5 meters (1.64 feet) |
| Aver Los Tota Angeles Harbor Hot d | Average Annual Temperature | 63.2°F | 66.1°F |
| | Total Annual Precipitation | 13.7 inches | 15.2 inches |
| | 100-Year Storm Event | 7.3 inches in 24 hours | 9.5 inches in 24 hours |
| | Hot days (over 95°F) | 6 days (1981-2000) ³ | 22 days ³ |
| | Sea-Level Rise | 2 mm/year ⁴ | >0.5 meters (1.64 feet) |

3 Dr. Alex Hall, UCLA Study on Climate Change in the Los Angeles Region: Temperature Results, Business As Usual Scenario

4 Historical global sea-level rise observations, used by CoSMoS 1.0

5 Projected sea-level rise data from – SLR from CoSMoS 1.0 for the year 2050, CoSMoS 3.0 model calculations used at 100-year storm plus 0.5m sea-level rise scenario



RISK ANALYSIS

Landslide, Liquefaction, Wildfire, and Tsunami Zones

Terminal Island Water Reclamation Plant



Flood Zones/

VENICE BEACH LOW-FLOW DIVERSION PUMPING PLANT NO. 647



Climate change risks

- Located in the 500-year flood zone and tsunami zone
- Coastal flooding, additional risk with sea-level rise
- Liquefaction*



Figure 1. Hazard Zones for Kinney Circle Pumping Plant No. 647

* Minimized by flat terrain and development

Adaptation options

- Waterproof hatches
- Raise vents to elevations above future design flood elevation
- Use watertight enclosures on electrical, instrumentation and controls, and MCCs
- Resize green infrastructure and other drainage enhancements for design storms
- Capture and reuse stormwater for irrigation or other nonpotable uses

For planning purposes, the estimated cost of the recommended adaptations is \$610,000. The estimated damage replacement costs of the facility is \$3,750,000.



WASTEWATER PUMPING PLANT #666 FRIES



Hazards

- 500-yr Flood Zone (Elev 12.25)
- Tsunami (Elev ~20)
- 0.5-1.5m CoSMoS (Elev 11.64 14.92)

Damage Threshold Elevations

- Door Elev 11.17
- Generator Pad Elev 11.89



*Elevations shown are in NAVD88 and 1' include freeboard

HAWAIIAN & B PUMPING PLANT NO. 677



Climate change risks

- Located in the 500-year flood zone and tsunami zone
- Coastal flooding from tsunami
- Liquefaction*



Figure 1. Hazard Zones for Hawaiian & "B" Pumping Plant No. 677

* Minimized by flat terrain and development

Adaptation options

- Install watertight connections and protect the motor control center
- Waterproof instrumentation and controls



- Waterproof hatches and raise vents
- Install submarine doors to control room
- Raise generator pad
- Install bollards to protect above-ground structures from tsunami wave debris

For planning purposes, the estimated cost of the recommended adaptations is \$870,000. The replace-in-kind cost estimate is \$4,071,600.

CAPITAL COST ESTIMATES (SOLID RESOURCES FACILITIES ONLY)



| Facility/Operation | Estimated Replacement Costs | Estimated Resilience Improvement Cost |
|-----------------------------------|-----------------------------------|---|
| CLARTS | \$1,100,000 | \$0 |
| Harbor Collection Yard | \$6,300,000 | \$230,000 |
| Harbor Mulching Facility | \$8,500,000 | \$0 |
| Gaffey Street Landfill | \$530,000 | \$0 |
| Toyon Canyon Landfill | \$500,000 | \$220,000 |
| Griffith Park Composting Facility | \$2,200,000 | \$220,000 |
| East Valley Yard | \$108,900,000 | \$1,540,000 |
| Lopez Canyon Landfill | \$29,500,000 | \$0 |
| Alternative Fueling Systems | n/a | \$7,040,000 |
| Totals | \$157,530,000 | \$9,250,000 |



CAPITAL COST ESTIMATES (CLEAN WATER AND WATERSHED PROGRAMS)

| Assets | Estimated Replacement Costs | Estimated Resilience Improvement Costs |
|-------------------------------|--------------------------------|---|
| Water Reclamation Plants | \$300,000,000 | \$33,212,900 |
| Wastewater Pumping Plants | \$92,474,800 | \$12,946,000 |
| Stormwater Pumping Plants | \$23,166,000 | \$1,860,000 |
| Low-Flow Diversions | \$3,250,000 | \$380,000 |
| Low-Flow Diversion/Stormwater | \$12,174,000 | \$1,570,000 |
| Total Estimates | \$431,064,800 | \$49,968,900 |





NEXT STEPS

