

# Sea-level Rise Impacts to Vulnerable and Disadvantaged Communities

Ocean Day 2019 - CSU COAST Luncheon  
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VIRTUAL PLANET



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# USGS Coastal Flood Study (March 13)

By 2100 yearly storms could impact:

- ✓ 500,000 people and \$150 billion

Likely underestimated as it does not consider:

- ✓ Vulnerable populations
- ✓ Lost Jobs



$$\text{Risk} = f(\text{Hazards}, \text{Exposure}, \text{Vulnerability})$$

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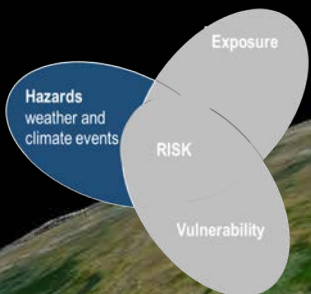
“Capacity to anticipate,  
cope with, resist, or recover  
from hazards”

Wisner et al. (2003)

(IPCC SREX, 2012)

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation





Hurricane Wilma

# Hazards

- Sea Level Rise
- Coastal Storms
- Strong Winds
- Wave Energy
- El Niño





# Exposure

- Buildings and Assets
- Infrastructure
- Population in low lying areas
- Agriculture
- Ecosystems (Beach, Coastal Forests, Wetlands...)





# Vulnerability

- Inequality
- Low Income
- Language
- Age
- Malnutrition



# Vulnerable groups suffer disproportionate impacts

Damaged homes still unsafe:

- ✓ Hispanics 27%
- ✓ African Americans 20%
- ✓ Whites 11%

## A Year After Hurricane Harvey, Houston's Poorest Neighborhoods Are Slowest to Recover

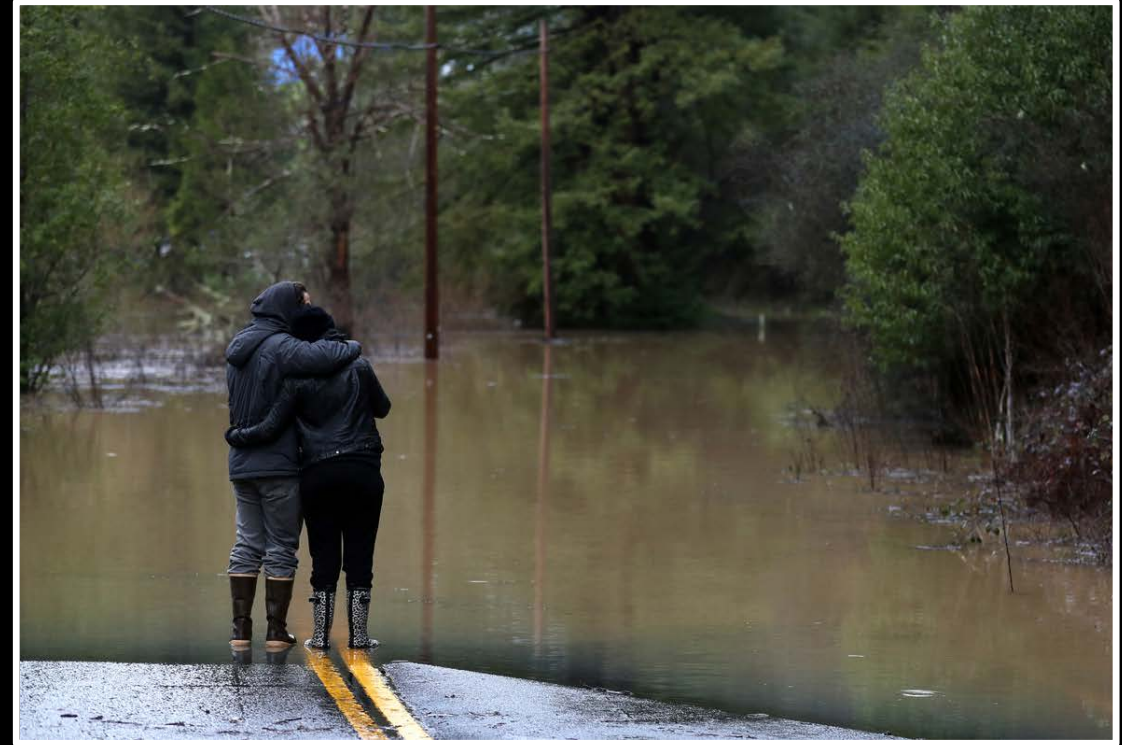
Texas has made progress recuperating from Hurricane Harvey, but low-income and minority residents have had a much harder time.





# Vulnerable groups suffer disproportionate impacts

- ✓ Usually located in high-risk areas
- ✓ Lack basic resources (e.g. insurance)
- ✓ Take much longer to recover
- ✓ Disasters reduce income and consumption further aggravating poverty



*Justin Sullivan/Getty Images*

Juneja S (2009); Dunning and Durden (2013)

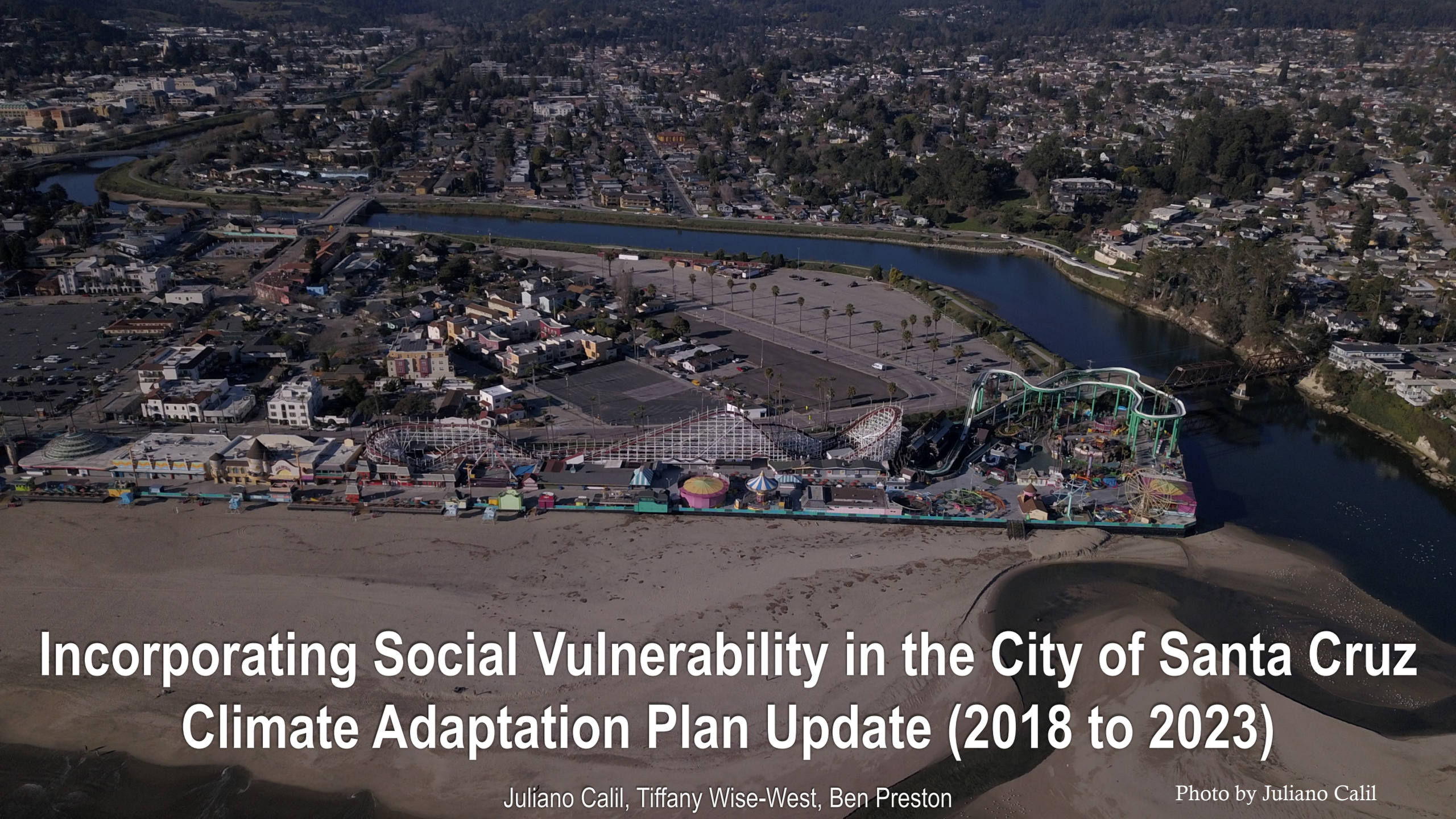


Most SLR studies in CA still  
ignore Social Vulnerability



*Justin Sullivan/Getty Images*



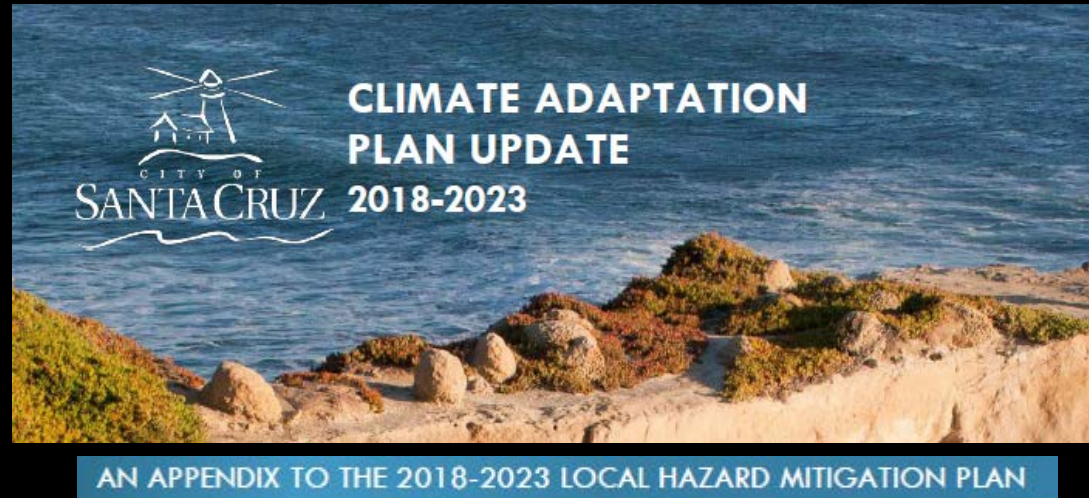


# Incorporating Social Vulnerability in the City of Santa Cruz Climate Adaptation Plan Update (2018 to 2023)

Juliano Calil, Tiffany Wise-West, Ben Preston

Photo by Juliano Calil



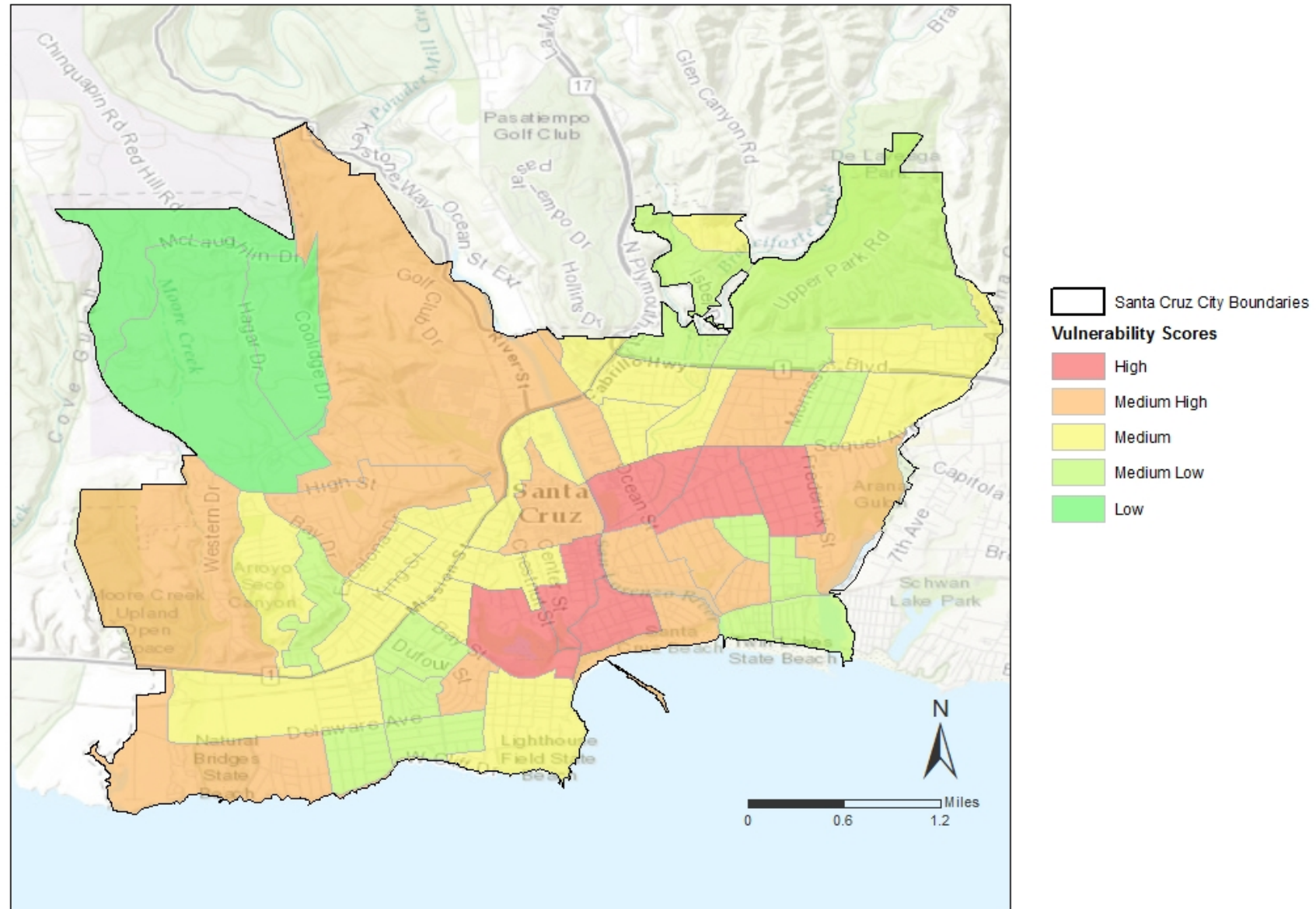


## Project Steps

- Review pre-existing Vulnerability Indices (70+ Studies)
- Developed a custom Vulnerability Score
- Vulnerability Scores + Hazards



CITY OF SANTA CRUZ  
SOCIAL VULNERABILITY SCORES

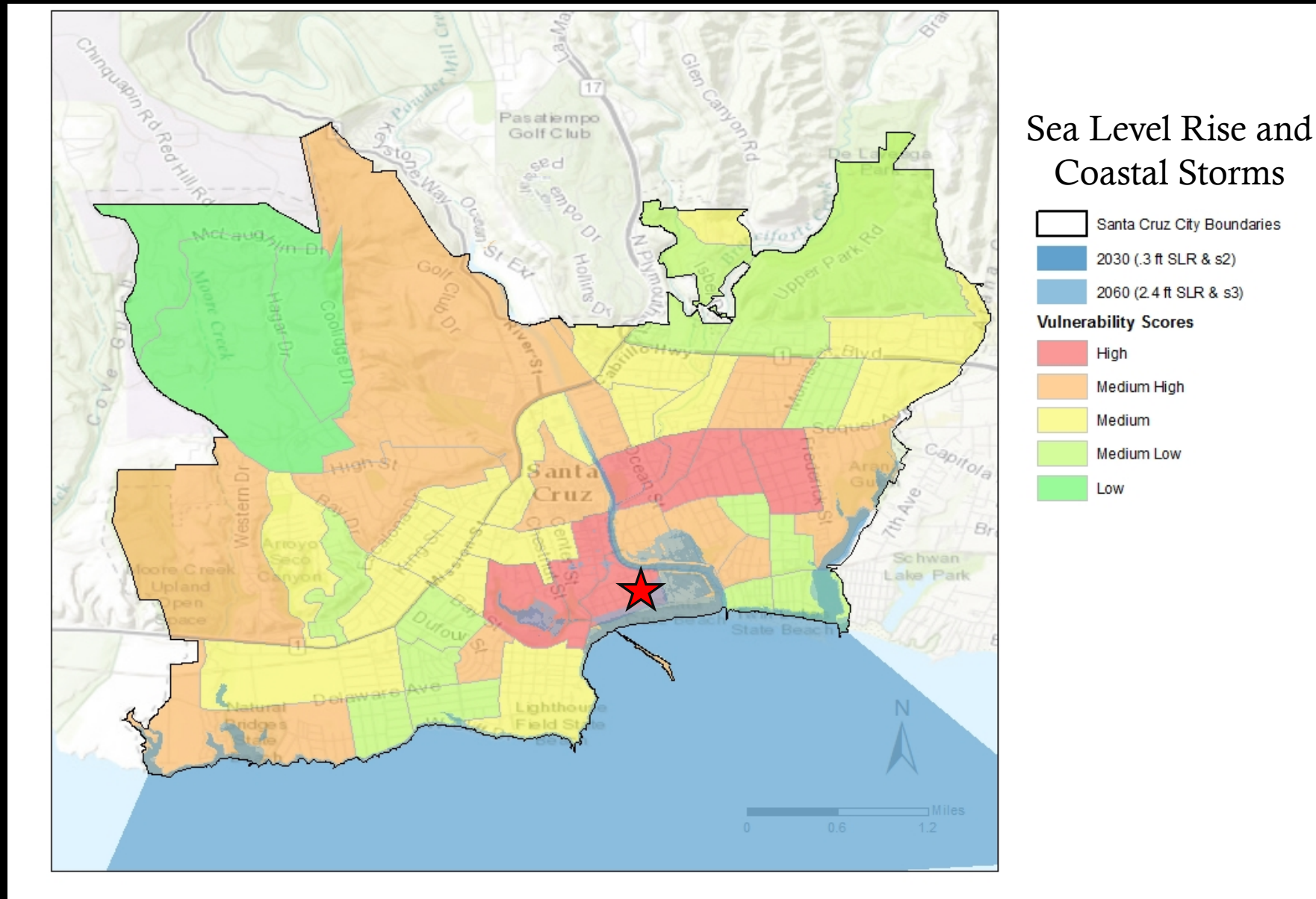


Income  
Elderly  
Language  
Disability  
Crime

*City Block Groups*

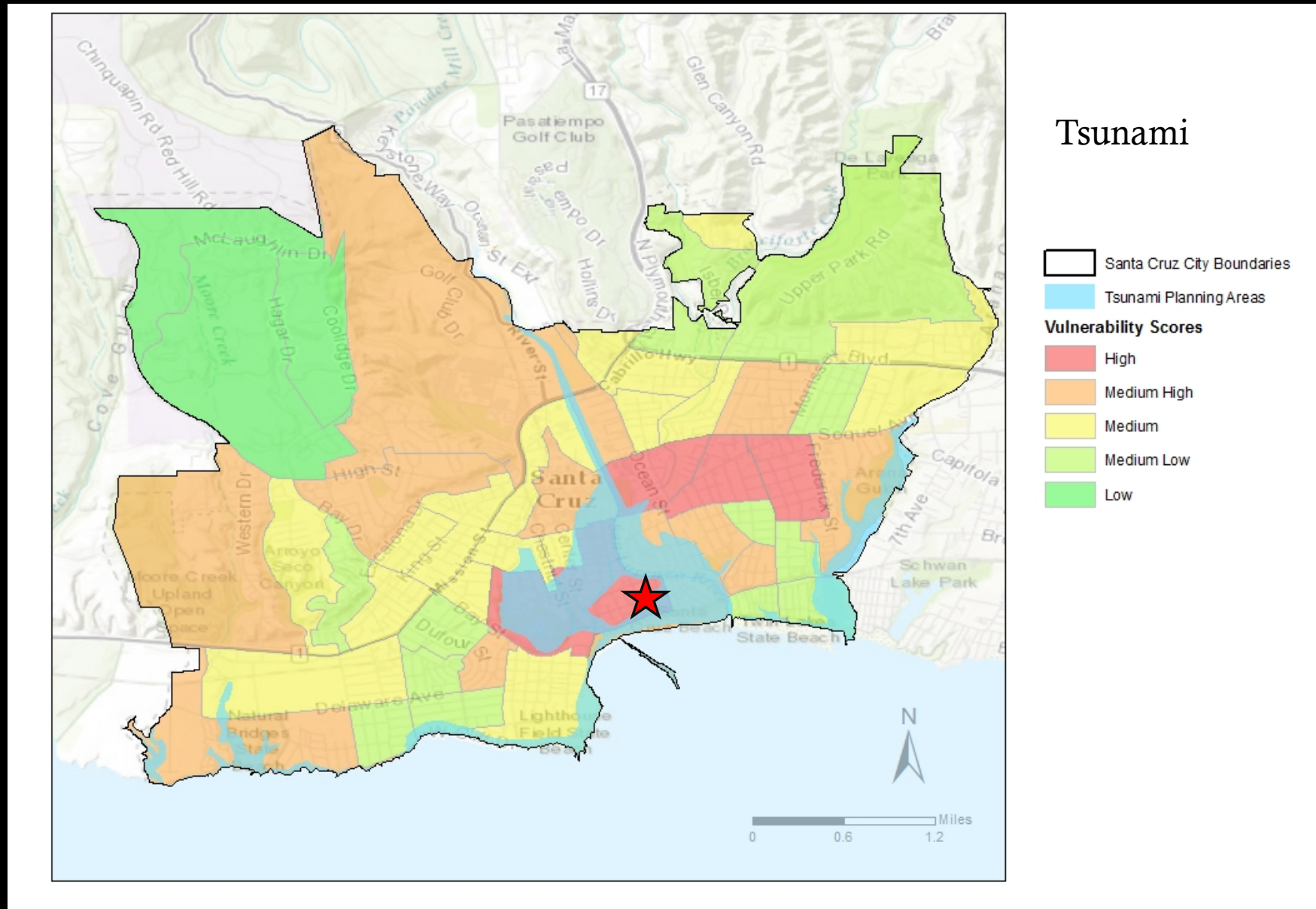


# Beach Flats Neighborhood Particularly Vulnerable to Flooding



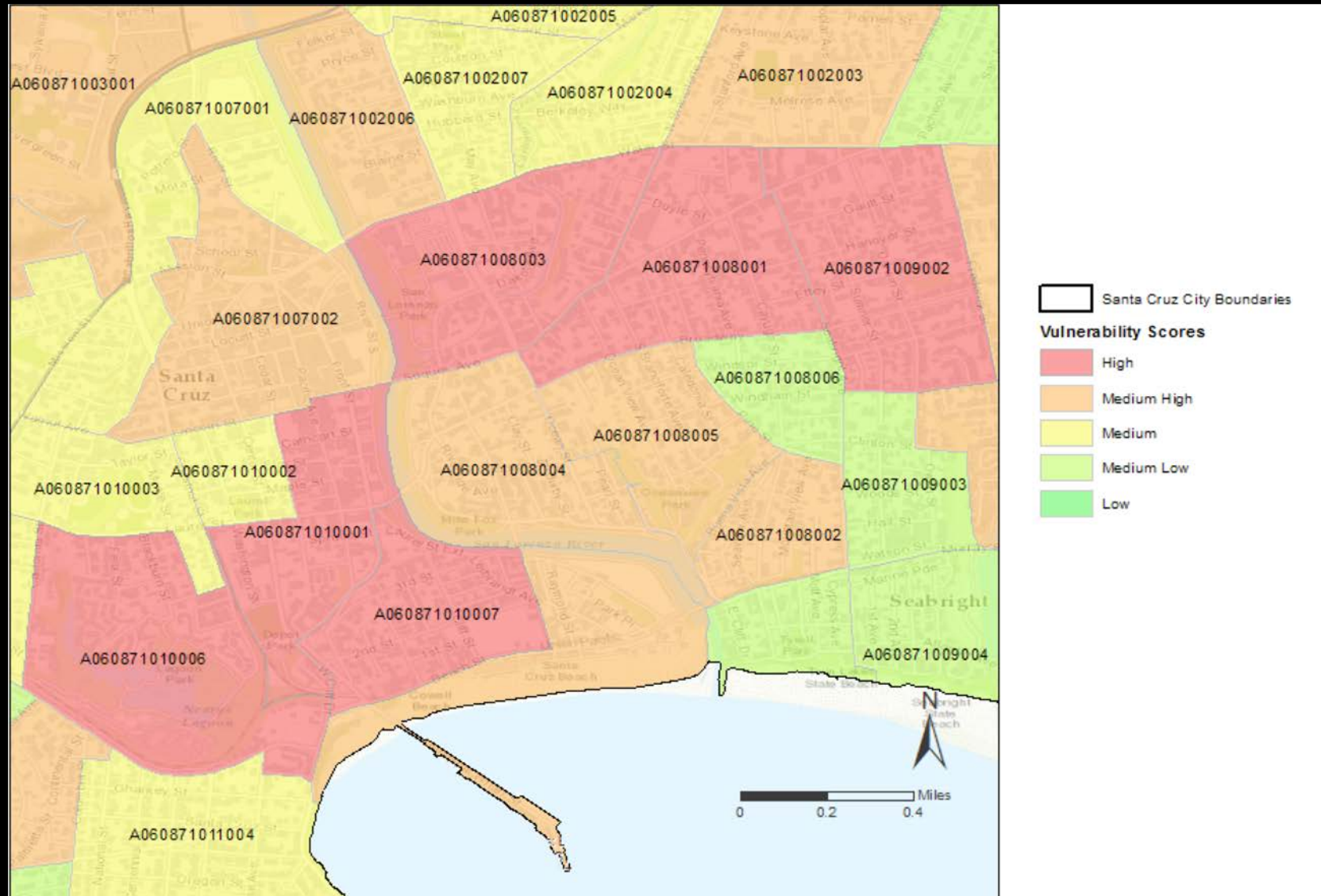


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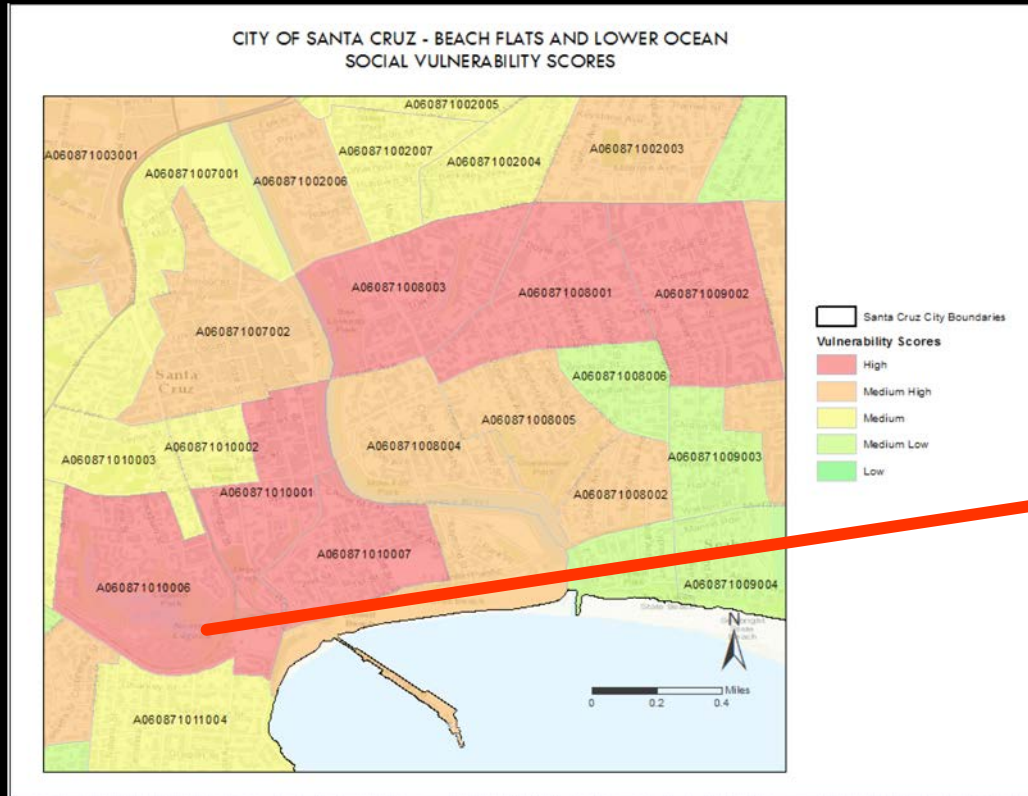


# What is Driving Vulnerability?

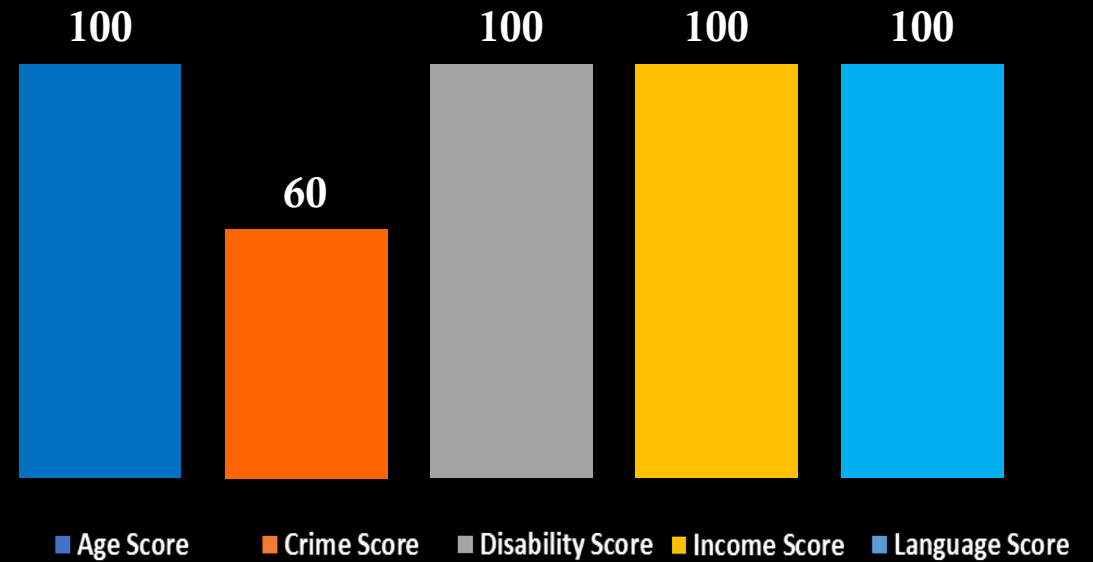




# What is Driving Vulnerability?



## Social Vulnerability Drivers





# Links to Action

- Information being disseminated through City's departments
- Emergency Response
- Translation is now a high priority
  - Reverse 911 calls in Spanish
- 51 outreach meetings (616 people)
  - 10+ involving vulnerable communities
- Upcoming projects
  - West Cliff Dr Transportation Plan
  - LCP update
- New Tools – Virtual Reality and 3d Models



# Thank you!

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