New Orleans Municipal Yacht Harbor

Environmental Conditions and Wave Modeling

moffatt & nichol

Creative People, Practical Solutions.®

601 Poydras St., Suite 1860
New Orleans, LA, 70130
504-648-3560

moffattnichol.com

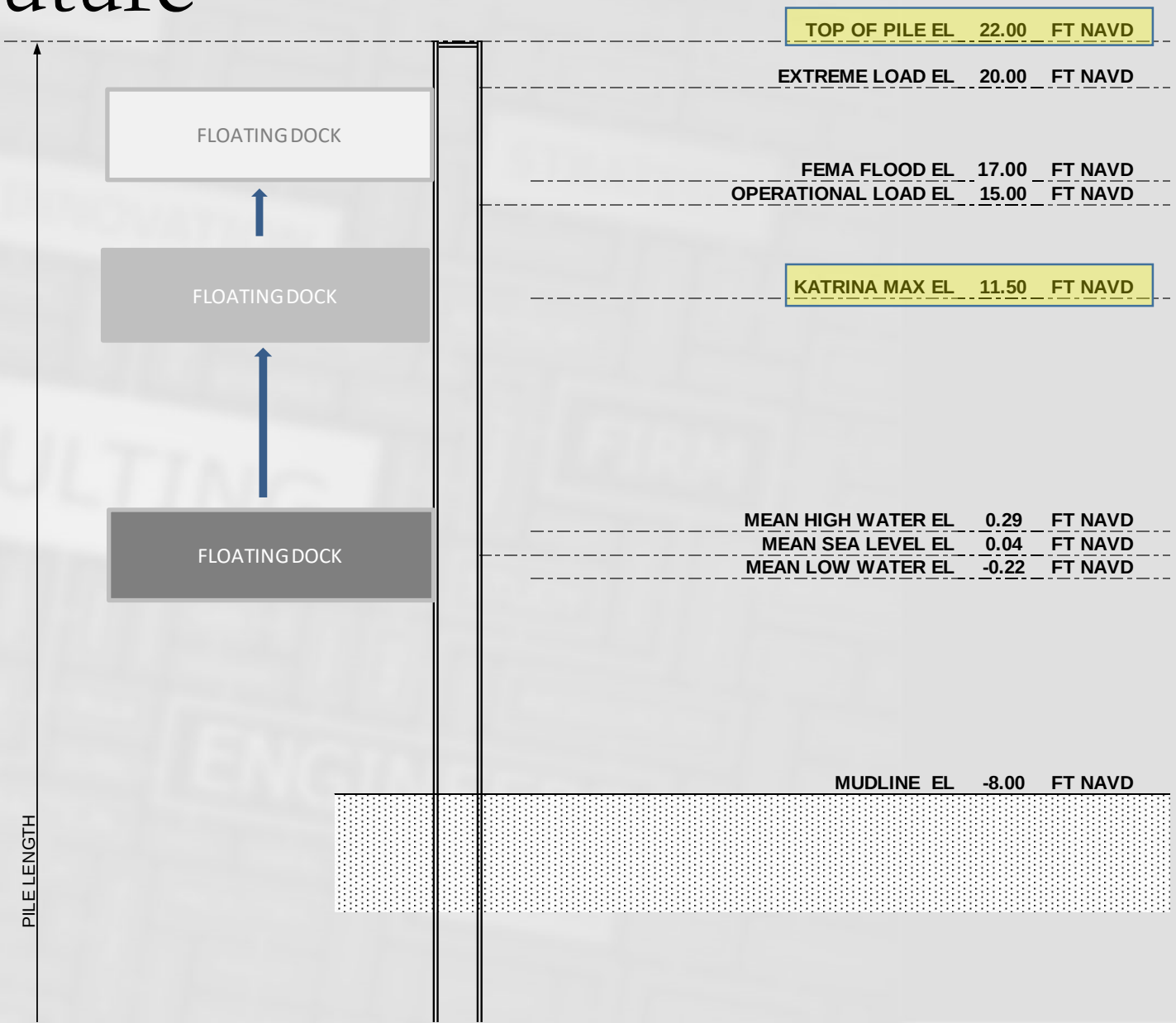
1. Performance-based design

- Floating docks designed to withstand extreme (1% annual chance) storm
  - Can rise and fall with surge.

- Docks won't submerge during high water
  - Lets boats stay at berth
  - Reduces chance of boats striking sunken objects

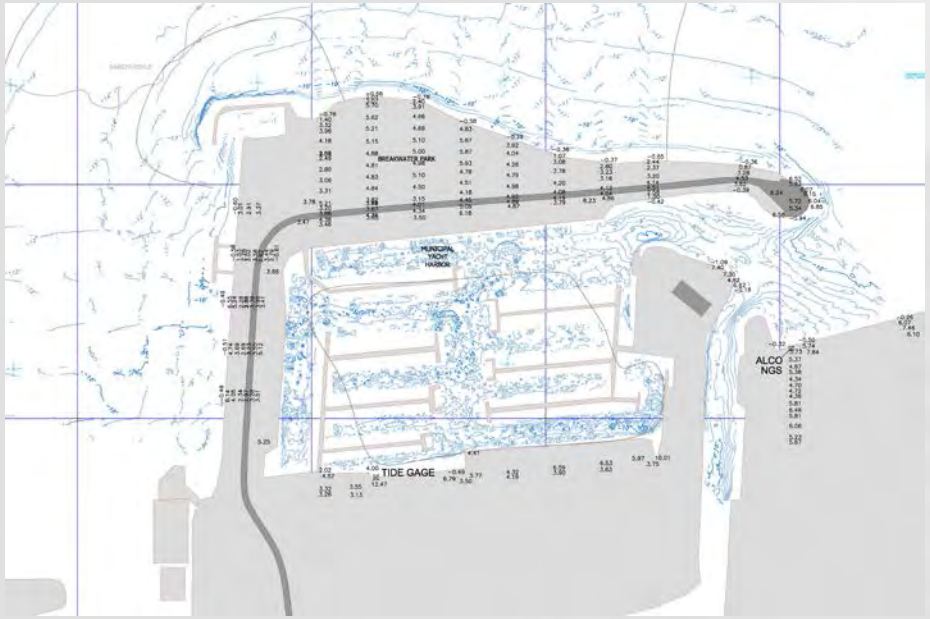
2. Planning for the future

- Conservative, scientifically sound sea level rise and subsidence projections
- Future hurricane waves and surge based on HSDRRS project – most rigorous data available
- Pile caps (how high docks can rise with surge) are set at +22’ NAVD88 – more than 10.5’ higher than Katrina’s high water mark at MYH

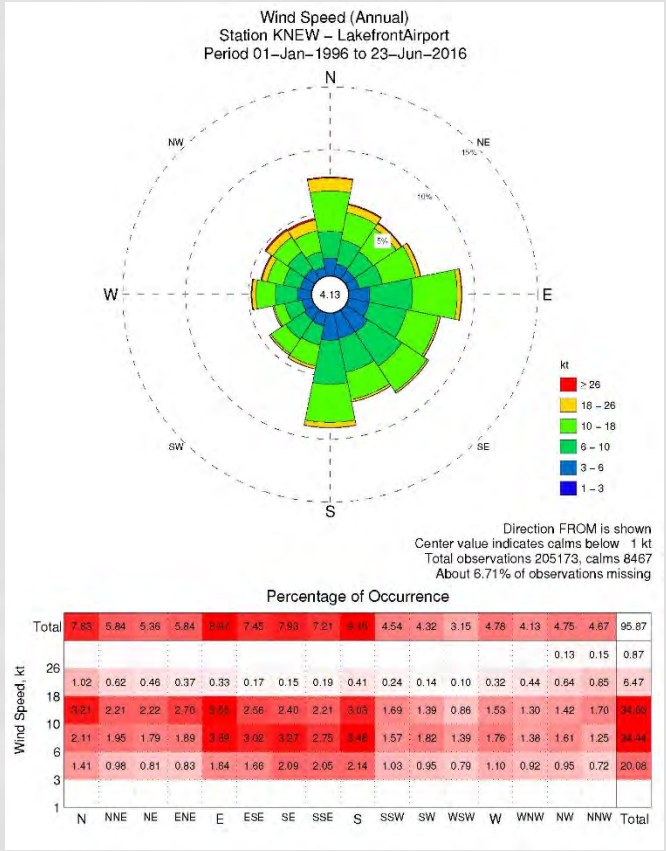


3. Data Sources

- Bathymetric surveys and geotechnical investigations
- 11-year NOAA tide gauge on site
- 20-year Wind records at Lakefront Airport
- USACE HSDRRS Studies
- FEMA / US Army Corps high water marks from Katrina

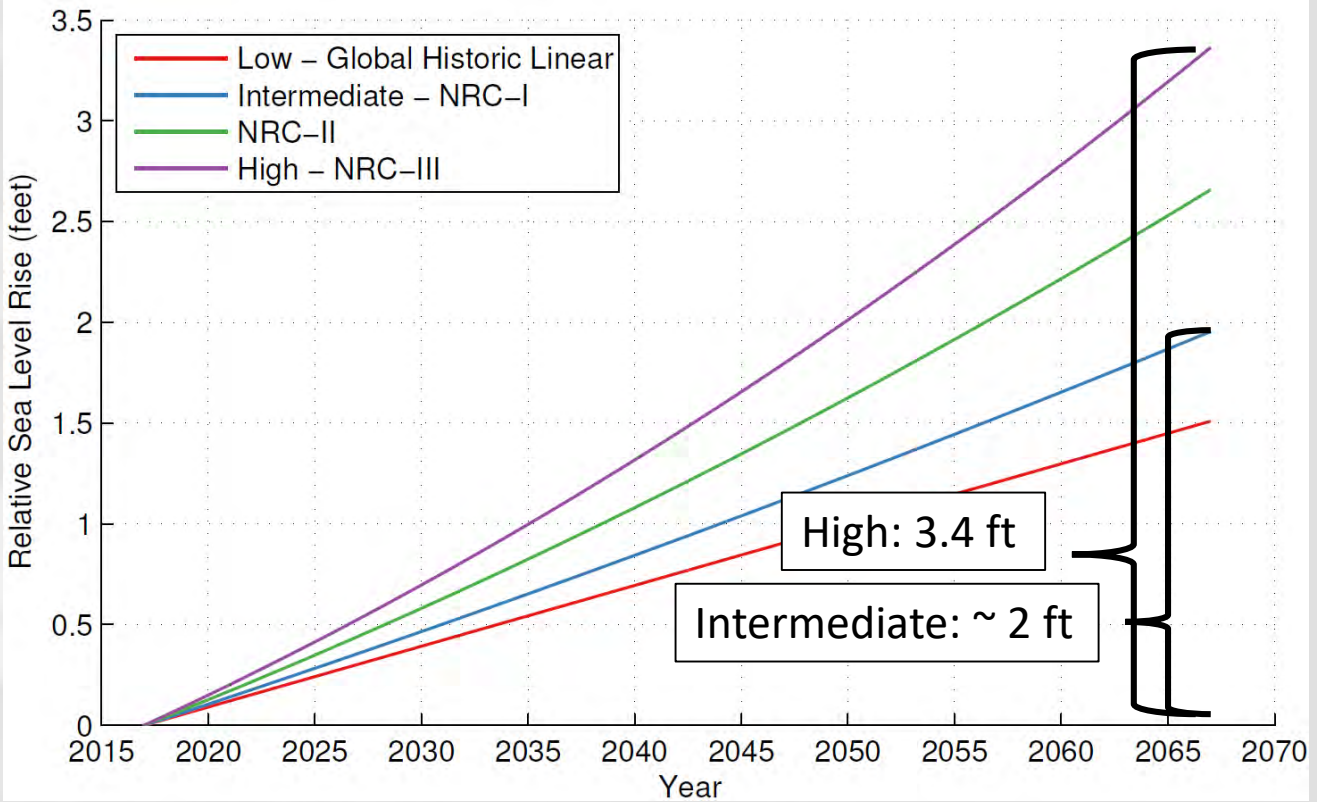


https://tidesandcurrents.noaa.gov/stationhome.html?id=8761927



4. Sea Level Rise

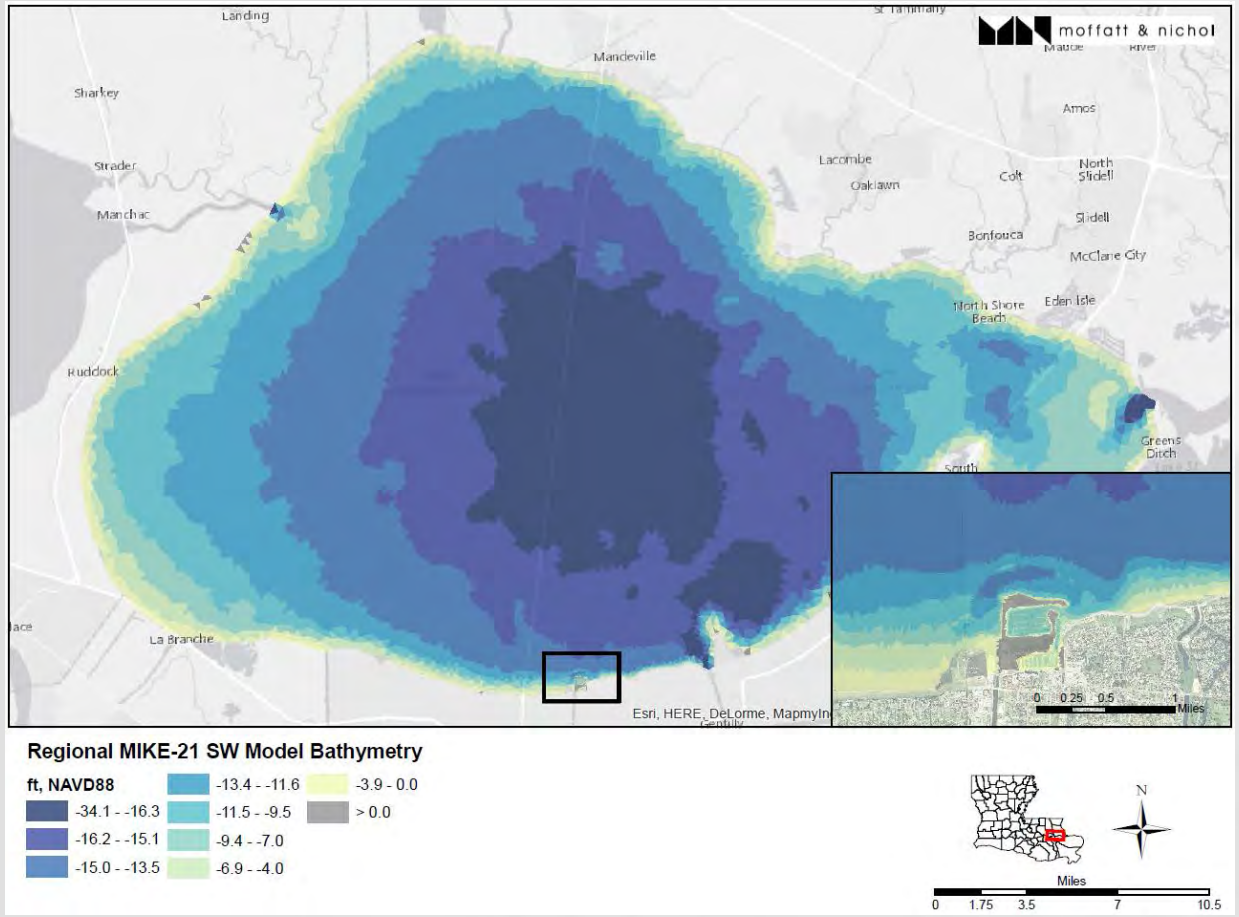
- Land subsidence rate of **7.5 mm/yr**.
  - *West Shore Lake Pontchartrain Hurricane and Storm Damage Risk Reduction Study* (US Army Corps of Engineers, 2014).
- Global mean sea level rise rate of **1.7 mm/yr**.
  - Intergovernmental Panel on Climate Change (IPCC, 2014)
- Projection equations, which account for **accelerated rates** of mean sea level rise and subsidence
  - *Engineering Technical Letter 1100-2-1: Procedures to Evaluate Sea Level Change* (US Army Corps of Engineers, 2014).



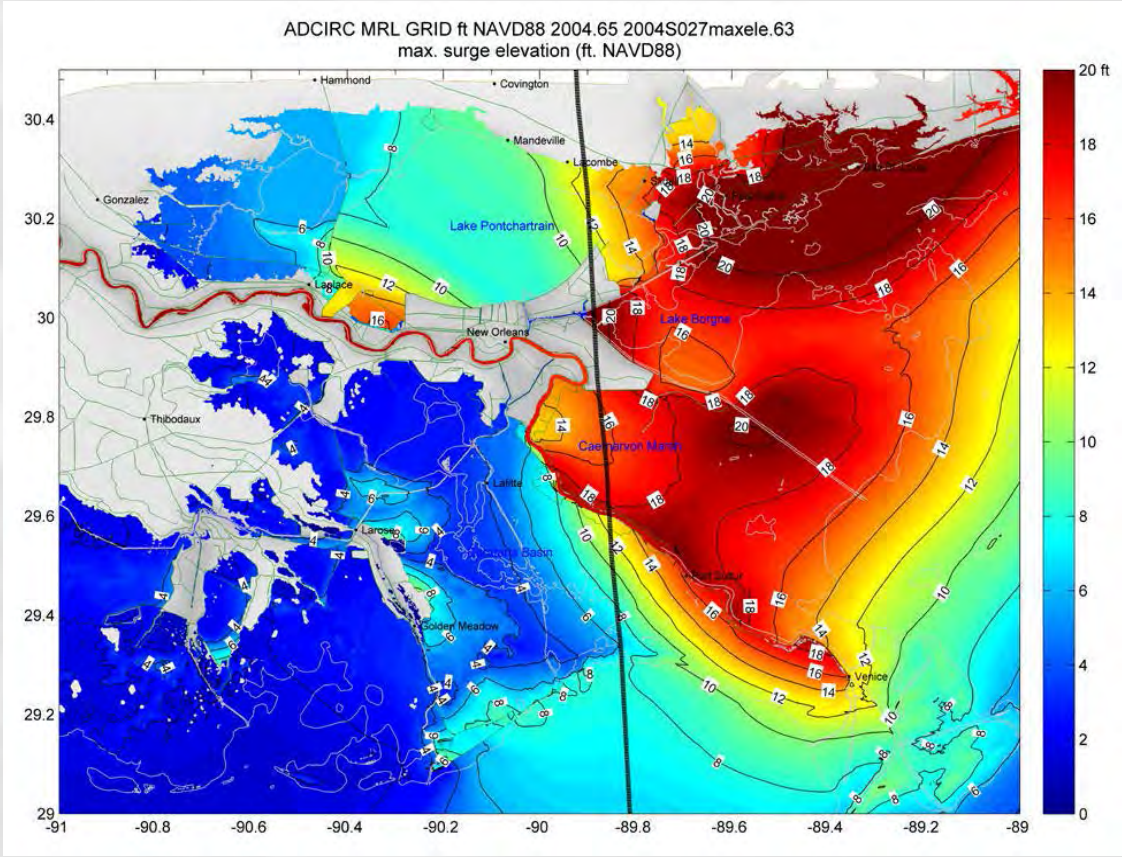
- Recommend using **Intermediate** value for design, while also assessing cost implications for accommodating **High** scenario

5. Operational and Extreme Wave Conditions

- Operational storms simulated in-house, based on wind records



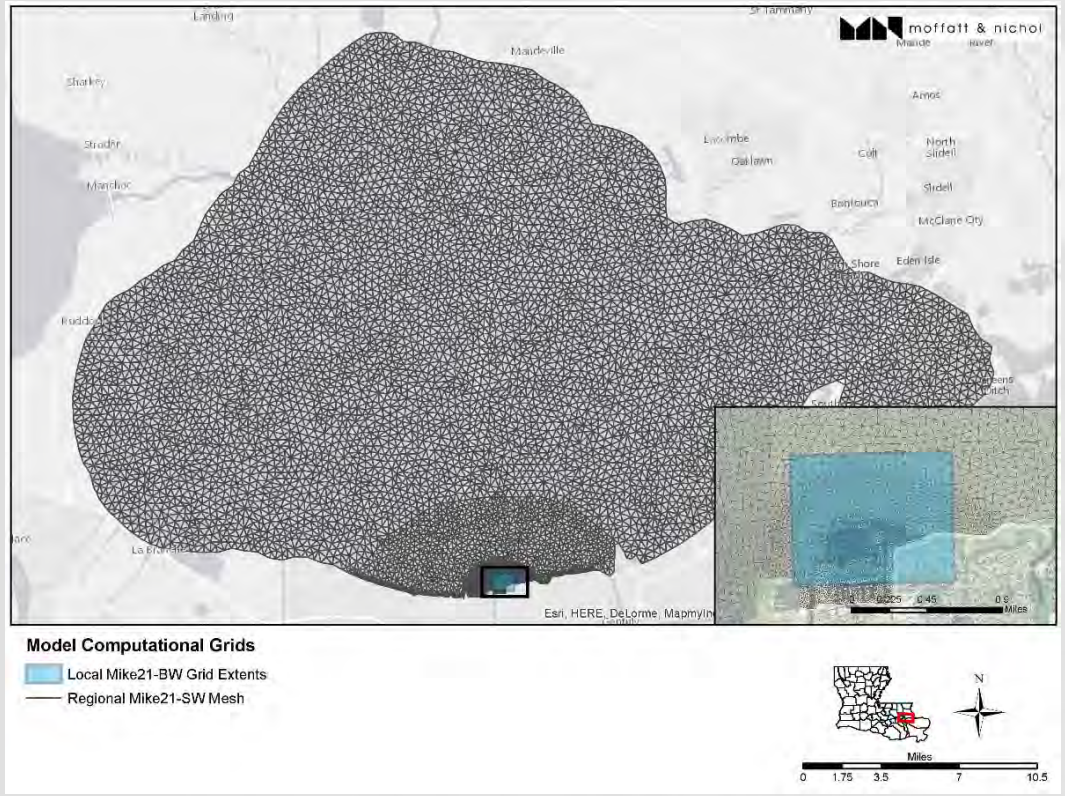
- Design 100-year (1% annual chance) storm taken as US Army Corps' conservative 2057 event used in HSDRRS projects

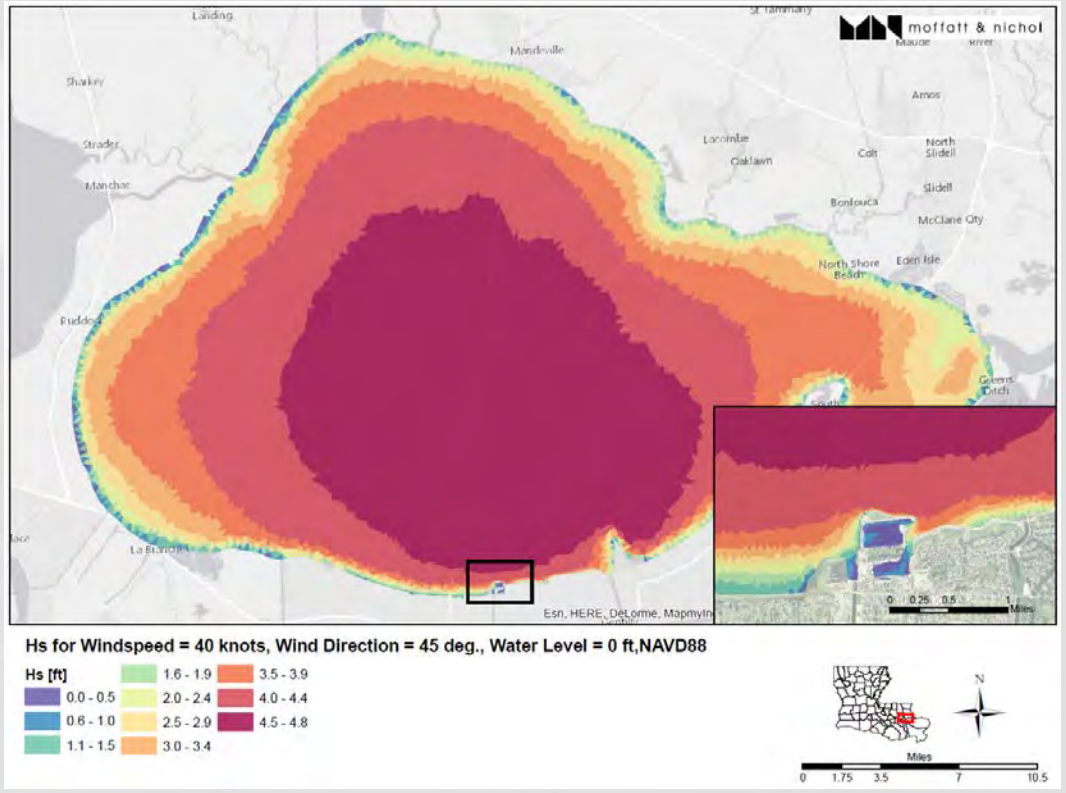


Source: US Army Corps *Elevations for Design of Hurricane Protection Levees and Structures: Lake Pontchartrain and Vicinity… Appendix A* (2014)

5.1 Regional Wave Modeling

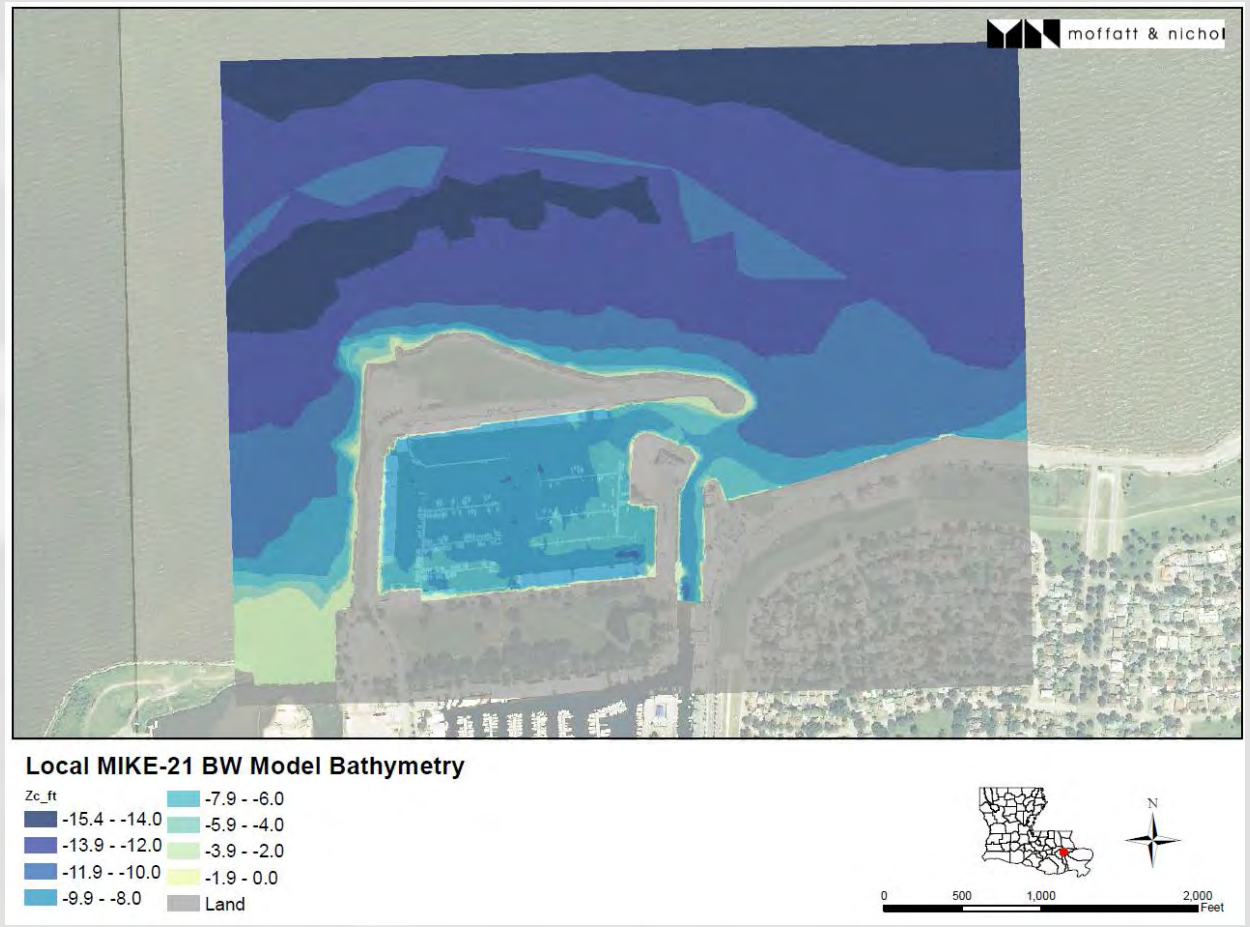
- Depth accurate computational grid, with high resolution at harbor
- Use of measured wind and water level to model waves offshore of harbor
- Statistical analysis of modeled waves to determine operational wave heights (1-yr through 50-yr Return Periods)





5.2 Local Wave Modeling

- Model propagation of offshore waves into harbor
  - Robust diffraction/reflection formulations
- Operational wave conditions
  - From statistical analysis of regional wave modeling
- Extreme wave conditions
  - 1% annual chance surge and wave conditions offshore of harbor (from USACE HSDRRS studies)

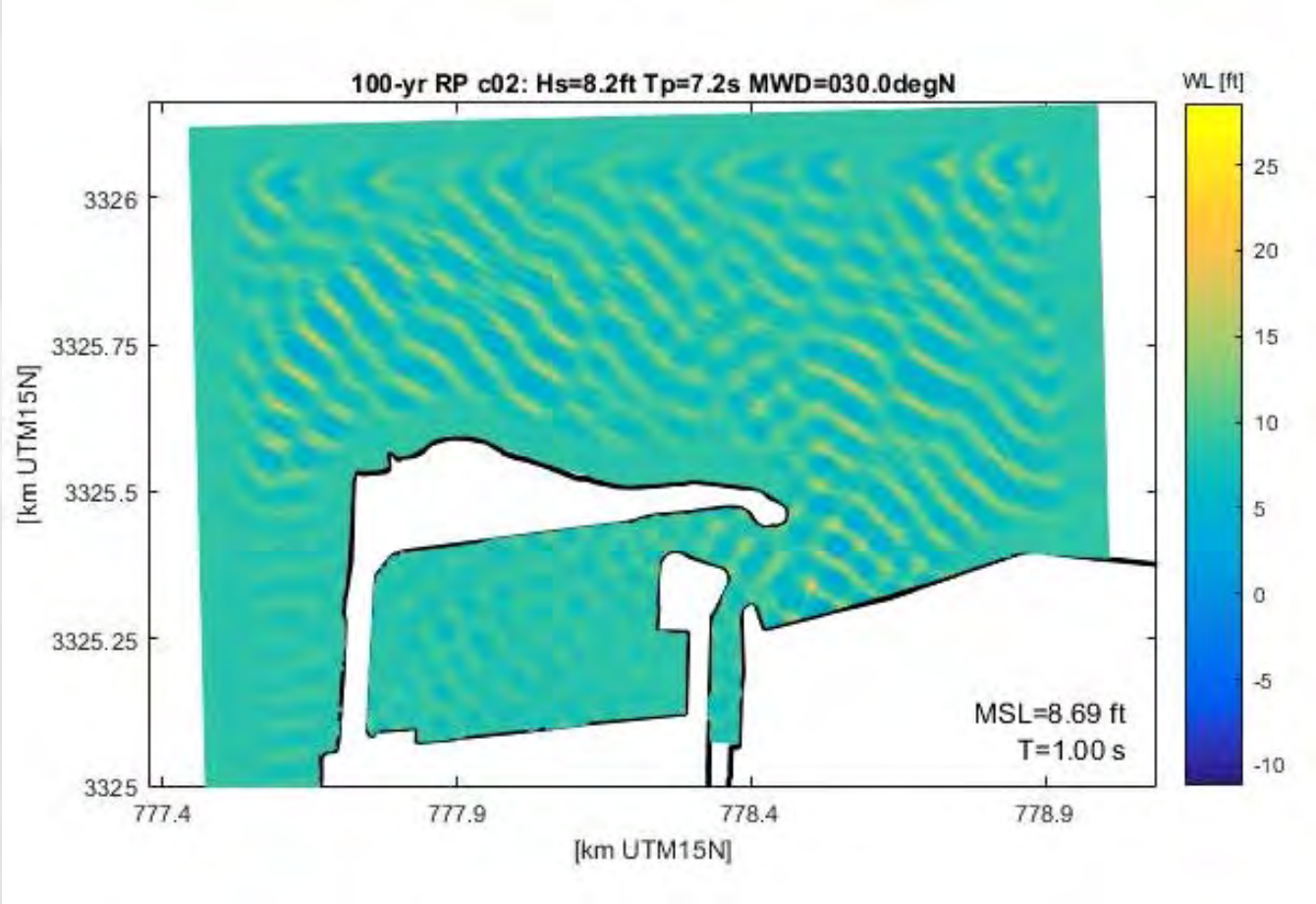


5.3 Extreme Modeling Results

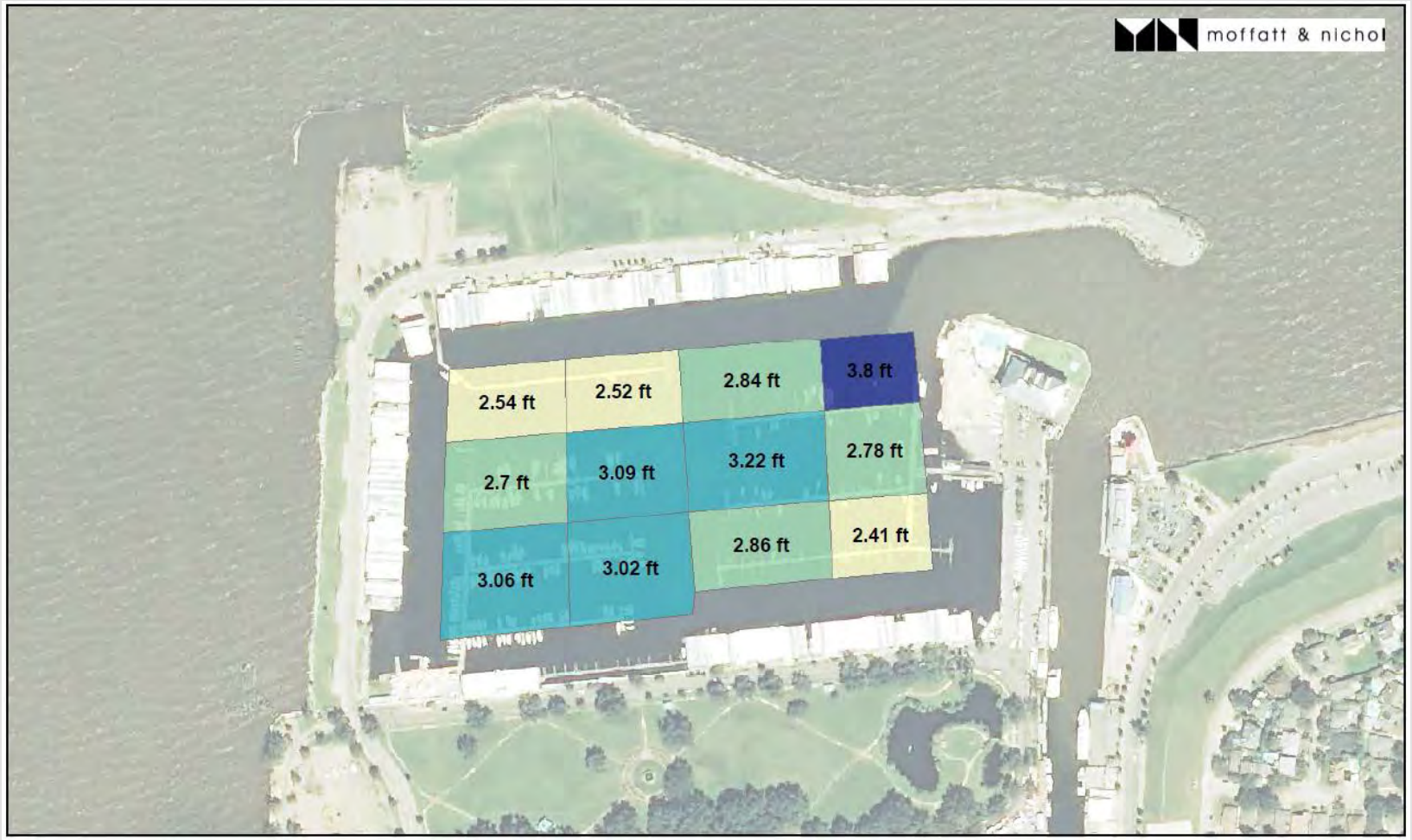
Robust diffraction-reflection formulation

Accurate simulation of waves penetrating harbor and reflecting within

High-confidence dock design



5.4 Extreme Modeling Results



6. Conclusions

- Safer harbor with floating docks
- Planned for the future with high conservatism
- Modeled with accurate data and state-of-the-art tools

Questions or comments?

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THANK YOU!

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