

**Inner Cabrillo Beach
Source Tracking Study
And
Quantitative Microbial Risk
Assessment (QMRA)**

Background

- **The issue: Not all FIB come from human sources**
 - non-human sources are less “risky”
- **The option: EPA identified QMRA as a tool for Site-Specific Objectives**
 - New objectives based on health risk
- **The challenge: QMRA for Site-Specific Objectives has never been done at a marine beach**
- **The goal: Conduct a QMRA at a marine beach in California**
 - Use as a precedent setting case study

QMRA Framework

- **Source identification**
 - Goal is to know sources for sampling pathogens
- **Pathogen loading**
 - To generate exposure information
- **Risk modeling**
 - Sensitivity testing
- **Advisory Committee**
 - Regulatory, regulated, NGO

Inner Cabrillo Beach Met the 8 Criteria

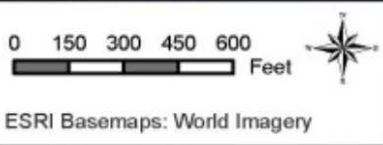
- Persistent, but low level FIB exceedances
- High level of effort to eliminate human sources
- Willing Partners
- High volume of beach use
- Total Maximum Daily Load (TMDL) completed/Adopted
- Septic tanks are minimal and not a prominent sewage treatment solution
- Implemented dry weather flow diversions
- Well defined, small watershed

The Final Outcome

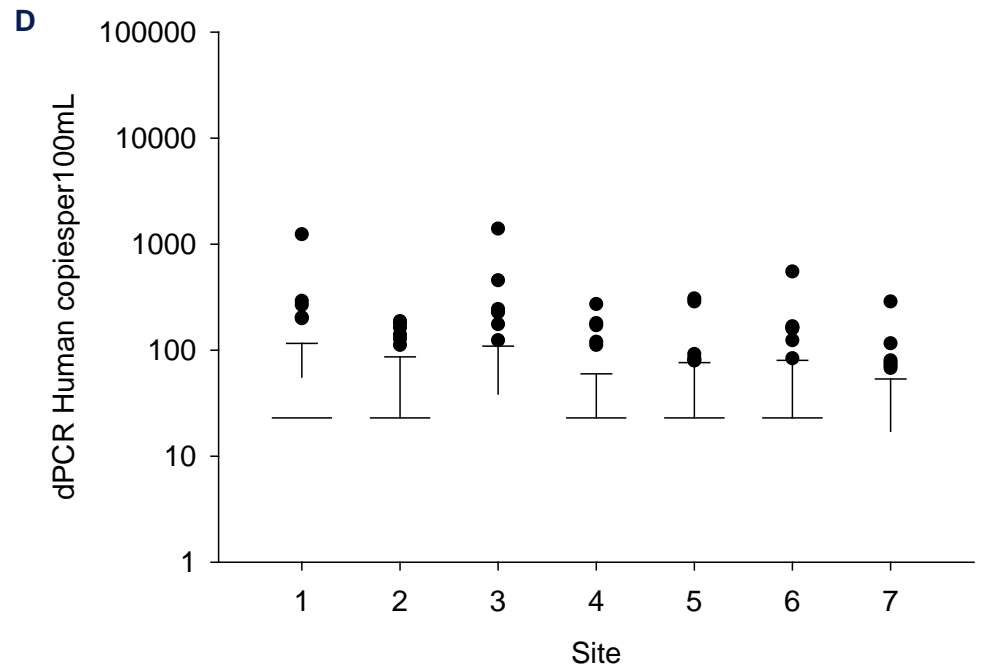
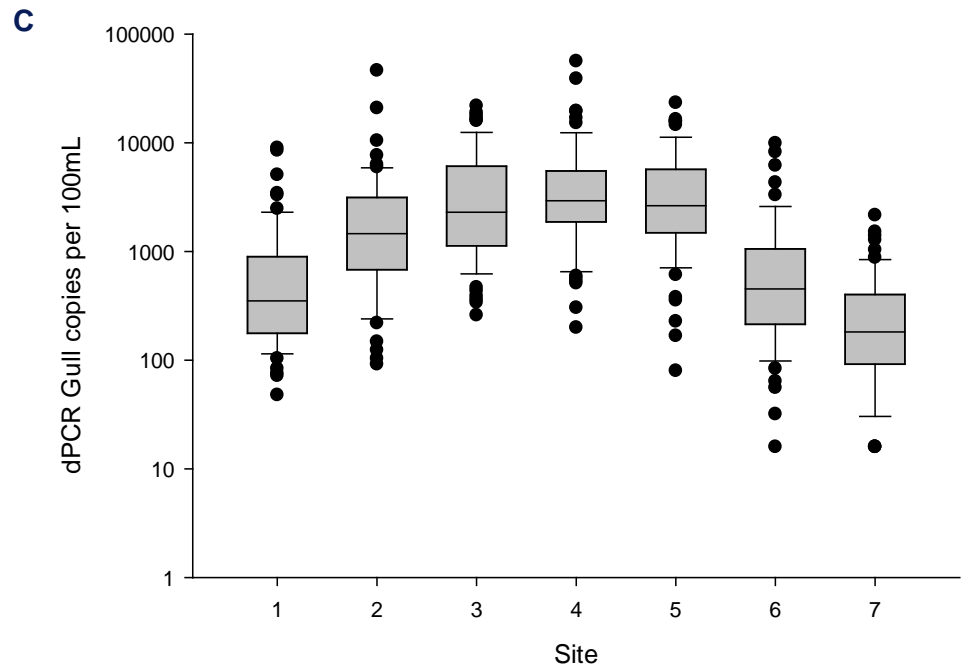
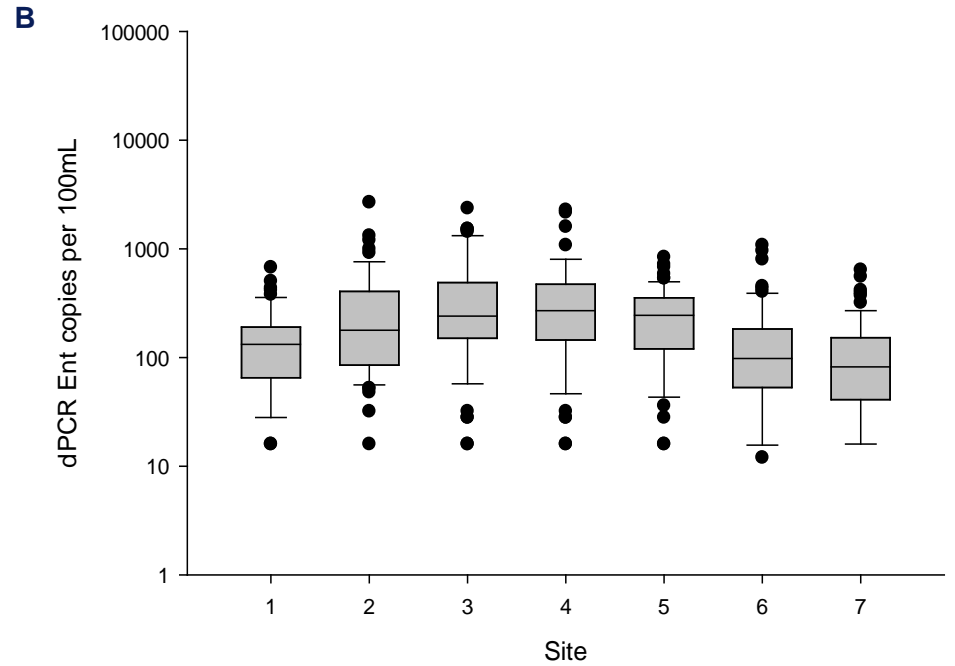
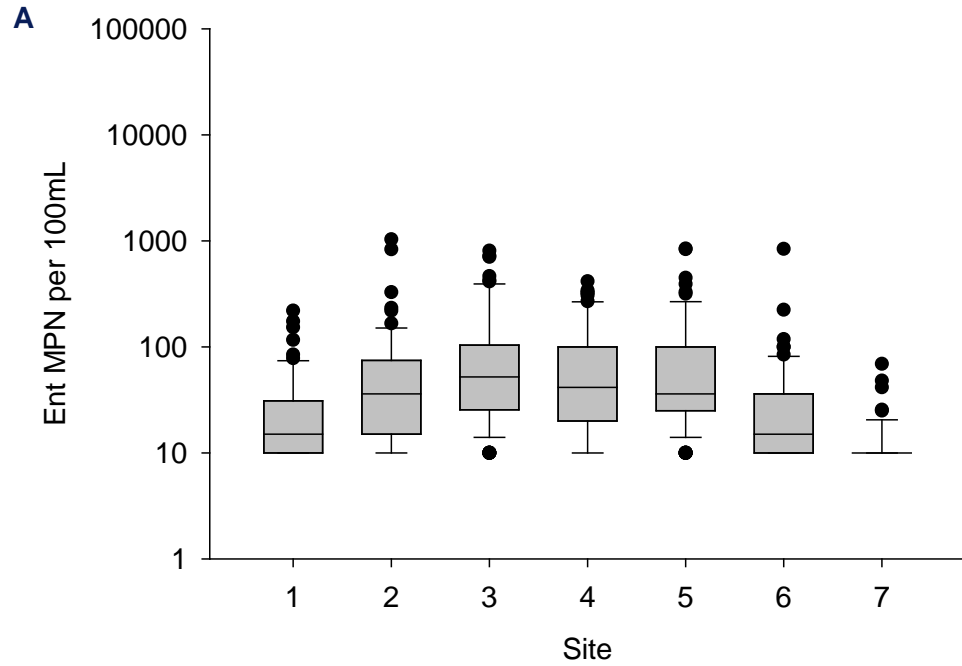
- **Birds were a major source of Enterococci at ICB**
- **There was a persistent, but low level of human fecal contamination at ICB based on HF183**
 - **Attempts to fix beach sewage infrastructure did not get rid of the HF183**
- **The QMRA has been placed on hold**



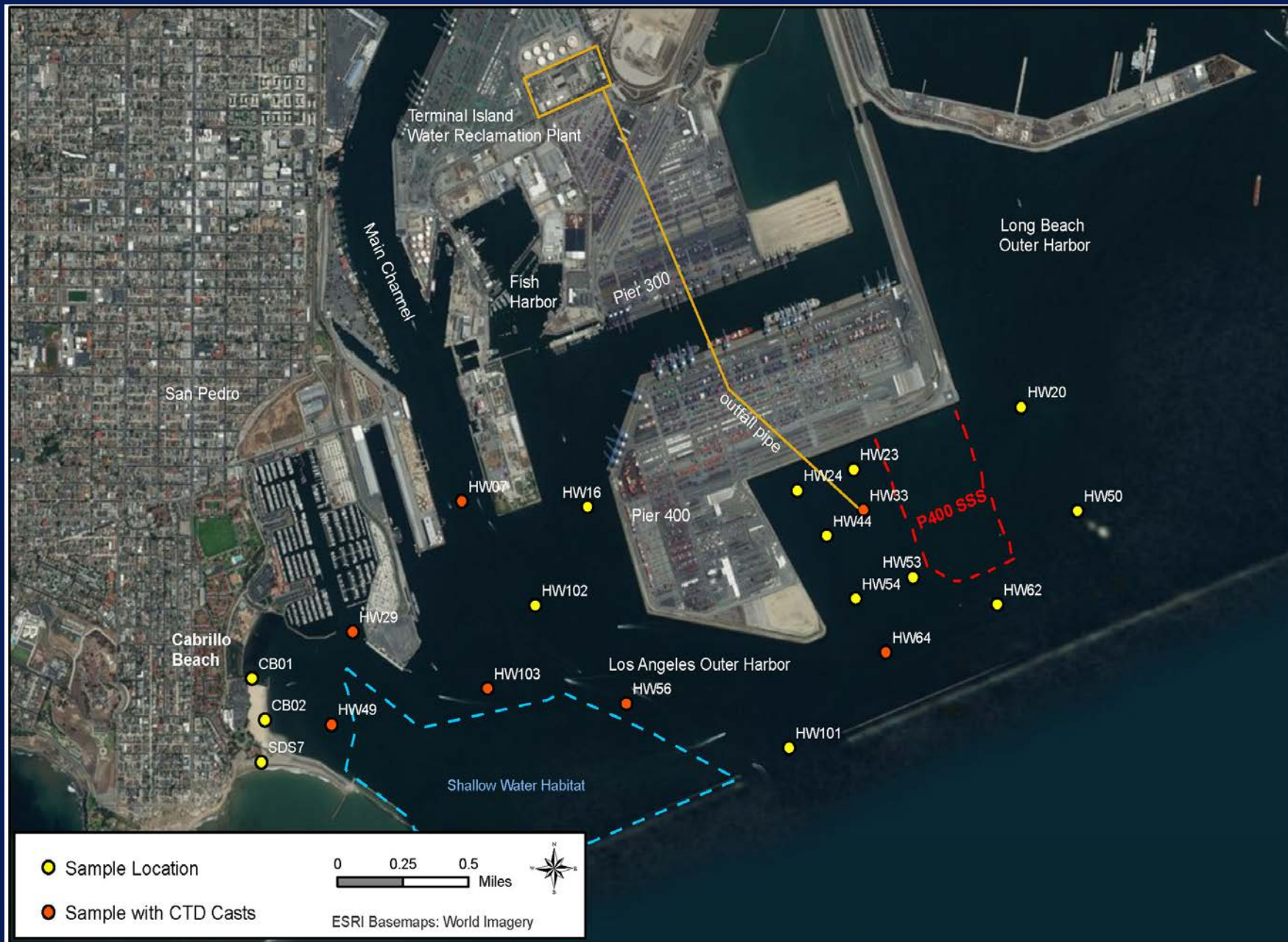
Sampling Sites at Cabrillo Beach (2016)



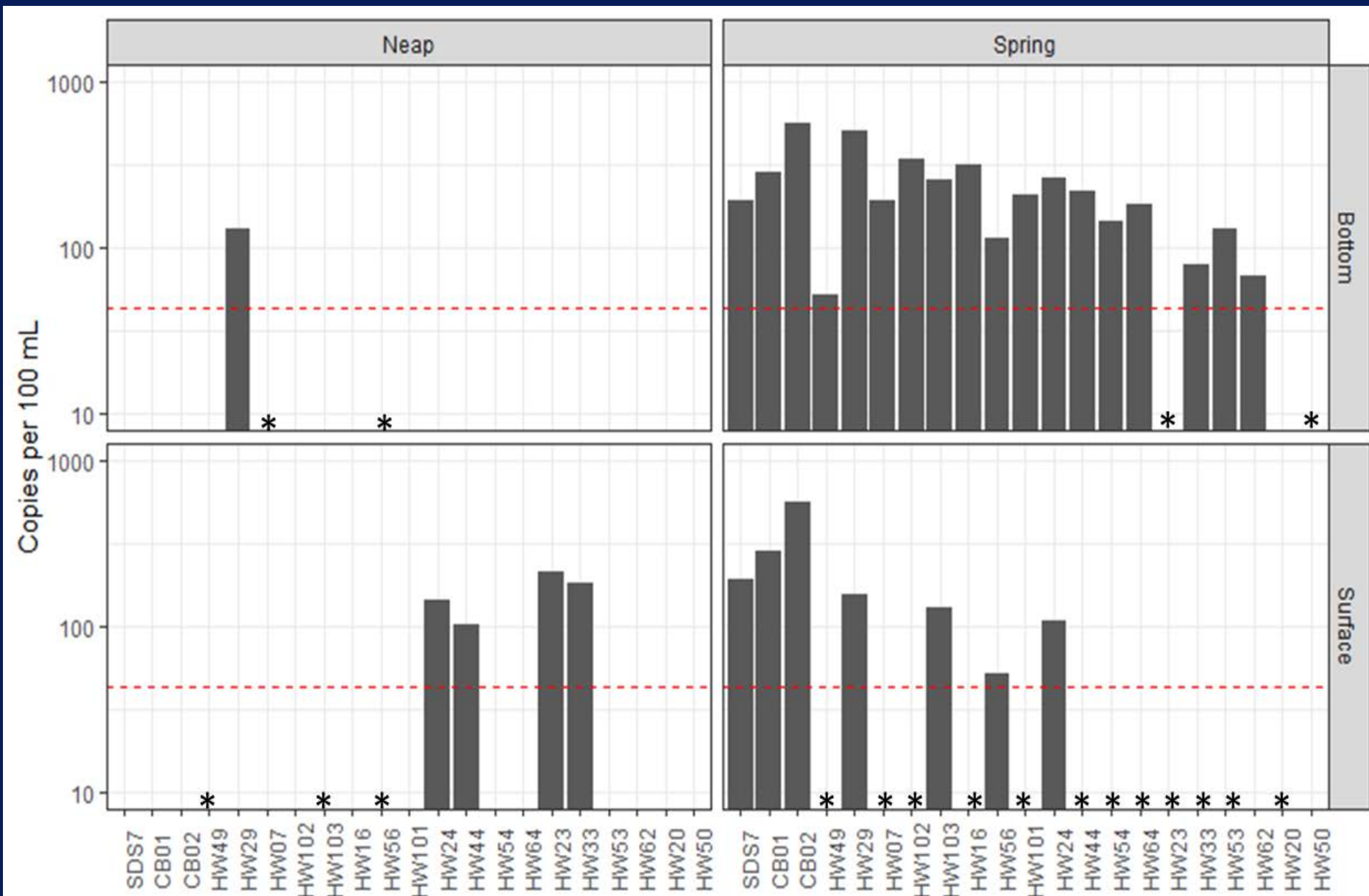
Enterococcus, Gull Marker and Human Marker Concentrations at Cabrillo Beach (2016)



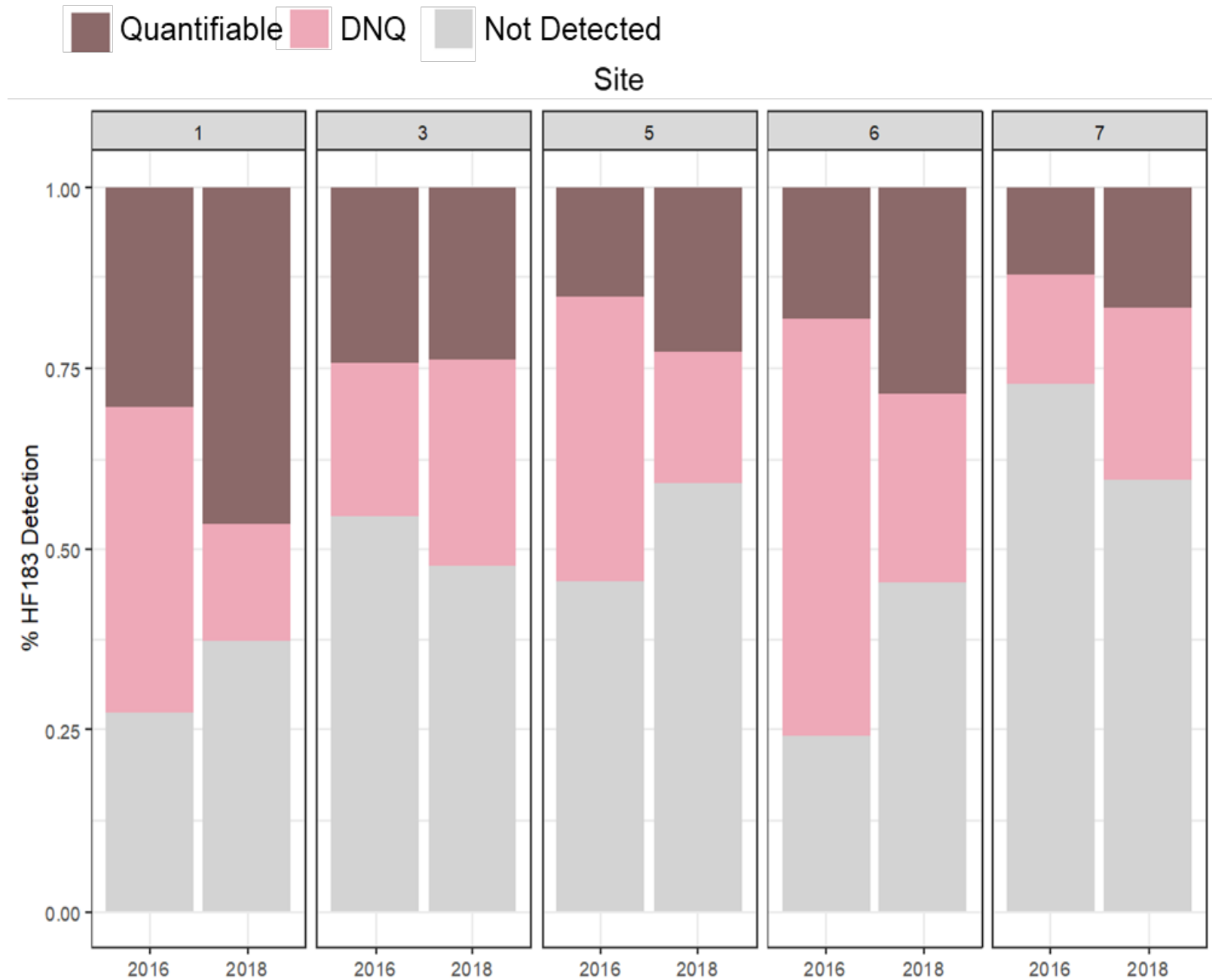
Human Marker Concentrations In Outer Los Angeles Harbor (2017)



Human Marker Concentrations In Outer Los Angeles Harbor (2017)



**Human
Marker
Detection
Frequency
Before
Sewage
Collection
System
Repairs
(2016)
Compared
to After
Repairs
(2018)**



The Final Outcome

- **Birds were a major source of Enterococci at ICB**
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Some Potential Next Steps

- **Identify the human source or pathway for pathogen loading**
 - Groundwater is the next logical choice
- **Conduct low-level pathogen analysis in receiving waters**
 - Will require substantial method development