# ADDRESSING THE SHEL BACTERIAL STANDARD

**Presentation to the Beach Water Quality Workgroup**

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**November 14, 2018**

# BACKGROUND

- **Bacterial monitoring and remediation has focused on the Rec-1 standard**
  - Enterococcus - 104/100ml
  - Fecal coliform – 400/100 ml
  - Total coliform – 10,000/100 ml
- **However, California also has a SHEL standard for bacteria**
  - Total coliform – 70/100 ml
  - Fecal coliform – 14/100 ml
  - The SHEL standard applies to almost all marine/estuarine areas regardless of whether shellfish are presently harvested
- **A SCCWRP study several years ago found that 40% of reference areas fail the SHEL standard**

# NEWPORT BAY

- **Newport Bay is the first water body where the SHEL standard has become a regulatory focus**
  - Their bacterial TMDL must be implemented by 2022
- **Newport Bay achieves REC standard for most sites in the summer**
  - They have some problems with REC in the winter
  - They fail the SHEL standard year-round
- **They formed a Stakeholder Advisory Committee to develop their direction**
  - Committee met a dozen times over the last two years
- **Their direction is a potential precedent for other water bodies**
  - Similar TMDL issues coming down the pike in Morro and Tomales Bays

# STAKEHOLDER DIRECTIONS

- **The Stakeholder Advisory Committee reached the conclusion that they can't meet the SHEL standard**
  - Even after exploring a range of engineering options, regardless of cost
- **The group felt the standard doesn't have a scientific basis**
  - Nearly 100 years old, no documentation or local validation studies
  - All parties (regulators, regulated, NGO) agree
- **They want to work toward a Site Specific Objective**
  - However, the agreed that studies to create an SSO need to be robust
  - Don't want to move to an SSO without meeting a heavy burden of proof
  - Group outlined studies they feel will meet that burden of proof

# STUDY APPROACH

- **Fecal indicator bacteria in the water column are sampled concomitantly with pathogens in bivalves**
- **Hypothesis: There is a disconnect between water column fecal coliform measurements and the beneficial use they are intended to protect**
  - A disconnect would allow for implementation of a site specific objective
- **They also considered an epidemiological approach, but recommended against it**
  - There are both logistic and ethical issues associated with asking people to eat potentially tainted shellfish

# WHAT MEASUREMENTS?

- **Measurements in water**
  - Enterococcus (using membrane filtration)
  - Fecal coliform (using both MF and multiple tube fermentation)
  - Coliphage (culture method)
  - HF183 Human marker

- **Measurements in shellfish**
  - Enterococcus (using membrane filtration)
  - Fecal coliform (using both MF and multiple tube fermentation)
  - Coliphage (culture method)
  - Viruses (All by polymerase chain reaction)
    - Adenovirus
    - Norovirus 1
    - Norovirus 2
    - PMMV

# WHAT SHELLFISH SPECIES?

- **Deployed shellfish**
  - Deployed shellfish allow standardization of species and size class across locations
- **Two species**
  - Burden of proof is to determine if the relationship doesn't exist
  - Doing that with only one species is not sufficiently comprehensive
- **Olympia oyster (Ostrea lurida)**
  - Presently being reintroduced into Newport Bay
- **Mediterranean mussel (Mytilus galloprovincialis)**
  - Non-native, but we have an aquaculture source for this species
  - Mytilus californianus and Mytilus edulis are native, but are less salinity tolerant

# SAMPLING INTENSITY

- **Ten sampling sites**
  - Four sites at places with high fecal coliform counts
  - Two sites where there are low coliform counts
  - Last four sites to ensure habitat representation
- **Three sampling periods**
  - Wet season (Nov-Feb)
  - Post wet season (April-May)
  - Dry season (Aug-Sept)
- **For wet season, sample every other week**
  - Eight sample times
  - Want to ensure we get a range of post-rain scenarios
- **For the other two periods, sample four times**
  - One week, two weeks, three weeks and six weeks post-deployment

# HOW WILL THE RESULTS BE USED?

- **Three potential outcomes**
  - Fecal coliforms in the water column correlate with pathogens in shellfish
  - There is a correlation, but the fecal coliform threshold is higher than 14/100ml
  - There is no correlation, but pathogens are present in shellfish
  - Pathogens are not present in the shellfish

- **Group agreed on management implications for each scenario**

- **Everyone wanted to agree on use of the data before proceeding**
  - They are even developing a Time Schedule Order so that everyone is on the same page about how the results will be used in a regulatory setting

# WATER COLUMN COLIFORMS CORRELATE WITH PATHOGENS IN SHELLFISH

- **This would mean the existing standard works**
  - A relationship exists between the present measurement parameter and the beneficial use
- **Get going on the TMDL and associated clean-up efforts**
- **A costly study to find that out, but provides justification for the much larger expenses associated with the clean-up effort**

# PATHOGENS NOT PRESENT IN SHELLFISH

- **This is the other extreme**
- **There is no loss in beneficial use**
  - Therefore there is no need for shellfish-related clean-up actions
- **The State would need to assess whether the outcome is specific to Newport or is generalizable to the State**
  - If so, that might warrant a change in the statewide objective

# NO CORRELATION, BUT PATHOGENS ARE PRESENT IN SHELLFISH

- **Proceed to a site-specific objective**
  - The existing standard is inappropriate
- **Challenge becomes identifying the alternative standard**
- **That will be easy if there is a correlation with another water column parameter**
- **Alternatively, could develop a standard based on pathogens in the shellfish**
  - That would likely require additional study to establish which pathogens and at what concentration level

# CORRELATION EXISTS, BUT THE FECAL COLIFORM LEVEL SHOULD BE HIGHER THAN 14/100ML

- **Proceed to a site-specific objective**
  - The measure is correct, but the existing threshold is inappropriate
- **Challenge becomes identifying an alternative threshold**
  - That will require agreeing on an allowable number of pathogens in shellfish
  - A risk question comparable to the 32/1000 acceptable risk for the rec standard
- **This outcome would also be one that would likely lead to reconsideration of the Statewide standard**

# IMPLEMENTATION

- **Using a phased implementation approach**
  - Study will begin next spring
- **Phased implementation will start with a single season and single species**
- **Phasing provides some advantages**
  - Identifies SSO likelihood and whether funding of further study is warranted
  - Allows design refinement of later study phases based on the early data
  - Provides information (and time) to talk about the transition from study to SSO
- **Early results will also guide the State as the assess whether to make this issue part of their triennial review process**