



DEPARTMENT OF
ECOLOGY
State of Washington

OAKLAND BAY SEDIMENT INVESTIGATION

Mason County Commissioners, May 3, 2011

Toxics Cleanup Program / Southwest Regional Office

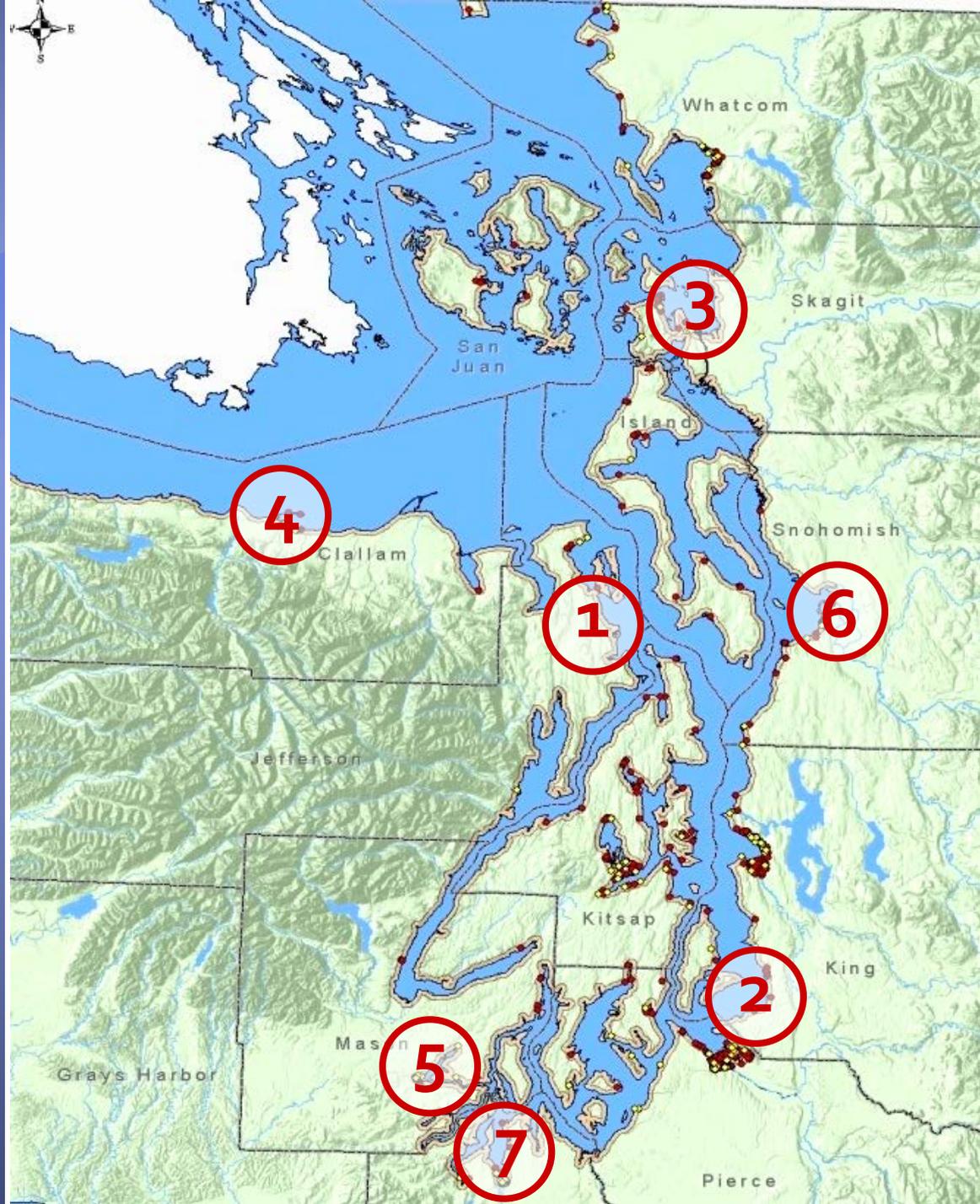
Rebecca Lawson, Section Manager

Joyce Mercuri, Site Manager

Puget Sound Initiative

1. Port Gamble
2. Dumas Bay
3. Padilla / Fidalgo Bay
4. *Port Angeles
5. *Oakland Bay
6. Port Gardner / Port of Everett
7. *Budd Inlet

*Managed by the Southwest Regional Office



Timeline

2008

- Study of historical land uses
- Sampling and analysis plan
- Sediment sampling

2009

- Preliminary results & additional lab work
- Department of Health shellfish and sediment evaluations

2010

- Final report completed
- SIR public comment period (December 2010 – January 2011)

2011

- SIR responsiveness summary issued

Overview

- ◆ **Purpose:** Better understand the extent of contamination
- ◆ **Major elements of the study:**
 - ◆ Sediment sampling and analysis
 - ◆ Dioxin profile evaluation
 - ◆ Biological testing
 - ◆ Geophysical survey



Sediment Sampling

Collected:

- ◆ 50 surface sample locations
- ◆ 48 core sample locations
- ◆ 3 reference locations (Carr Inlet)

Tested for:

- ◆ Metals, organic chemicals, pesticides, dioxins, sulfides, and ammonia
- ◆ Petroleum and tributyltin (only a few locations)
- ◆ Wood waste chemicals (selected locations)
 - ◆ Total volatile solids
 - ◆ Resin acids and guaiacols

Sediment Sampling Results

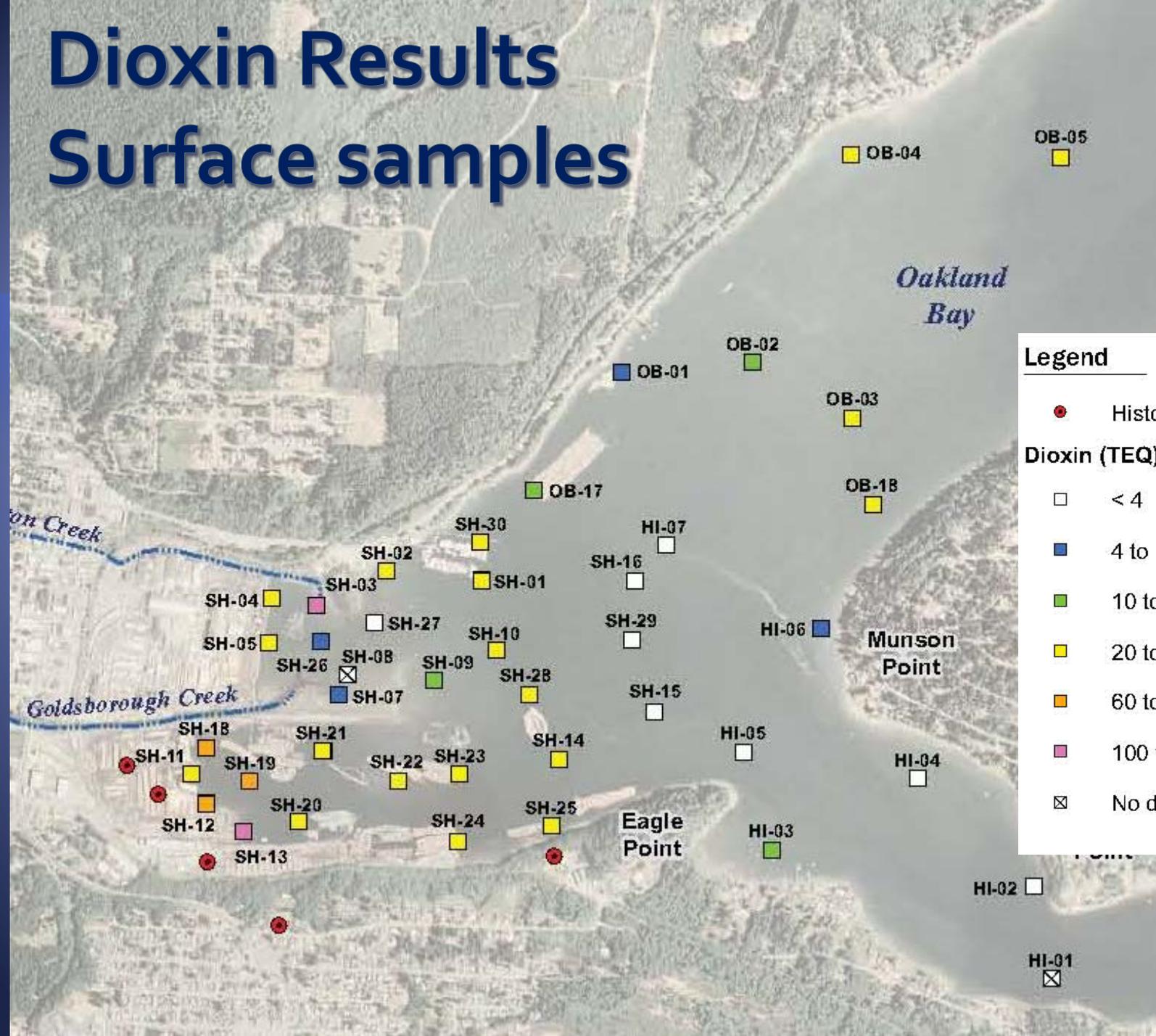
- ◆ No samples above standards for chemicals on sediment management standards list
- ◆ Elevated levels of some wood-related chemicals
- ◆ Dioxins in all sediment samples

Dioxin Results: Surface samples

Location	Range of dioxins (ppt) in surface samples
Oakland Bay	4.4 - 54
Shelton Harbor	1 - 175
Hammersley Inlet	1.8 - 13
Reference location (Carr Inlet)	0.25 - 0.7

Dioxin Results

Surface samples



Legend

● Historic emission stack

Dioxin (TEQ) (ng/kg)

- < 4
- 4 to 10
- 10 to 20
- 20 to 60
- 60 to 100
- 100 to 200
- ⊠ No data

Dioxin Results Surface samples

Legend

● Historic emission stack

Dioxin (TEQ) (ng/kg)

□ < 4

■ 4 to 10

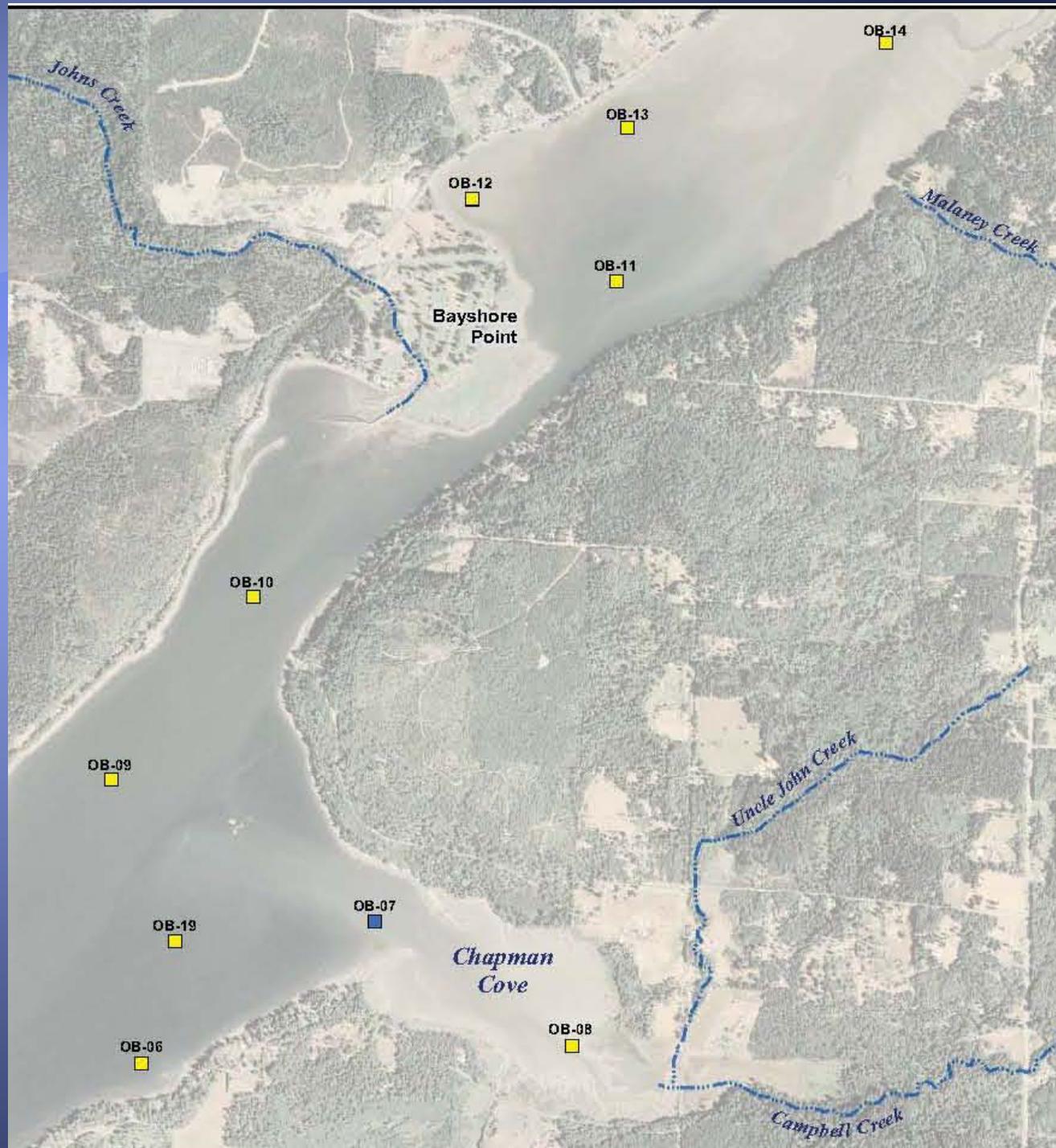
■ 10 to 20

■ 20 to 60

■ 60 to 100

■ 100 to 200

⊠ No data



Dioxin Results

Subsurface samples

- ◆ Tested 12 locations for deeper sediments (1-2 feet and 2-3 feet)
- ◆ Higher concentrations with depth
 - ◆ Shelton Harbor: 2.68 ppt – 902 ppt
 - ◆ Oakland Bay: 52.4 – 180 ppt

Geophysical Survey

What we did

- ◆ Examined physical environment using sonar and other techniques
- ◆ Evaluated location and amount of woodwaste

What we found

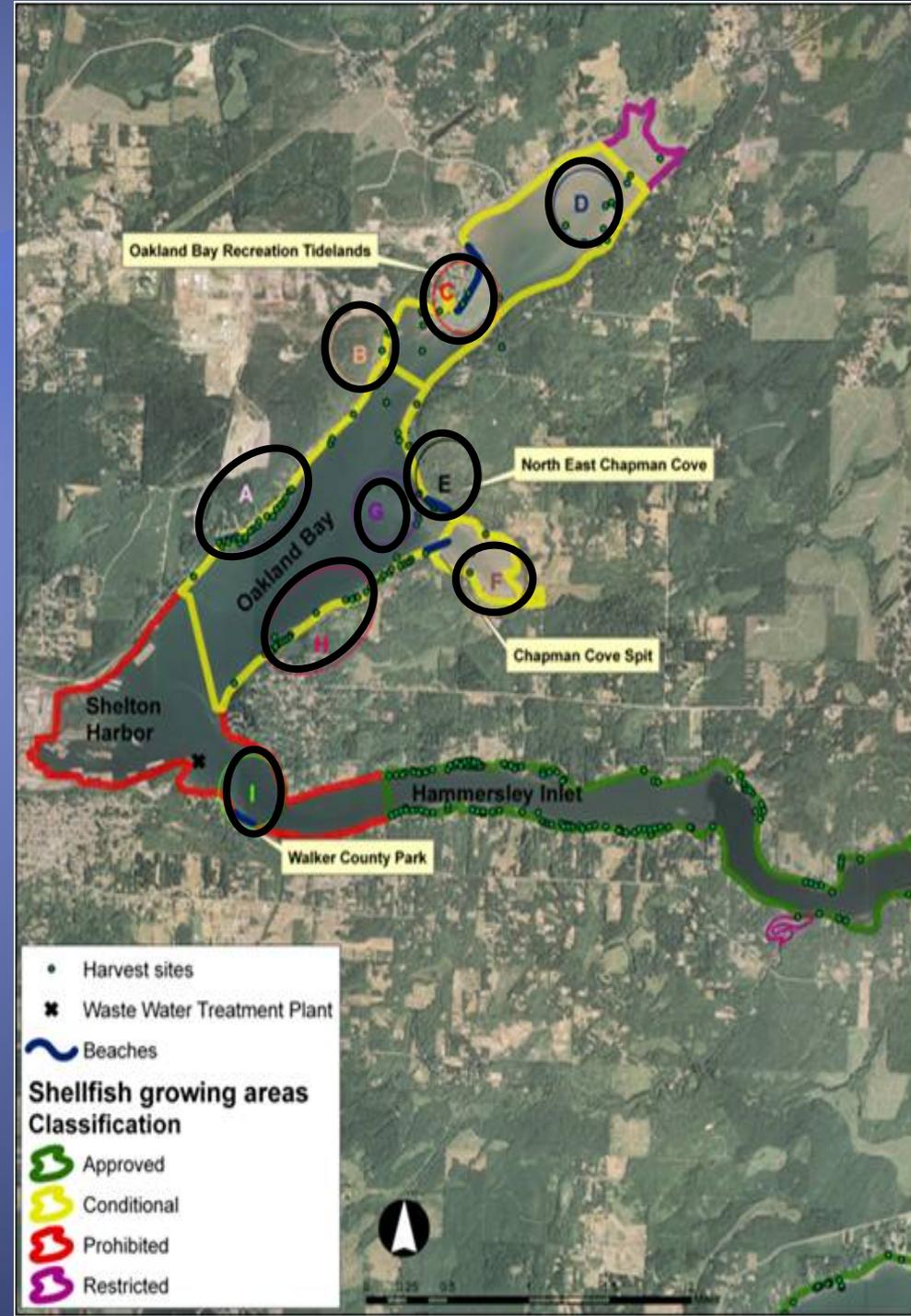
- ◆ Very little sediment movement
- ◆ Sediment stays in the system
- ◆ Several areas of high amounts of wood
- ◆ Small amounts mixed with sediments throughout Bay

Health Consultation

- ◆ **WA Department of Health evaluated contaminant levels in shellfish and sediments**
- ◆ **Sediment evaluation**
 - ◆ Touching, breathing, or accidentally eating sediments from Oakland Bay is not likely to harm people's health
- ◆ **Shellfish evaluation**
 - ◆ Eating shellfish from Oakland Bay is not likely to harm people's health

Shellfish Sampling

- ◆ Four types of shellfish
 - Manila clams
 - Pacific oysters
 - Kumamoto oysters
 - Mussels
- ◆ Eight different locations



Total Dioxin Concentrations

Species	Mean of dioxins (ppt)	Range of dioxins (ppt)
Manila clams	0.11	0.05-0.27
Pacific oysters	0.26	0.13-0.37
Kumamoto oysters	0.45	0.3-0.6
Mussels	0.17	N/A

Shellfish Consumption Scenarios: Clams from Oakland Bay

Consumption	Grams of clams per day	Approx. # of clams per month
Average U.S. population	17.5	89
Low subsistence	30	152
Medium subsistence	88	443
High subsistence	130	659

**Low, medium, and high presume 50% of total seafood consumed is Oakland Bay Clams*

Health Effect Assessment

Non-Cancer Risks

Picograms of dioxin / kg body weight / day

High-end daily intake from shellfish

Minimal risk level

0.175

1

Increased Chance of Cancer

High-end consumers

EPA acceptable range

2.6 in 100,000

1 in 10,000 or less

What Happens Next?

- ◆ Identify areas for cleanup & cleanup options
- ◆ Look for ongoing sources
- ◆ Work with potential habitat restoration projects
- ◆ Continue public involvement
- ◆ **Oakland Bay Web site:**
http://www.ecy.wa.gov/programs/tcp/sites/oaklandBay/oaklandBay_hp.htm