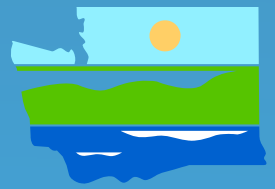
Port Angeles Harbor Sediments Investigation Results

March 13, 2012

Olympic Medical Center

Rebecca Lawson, P.E., L.H.G.

Connie Groven, Project Manager



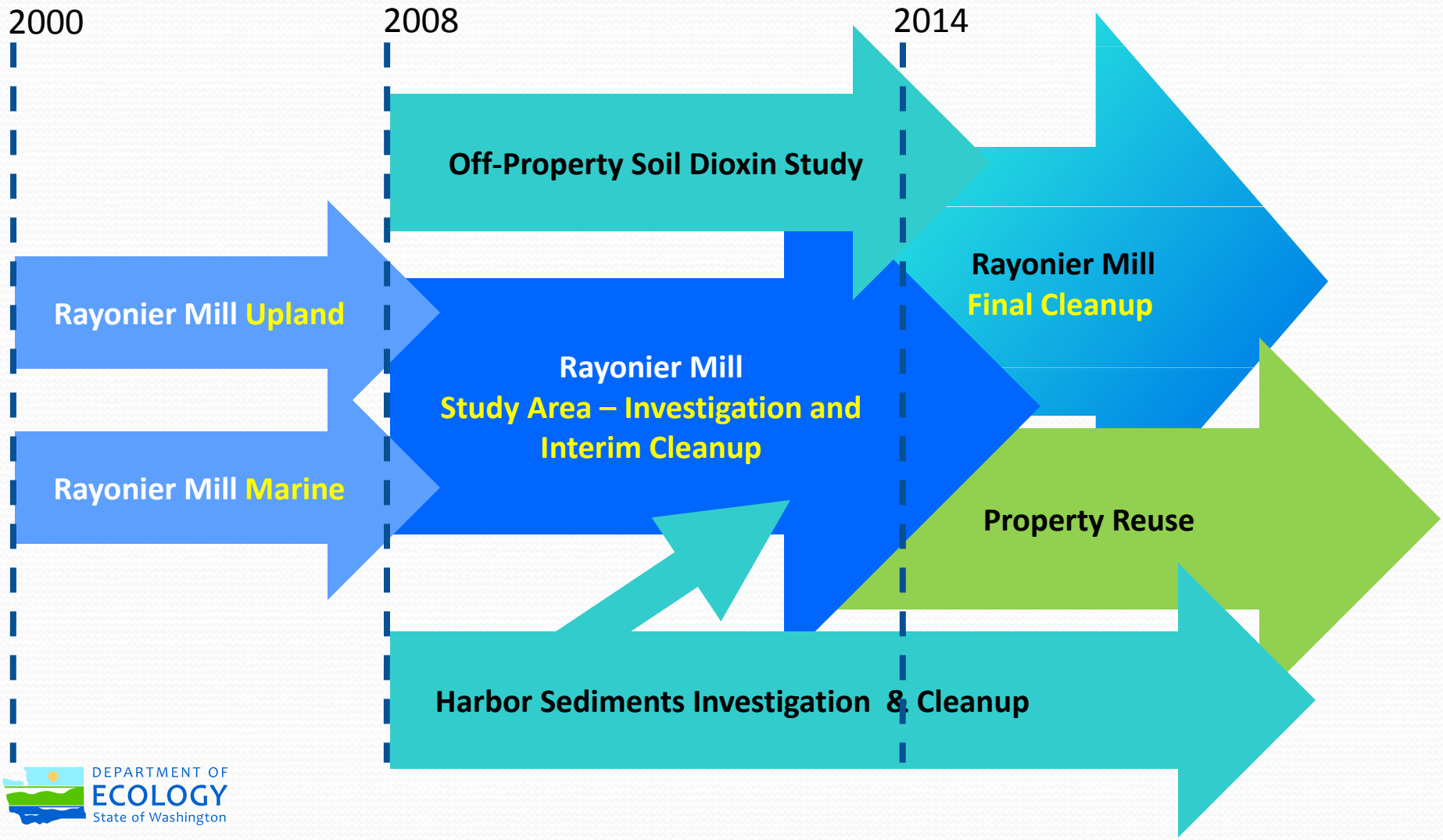
DEPARTMENT OF ECOLOGY
State of Washington

Presentation Outline

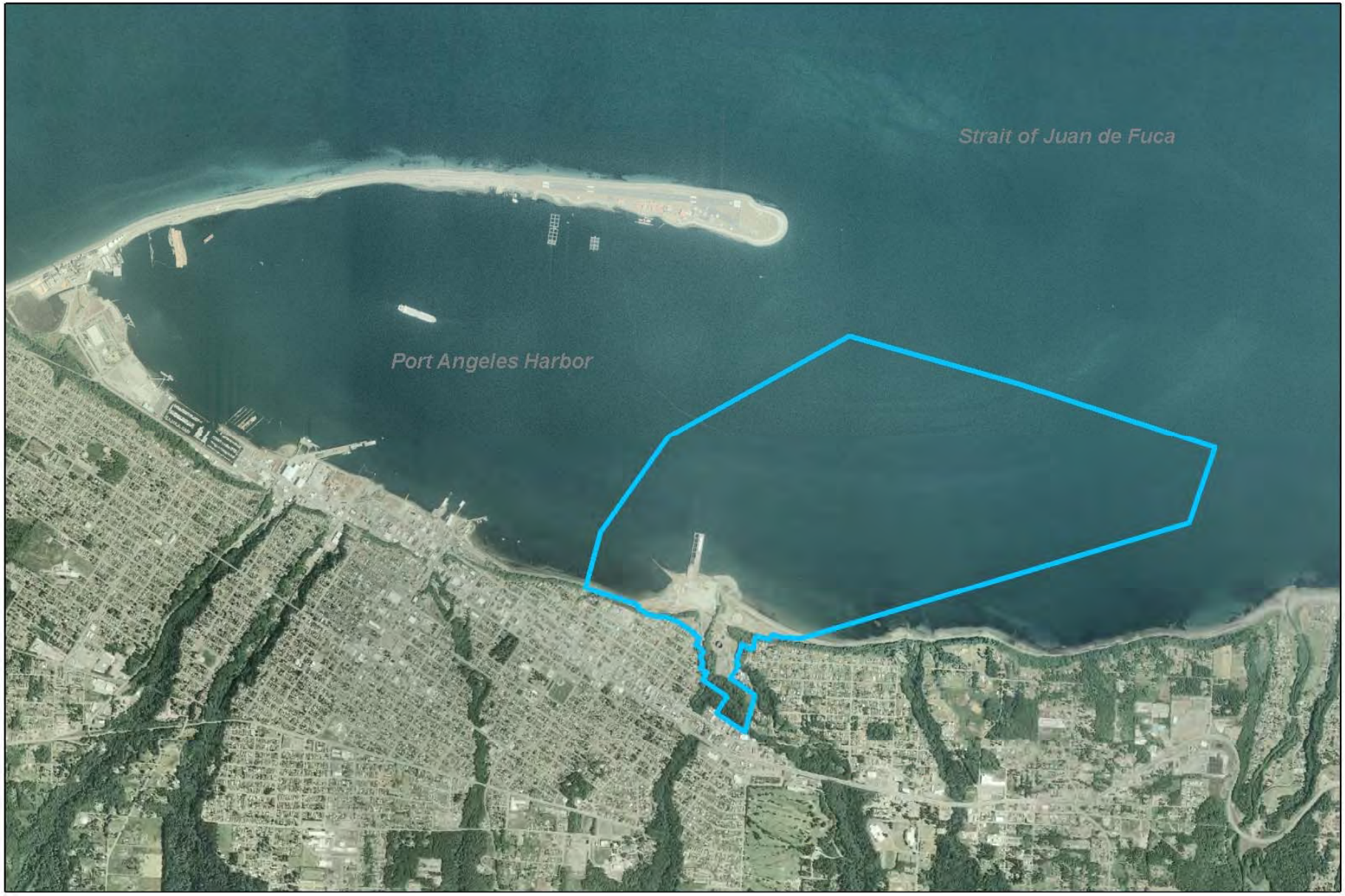
- Cleanup work in Port Angeles
- Study objectives
- Recommendations and next steps
- Contents of the reports
- Methods and results
- Conclusions

DEPARTMENT OF ECOLOGY
State of Washington

Rayonier Mill Investigation and Cleanup Timeline



DEPARTMENT OF ECOLOGY
State of Washington



StudyArea boundary

Port Angeles Rayonier Mill Study Area

DEPARTMENT OF ECOLOGY
State of Washington

Port Angeles Harbor

- Potential historic and current sources:
  - Saw mills and plywood
  - Pulp and paper mills
  - Marine shipping, transport
  - Boat building
  - Petroleum bulk facilities
  - Commercial fishing
  - Combined sewer outfalls
  - Runoff, residential and industrial stormwater

2008 Study Objectives

- Broad assessment of pollution in harbor sediments.
  - How do sediments move in the harbor?
  - Where did the contamination come from?
  - What areas need cleanup?
  - What is the risk to humans and other living things?
- Provide more data for the Rayonier Mill cleanup.

DEPARTMENT OF ECOLOGY
State of Washington

Recommendations

- Focused removal of wood debris. Source control and best management practices of wood debris.
- Identification and control of upland sources.
- Cleanup of sediment hotspots near the former Rayonier Mill and in the western harbor.

Next Steps

- Finalize **Sediment Investigation Report** and **Supplemental Data Evaluation**.
- Begin working with potentially liable persons.
- Rayonier uses study data to complete its **Marine Data Summary Report**.

DEPARTMENT OF ECOLOGY
State of Washington

Sediment Investigation Report

Main findings

Executive summary

Summary, conclusions, and recommendations (Ch. 11)

More details

Summary of existing info

Sampling and analysis

Sediment chemistry

Sediment toxicity

Chemicals in tissues

Wood debris

Sediment transport

Risk assessment

Supplemental Data Evaluation

Main findings

Introduction (Ch.1)

Summary and recommendations(Ch. 9)

Maps of contamination

More details

Background concentrations

Chemical fingerprinting

Sediment transport

Source identification

DEPARTMENT OF ECOLOGY
State of Washington

SIR Appendices

A	B	C	D
• Field Data Log Sheets	• Station Locations and Sample Descriptions	• Data Tables	• Current Data Report

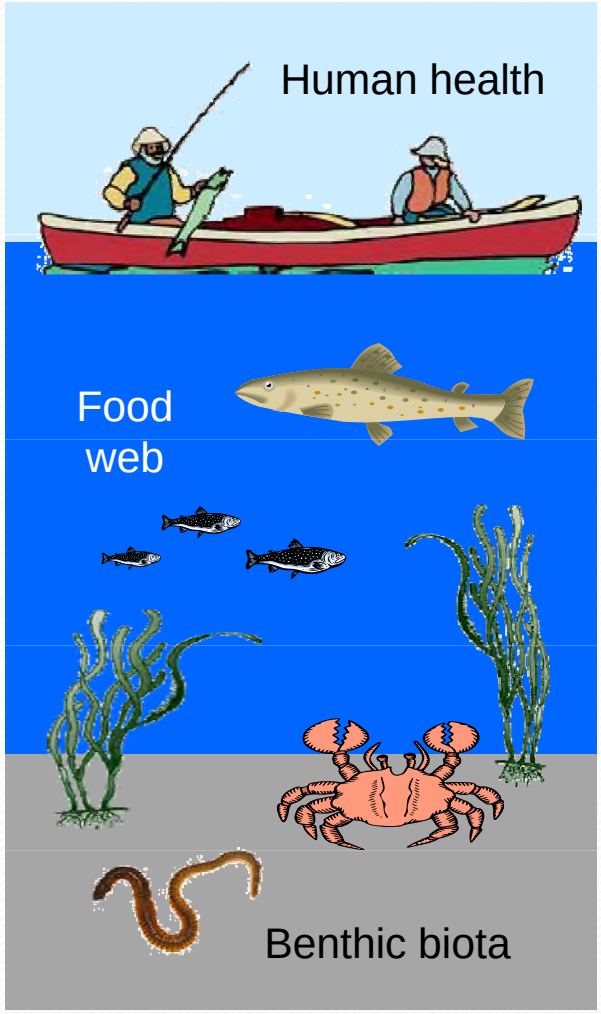
E	F	G	H
• Sediment Trend Analysis	• Cultural Resources Report	• Human Health and Ecological Risk Assessment	• Chemistry Data Validation Memoranda

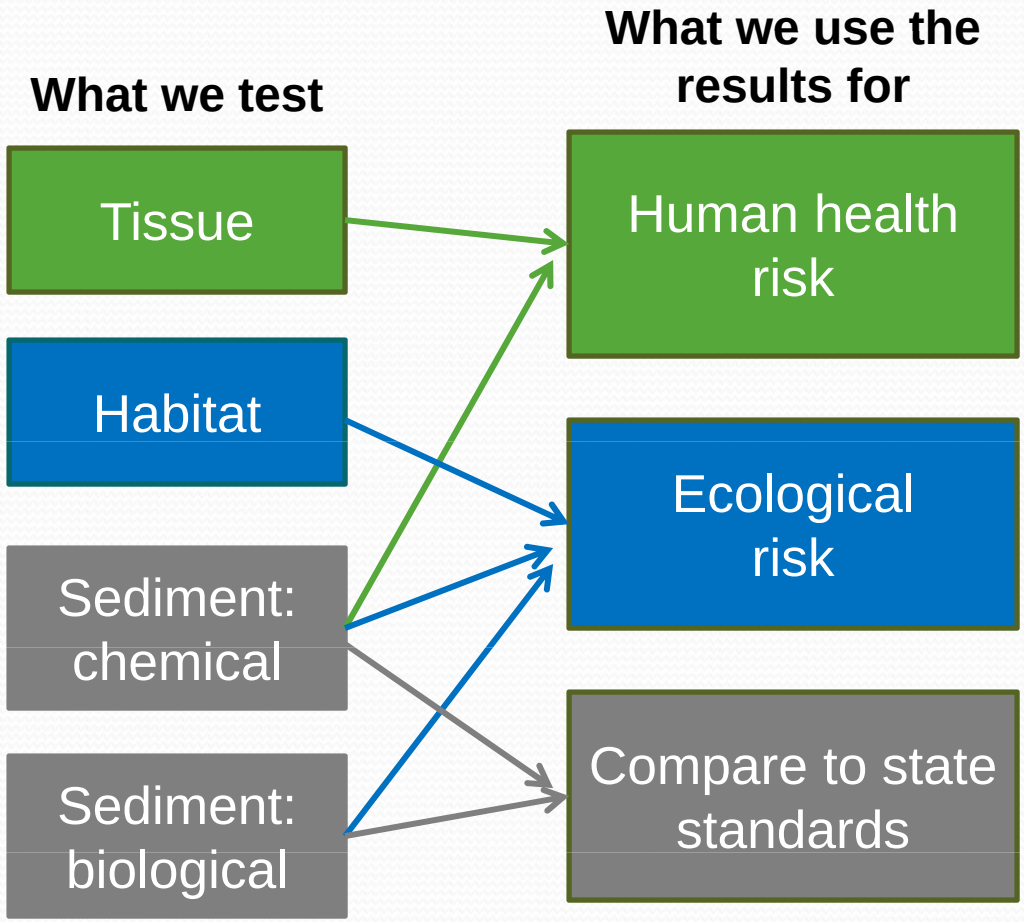
I	J	K
• Geomorphic Report	• Fingerprinting Memos	• Bioassay Data Validation Report

DEPARTMENT OF ECOLOGY
State of Washington

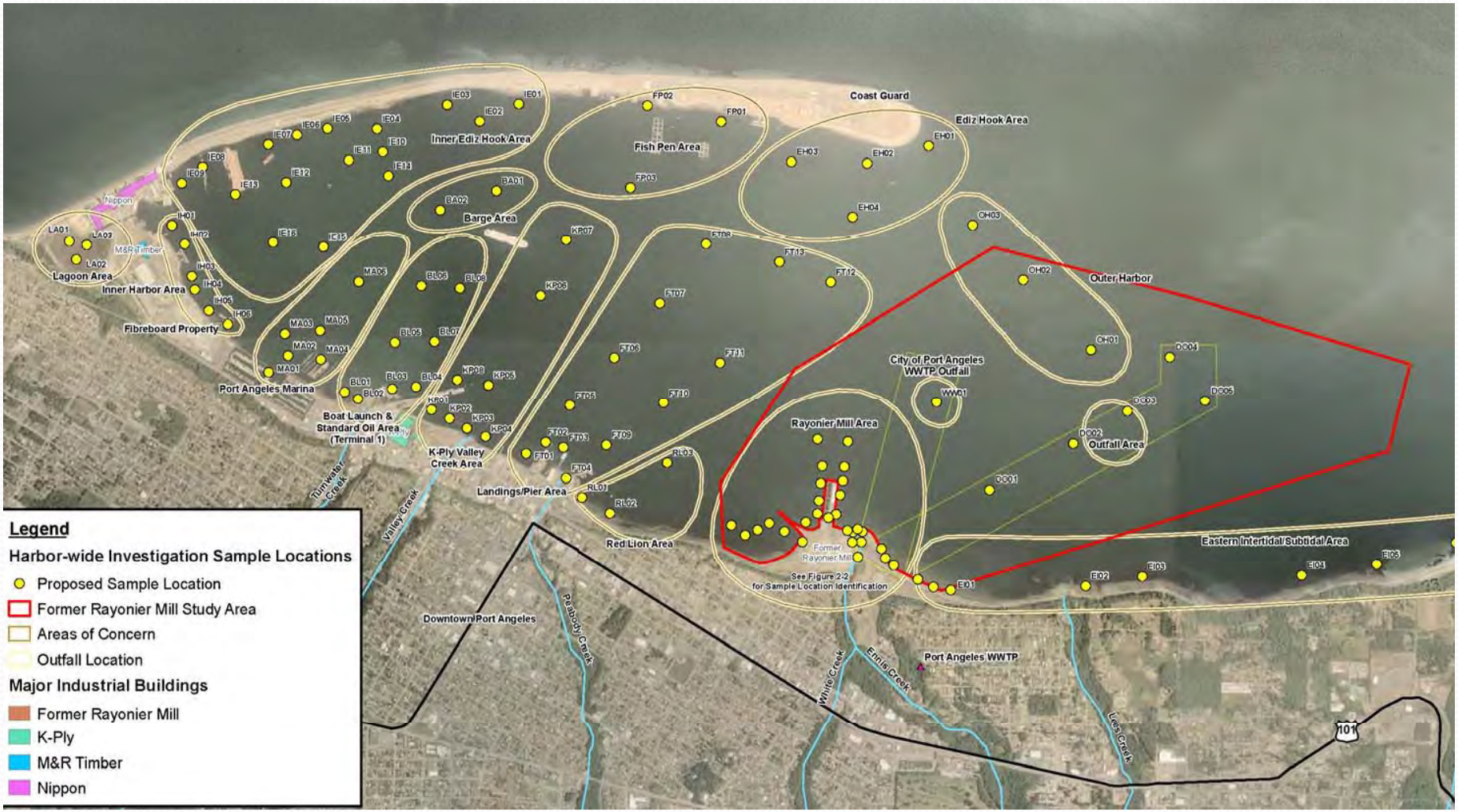
Why and how do we study sediment?

Contamination can harm…





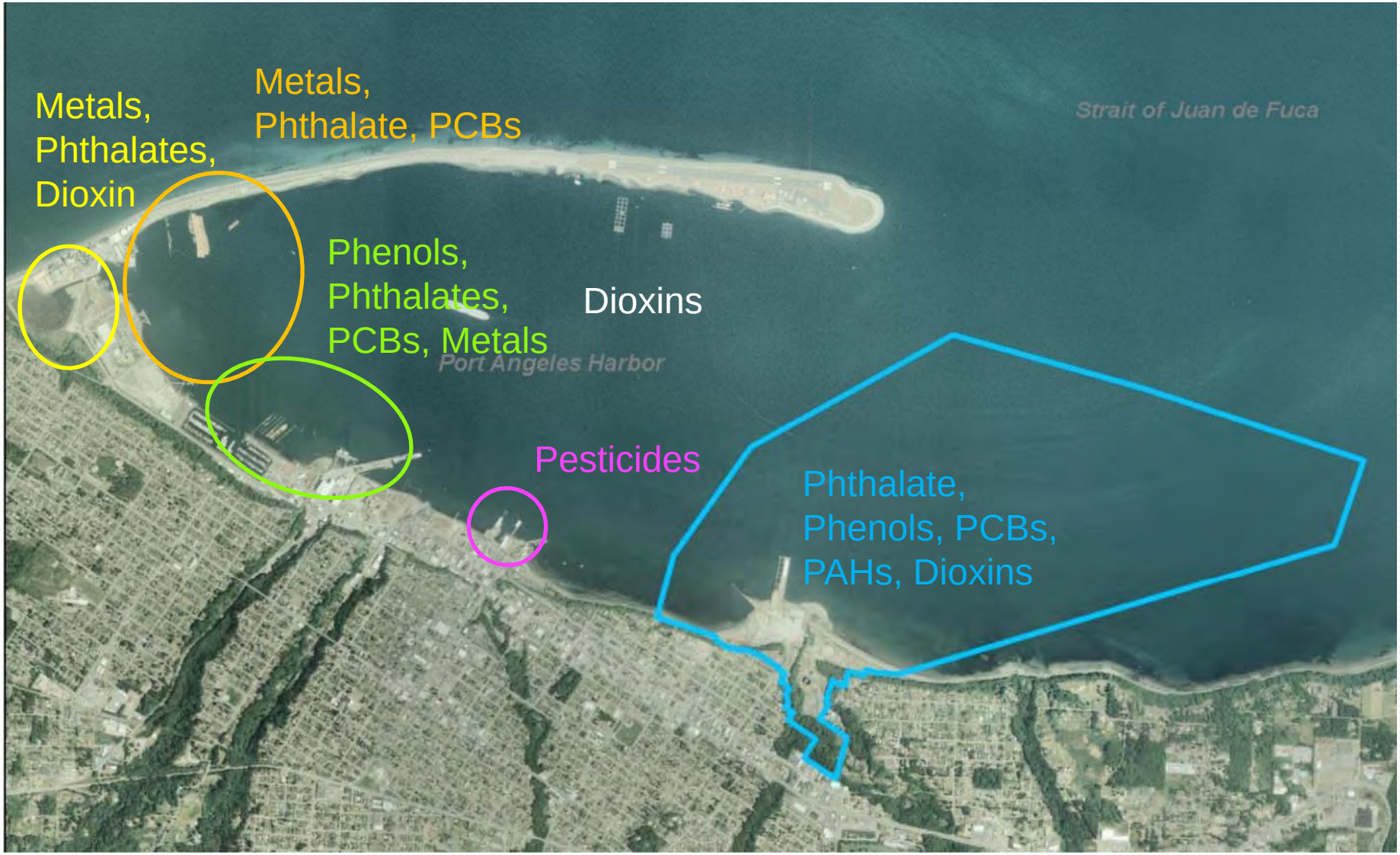
Surface Sampling locations



Chemical Contaminants

Where is there contamination and what are the levels?

Areas of Sediment Contamination



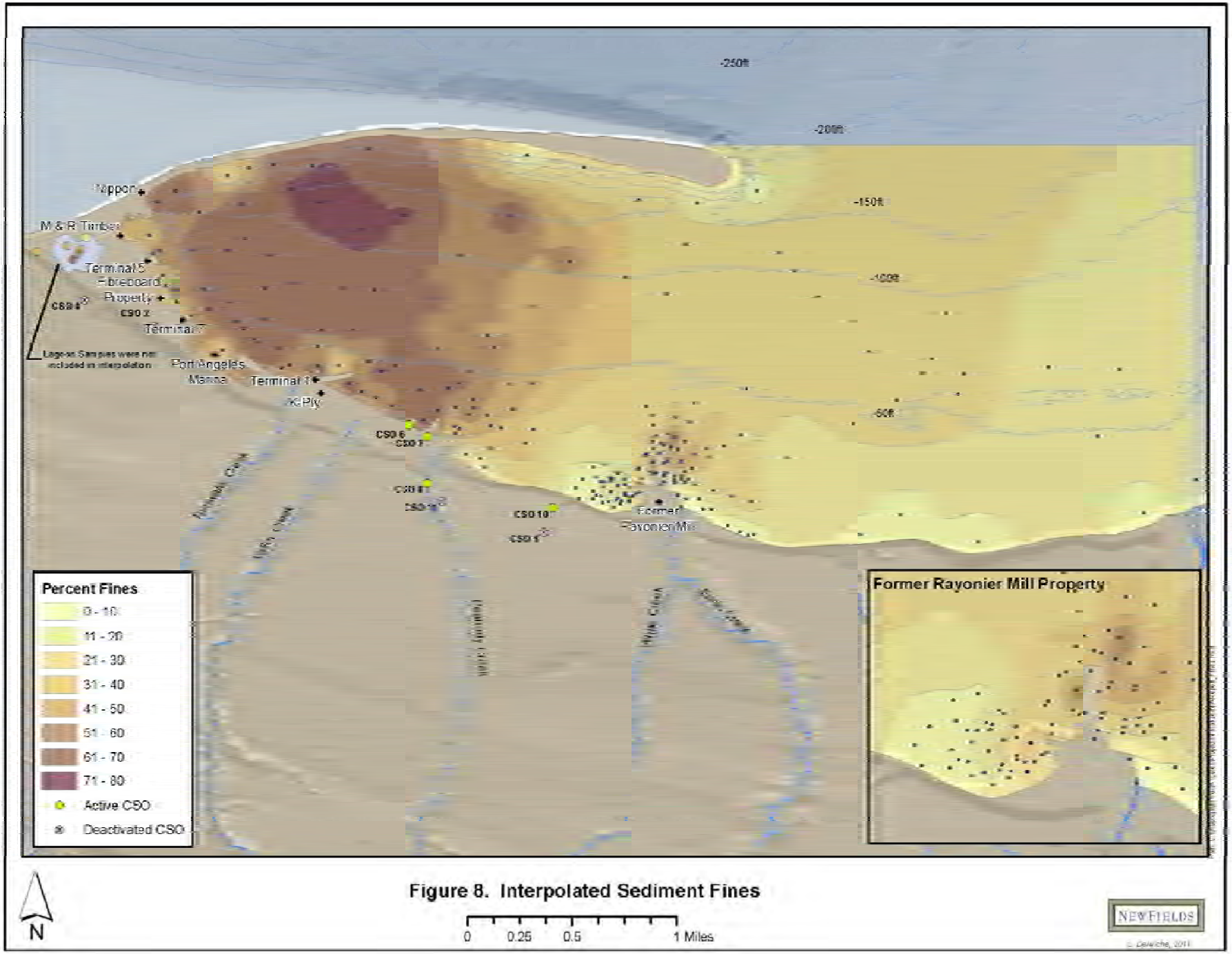


Figure 8. Interpolated Sediment Fines

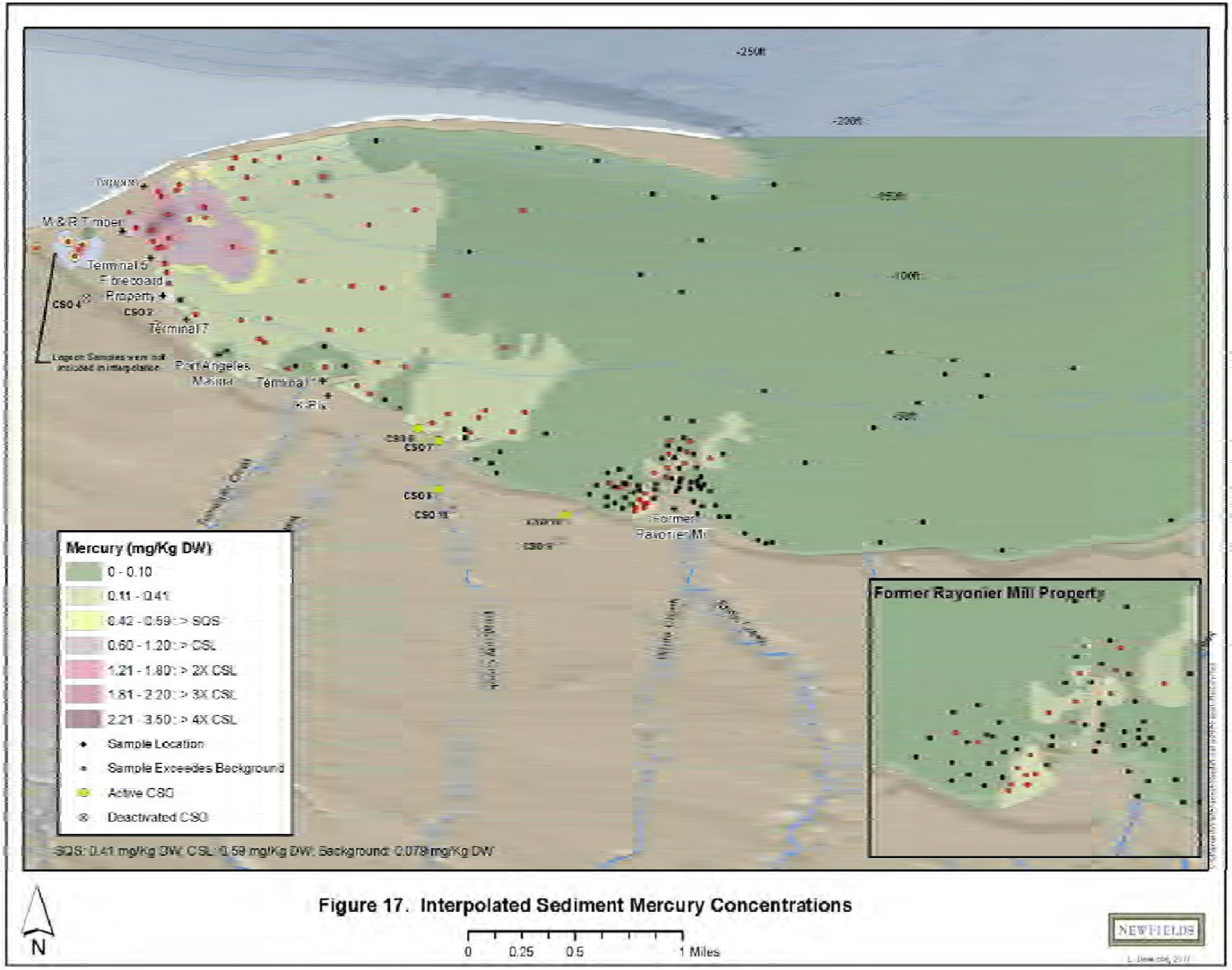


Figure 17. Interpolated Sediment Mercury Concentrations

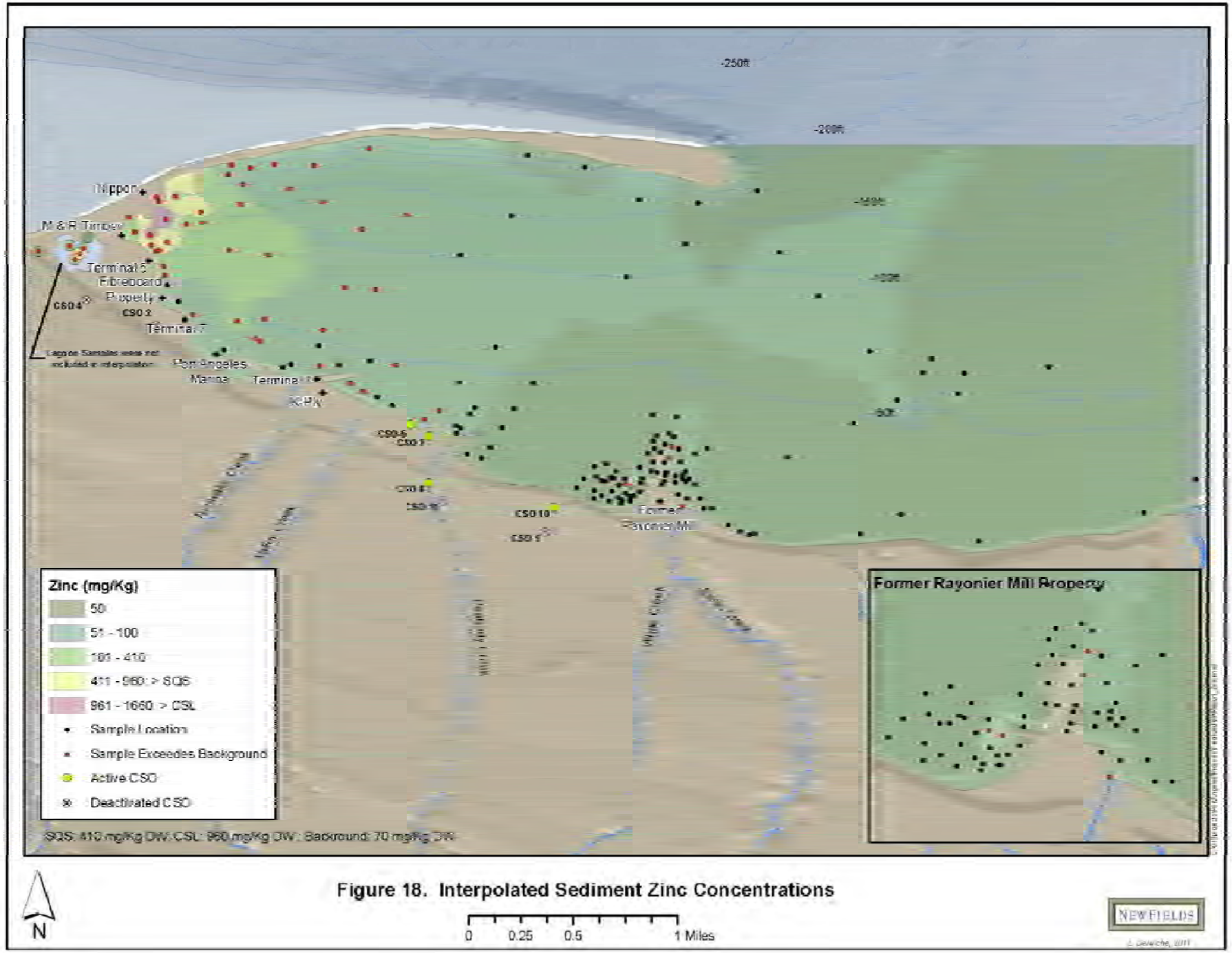


Figure 18. Interpolated Sediment Zinc Concentrations

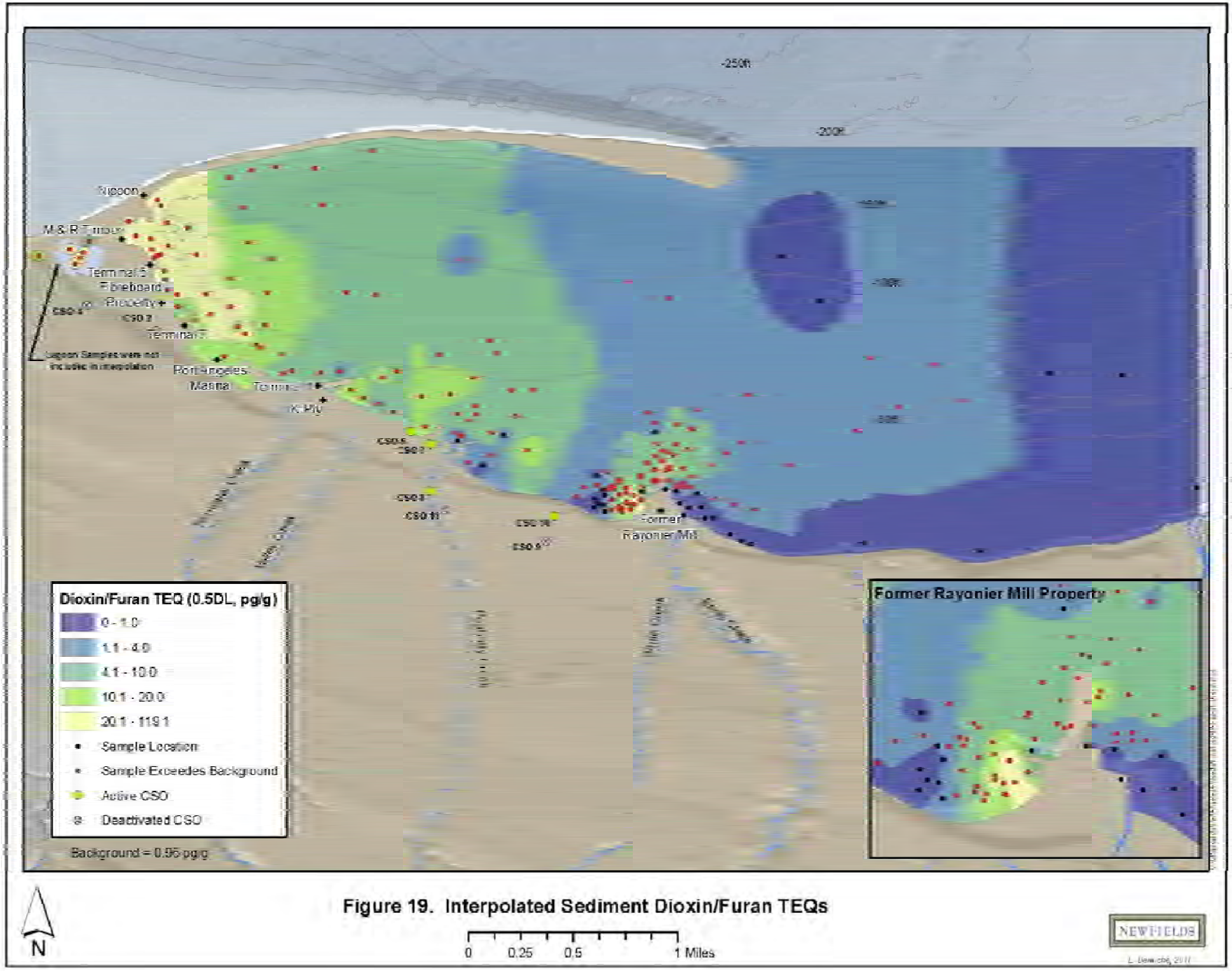


Figure 19. Interpolated Sediment Dioxin/Furan TEQs

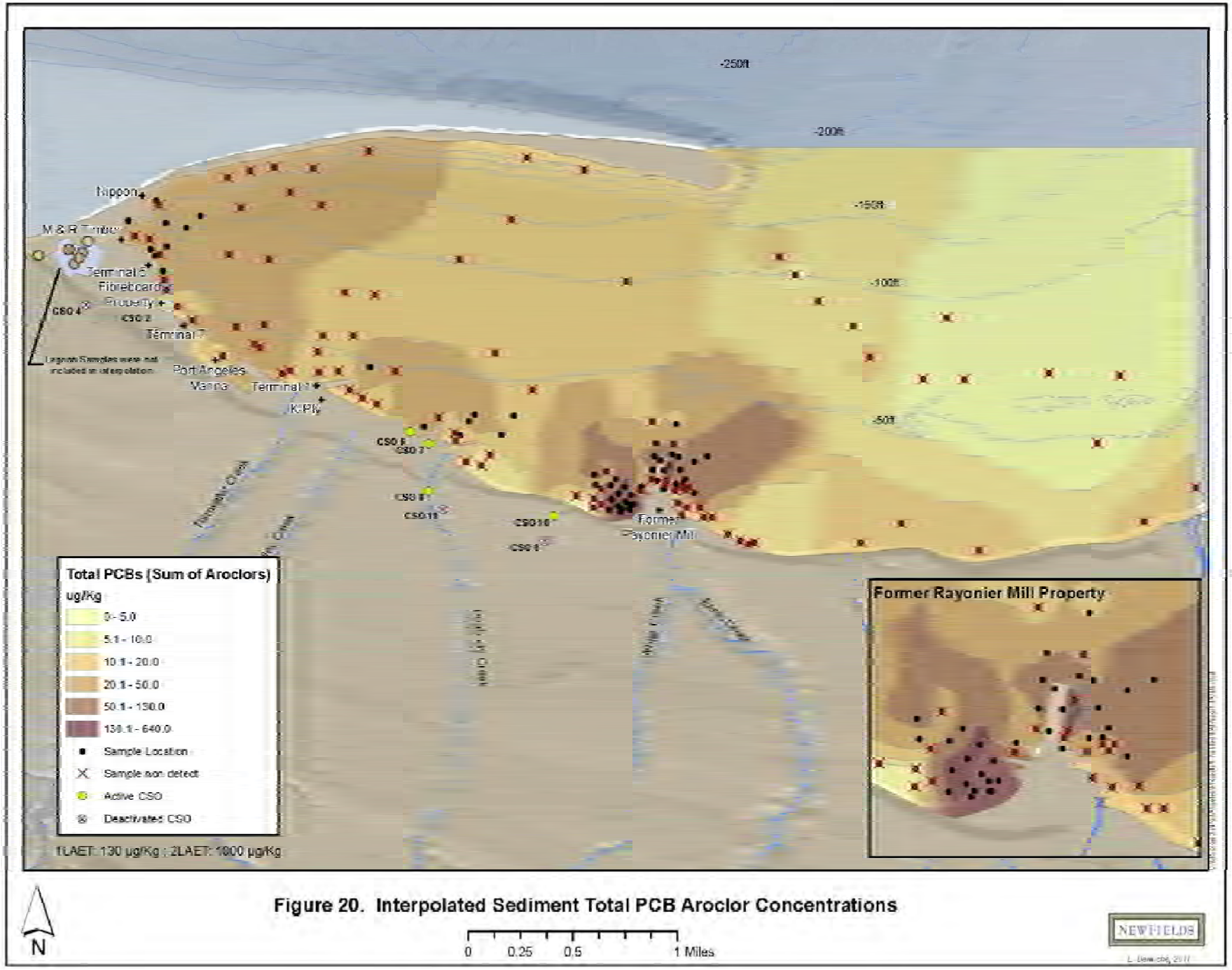


Figure 20. Interpolated Sediment Total PCB Aroclor Concentrations

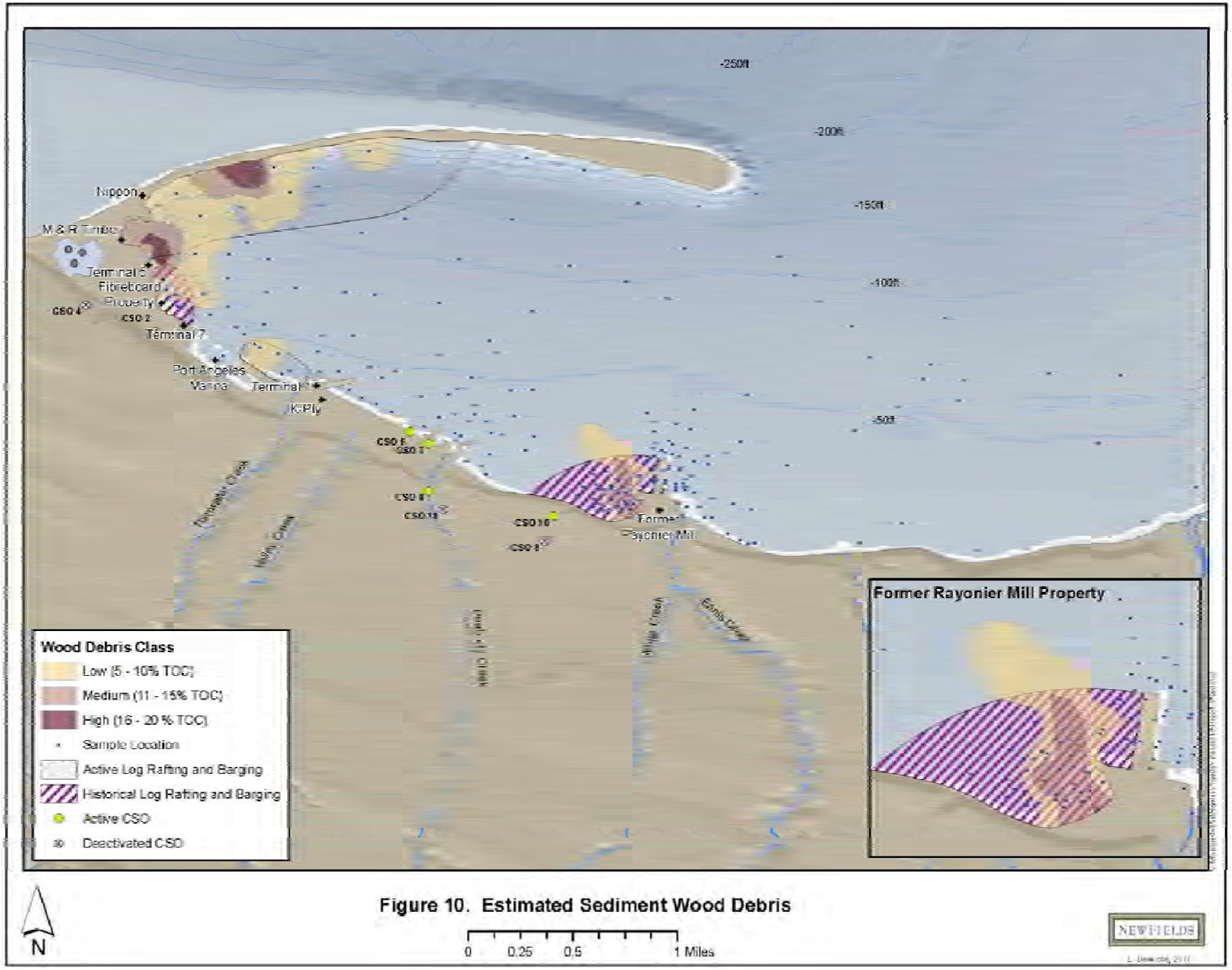


Figure 10. Estimated Sediment Wood Debris

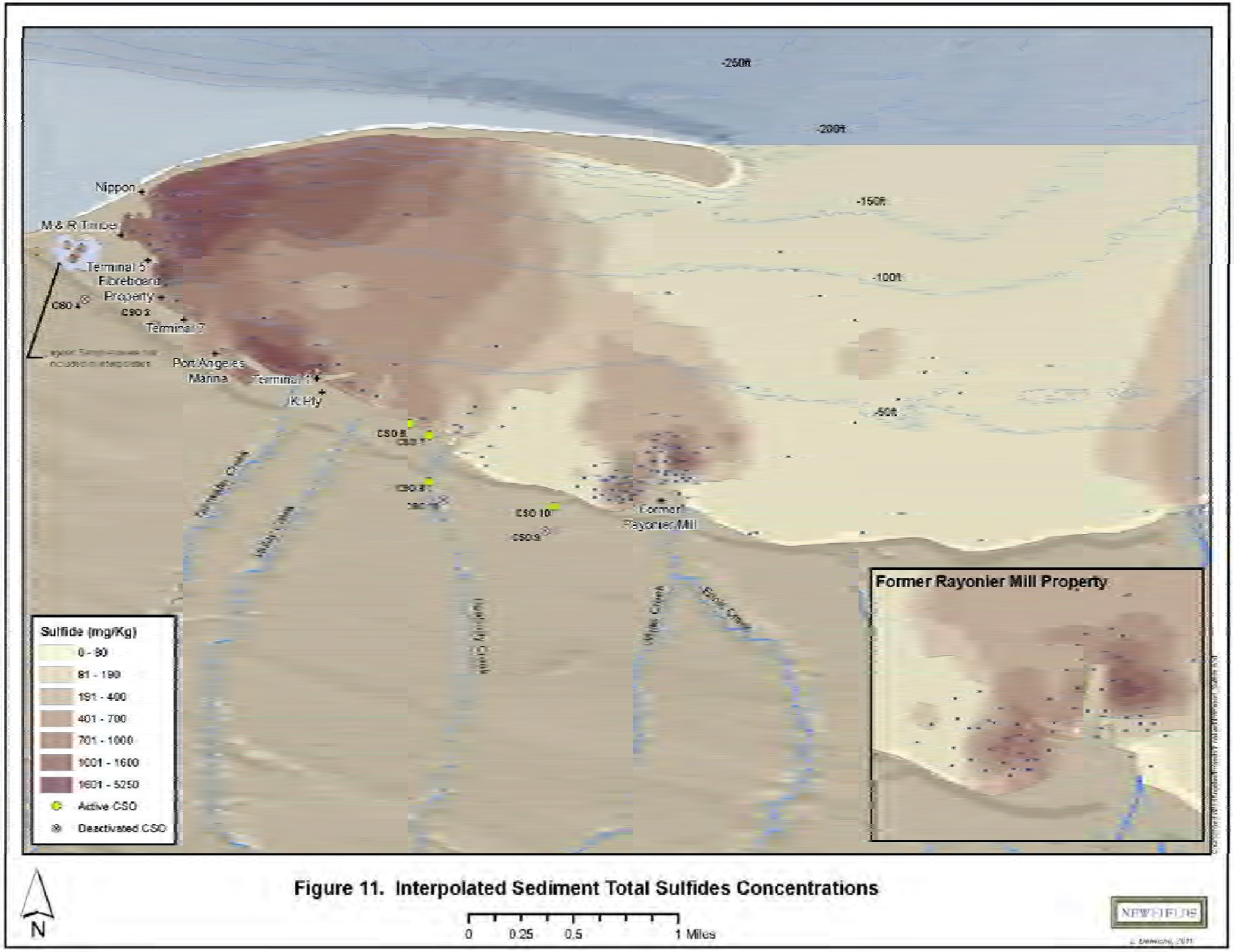


Figure 11. Interpolated Sediment Total Sulfides Concentrations

Other Contaminants of Concern

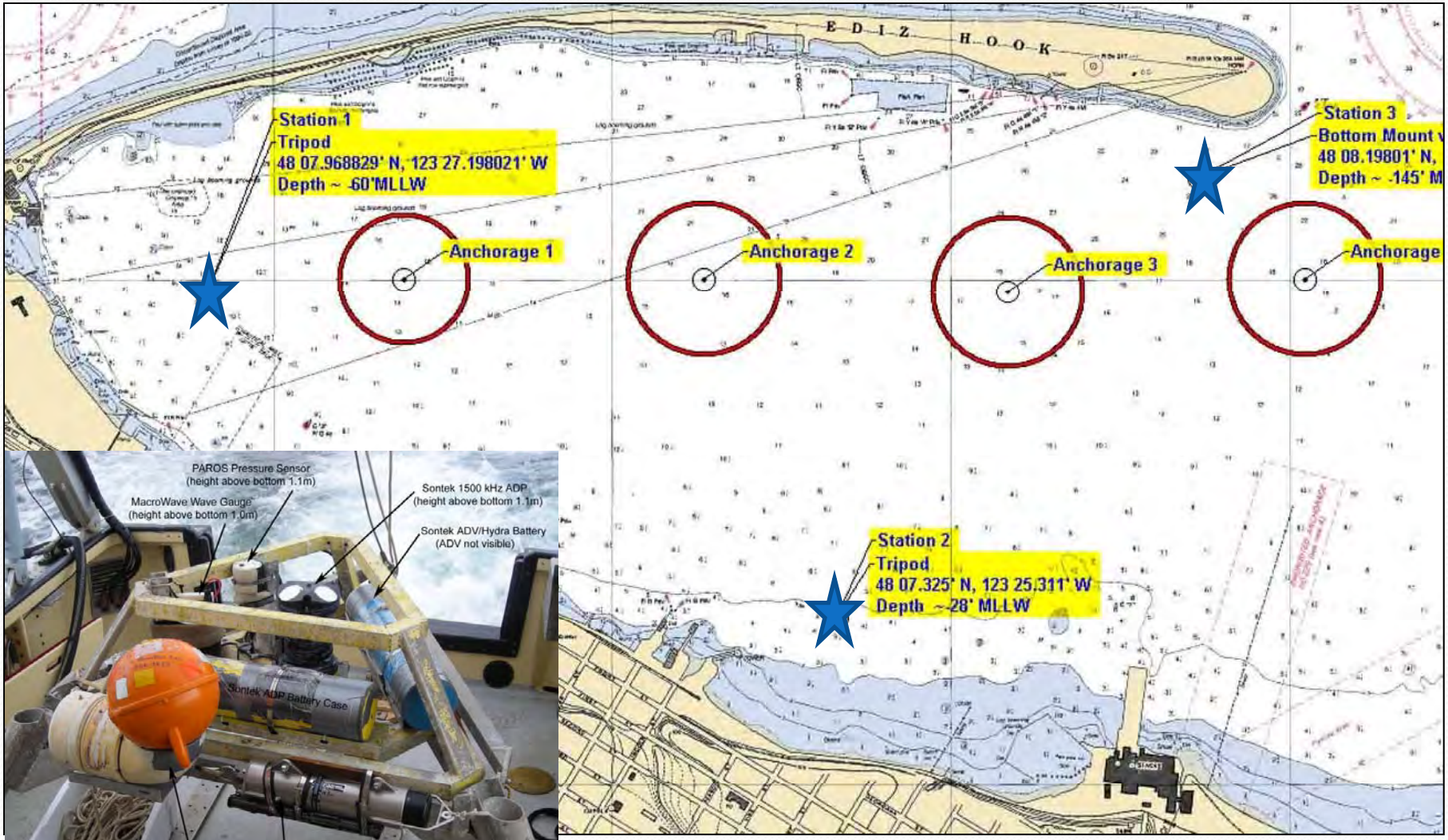
- **Tributyltin** (TBT) detected along the shoreline next to the Marina, Terminal One, and K-Ply areas.
- Gasoline not detected in any samples. **Motor oil** and **#2 diesel** were highest in inner harbor.
- **Resin Acids** were highest in the Inner Harbor , near the Marina, and near the deep outfalls.

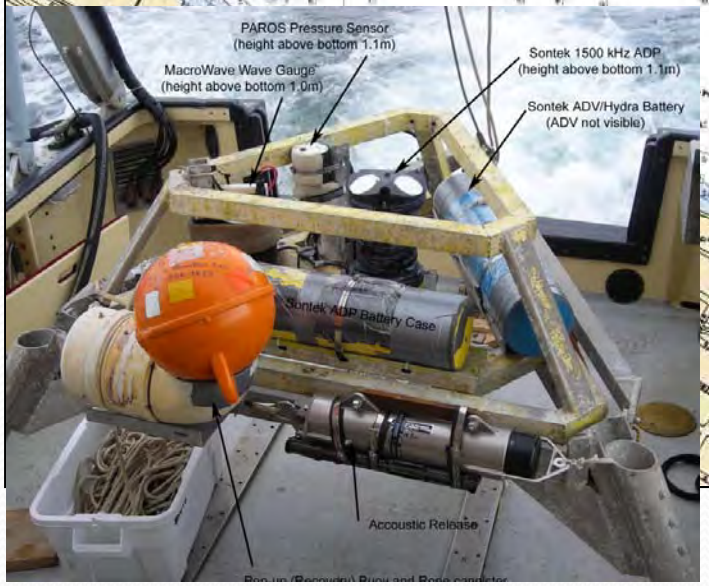
DEPARTMENT OF ECOLOGY
State of Washington

Sediment Transport

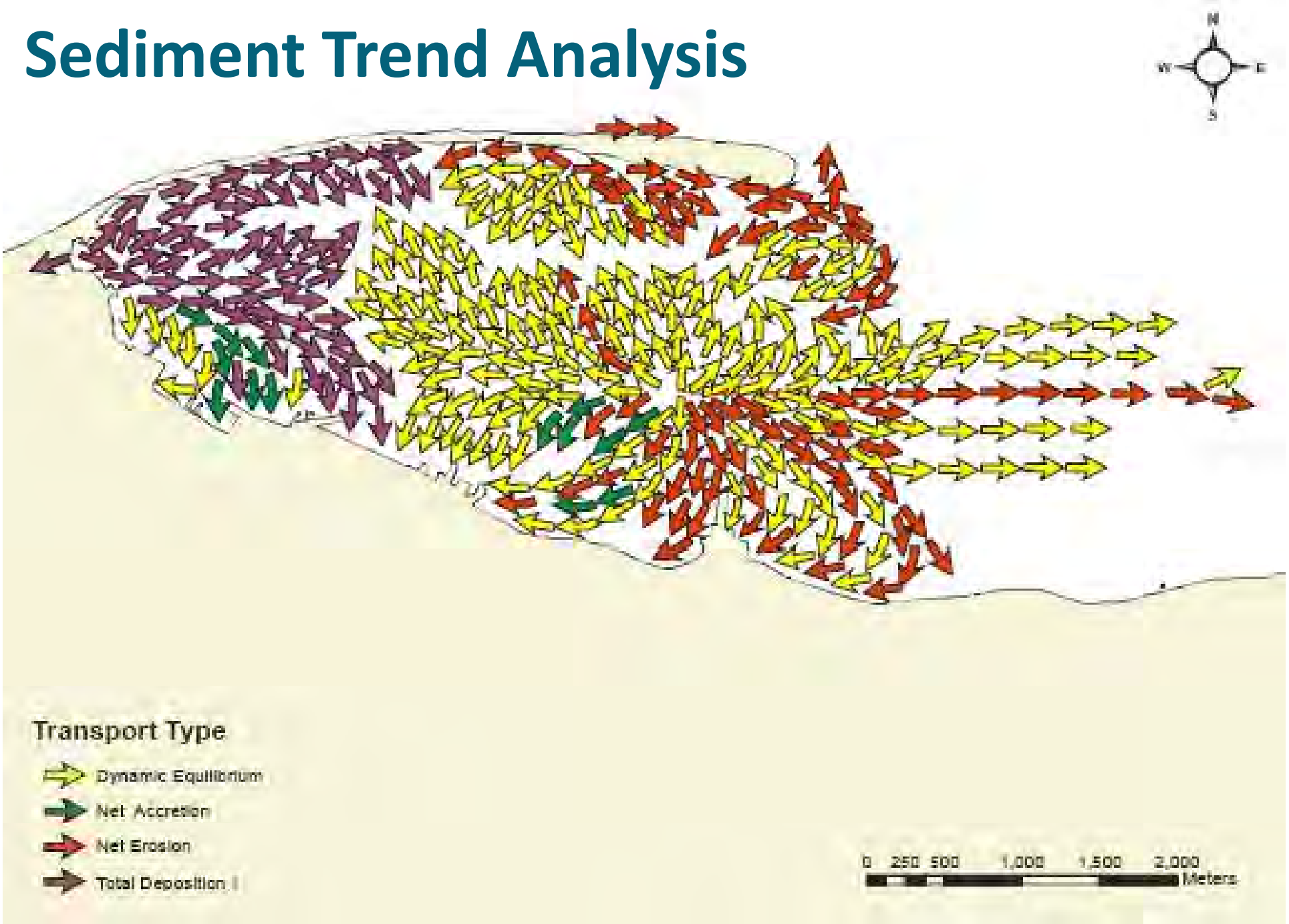
How do sediments move and how might contamination move in the harbor?

Current Data Summary

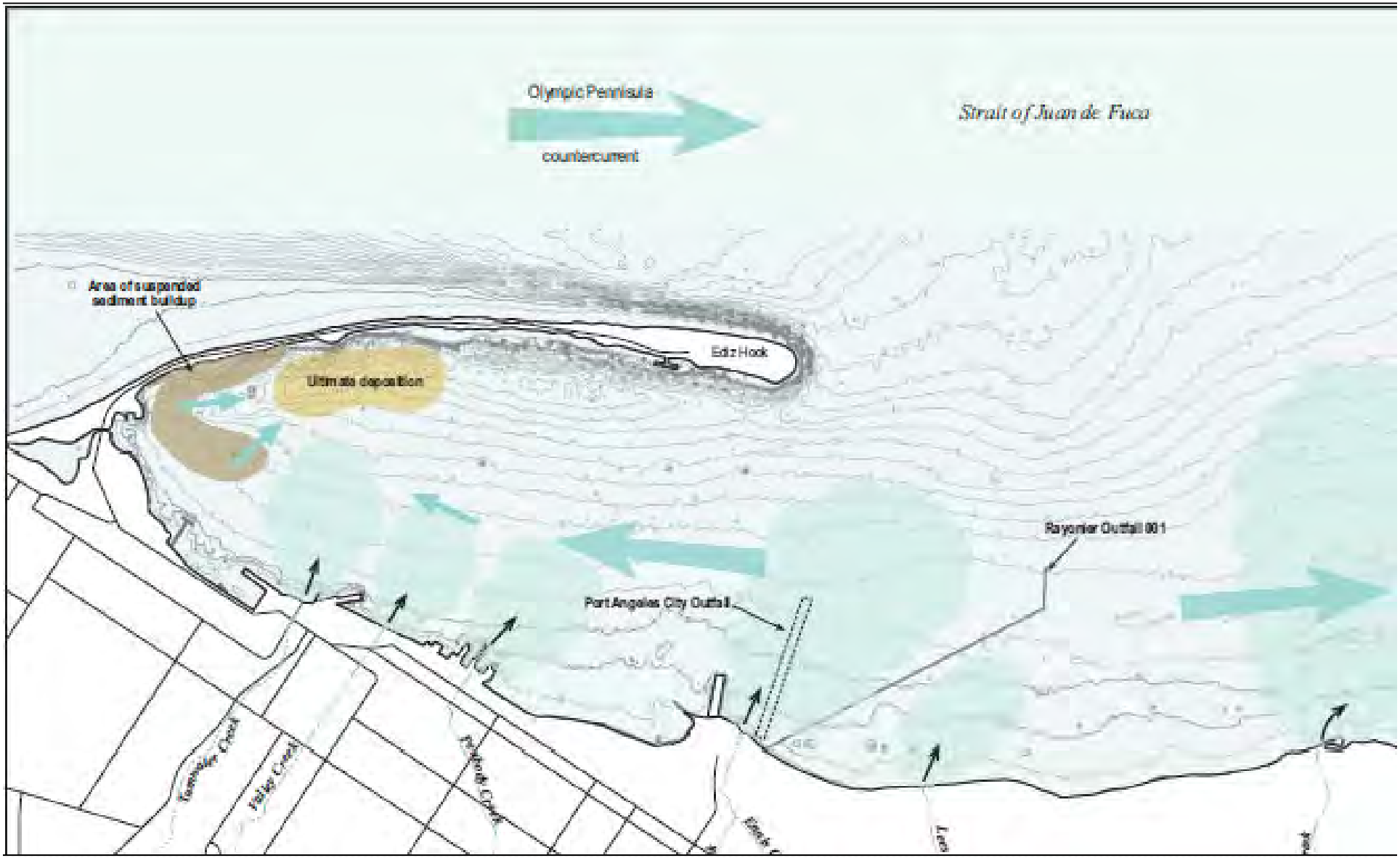


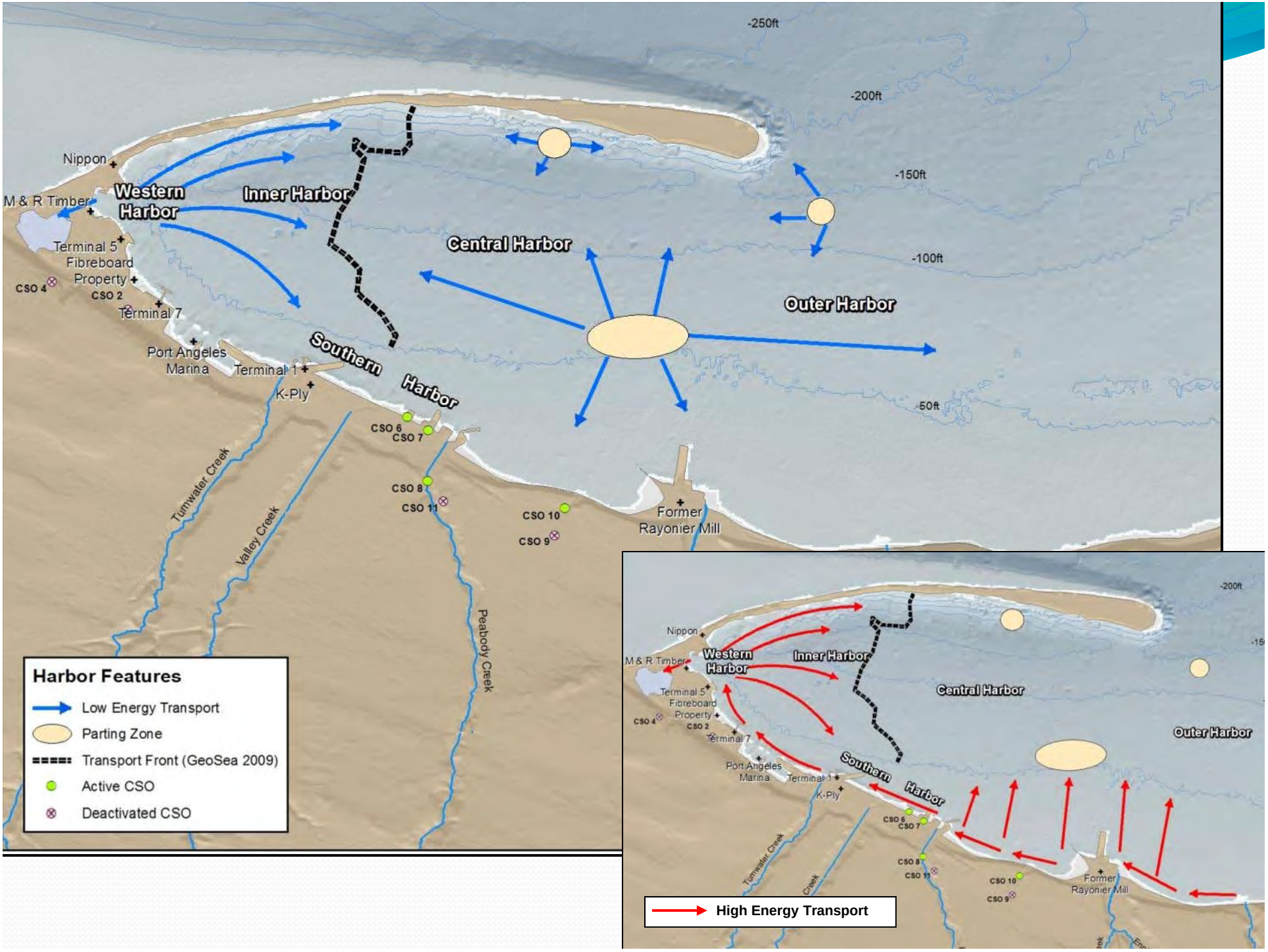


Sediment Trend Analysis



Geomorphic Report



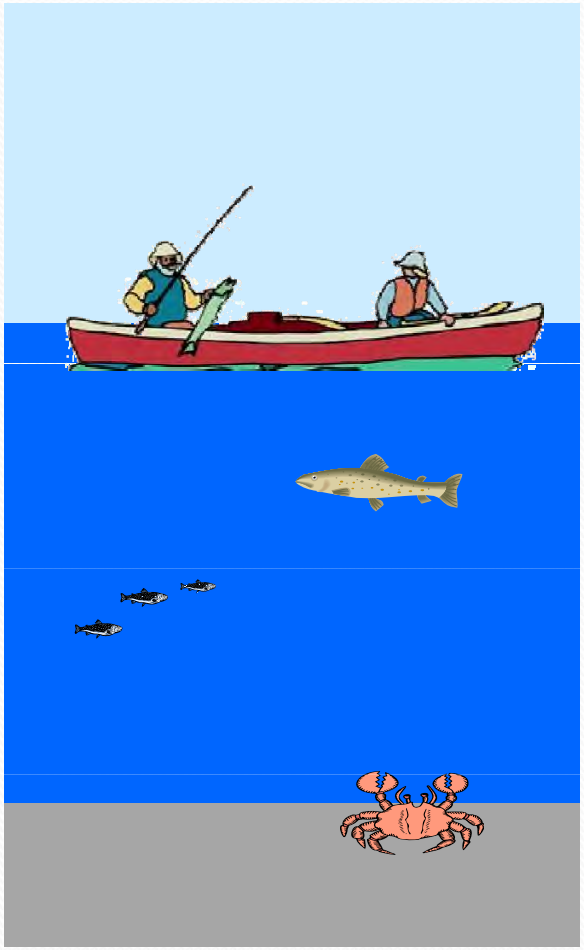

-250ft
-200ft
-150ft
-100ft
-50ft
Nippon
M & R Timber
Western Harbor
Inner Harbor
Central Harbor
Outer Harbor
Terminal 5
Fibreboard
Property
CSO 4
CSO 2
Terminal 7
Port Angeles
Marina
Terminal 1
K-Ply
Southern Harbor
CSO 6
CSO 7
CSO 8
CSO 11
CSO 10
CSO 9
Former
Rayonier Mill
Tumwater Creek
Valley Creek
Peabody Creek
Harbor Features
Low Energy Transport
Parting Zone
Transport Front (GeoSea 2009)
Active CSO
Deactivated CSO
High Energy Transport

Risk

What is the risk to humans and other living things?

Human Health Risk

- Subsistence and recreational fishers are at greatest risk.
- Most risk is from arsenic, PCBs, and dioxins in fish and shellfish.
- Lead in fish and shellfish is a concern for children.
- Very small risk from skin contact with sediments.



DEPARTMENT OF ECOLOGY
State of Washington

Ecological Risk

- Receptors most at risk:
  - Marine vegetation
  - Benthic invertebrates
- Most critical stressors:
  - Sediment habitat degradation by wood waste
  - Metals
  - Organic contaminants
- Arsenic may pose a risk to fish and omnivorous mammals.

DEPARTMENT OF ECOLOGY
State of Washington

Five Lines of Evidence

- Harbor history
- Chemical concentrations
- Bioassay results
- Spatial patterns
- Sediment transport

2012 Conclusions

- Throughout the harbor, we found:
  - Metals and organic contaminants.
  - Bioassay (lab tests of toxicity) failures.
  - Large deposits of wood debris.
- Sediments tend to deposit in the western part of the harbor, but their movement is a dynamic process.
- Arsenic, PCBs, and dioxin in fish and shellfish pose a risk to subsistence and recreational fishers.
- Marine vegetation and benthos are also at risk.

DEPARTMENT OF ECOLOGY
State of Washington

Once more…recommendations

- Focused removal of wood debris. Source control and best management practices of wood debris.
- Identification and control of upland sources.
- Cleanup of sediment hotspots near the former Rayonier Mill and in the western harbor.

Once more…next steps

- Finalize **Sediment Investigation Report** and **Supplemental Data Evaluation**.
- Begin working with potentially liable persons.
- Rayonier use study data to complete its **Marine Data Summary Report**.
- Complete a dioxin chemometric (fingerprinting) study.
- Public review of **Preliminary Cleanup Goals**.

DEPARTMENT OF ECOLOGY
State of Washington