USING OILMAP TO TEST GEOGRAPHIC RESPONSE STRATEGIES

RRT 5 FALL MEETING

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RPS Ocean Science
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MAKING COMPLEX EASY

Gabrielle McGrath

Senior Scientist / Senior Project Manager

- 26 years on Active Duty in the U.S. Coast Guard, retired in 2018.
- Served as Co-Chair for 3 Area Committees. Full rewrite of ACPs at USCG Sector San Francisco & at USCG Sector Boston.
- FEMA / USCG ICS Instructor since 2002. Certified Type 3 IC, Type 1 OSC, and Type 1 PSC.
- Joined RPS in July 2018. Leads all response and contingency planning projects. Project Manager for all International projects.
- Currently leading 5-year project with BSEE to develop offshore response information for RCPs/ACPs.

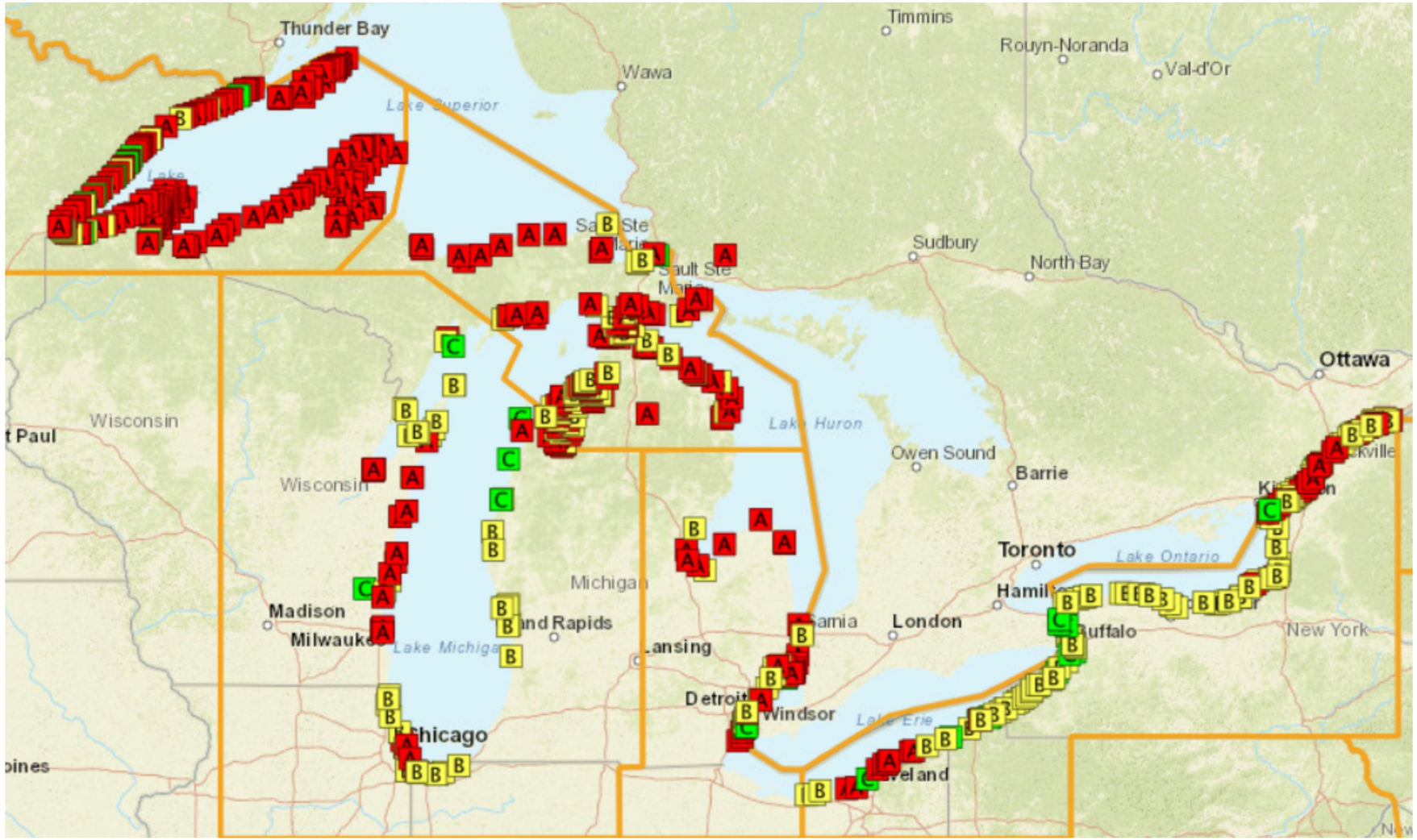
BACKGROUND

- ACPs include Geographic Response Plans or Strategies.
- Challenges of physically testing these strategies:
  - Man hours
  - Safety risk
  - Social distancing requirements
  - Regulatory consultations
  - Limited environmental conditions

- Computer simulations enable user to test multiple strategies under different conditions within minutes from an office environment
- Benefits FOSC, State, Facility Owners, Public, Natural Resource Trustees, etc.

Containment of an oil spill with a boom on the Kalamazoo River, 2010. Photo from www.oilandwaterdontmix.com.

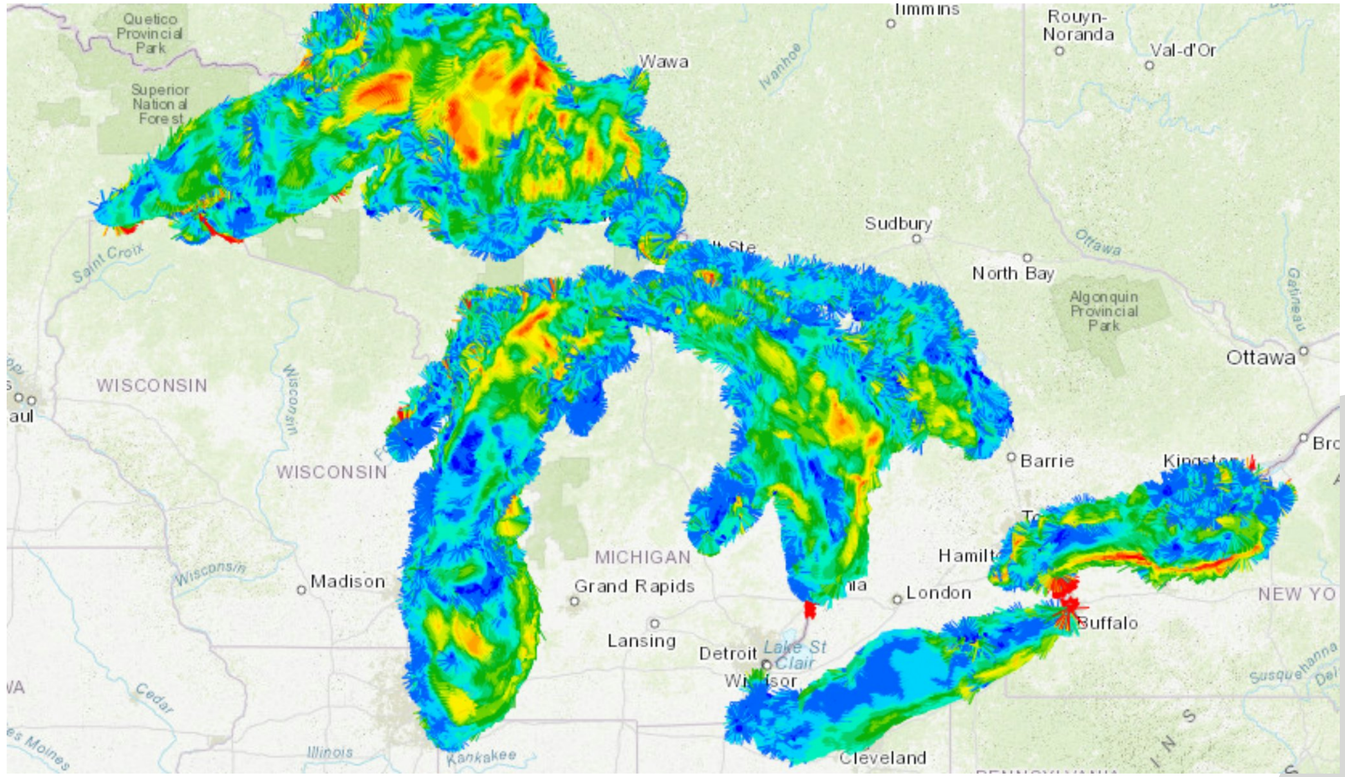
NUMERICAL MODELING OF RESPONSE STRATEGIES



RRT 5 GRS LOCATIONS FROM ERMA

ENVIRONMENTAL DATA SERVER (EDS): CURRENTS

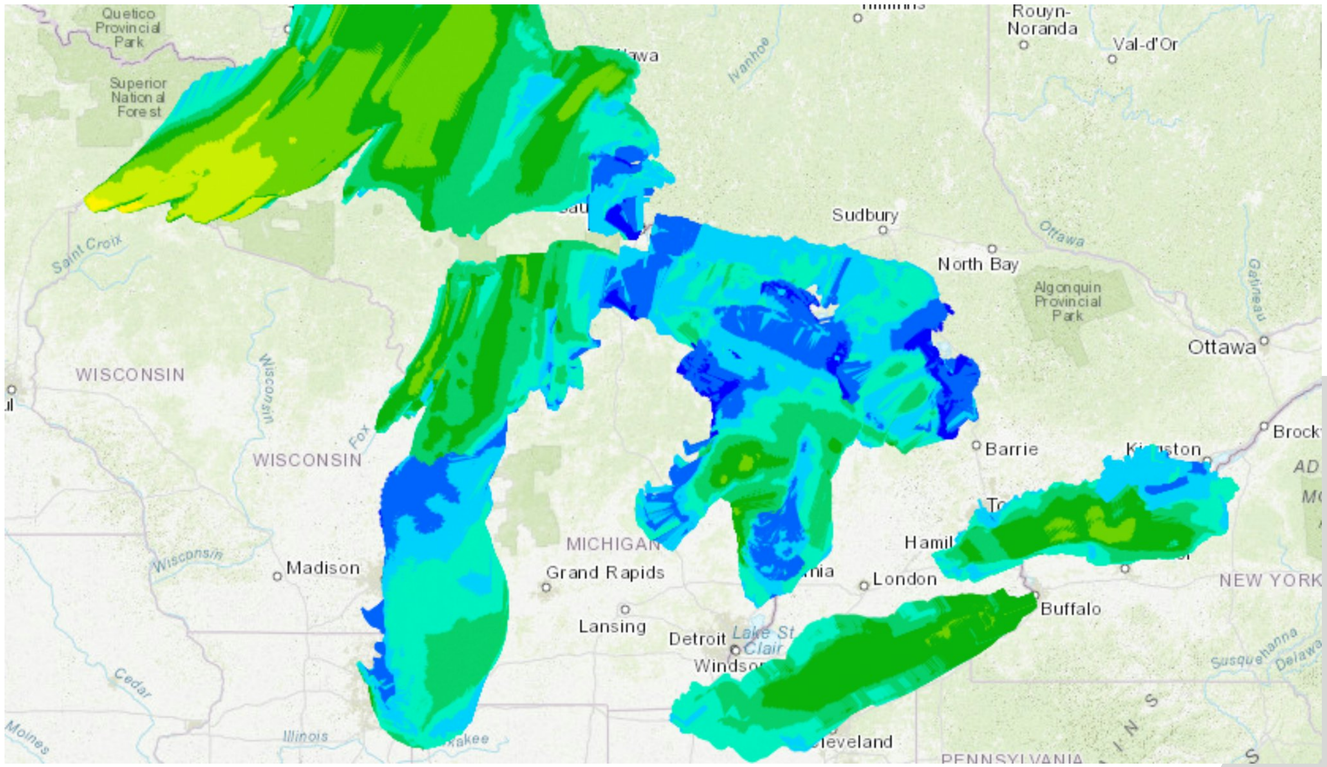
- Model Forecasts
- Measurements and Observations
- Local, Regional, & Global Datasets Available
- Critical input to trajectory and fate model
- Spatially- and temporally- varying
- Downloaded for extent of simulation
- Current speed by color



Great Lakes Coastal Forecasting System (GLCFS)
Finite Volume Coastal Ocean Model (FVCOM) Currents

ENVIRONMENTAL DATA SERVER (EDS): WINDS

- Model Forecasts
- Measurements and Observations
- Local, Regional, & Global Datasets Available
- Critical input to trajectory and fate model
- Spatially- and temporally- varying
- Downloaded for extent of simulation
- Wind speed by color

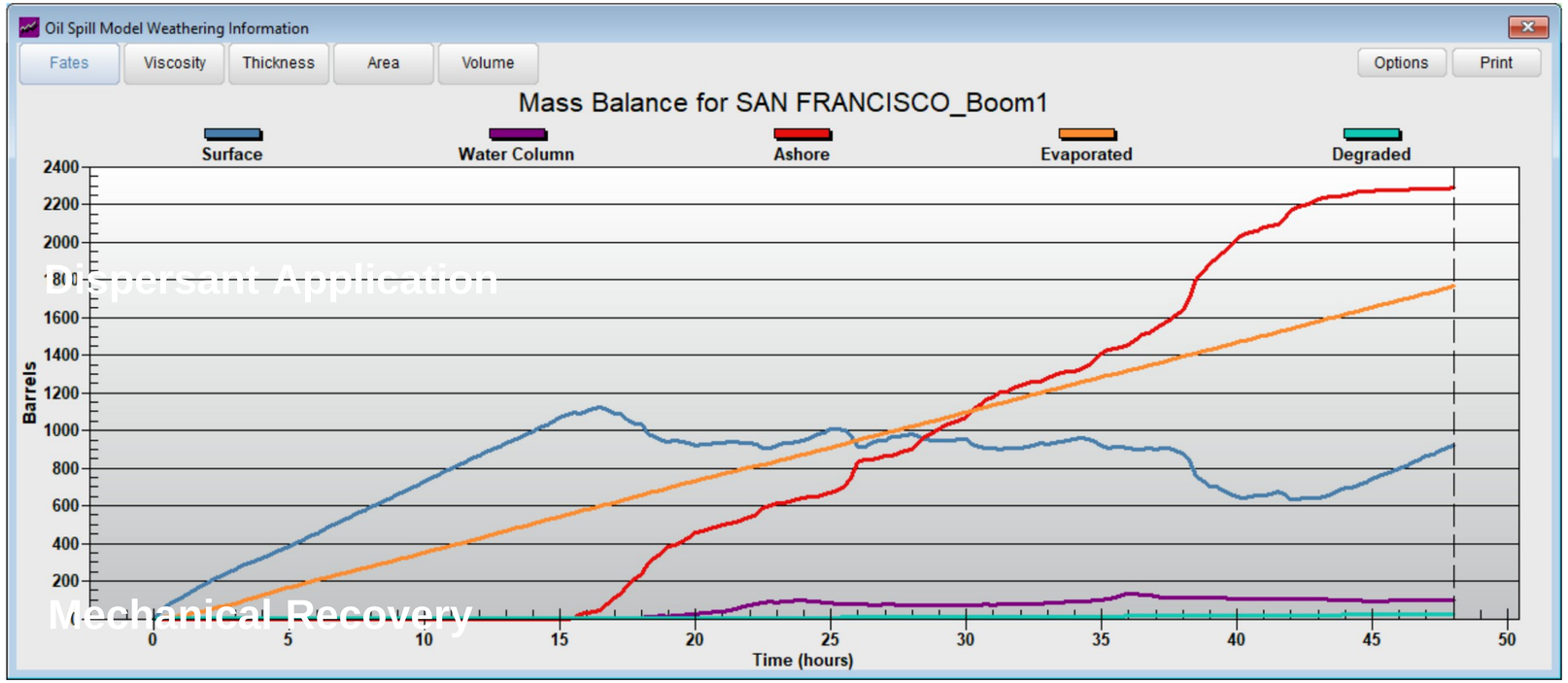


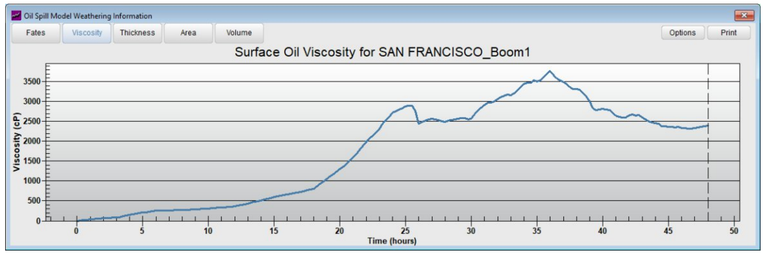
Great Lakes Coastal Forecasting System (GLCFS)
Finite Volume Coastal Ocean Model (FVCOM) Winds

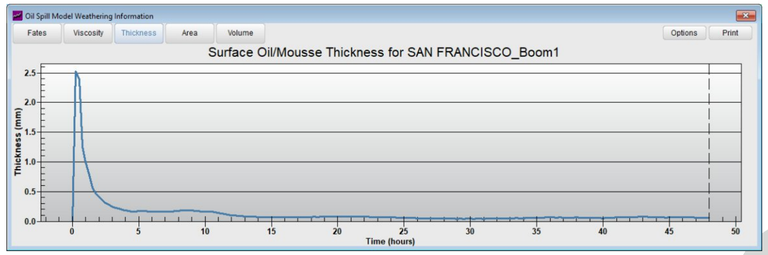
Model can provide:

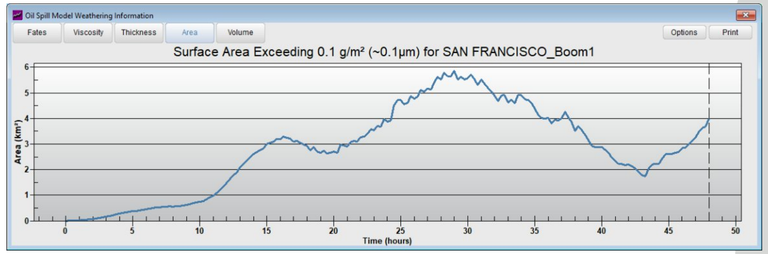
- Oil particle characteristics
- Floating surface oil
- Water column concentrations
- Shoreline oiling
- Evaporated hydrocarbons

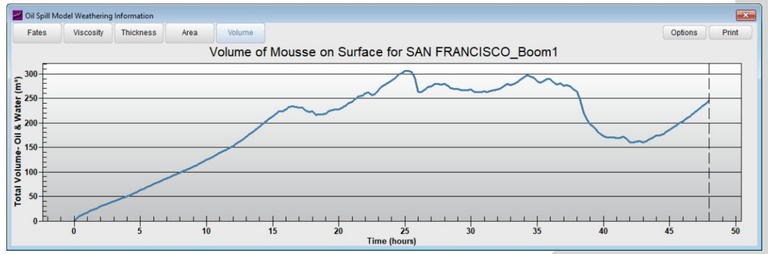
MODEL OUTPUTS





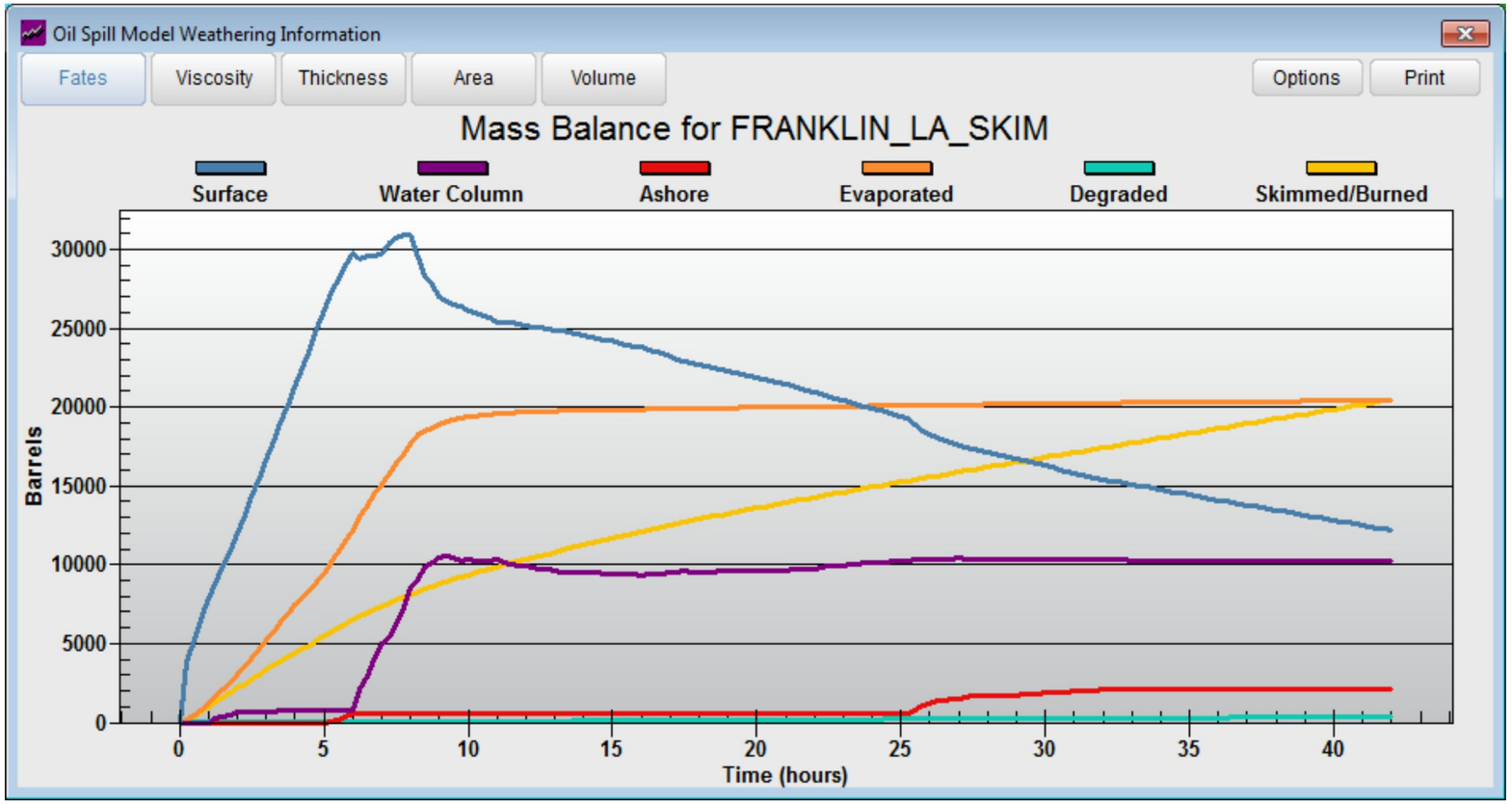






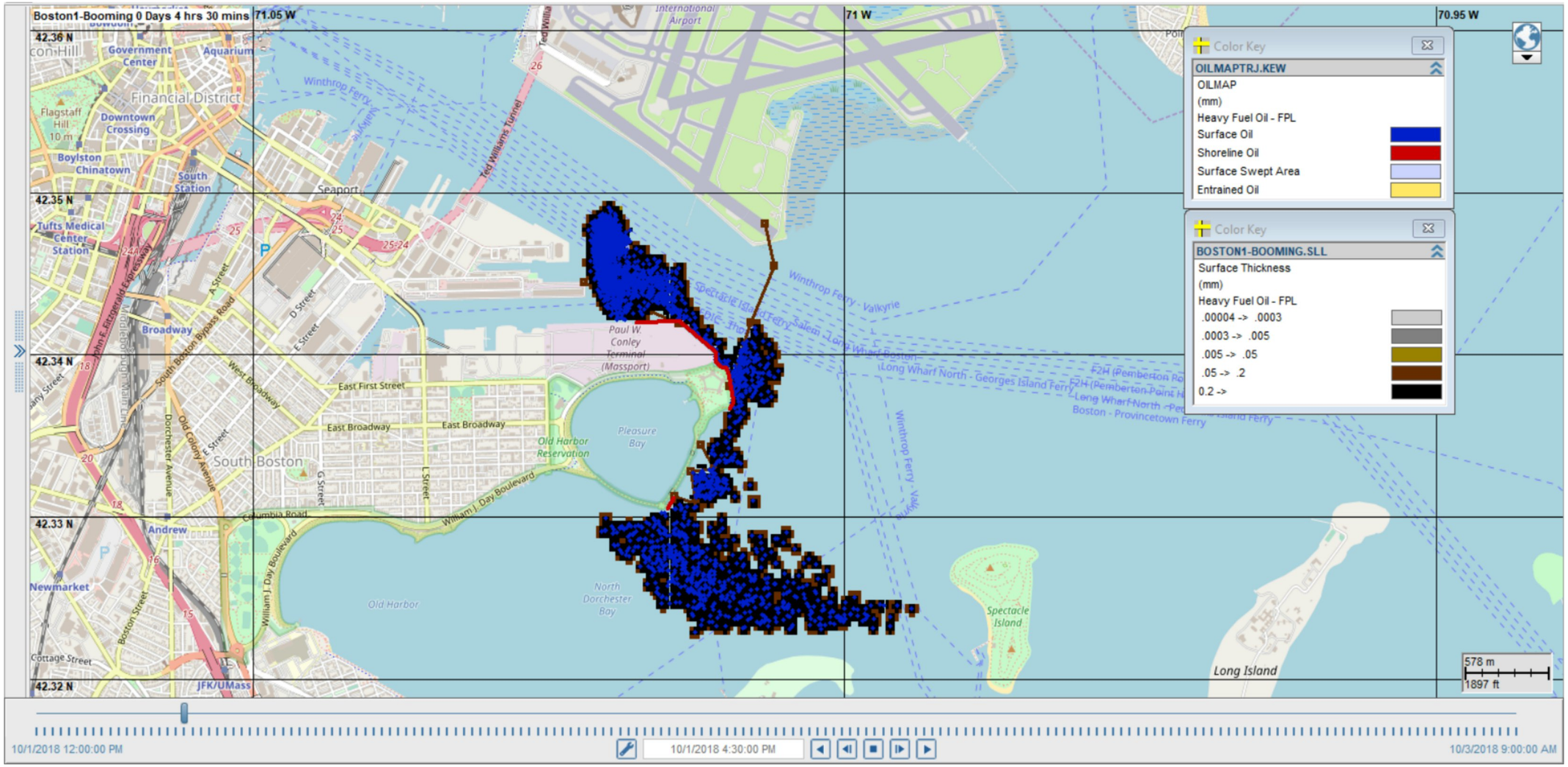
- Trajectory Maps
- Mass Balance
- Surface Area, Viscosity, Volume, Thickness
- All Temporally and Spatially-Varying
- Plots, graphs, tabular data, SHP, and KML exports

RESPONSE ACTIVITIES



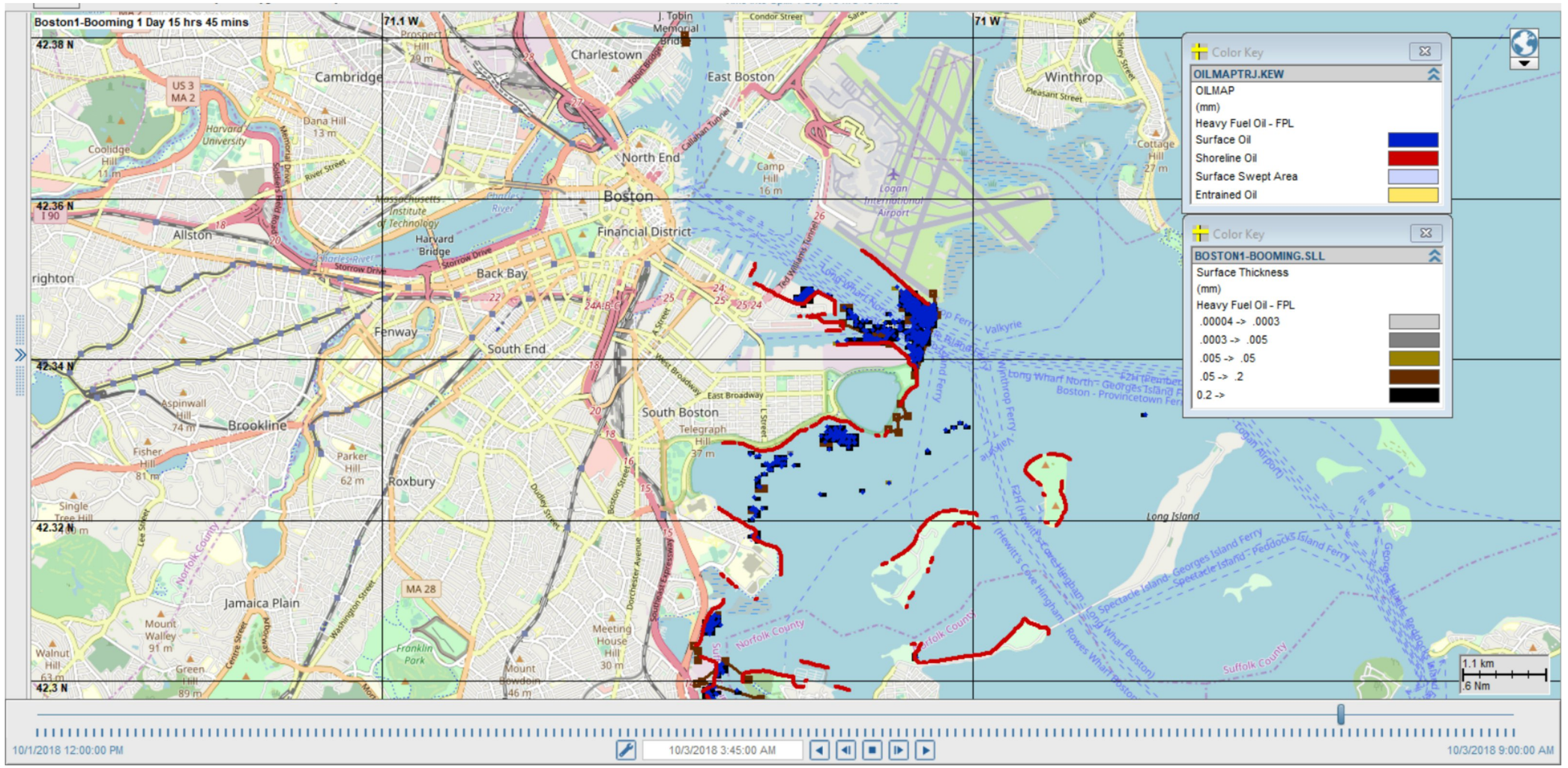
Examples of OILMAP Testing of ACP Geographic Response Strategies

COMPUTER MODELING OF RESPONSE STRATEGIES



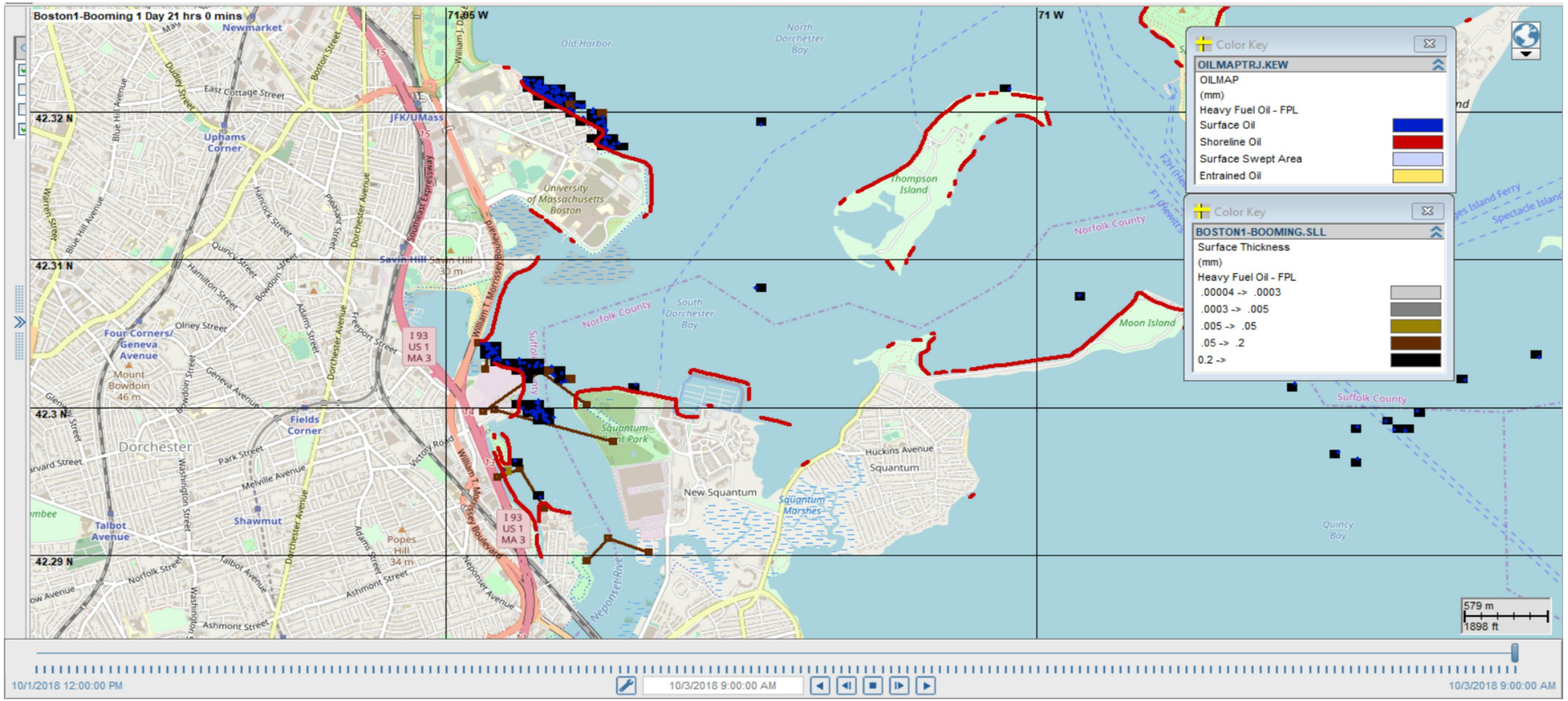
Boston Harbor 4.5 hours after oil was discharged.

COMPUTER MODELING OF RESPONSE STRATEGIES



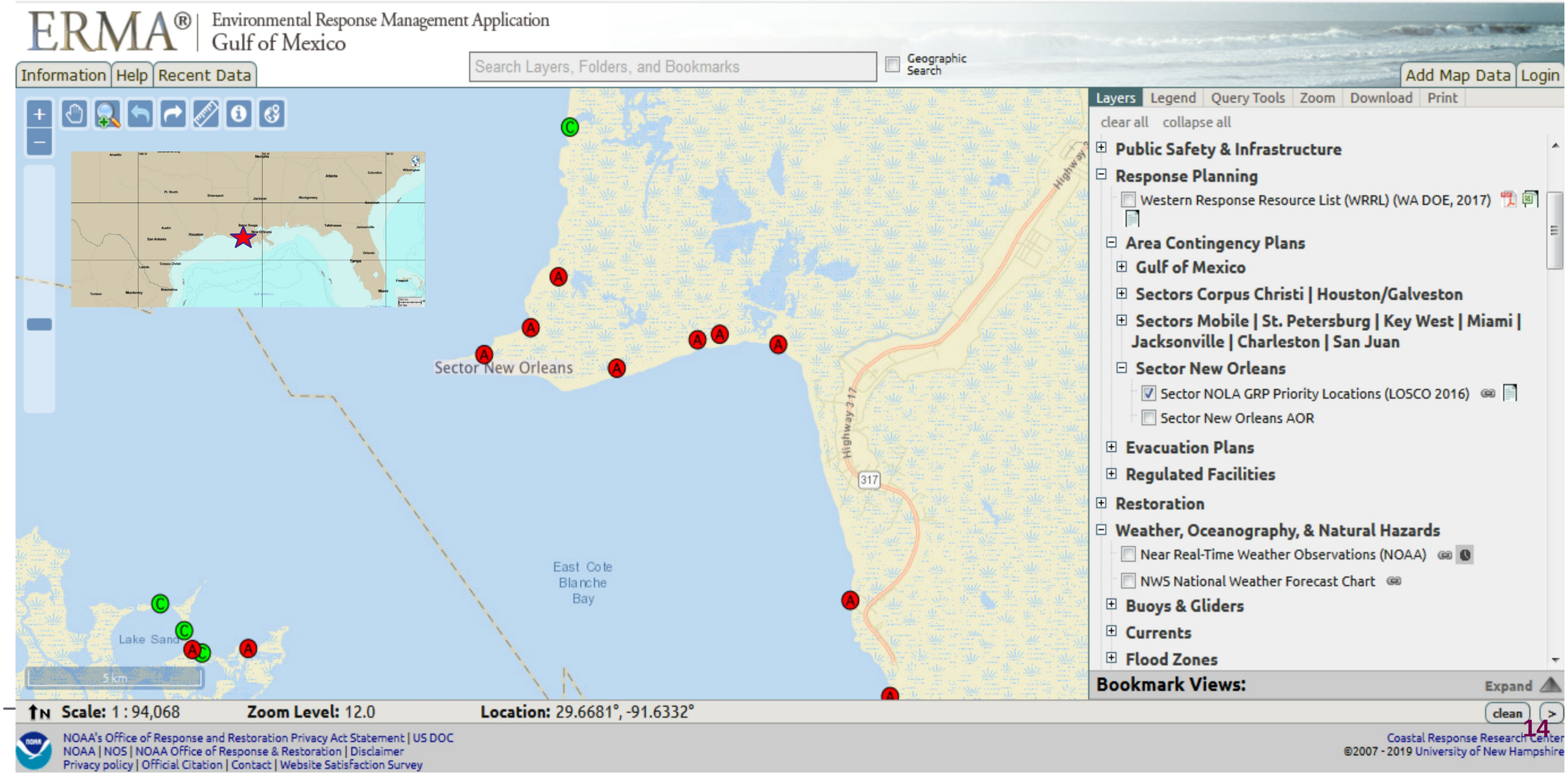
Boom deployed at the mouth of Boston Channel and Reserved Channel captures oil.

COMPUTER MODELING OF RESPONSE STRATEGIES



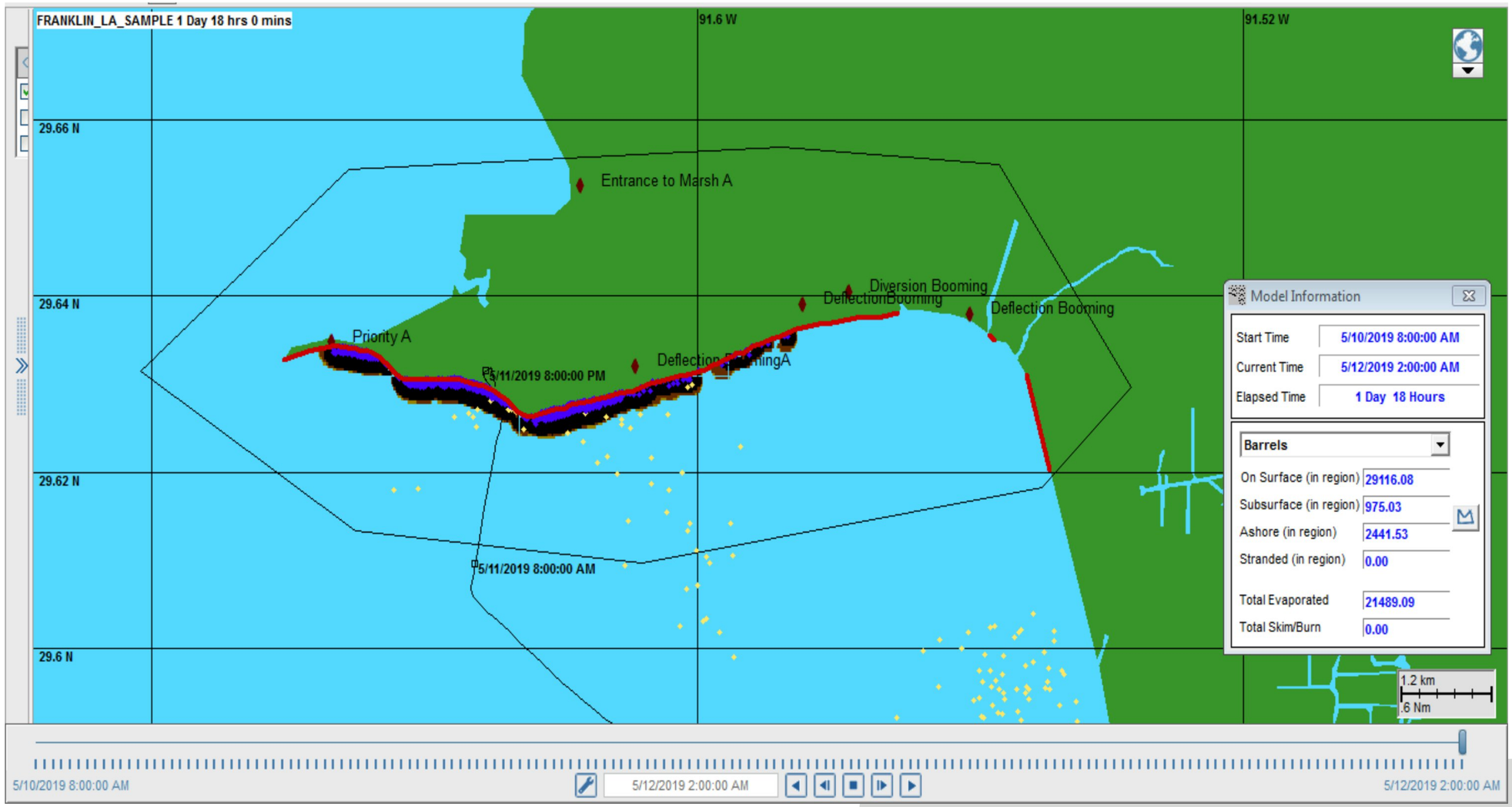
Several boom deployments along the Neponset River divert the oil from traveling further up the river, although there is shoreline oiling at the mouth of the river.

COMPUTER MODELING OF RESPONSE STRATEGIES



COMPUTER MODELING OF RESPONSE STRATEGIES

Shoreline Impact: No Booming



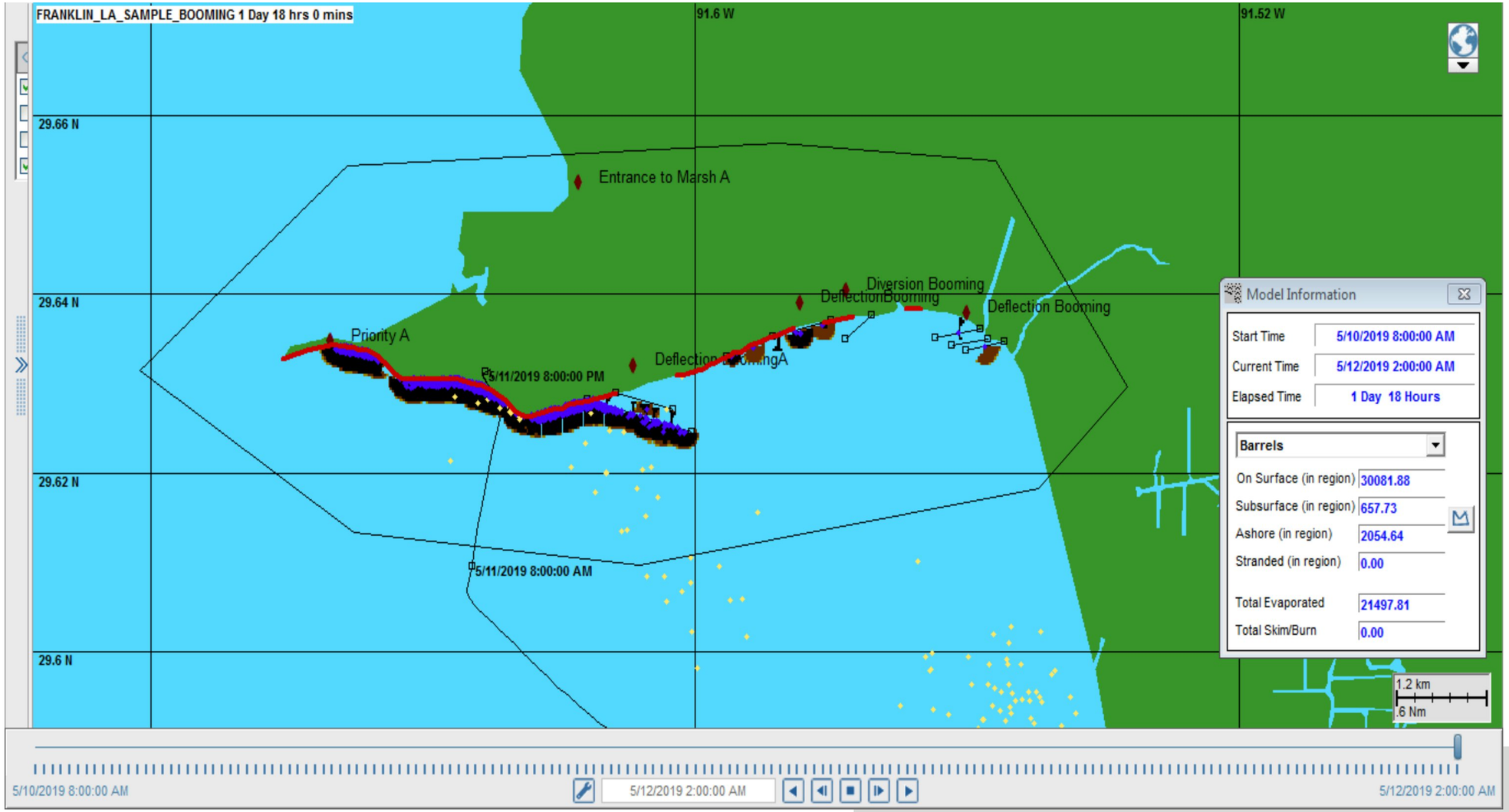
- South Louisiana Crude Oil
- No Booming

RESULT:

2,441 barrels of oil onshore

COMPUTER MODELING OF RESPONSE STRATEGIES

Shoreline Impact: Booming High Priority Areas in ACP



- South Louisiana Crude Oil
- Booming Strategy Based on ACP

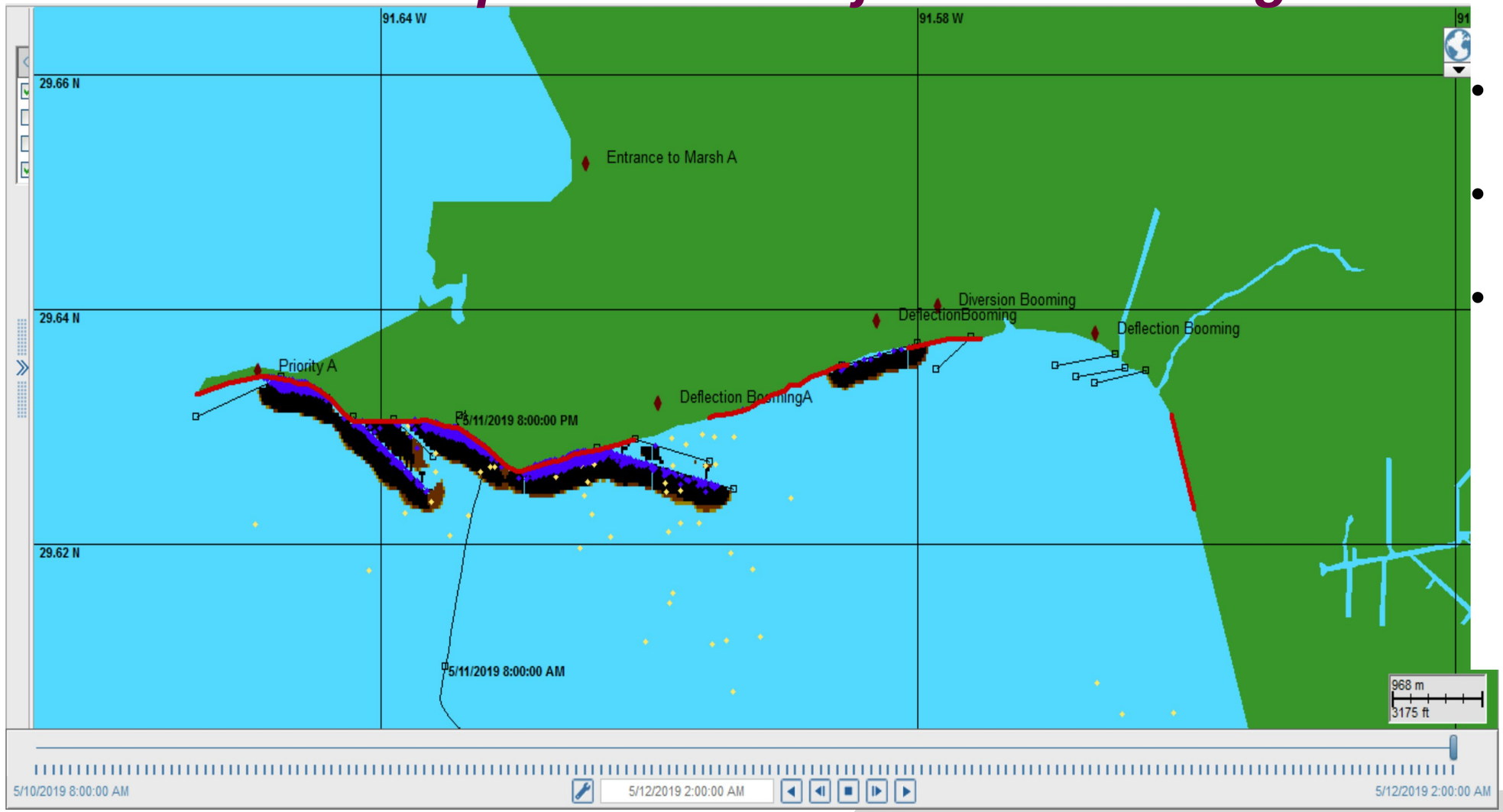
RESULT:

2,054 barrels of shoreline impact

16% reduction

COMPUTER MODELING OF RESPONSE STRATEGIES

Shoreline Impact: User-Adjusted Booming



- South Louisiana Crude Oil
- Booming Strategy User-Defined
- Quick test of different strategies
- Can simulate for different seasons / times of day

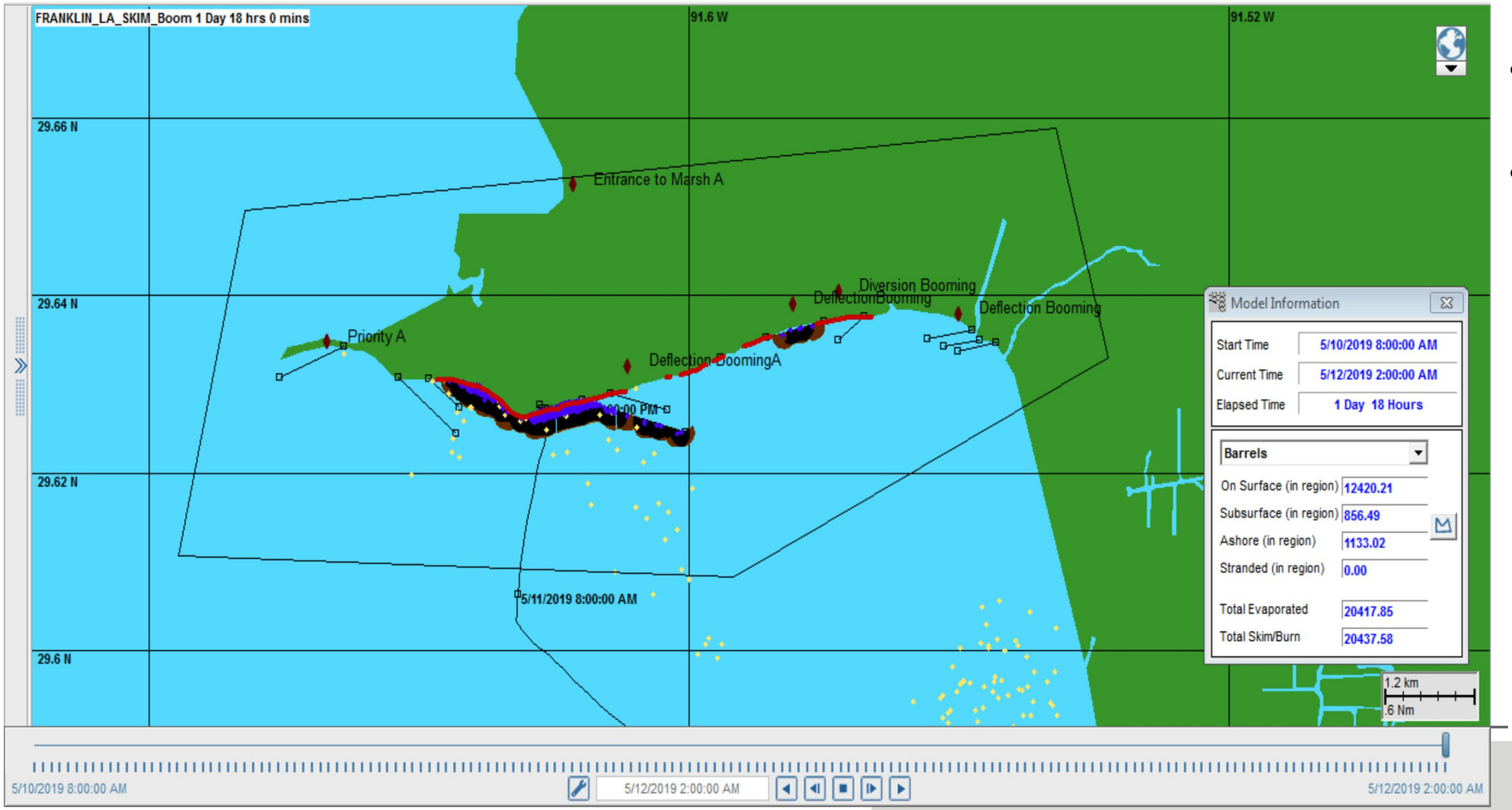
RESULT:

1,772 barrels of shoreline impact

28% reduction

COMPUTER MODELING OF RESPONSE STRATEGIES

Shoreline Impact: User-Adjusted Booming + Skimming



- South Louisiana Crude Oil
- Booming Strategy User-Defined
- Skimming Added

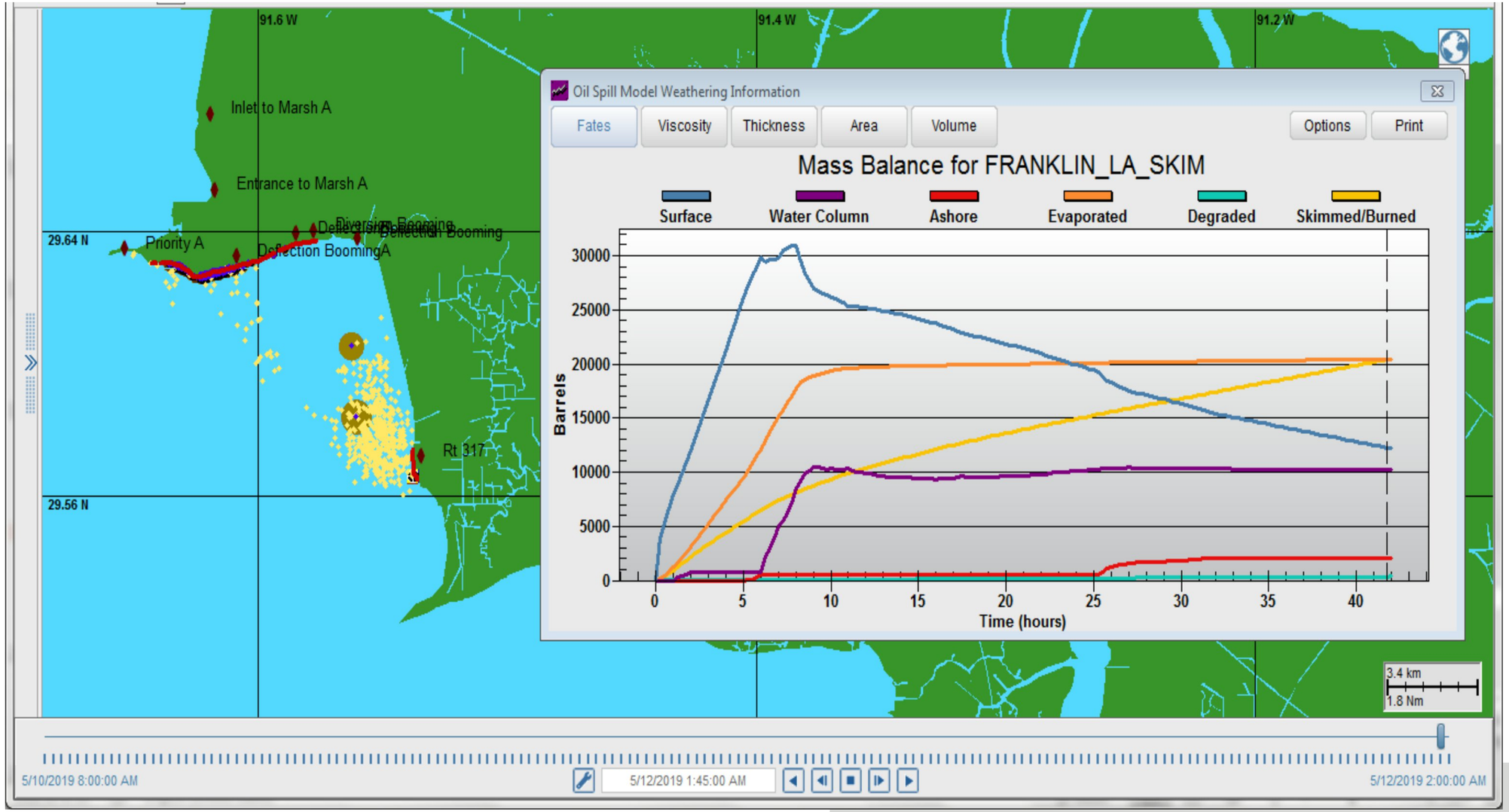
RESULT:

1,133 barrels of shoreline impact

54% reduction compared to No Booming Scenario

COMPUTER MODELING OF RESPONSE STRATEGIES

Mass Balance for User-Defined Booming + Skimming Scenario



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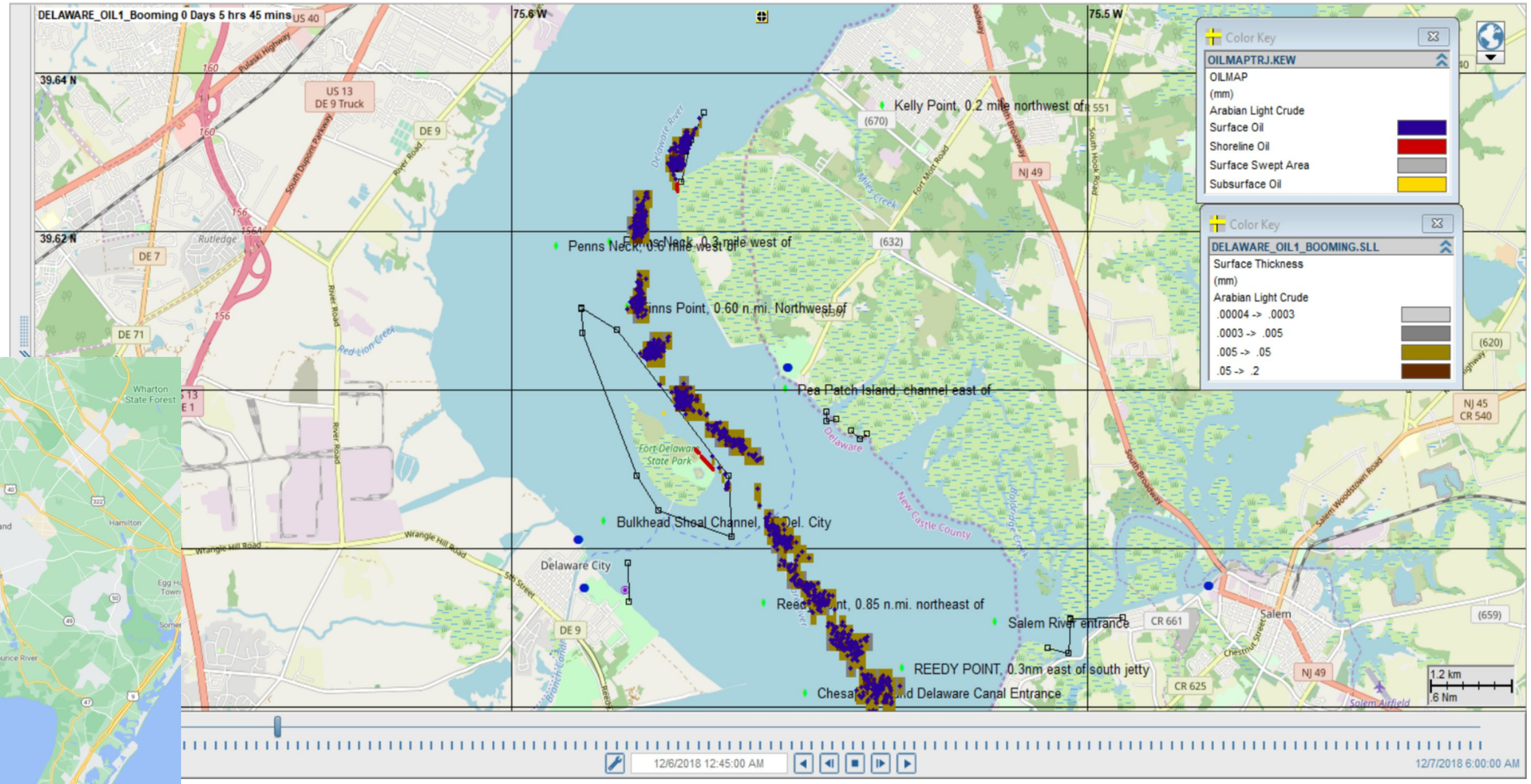
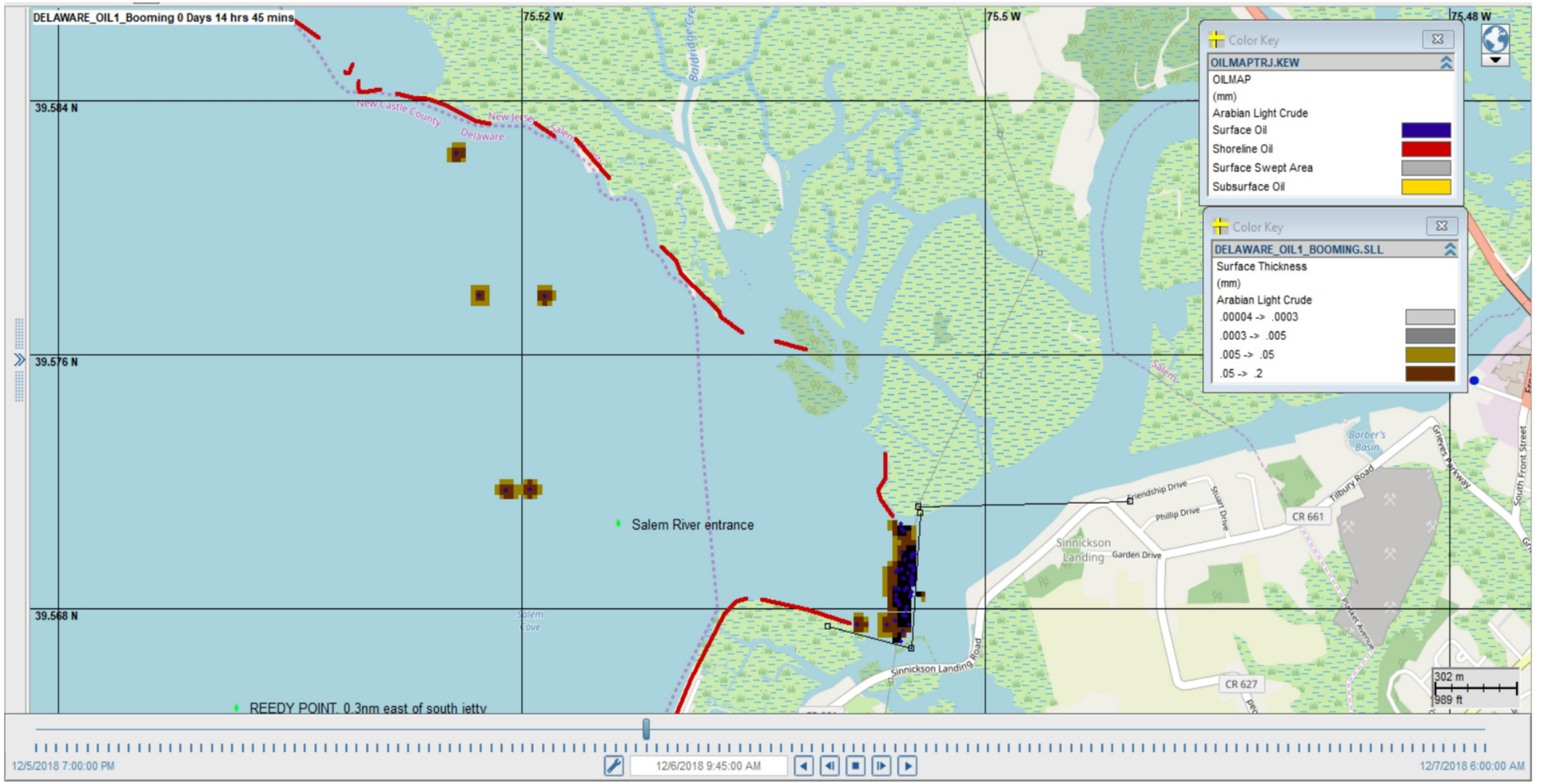


Philadelphia ACP GRS Test in the Delaware River

COMPUTER MODELING OF RESPONSE STRATEGIES



Booming is effective at the mouth of the Salem River

RPS COORDINATION WITH U.S. COAST GUARD

- OILMAP provides the unique capability of testing response strategies, including booming, skimming, and dispersants.
- OILMAP is currently being used by CG Exercise Support Team for all PREPEX and by select Northeast/Mid-Atlantic Districts and Sectors for testing GRS (D1, D5, CGA, and Sector Long Island Sound).
- RPS and CGA worked with Districts and Sectors and established cadet academic projects to test GRS around the country since 2019, including District 9.
- RPS briefed CG-MER in January 2020 on OILMAP tool and received support for field implementation.

U.S. COAST GUARD AND COMPUTER SIMULATIONS

- Meets requirements of CG-MER Manual for Geographic Response Strategy (GRS) Validation Levels 1 and 2.
- “Supplemented with computer simulations.”

Validation Level	Name	Description	Requirements
I	Desktop	Evaluation of GRS data by subject matter experts (i.e., natural resource trustees) in an office or workshop setting. Can be supplemented with computer simulations.	All data should attain Level I validation.
II	Visual Confirmation	Deployment of subject matter experts to specified geographic area. Visual inspection of operational environment and verification of tactical strategies. No equipment deployment. Can be supplemented with computer simulations.	Targeted for moderate to high-risk areas where a degree of uncertainty exists.
III	Equipment Deployment	Deployment of identified equipment to verify its performance in the specified operating environment.	Targeted for inconclusive Level II validation strategies. Performed in high-risk areas where rapid and efficient response is critical.
IV	Full Scale Exercise (FSE)	Deployment of all appropriate response personnel and equipment under an area full scale exercise setting.	As dictated by the area exercise design/objectives.
V	Incident	Deployment of all appropriate response personnel and equipment for an actual incident.	Real world event.

Table 4-1: Geographic Response Strategies (GRS) Tiered Validation Levels

BENEFITS OF GRS TESTING WITH COMPUTER SIMULATIONS

- Quickly evaluate a wide range of response activities.
- Assess each response strategy under varying environmental conditions (winds, currents, temperature, salinity).
- Make edits to response strategy based on model results and re-test.
- Compare and assess all strategies.
- More cost-effective, safer, and more efficient than field deployments.
- Better preparation for incidents for inclusion in the ACP for use by all responders.

QUESTIONS?

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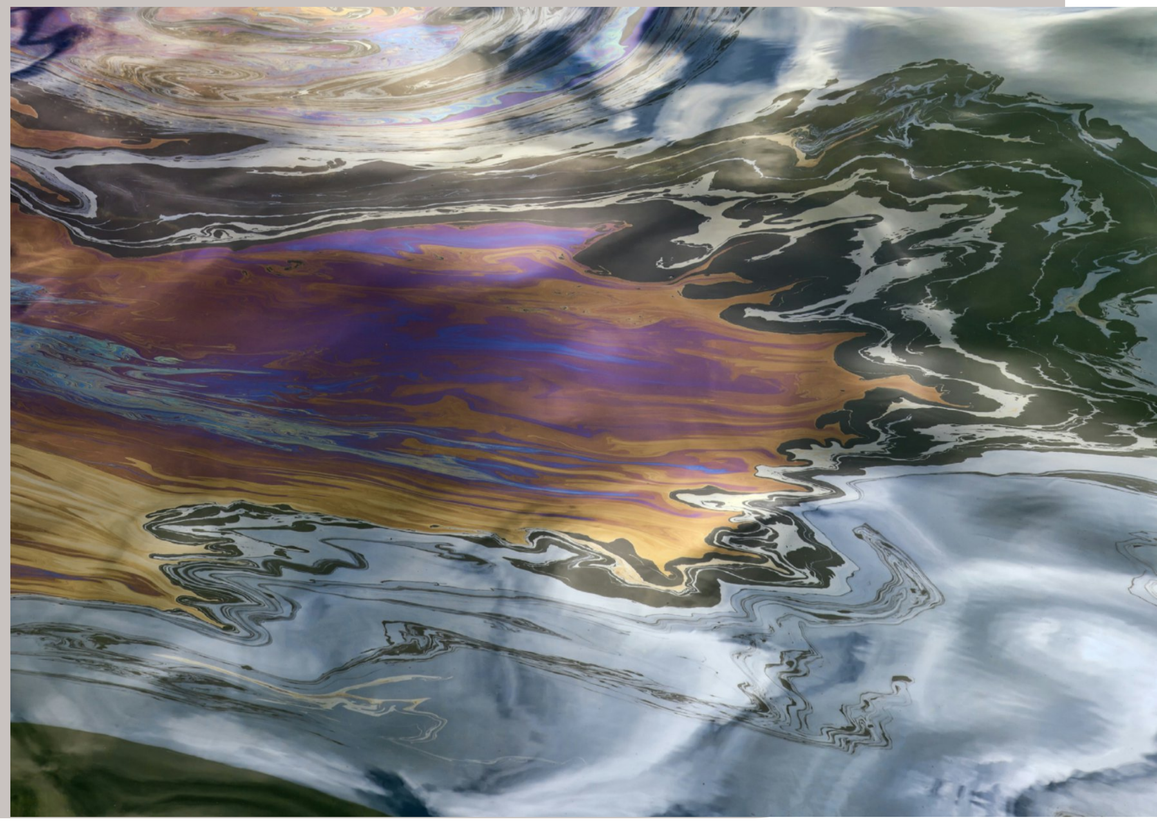

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