Analysis of Chesapeake Bay Marine Discharges

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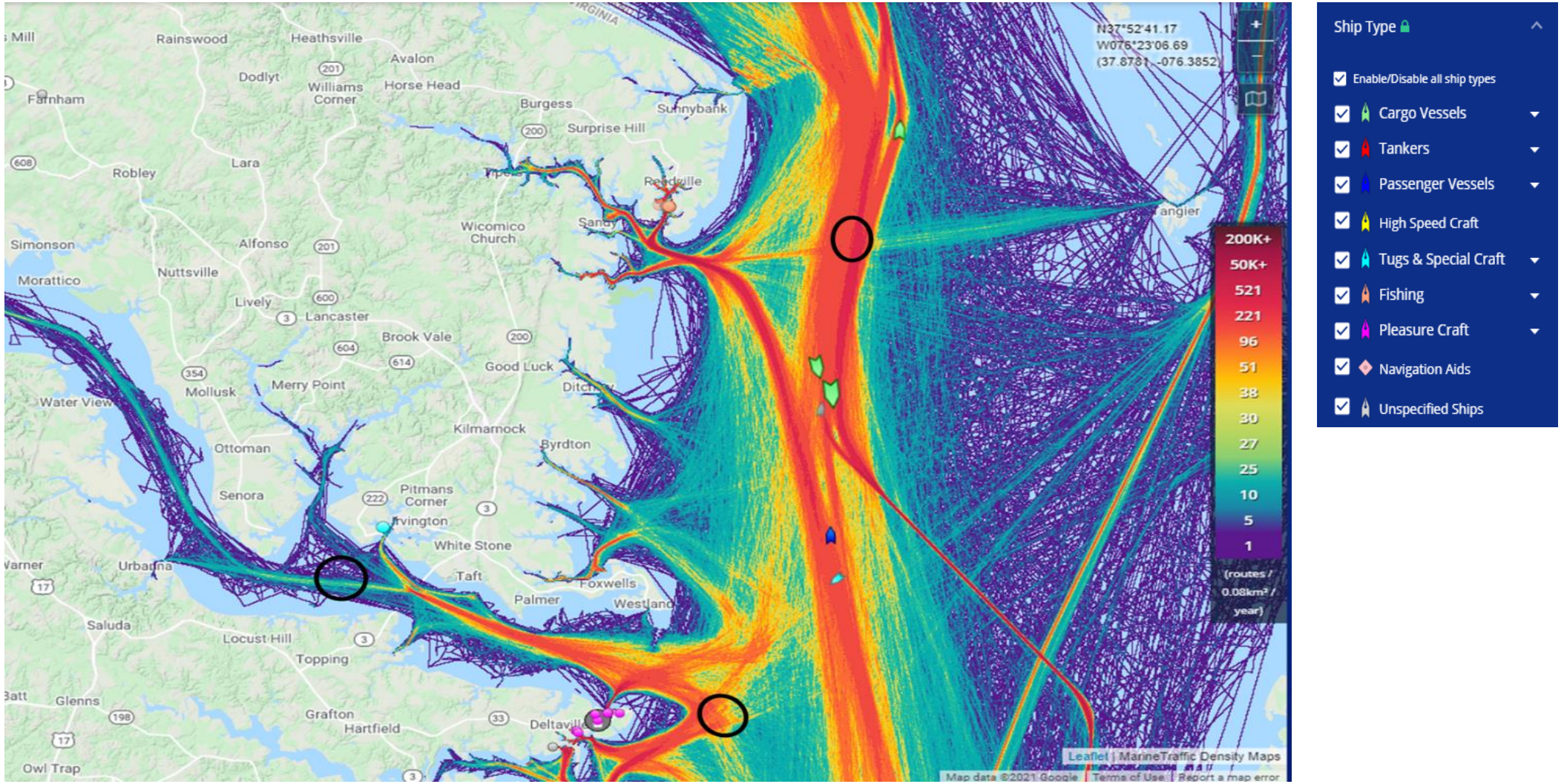
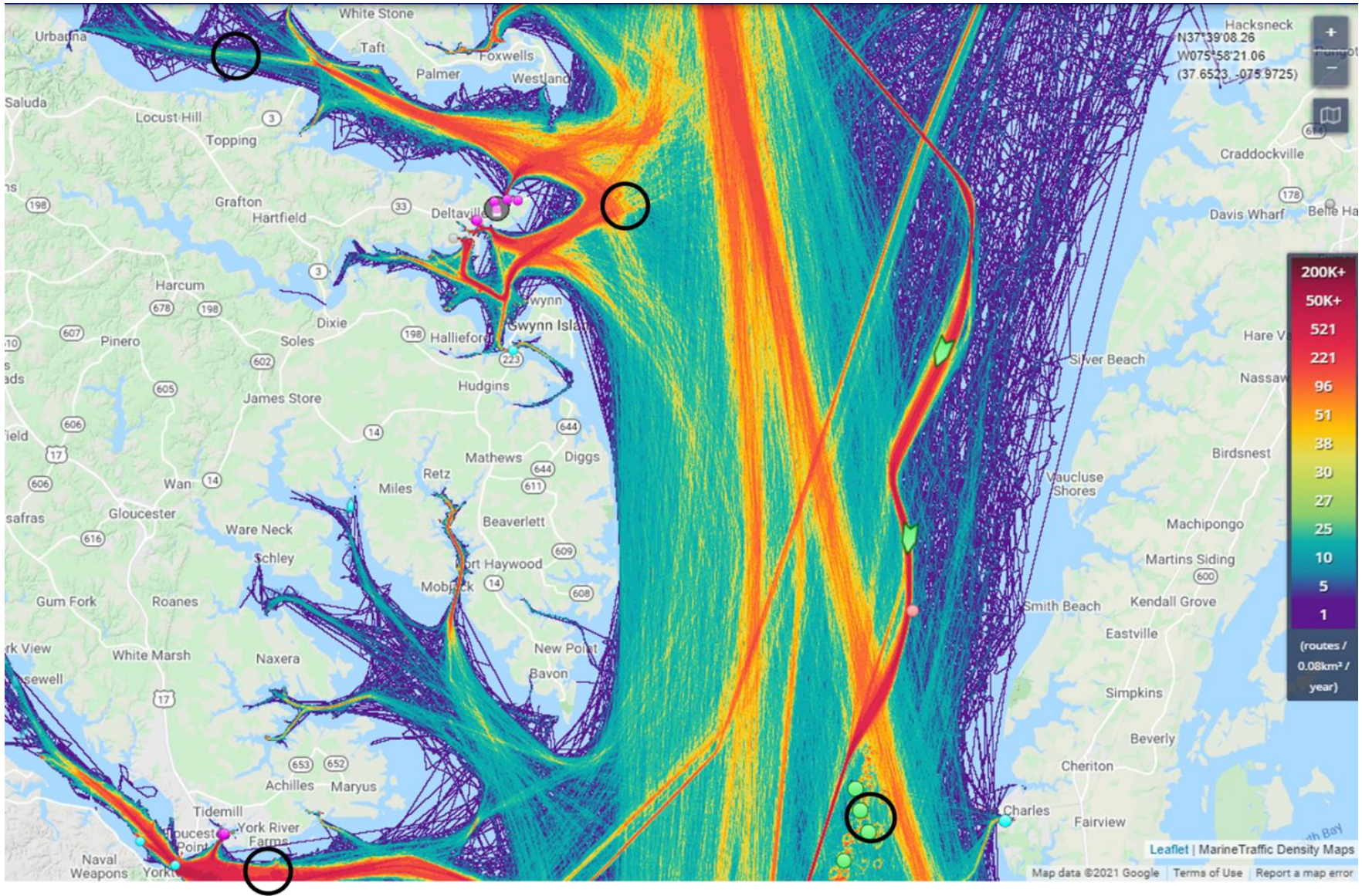
INTRODUCTION

- **A VA DEQ project**
- **Establishing No-Discharge Zones (NDZ) to protect sensitive area**
- **The primary concern is fecal coliforms.**
- **Identify influential area using model tracer analysis**

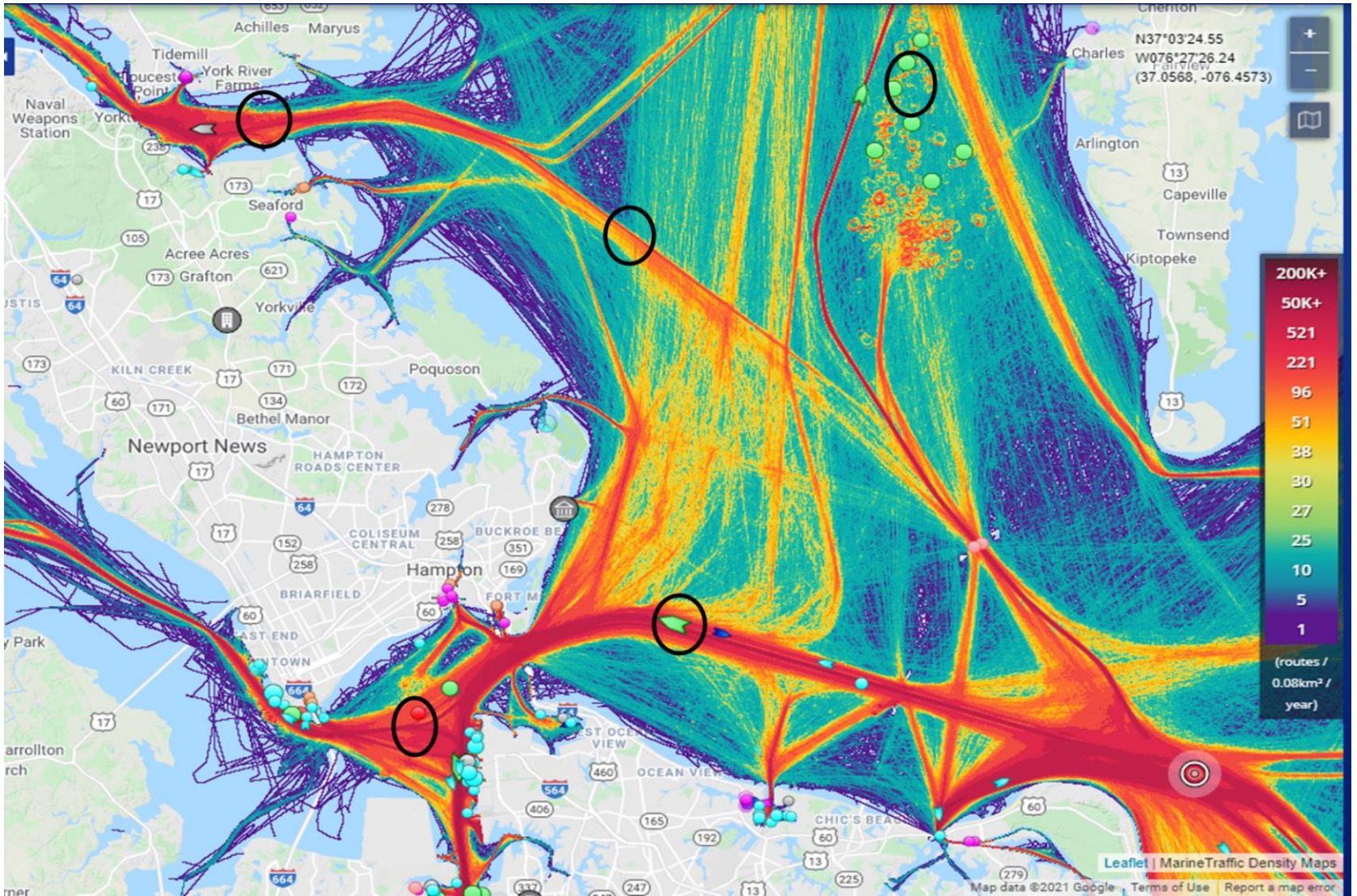
AIS vessel density map of the Northern Neck area. Black open circles are proposed discharge locations (from DEQ)



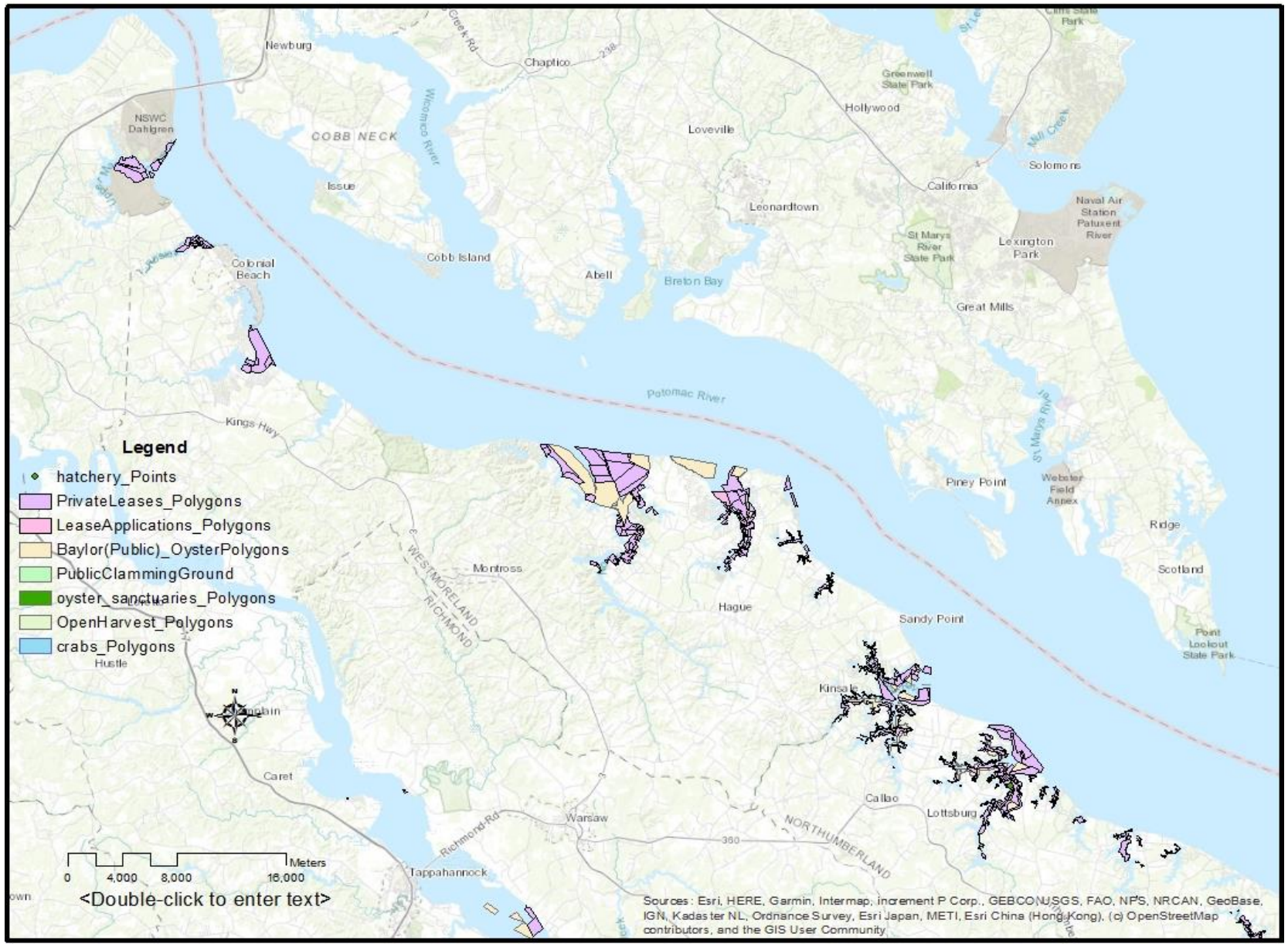
AIS vessel density map of the Middle Peninsula area. Black open circles are proposed discharge locations (from DEQ).



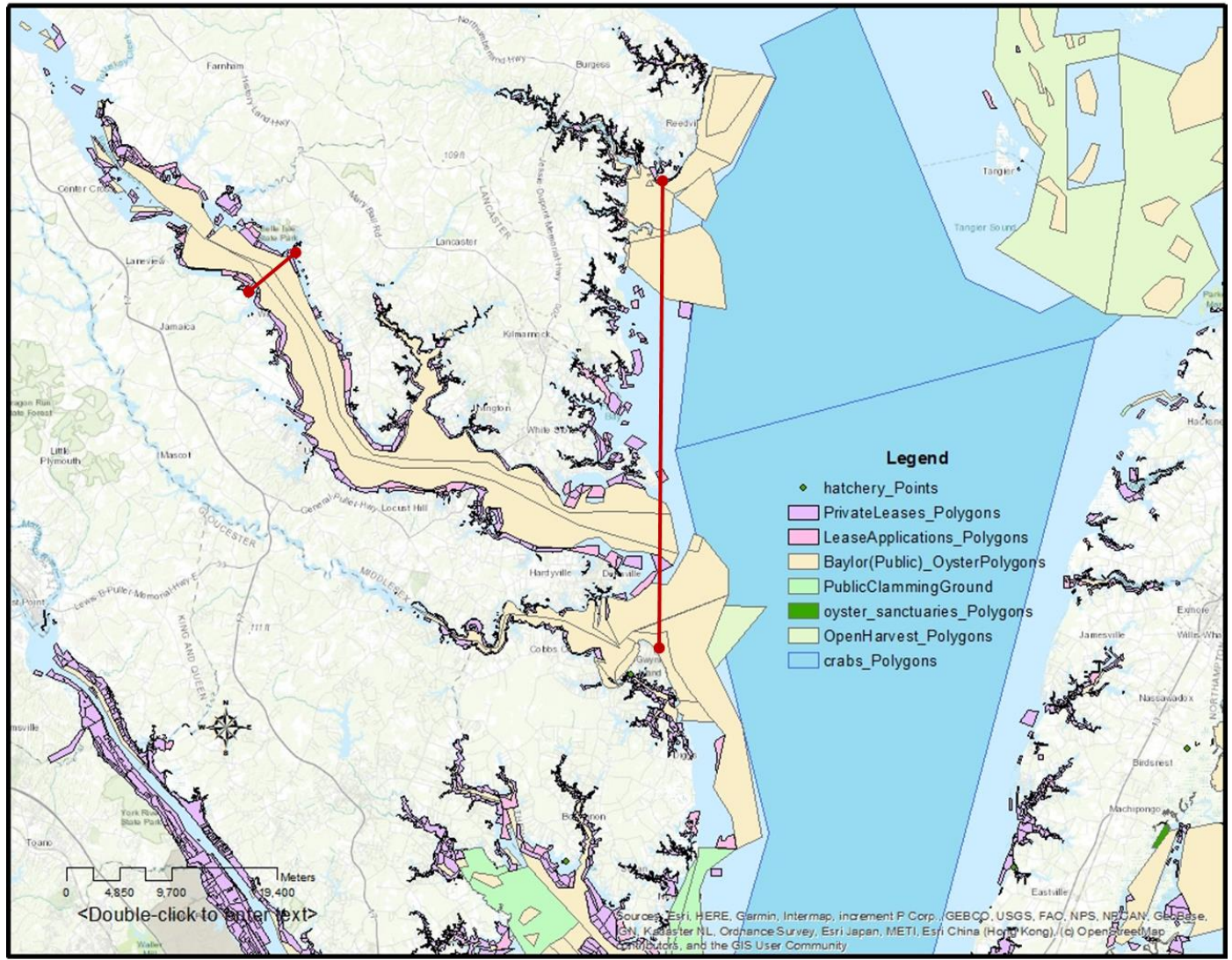
AIS vessel density map of the Hampton Roads/Tidewater area. Black open circles are proposed discharge locations (from DEQ).



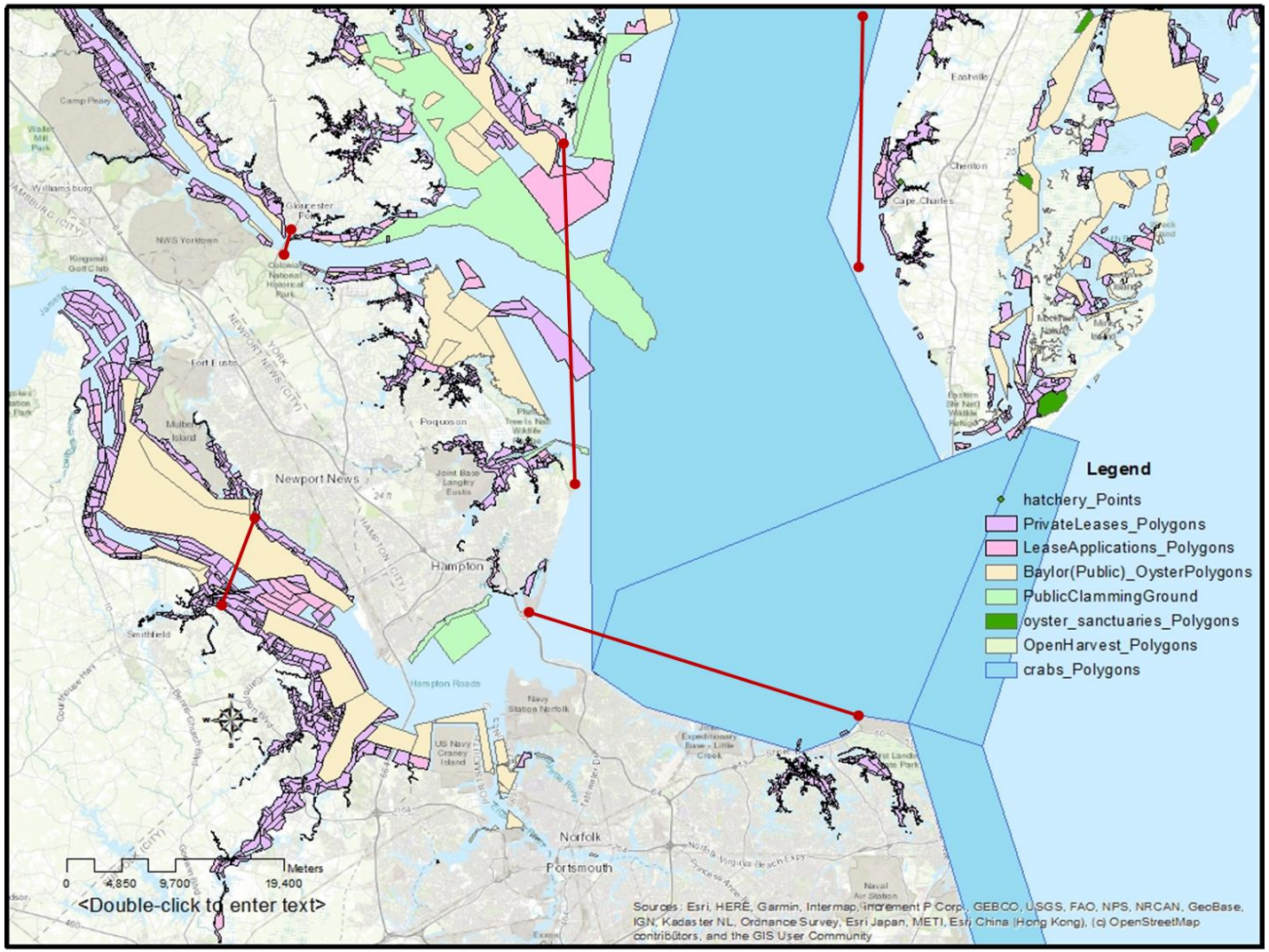
Western Northern Neck shellfish leases and grounds (from DEQ)



Northern Neck and northern half of middle peninsula shellfish leases and grounds. Two proposed gates are illustrated with red bars.



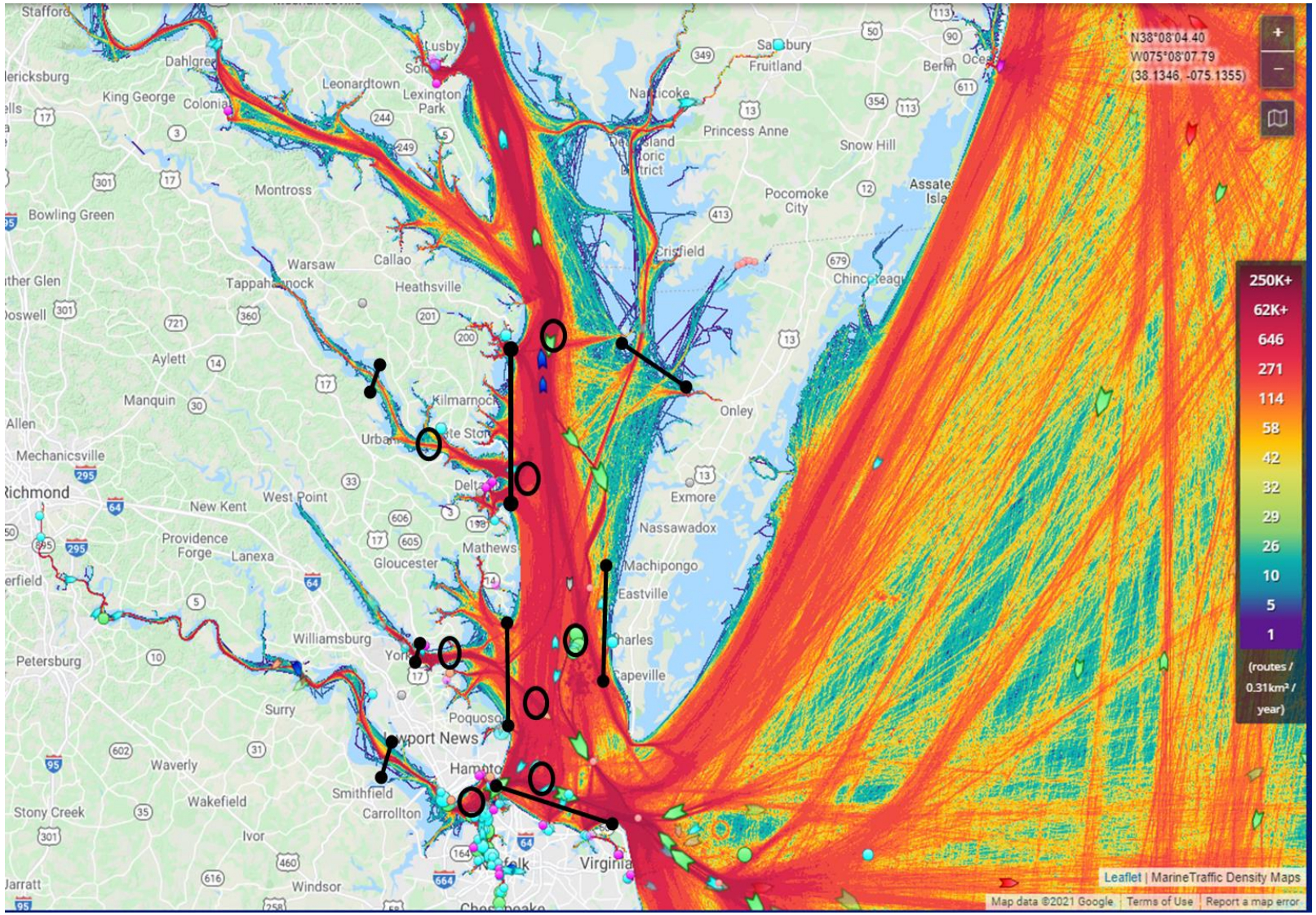
Southern Bay and tributaries shellfish leases and grounds. Five proposed gates are illustrated with red bars.



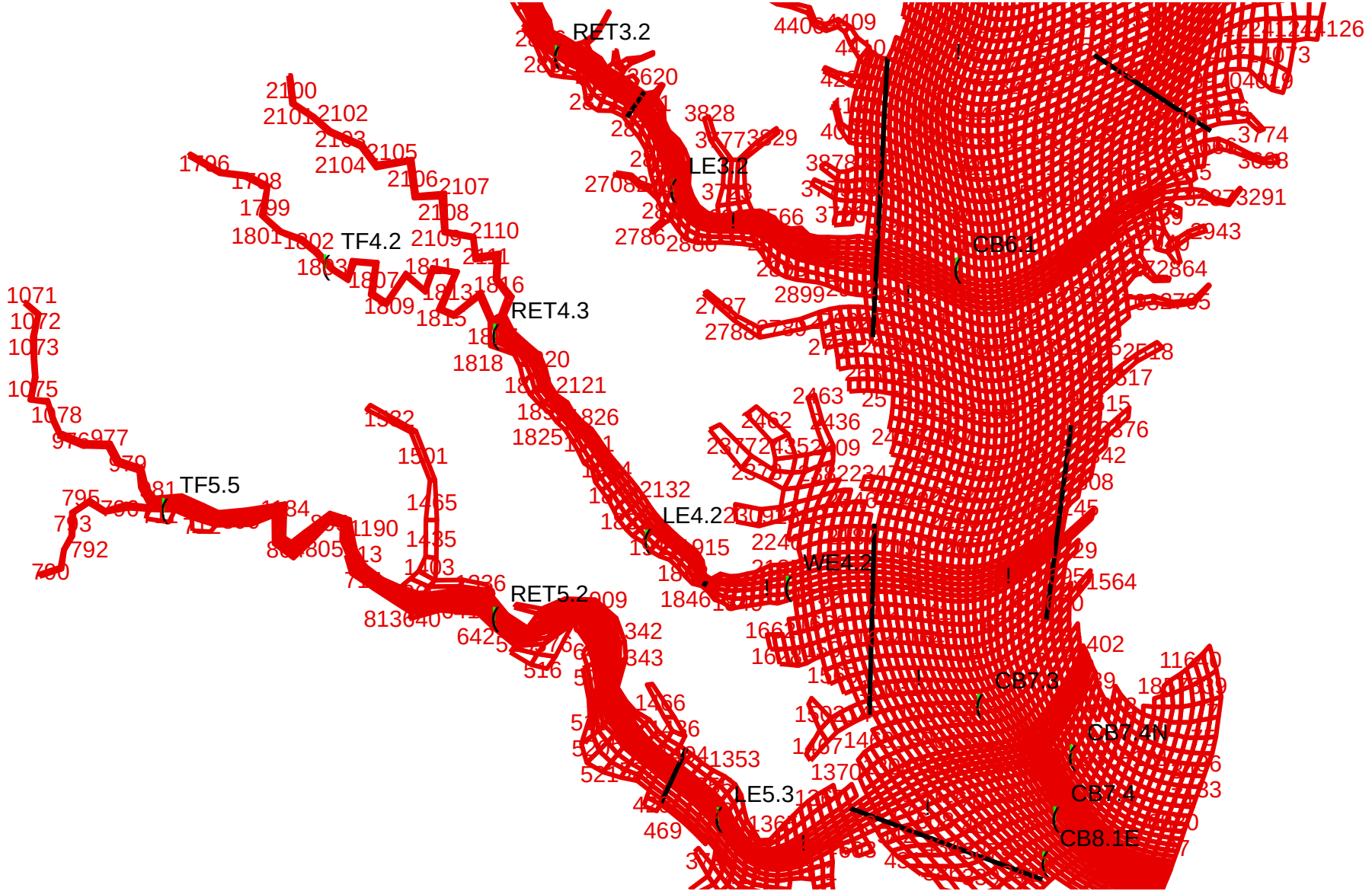
Proposed gate locations were selected based on a number of factors including:

- **Presence of shellfish leases and public shellfish grounds**
- **VDH shellfish closures (Virginia Department of Health)**
- **Slow to intermediate flushing rates**
- **State parks and public beaches**

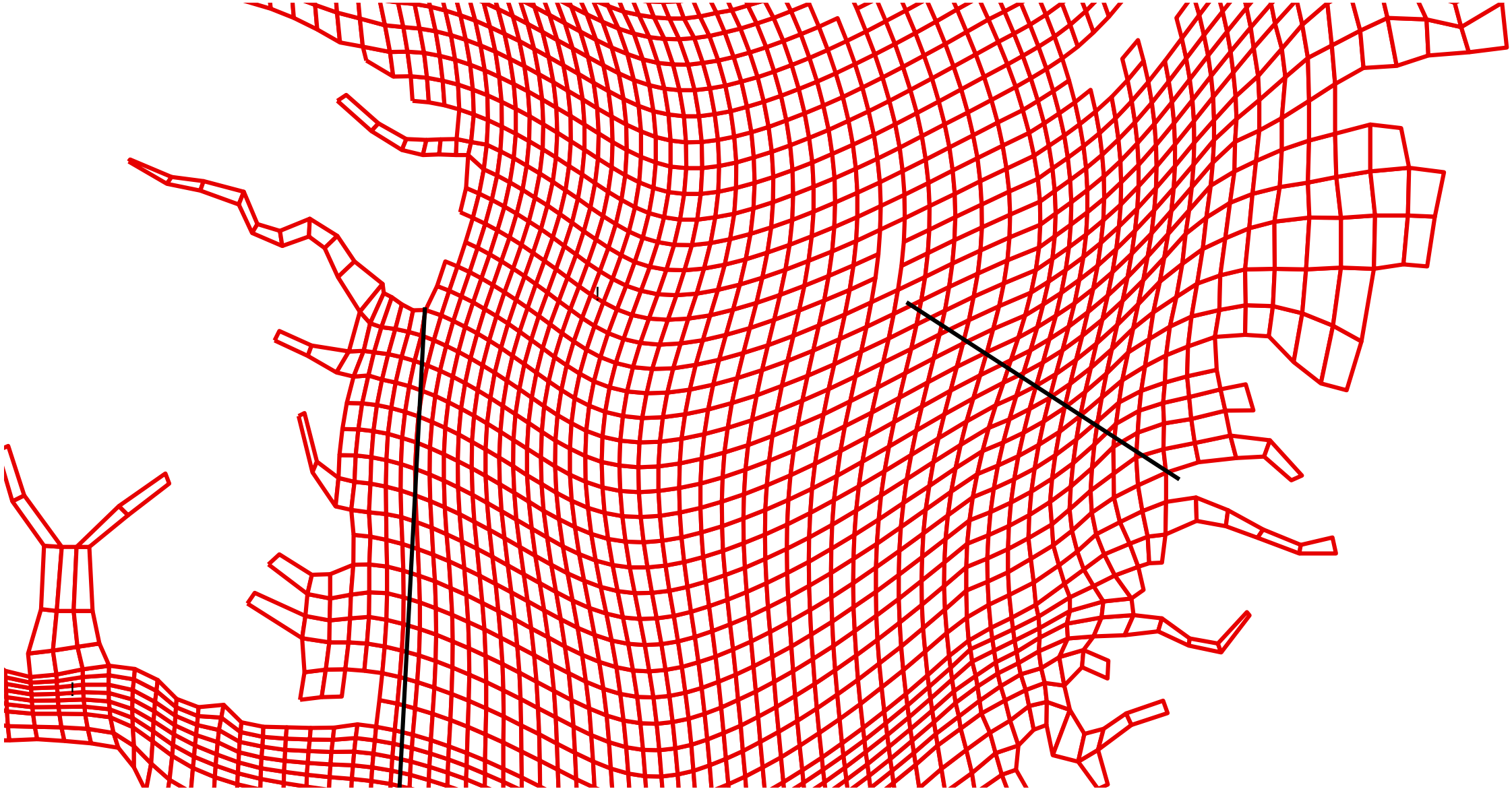
All proposed discharge locations are illustrated with a black, open circle. All proposed gates are illustrated with a black bar.



Discharge locations and tracer flux gates on the model grid



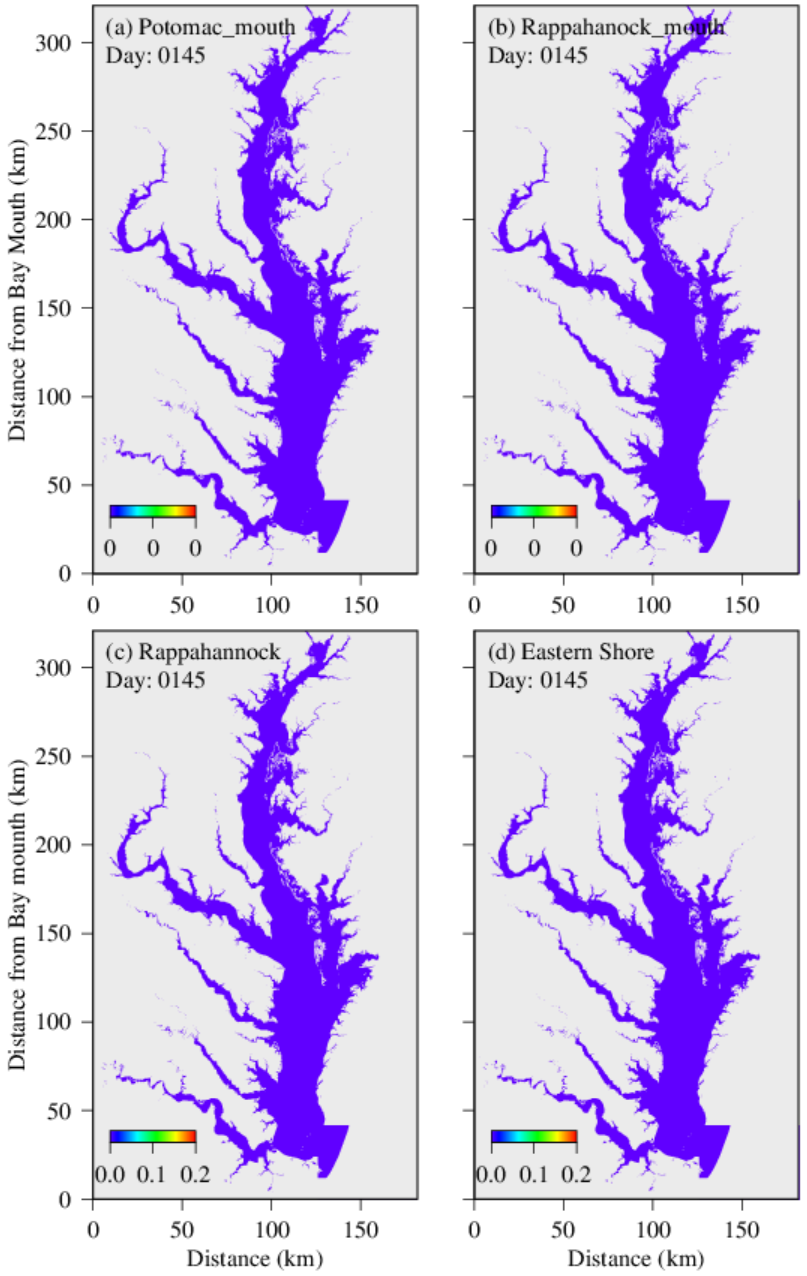
Gates along the grid versus crossing the grid



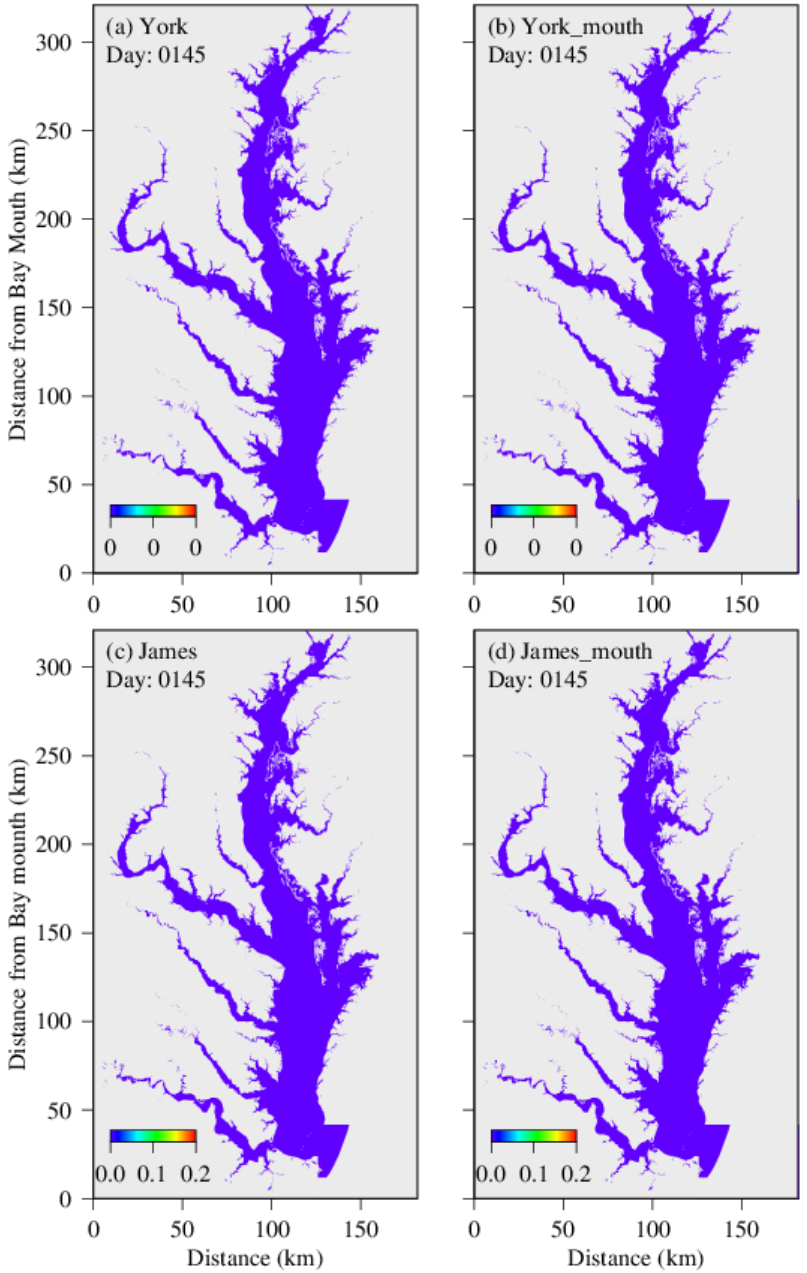
A test case

- 1994 hydrodynamics
- Tracer continuously released from Jun. 1 through Sep. 31.
- 500k pounds per day
- Model ran 2 years from 1994 to 1995
- Movie stopped at the end of 1994.

Northern tributaries



Southern tributaries



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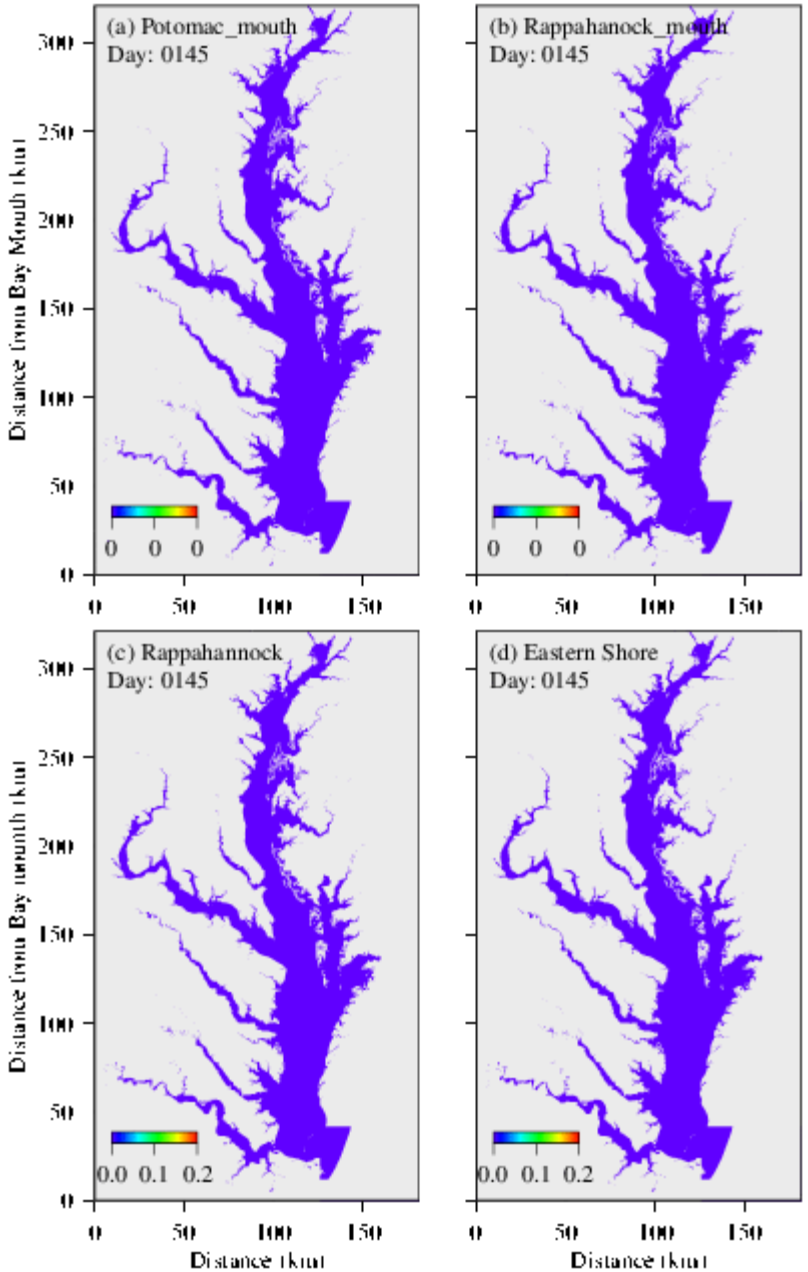
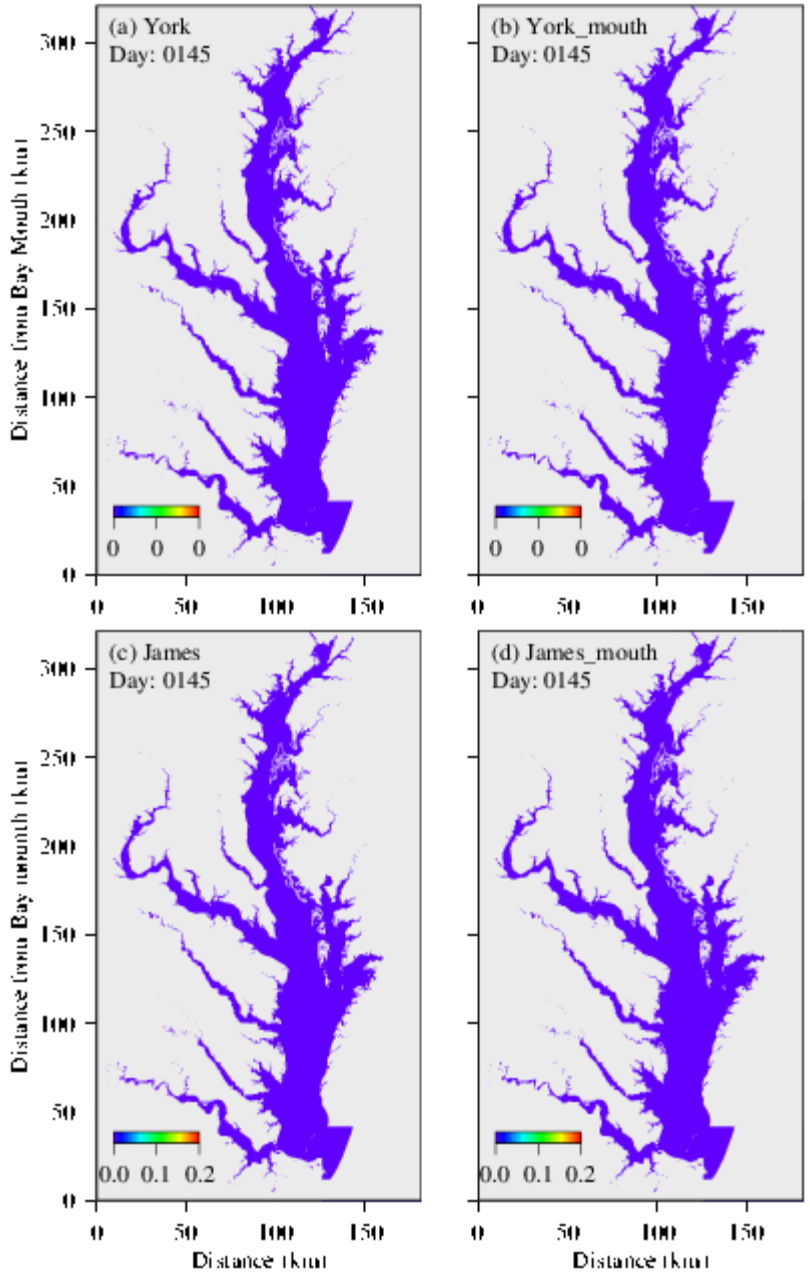
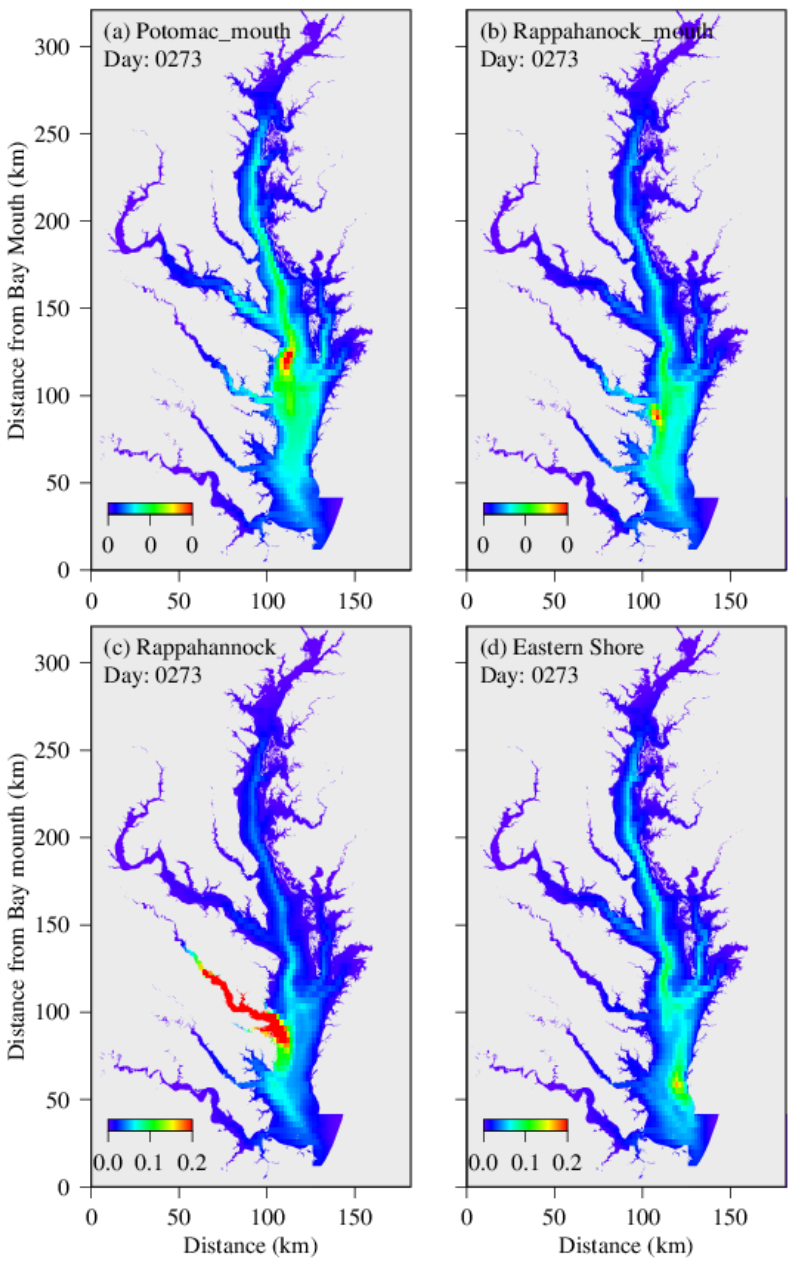


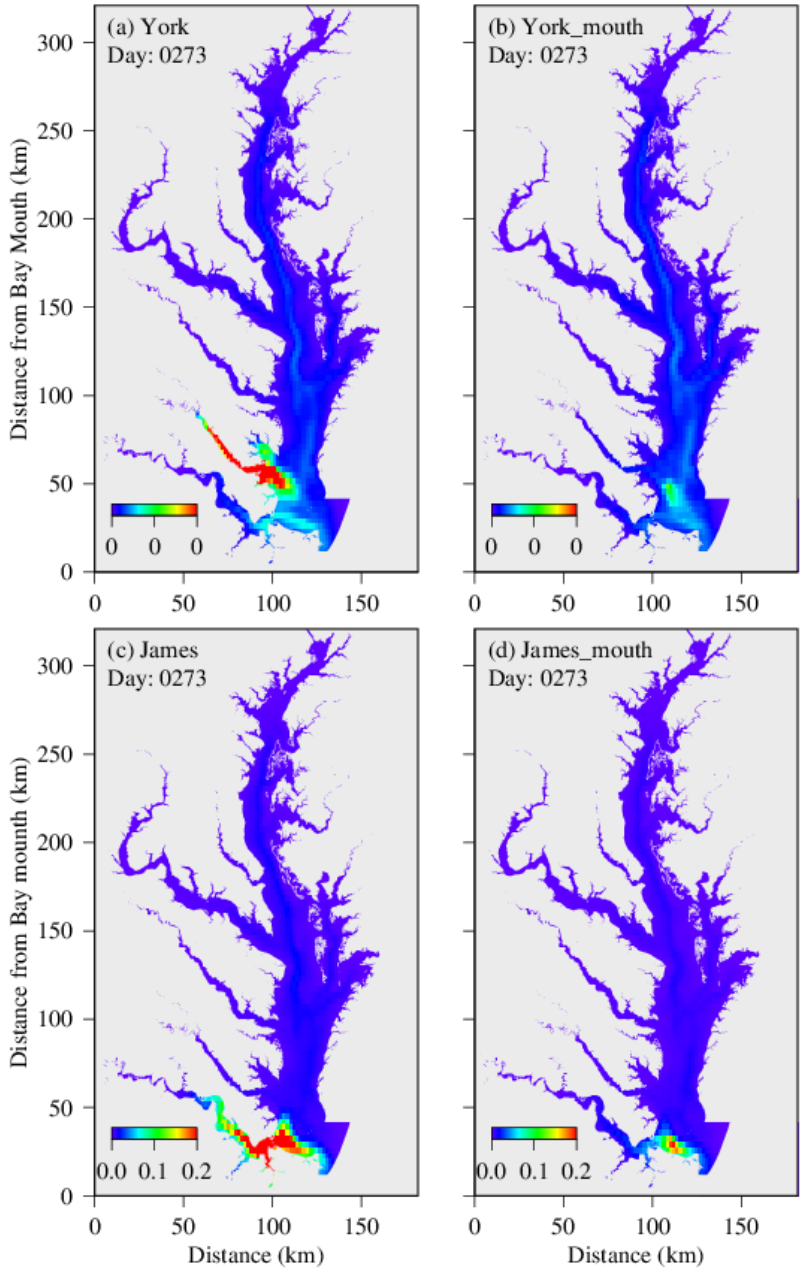
Southern tributaries



Northern tributaries



Southern tributaries



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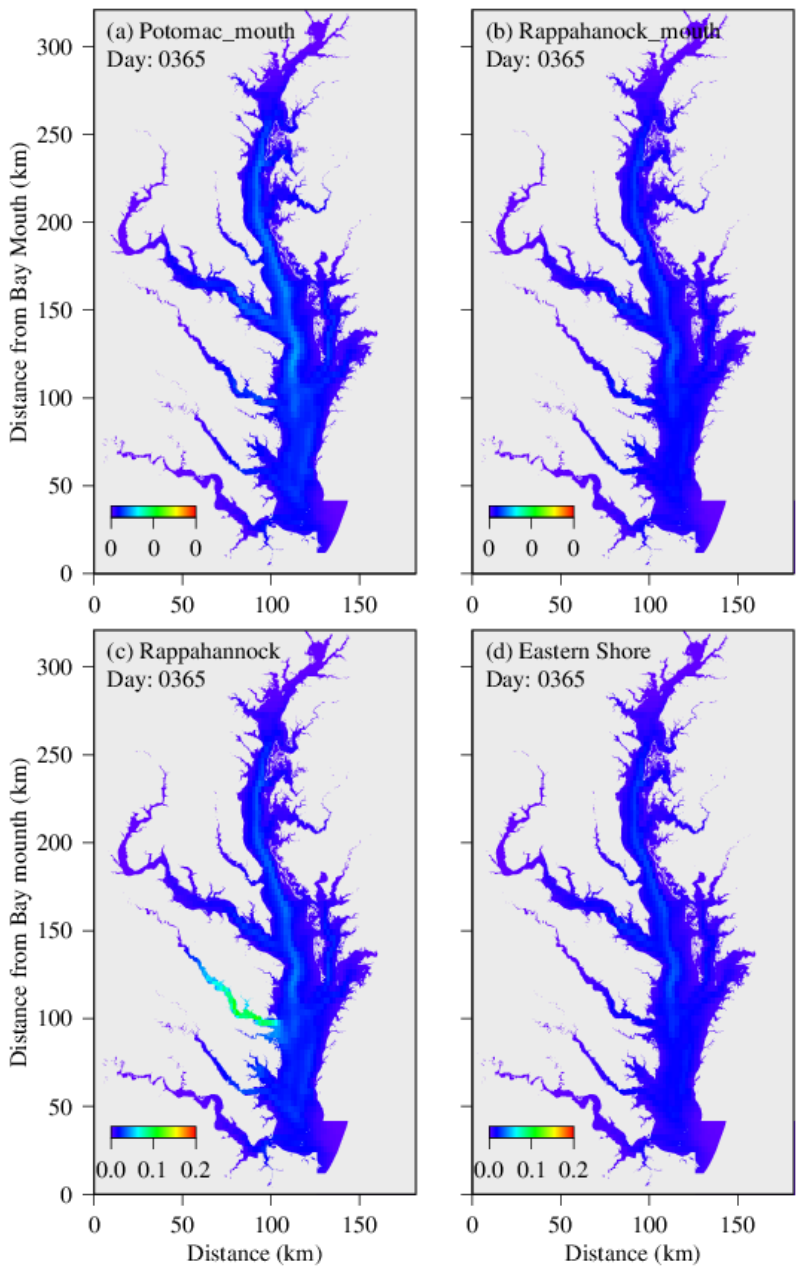
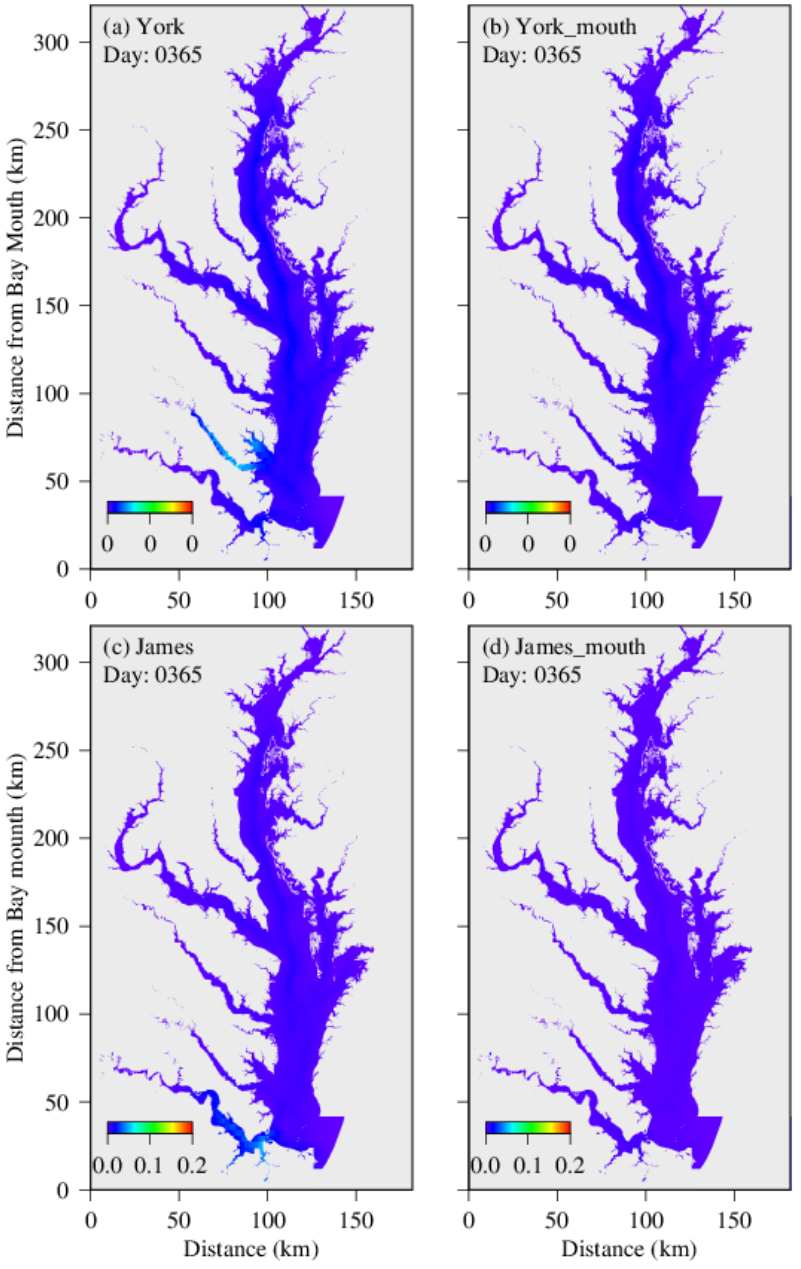


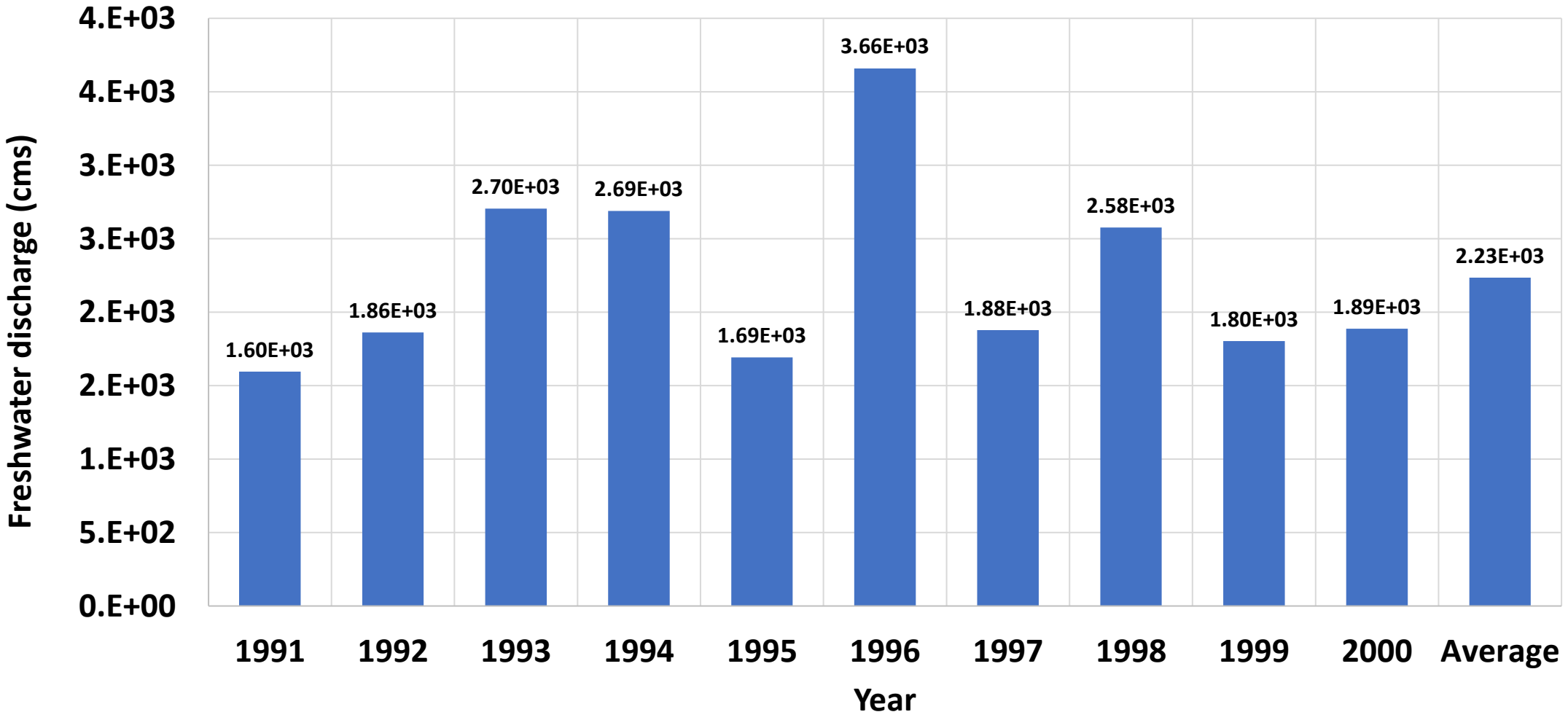
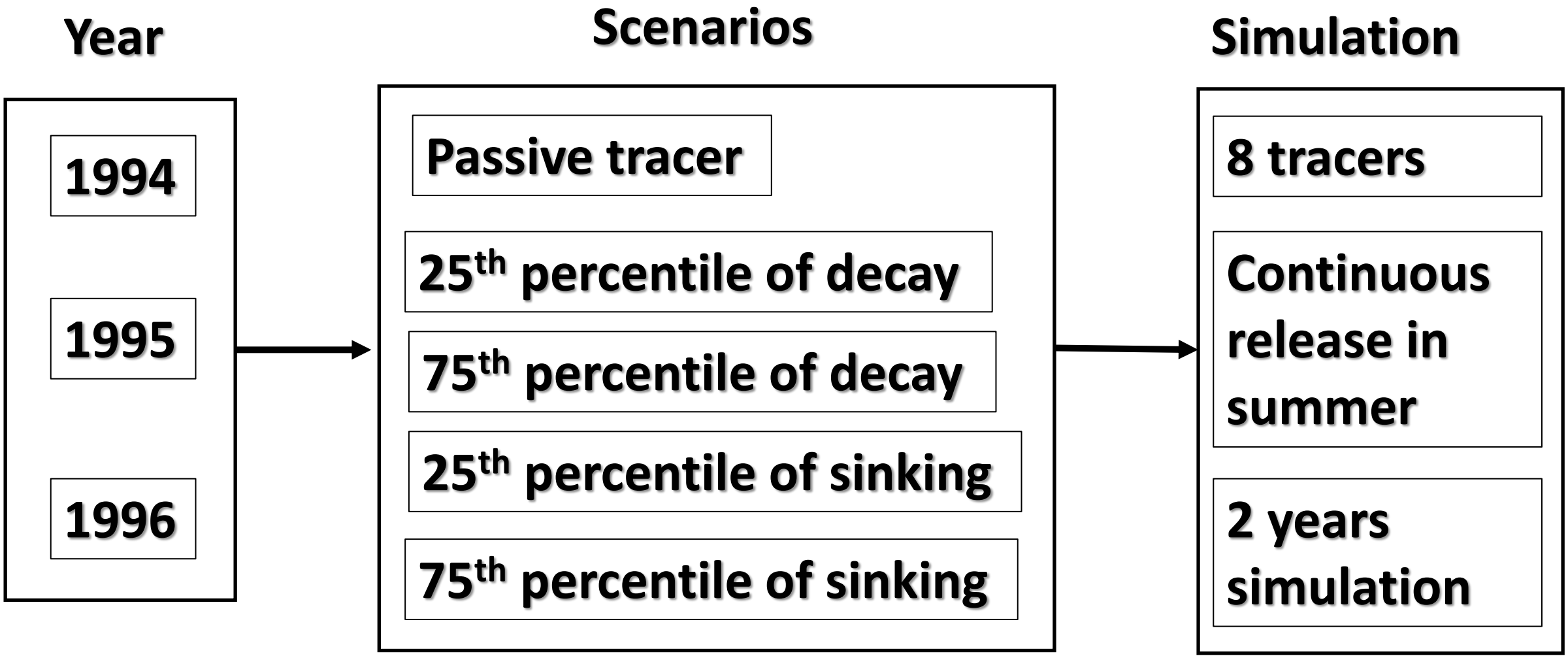
Southern tributaries



Assumptions and outstanding questions

- **The simulation will include a conservative (persistent), neutrally buoyant tracer.**
  - **Is it possible to include some decay rate (and sinking) in the tracer to be representative of enteric bacteria die off?**
- **All discharges would release and be tracked independently at each gate over some simulation period.**
  - **Will the discharge be set up as a one-time discharge or as a continuous release at a defined rate?**
  - **Is it possible to have a variable discharge rate through the simulation (heavier on weekends in the summer)?**
- **The conditions under which the simulation takes place should consider critical conditions (e.g. summer).**
  - **What are our options for seeing the effect of variable flow and weather?**
  - **Will the current modeling assumptions for a ten-year meteorological and hydrodynamic cycle (the “average” conditions) be used in the simulations?**

Freshwater discharge



Simulation plan