

EXPLAINING THE PATH AND FATE OF A FIRE-TRAINING AREA PFAS PLUME NEAR TWO CAPE COD LAKES: UNDERSTANDING GROUNDWATER-LAKE INTERACTIONS IS THE KEY



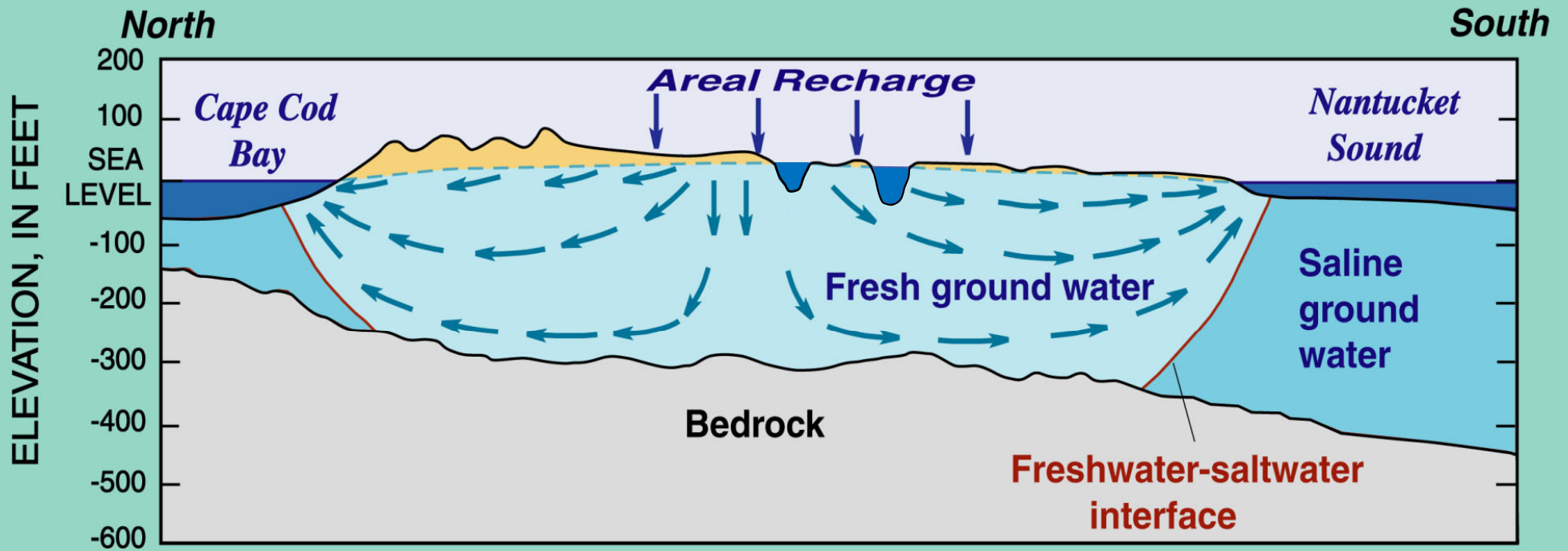
Federal Remediation Technology Roundtable
November 7, 2018



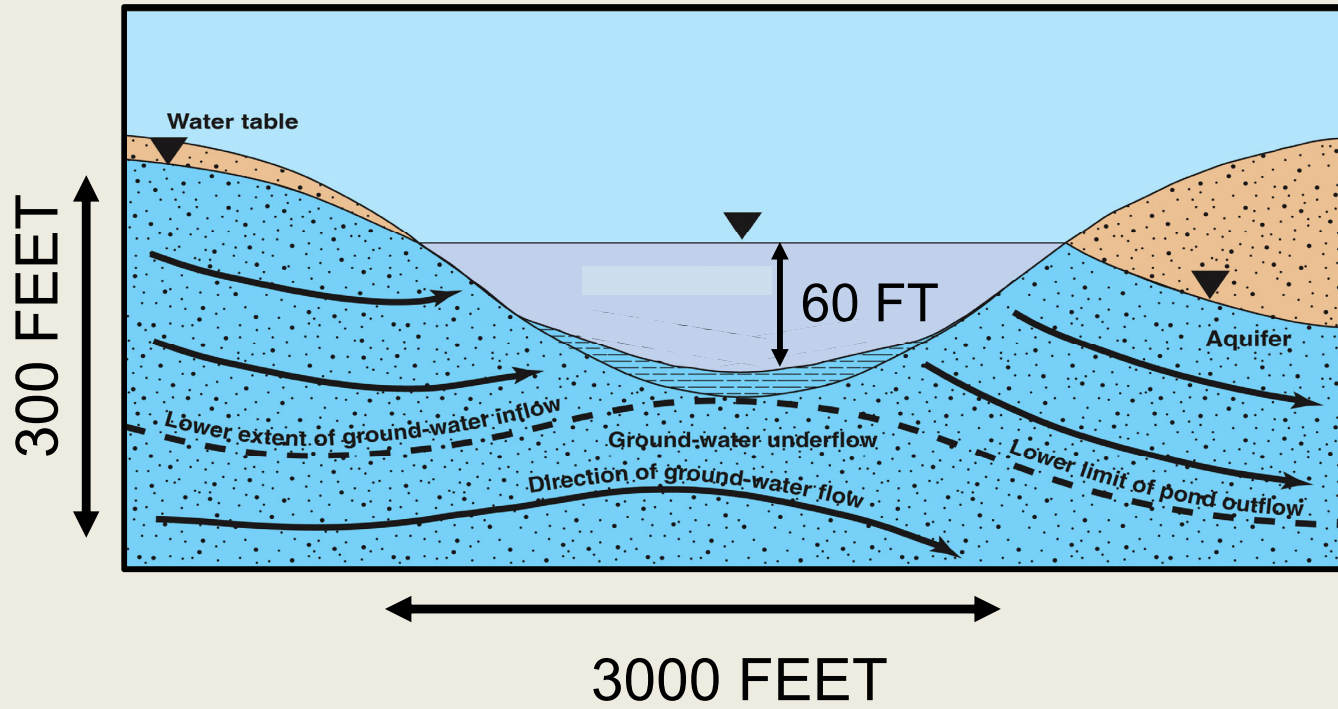
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Division*
³*Harvard University*
⁴*Air Force Civil Engineer Center*

Support from
Toxic Substances Hydrology Program
Earth Systems Processes Division
Air Force Civil Engineer Center
Harvard University



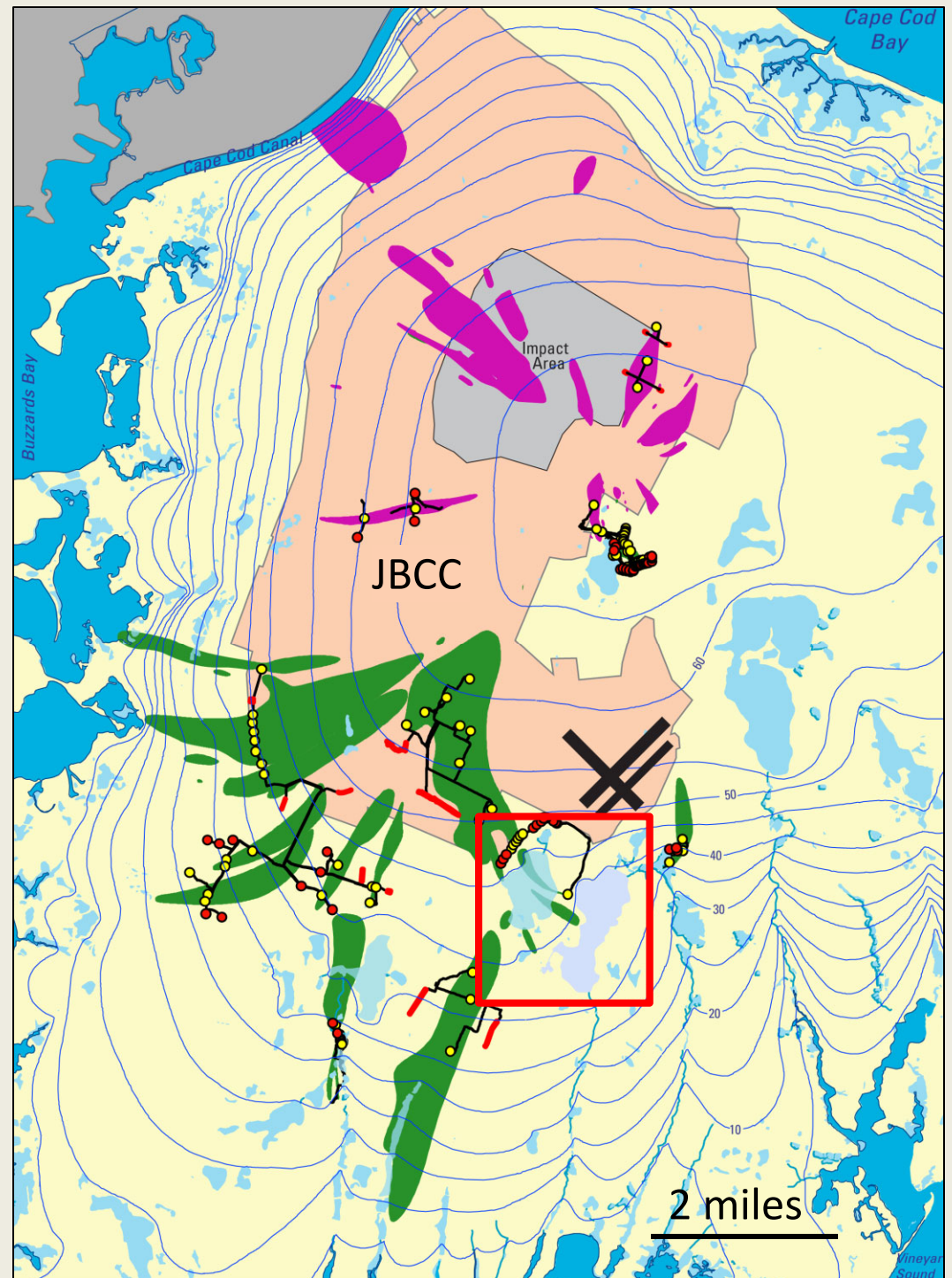
Hydrologic Cross Section of Western Cape Cod

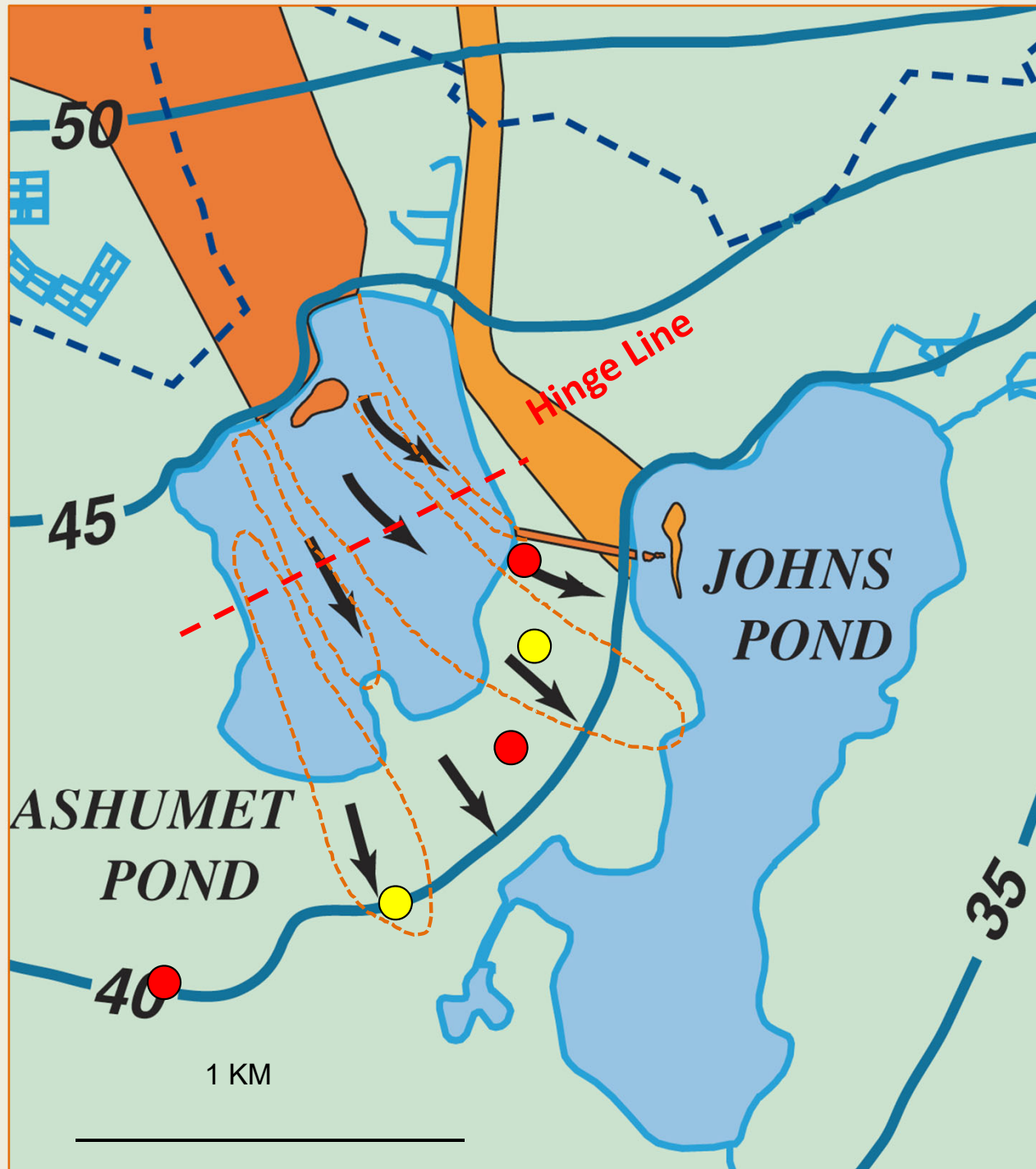


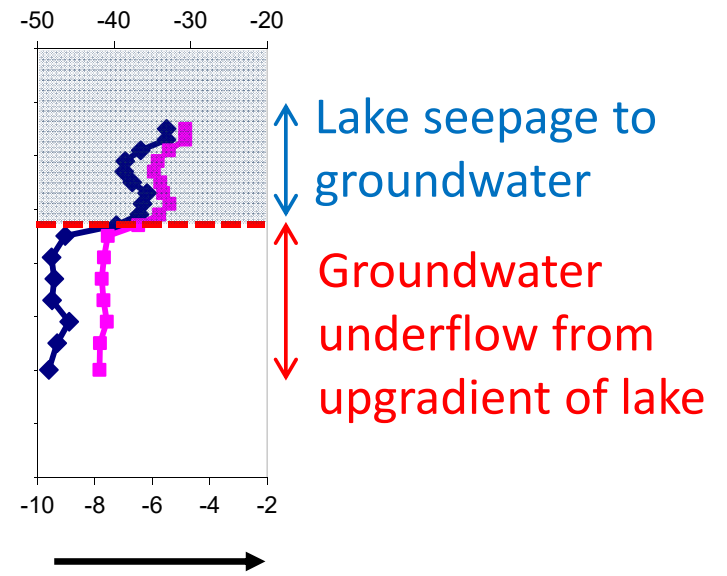
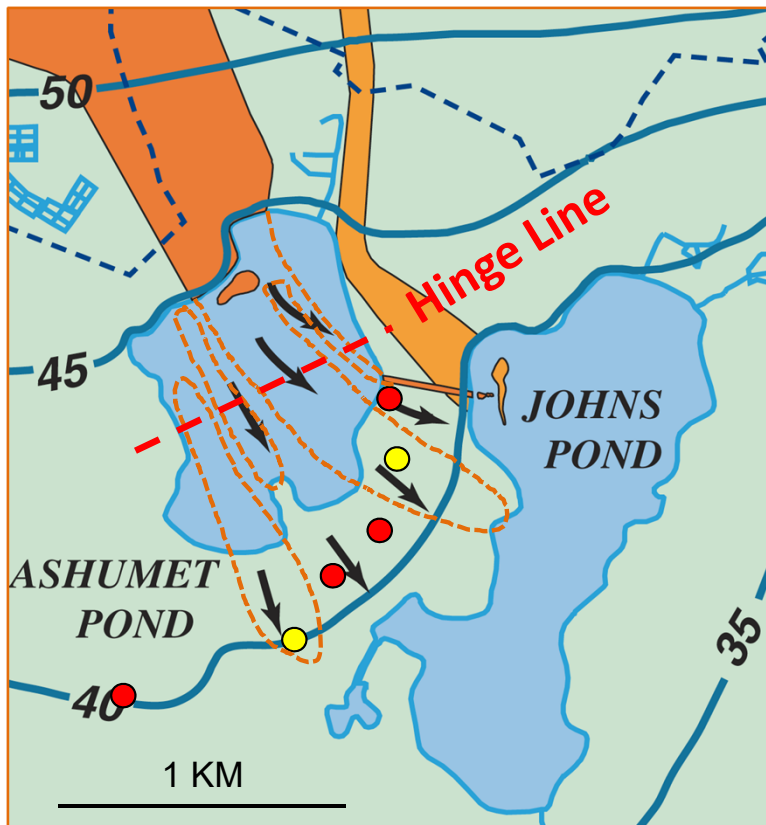
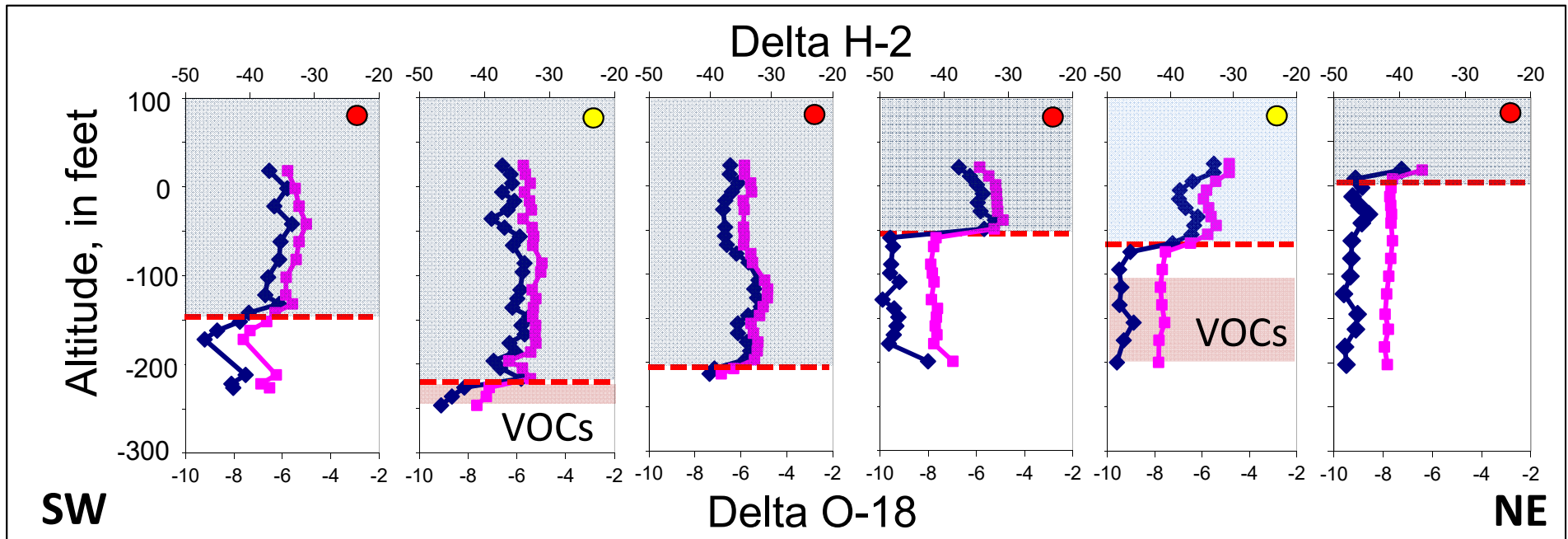
Joint Base Cape Cod Plumes

2007

- Solvents and Fuels
- Explosives and Perchlorate
- Extraction Well
- Injection Well or Infiltration Gallery





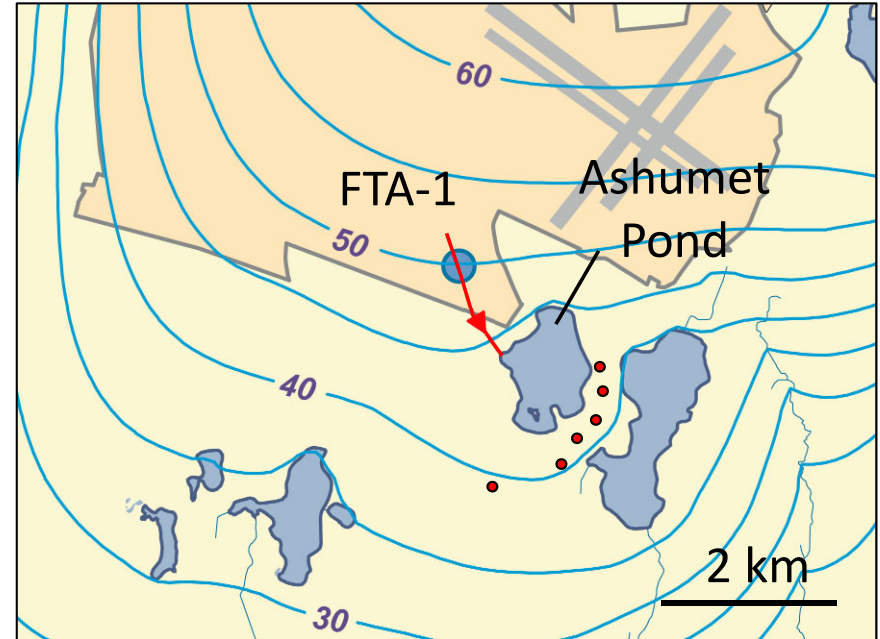


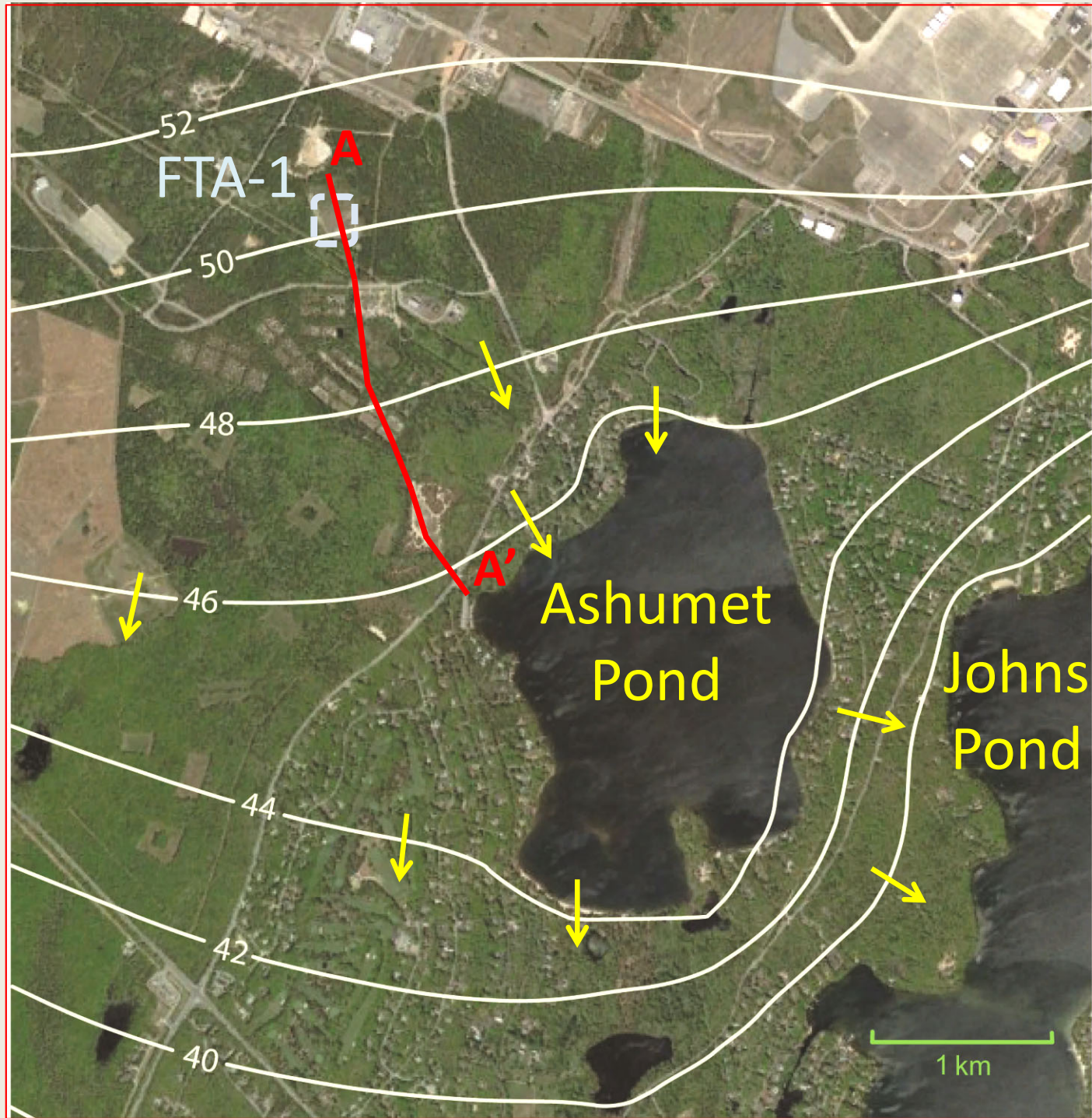
Not for citation
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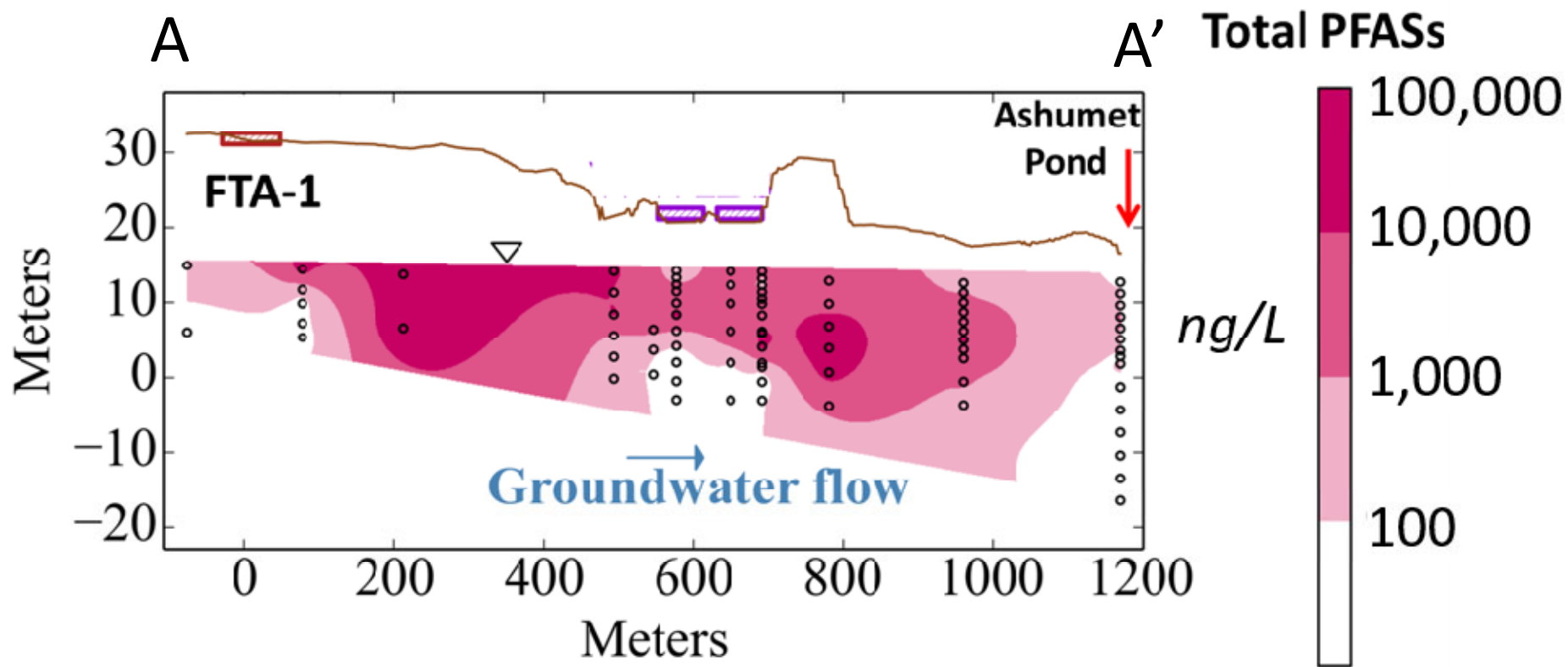


Fire-Training Area 1 Joint Base Cape Cod

- Operated from 1958 to 1985
- PFAS-containing foams used from about 1970 to 1985





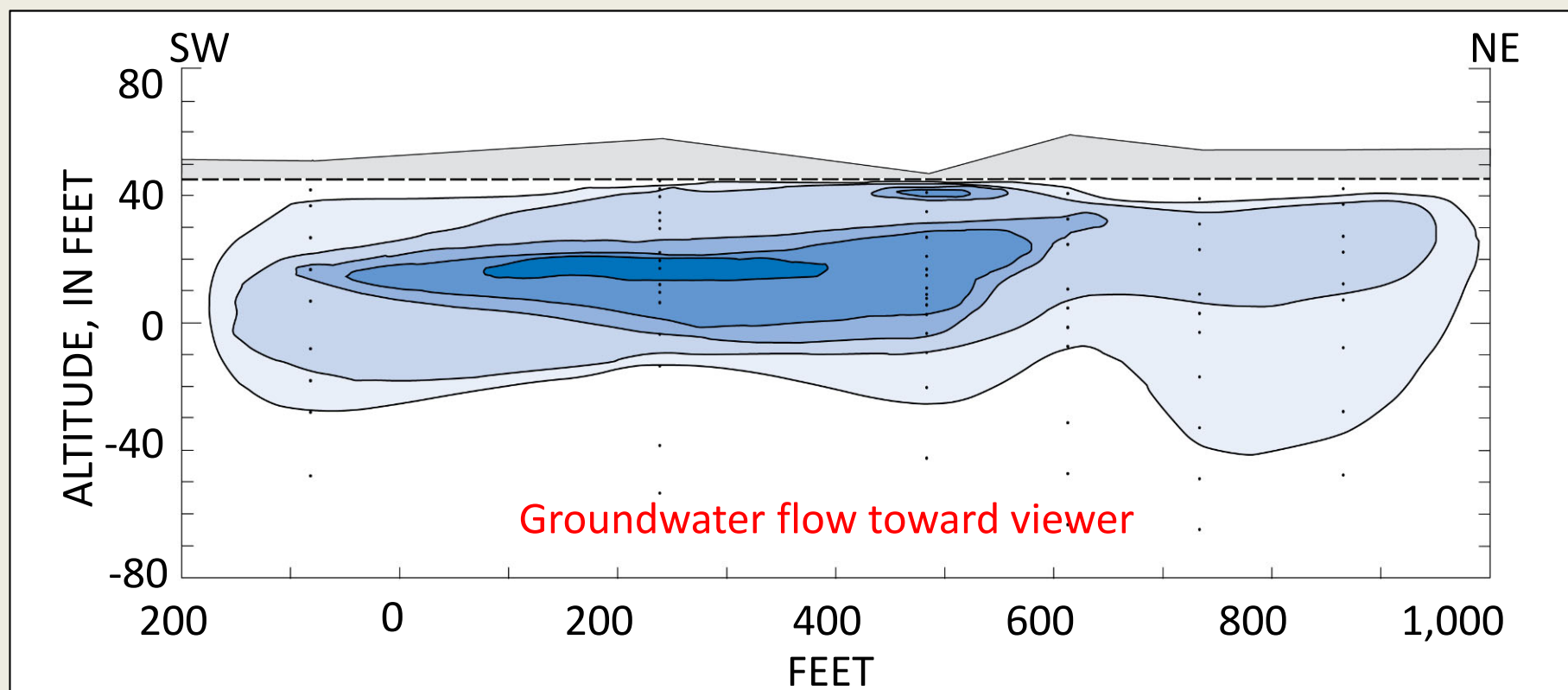
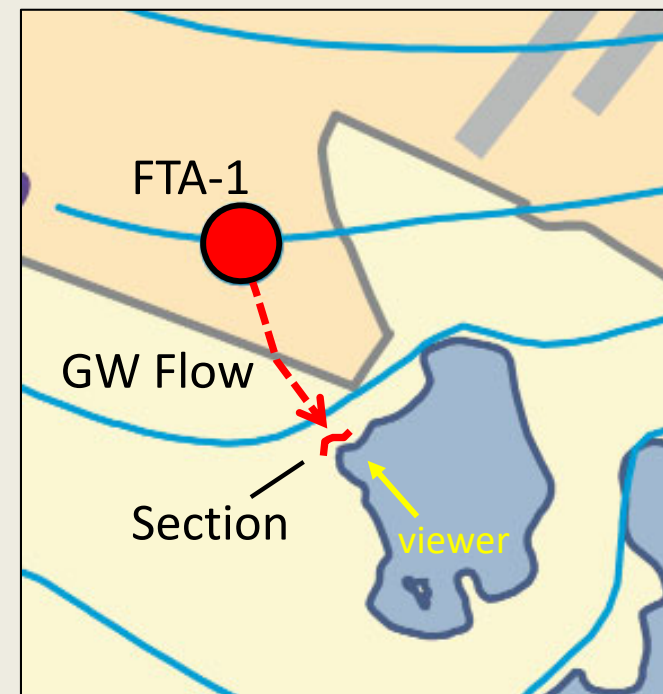
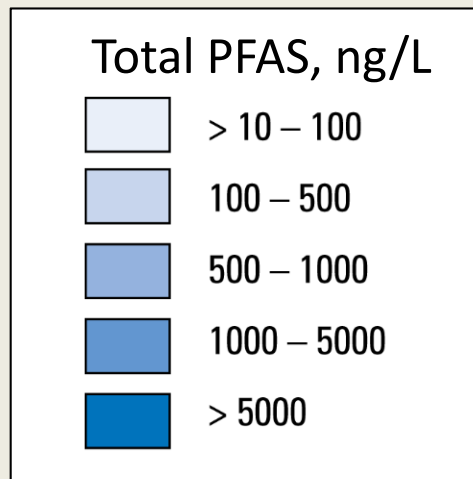


Weber et al., 2017, ES&T

Ashumet Pond
Total PFASs = 240 ng/L

PFAS Plume Intersects Shore of Ashumet Pond

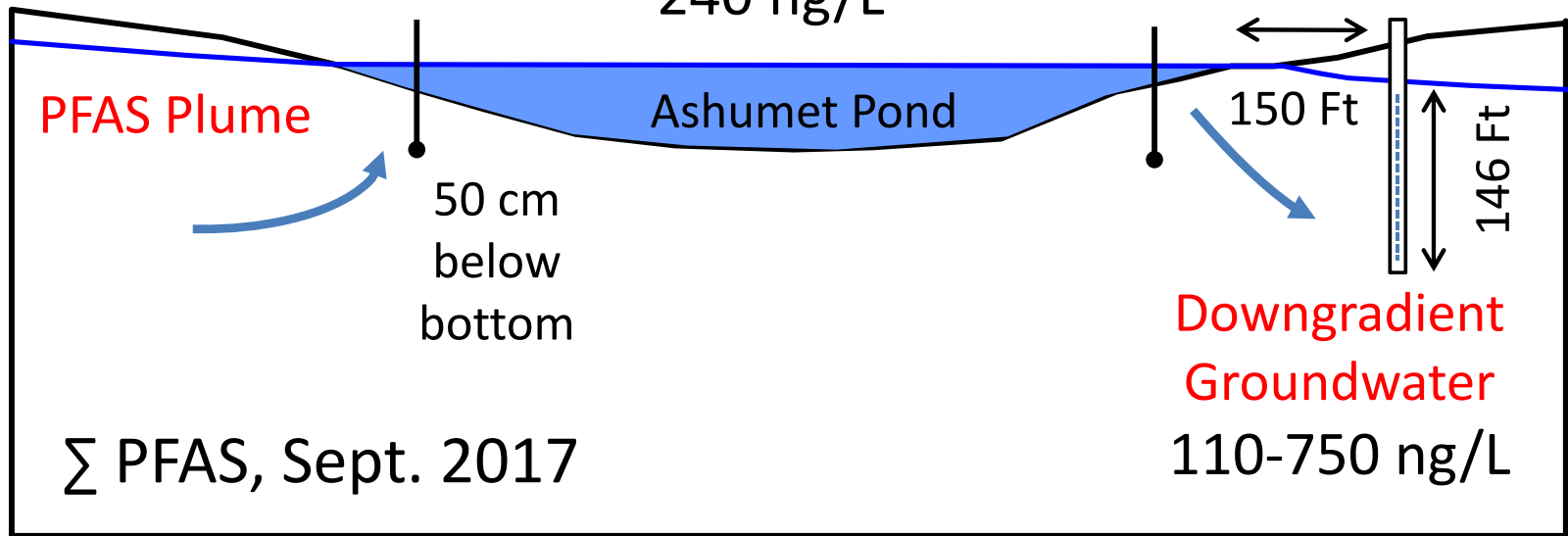
- Mass flux across section explains 25% of PFAS concentration in pond
- Uncertainties:
 - simulated water flux
 - concentration interpolation
 - precursors
 - other sources



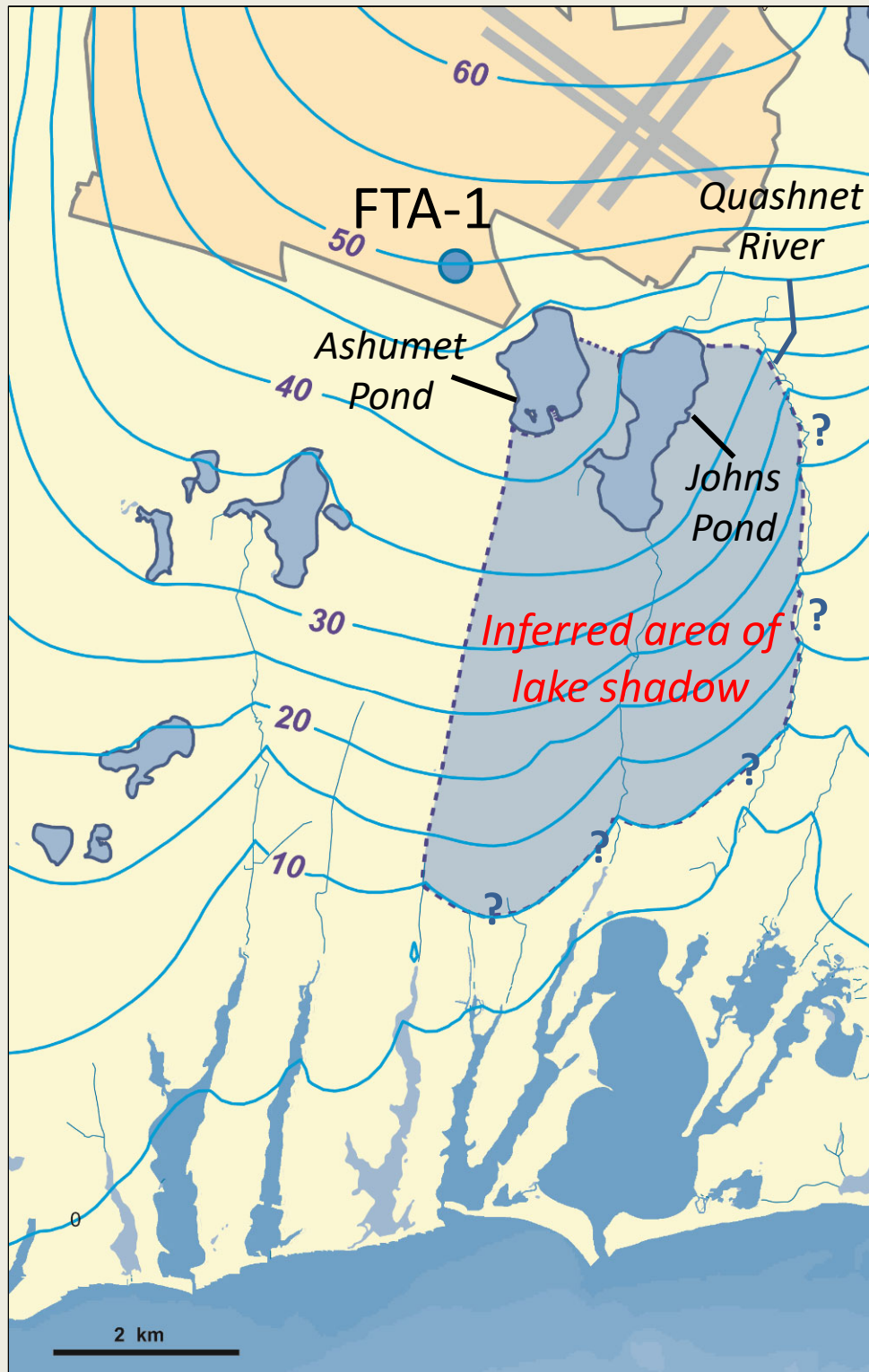
Groundwater Inflow
680 ng/L

Lake Water
240 ng/L

Lake Water Outflow
280 ng/L



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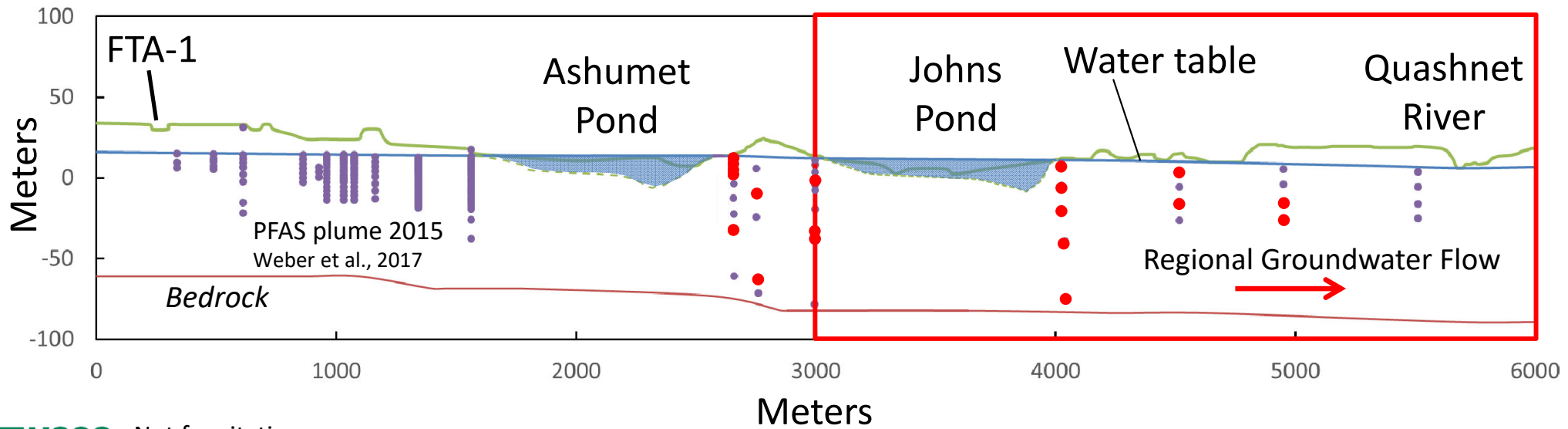
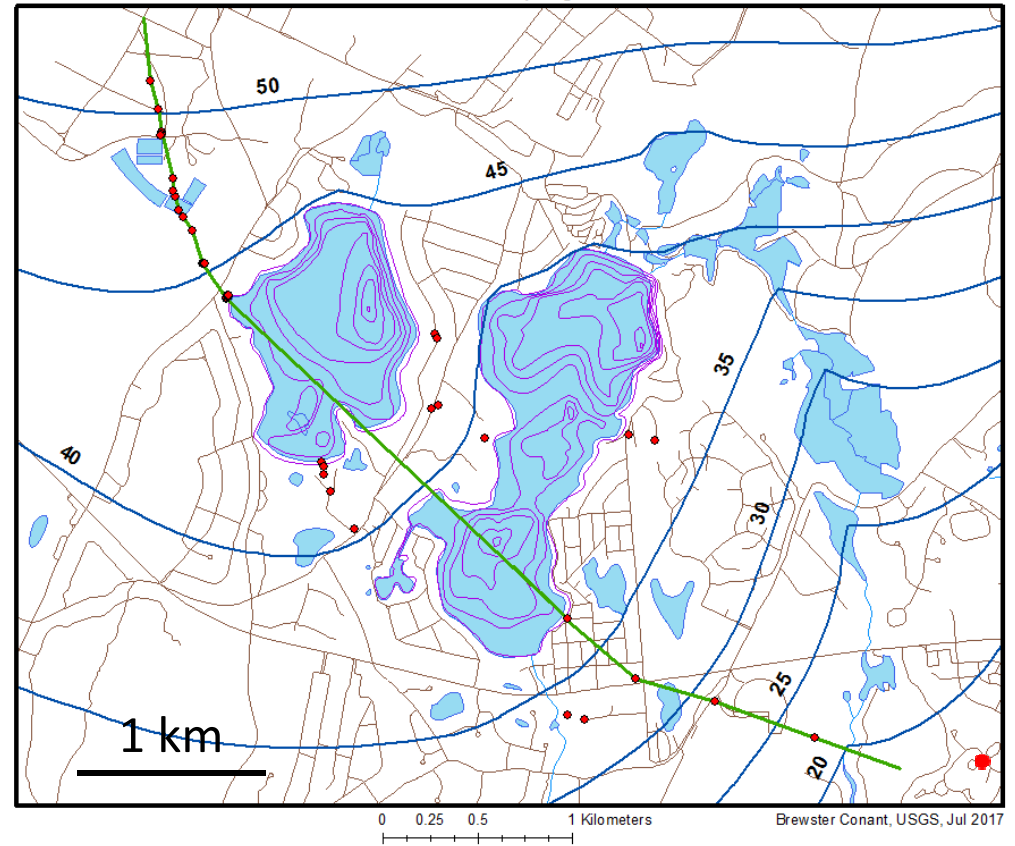
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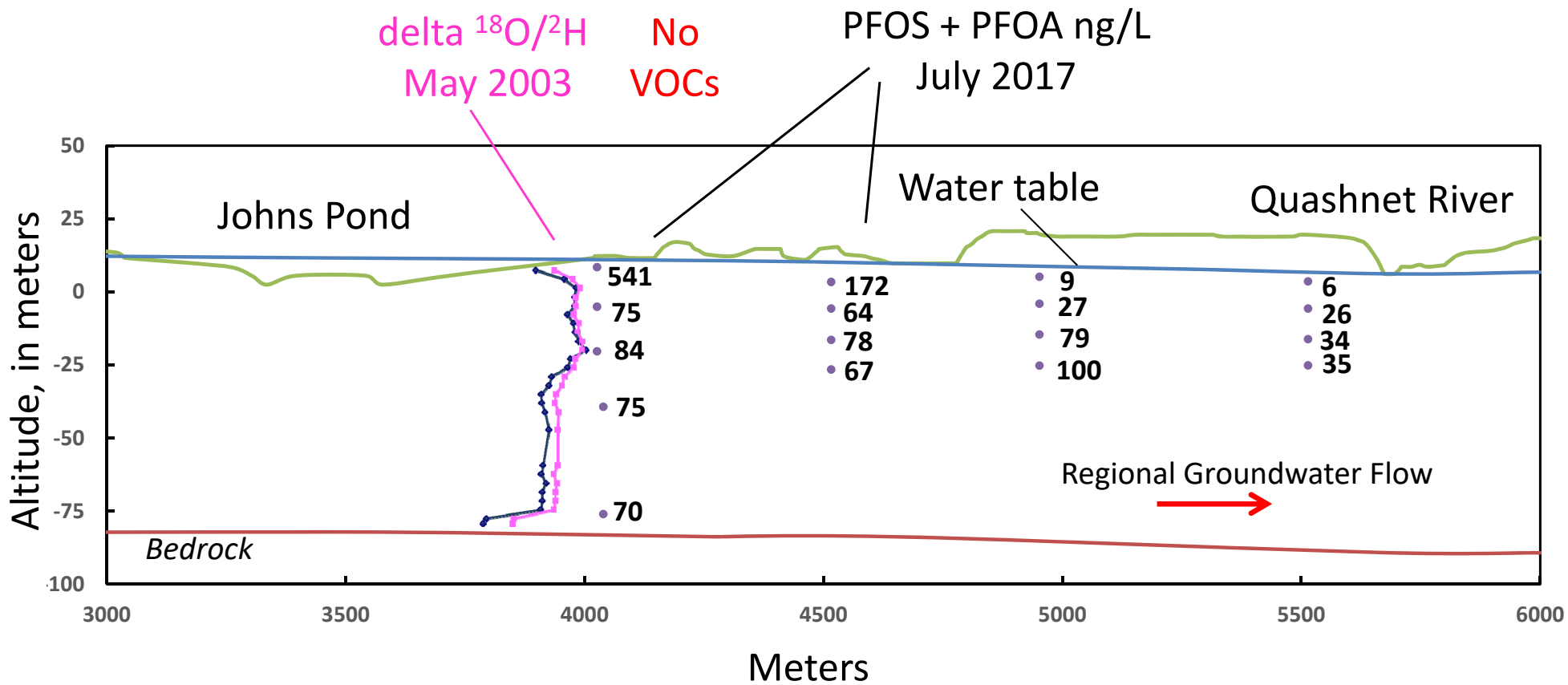


PFASs Downgradient from Ashumet and Johns Ponds

July-Sept 2017

- PFOS + PFOA > 70 ng/L
[EPA Health Advisory]





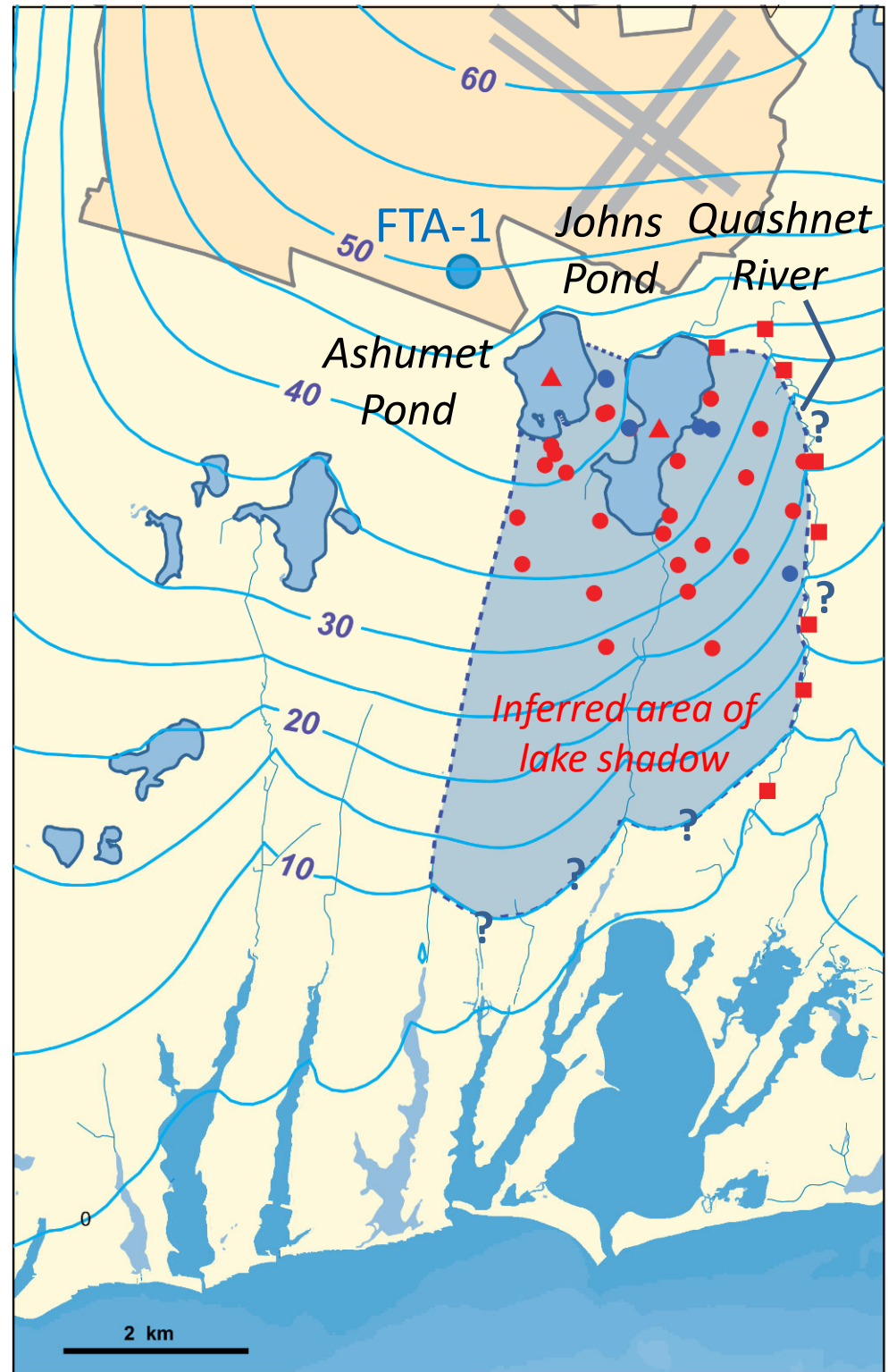
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PFASs Near Ashumet and Johns Ponds 2017

PFOS + PFOA > 70 ng/L
EPA Health Advisory

- Groundwater
- ▲ Lake water
- River water

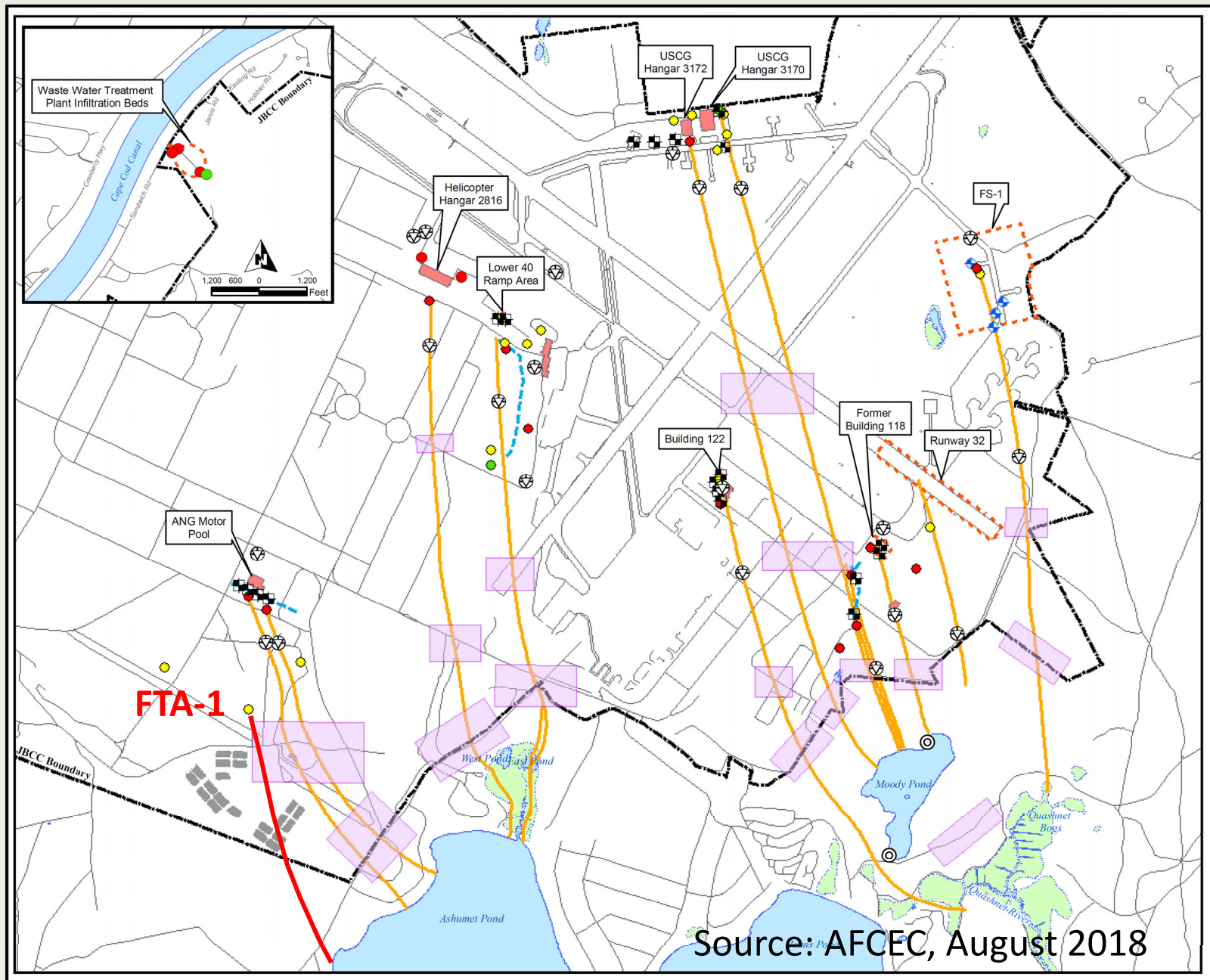


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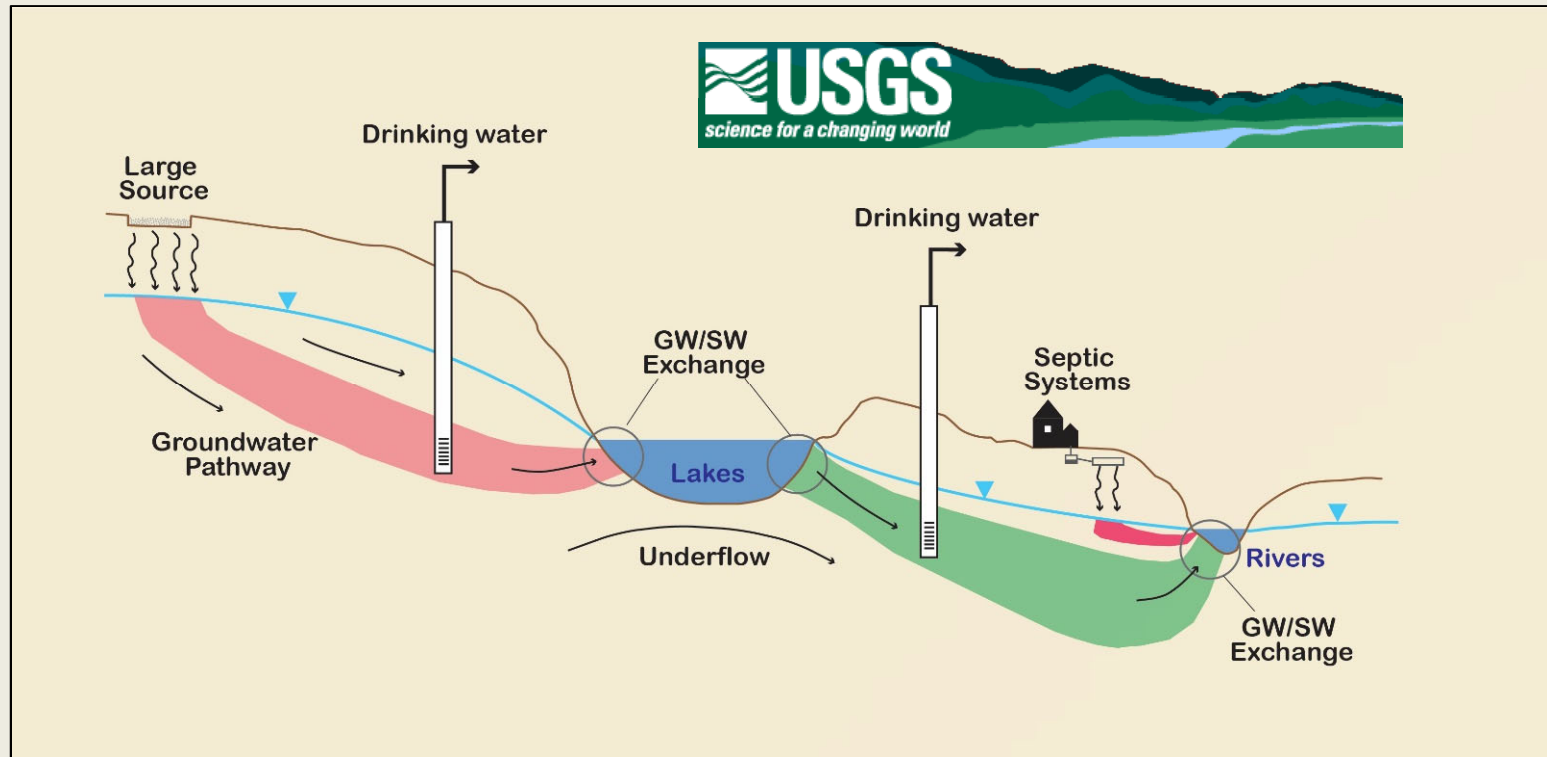


Results from
USGS and AFCEC

Other Identified Potential PFAS Sources on JBCC and Simulated Flow Paths to Lakes and Rivers



Summary



- Lakes are often an important part of groundwater systems
- Groundwater flow near the lakes can affect plume paths at local and regional scales
- At Cape Cod the spreading of the FTA PFAS plume is greatly increased by the lake/groundwater interactions

For More Information

Installation Restoration Program at Joint Base Cape Cod

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Cape Cod Toxic Substances Hydrology Project

https://toxics.usgs.gov/investigations/cape_cod/index.php

Groundwater resources of Cape Cod

<https://ma.water.usgs.gov/projects/capegwresources/>

Cape Cod lakes and plumes

Weber et al. (2017) PFAS plume:
<http://dx.doi.org/10.1021/acs.est.6b05573>

McCobb et al. (2018) Plume/lake interaction:
<https://doi.org/10.1016/j.jenvman.2018.02.083>

Stoliker et al. (2017) Plume/lake interaction:
<http://dx.doi.org/10.1021/acs.est.5b06155>