INVESTIGATING SUBMARINE GROUNDWATER DISCHARGE ALONG THE SOUTH SHORE OF GREAT SALT LAKE

UTAH DEPARTMENT OF Natural Resources

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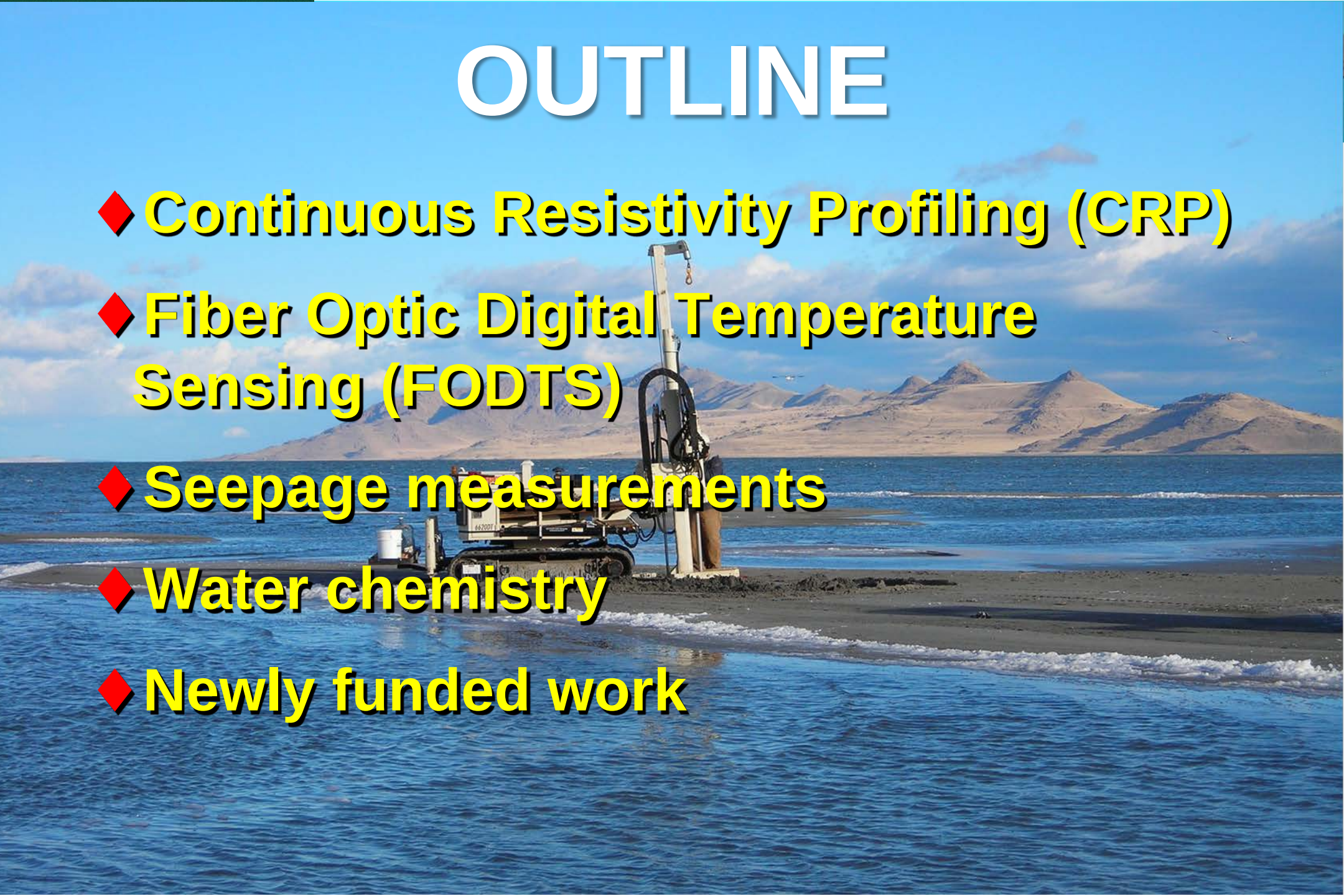
OUTLINE



- Continuous Resistivity Profiling (CRP)
- Fiber Optic Digital Temperature Sensing (FODTS)
- Seepage measurements
- Water chemistry
- Newly funded work

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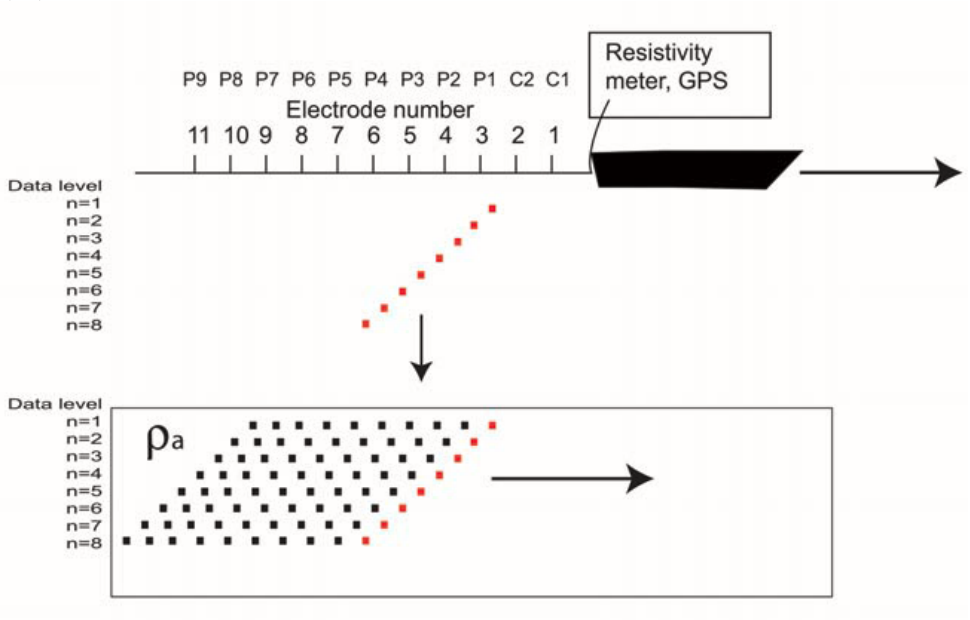
CRP METHOD

(a)



(b)

- Used to map sub-bottom electrical resistivity
- Resistivity is a function of lithology and pore fluid salinity

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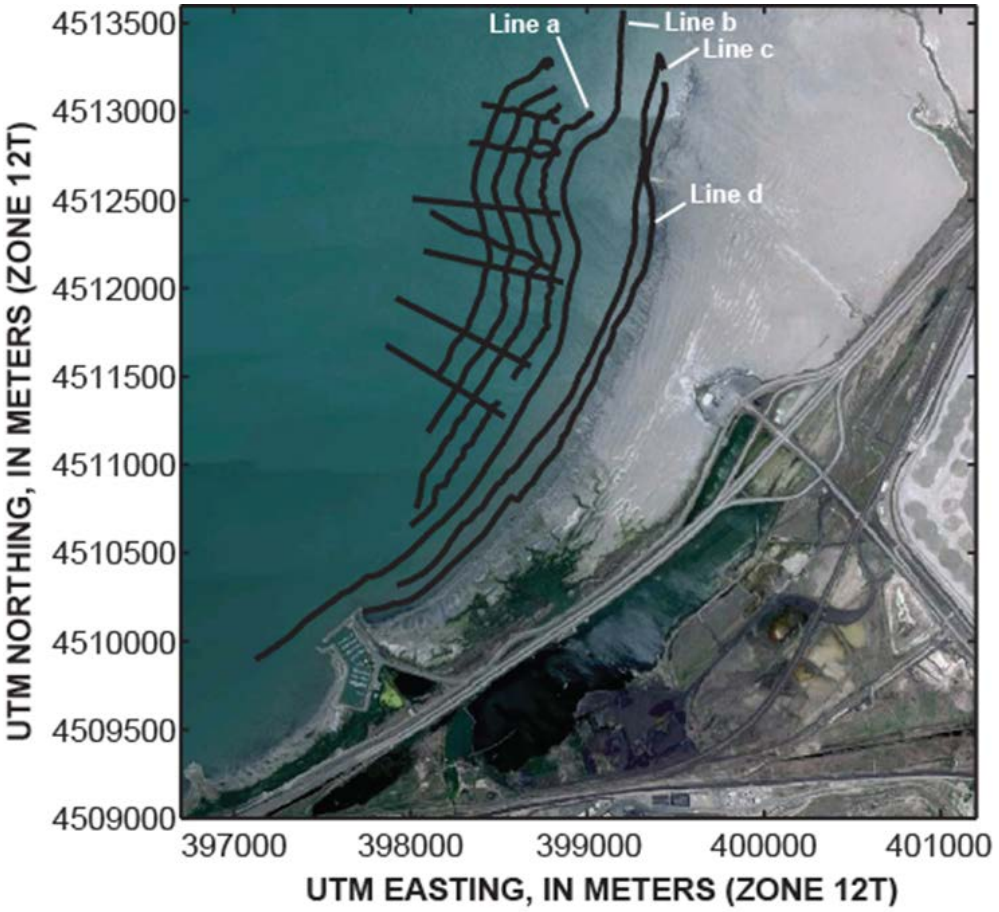
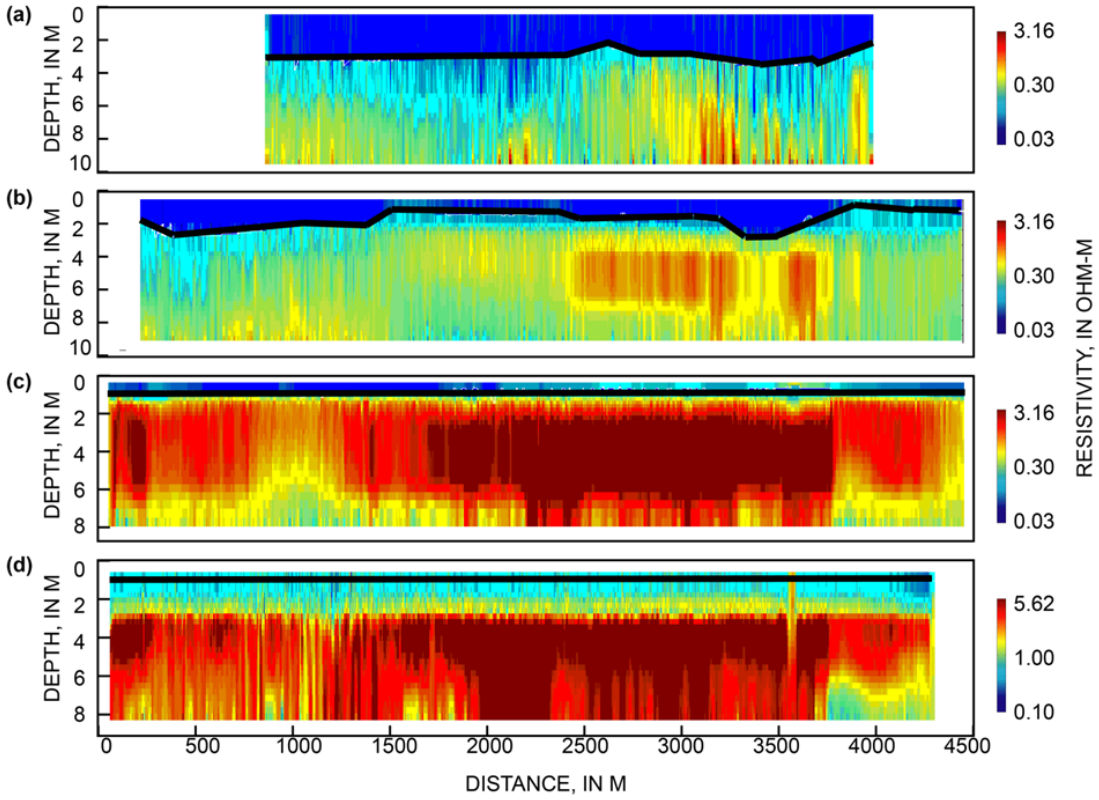
CRP RESULTS





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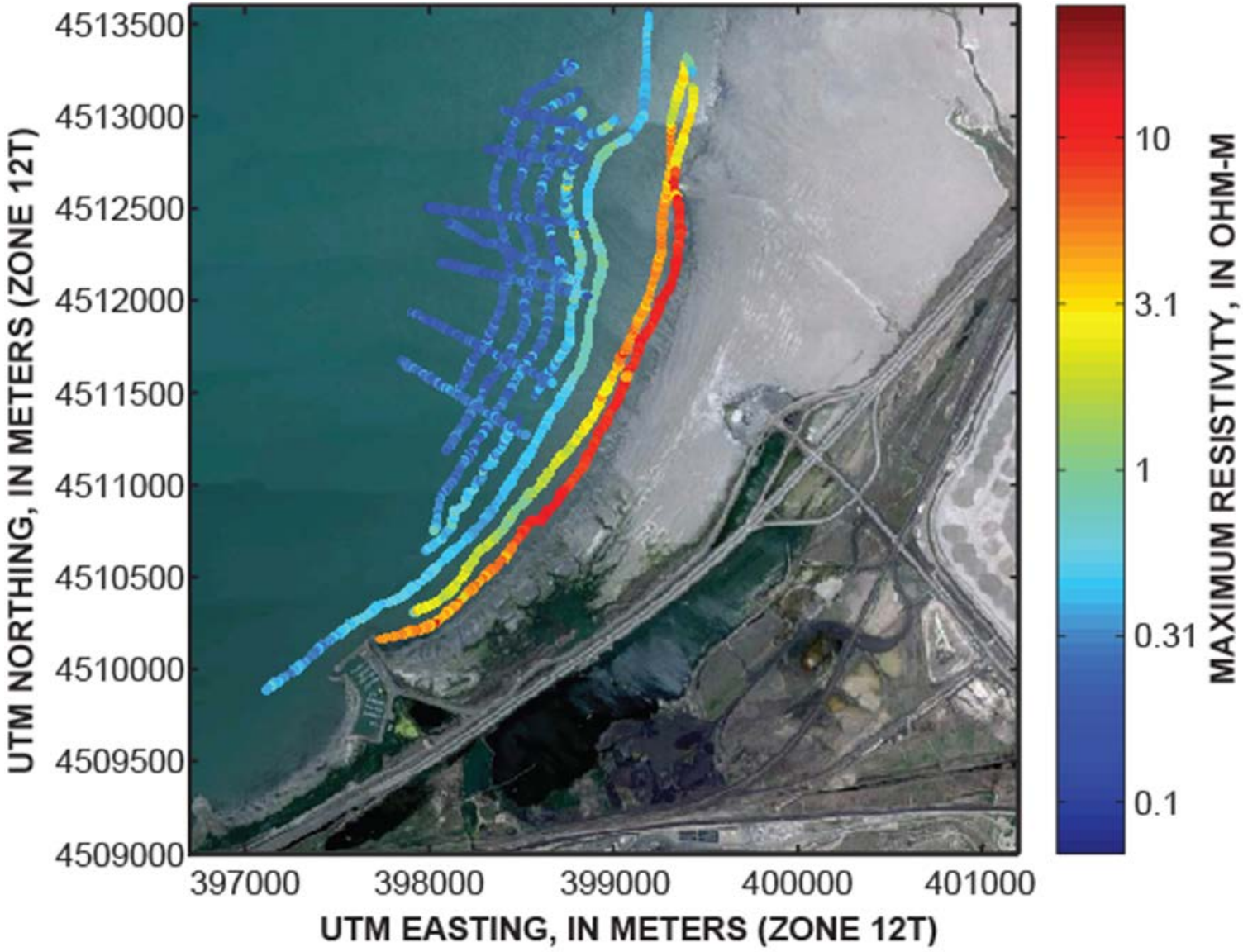
CRP RESULTS



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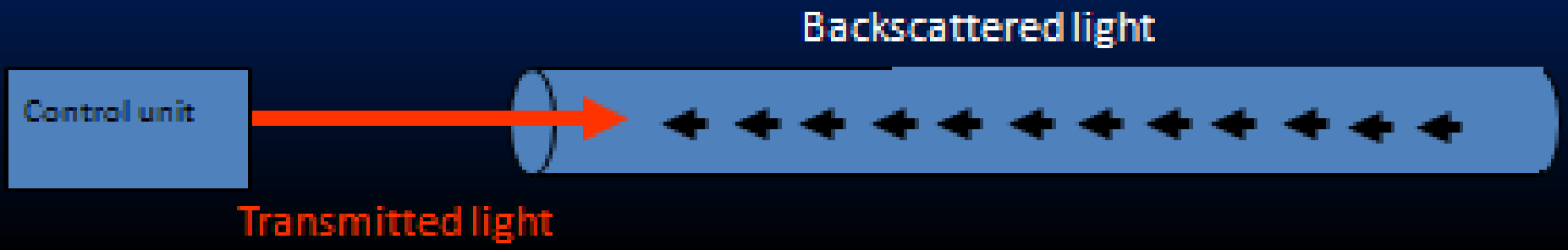
FODTS METHOD

Unwinding cable on the beach of GSL

Cable placement on lake bottom

Measurement physics (1)

- Control unit transmits laser light down cable
- Cable acts as a "light pipe" (more on this later)
- Light scatters back to the control unit by several mechanisms (Rayleigh, Brillouin, Raman)
  - *Backscatter is measured and analyzed to estimate temperature all along the cable*



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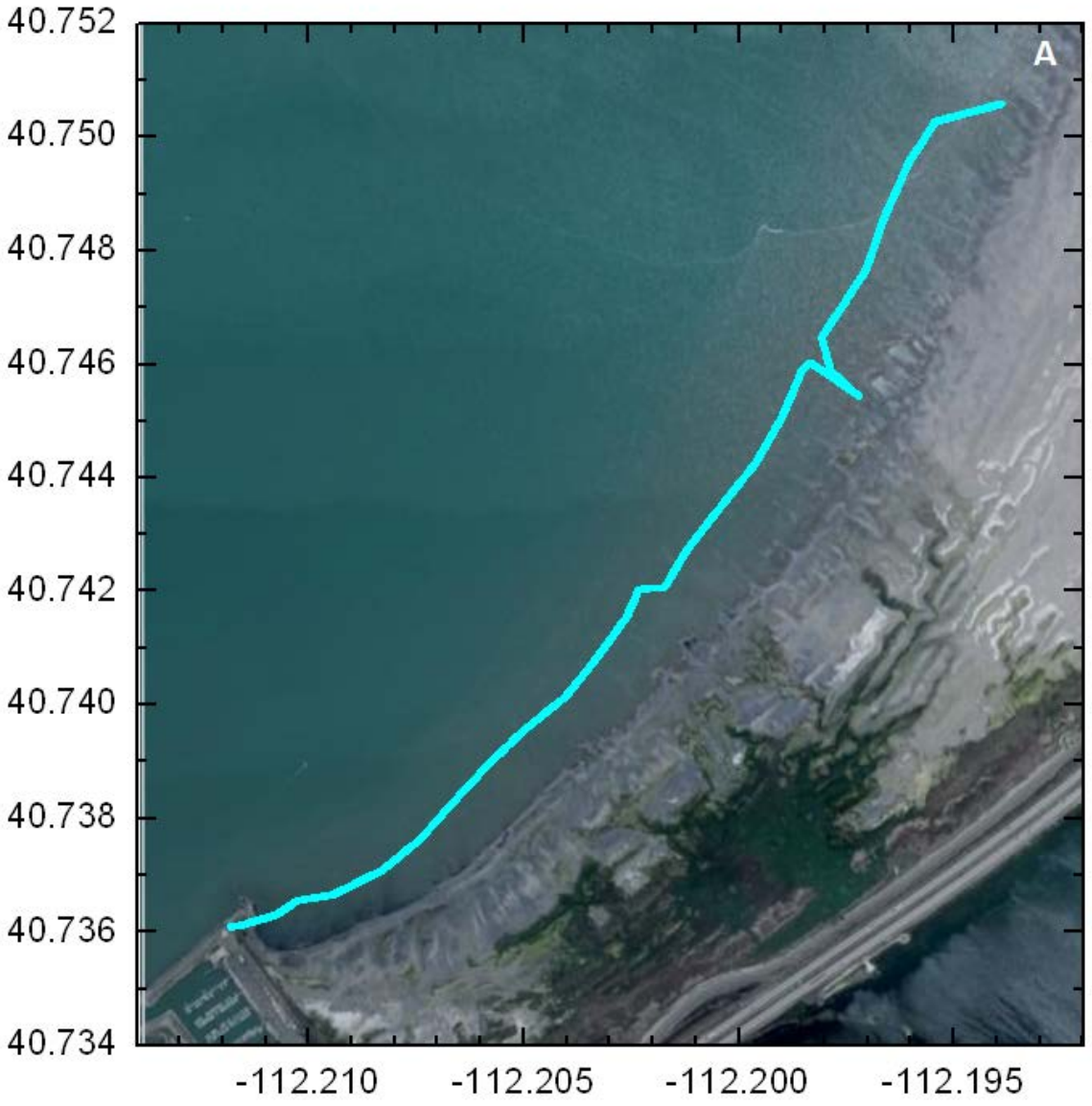
FODTS MAP



- 3 km of FO cable deployed
- Temperature data collected every ~ 20 minutes
- Temperature collected at 1-m intervals along the cable
- HUGE data sets

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THERMOGRAMS

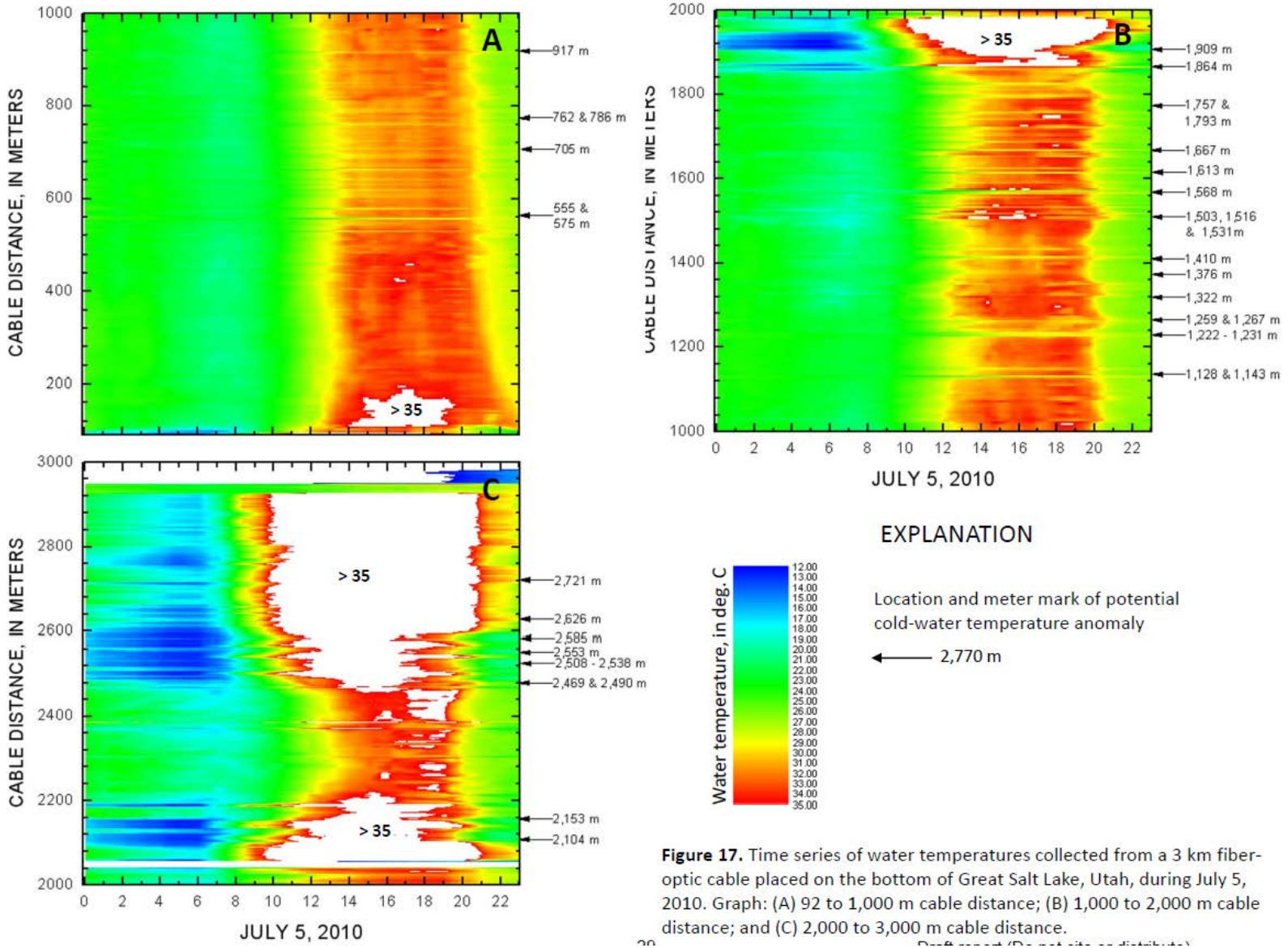

Figure 17. Time series of water temperatures collected from a 3 km fiber-optic cable placed on the bottom of Great Salt Lake, Utah, during July 5, 2010. Graph: (A) 92 to 1,000 m cable distance; (B) 1,000 to 2,000 m cable distance; and (C) 2,000 to 3,000 m cable distance.

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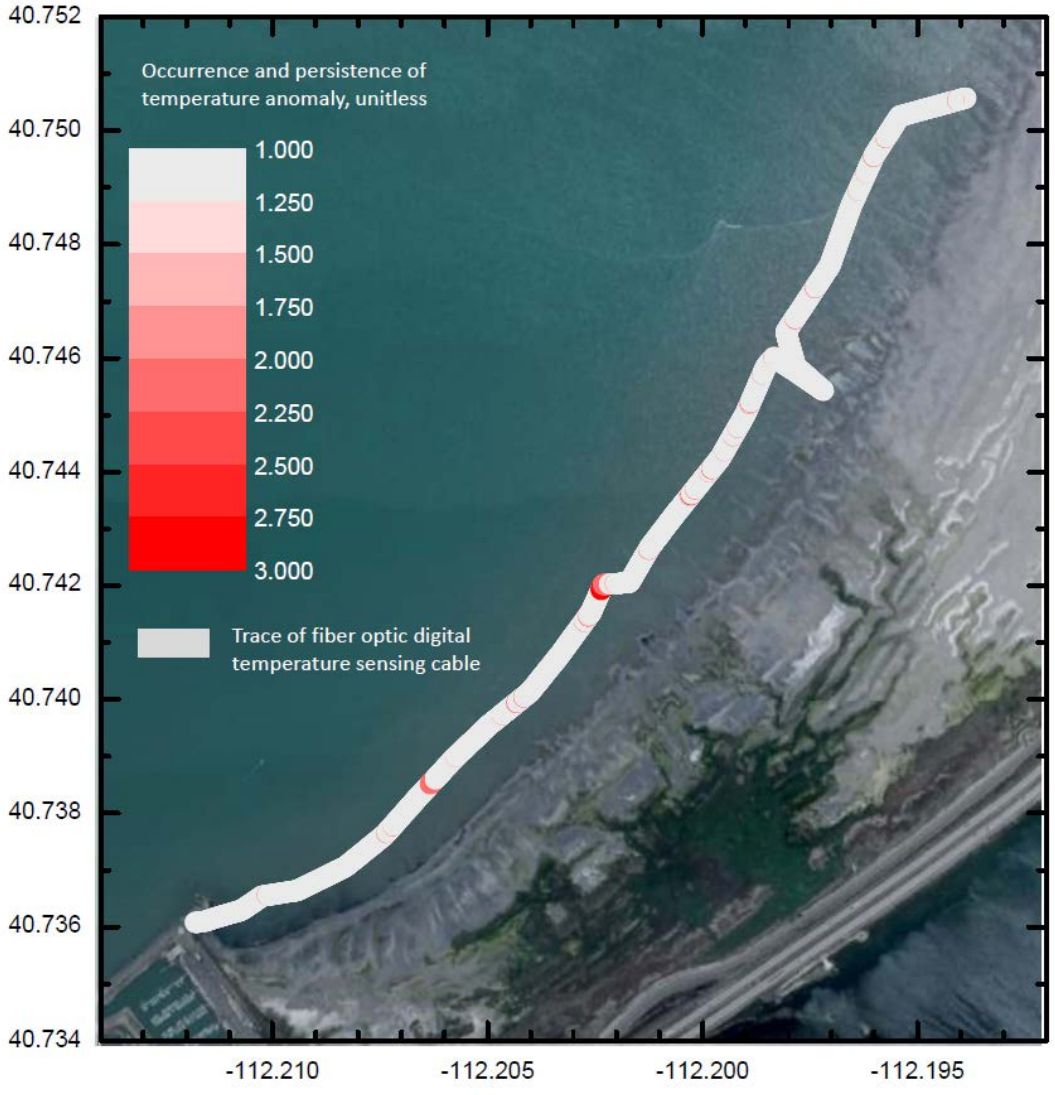
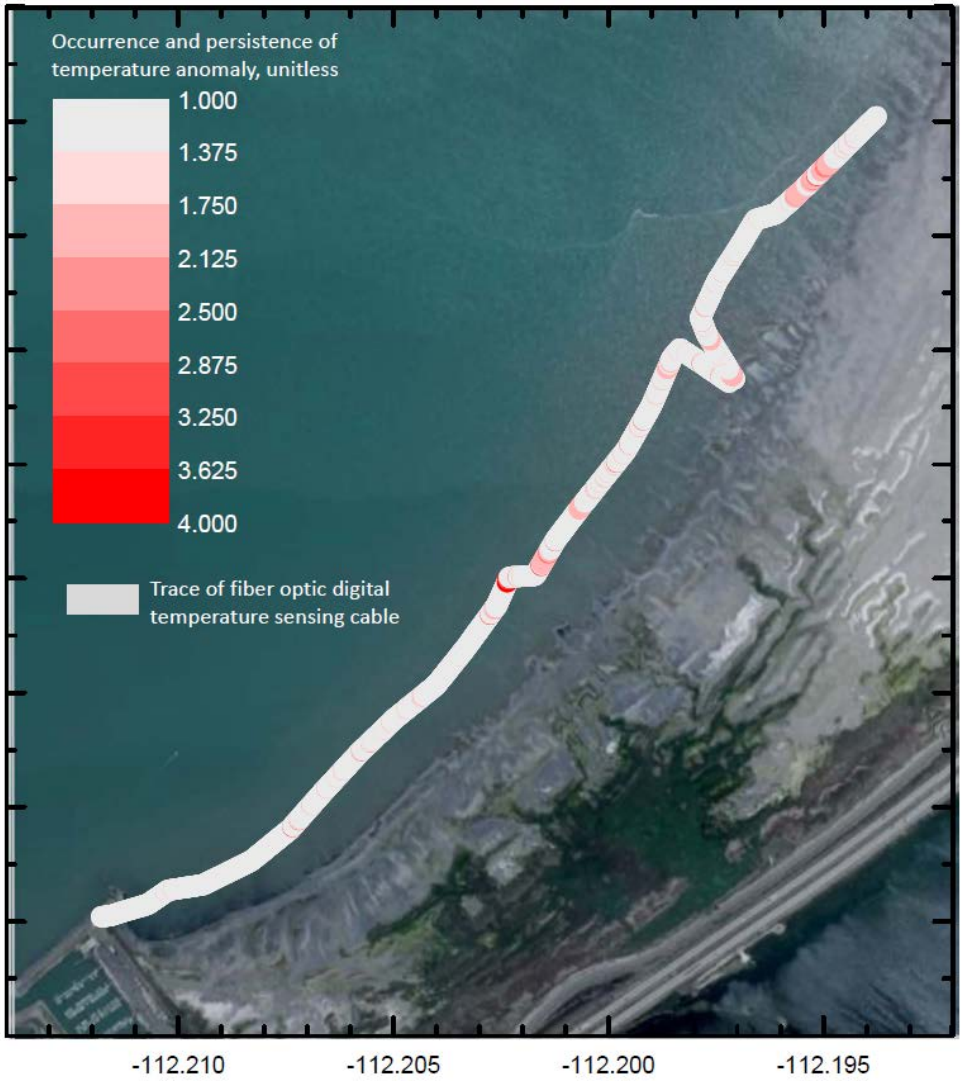
MAPS OF TEMP. ANOMALIES

June 12, 18, and 22



June 25, July 1, 5, 10




SEEPAGE METERS

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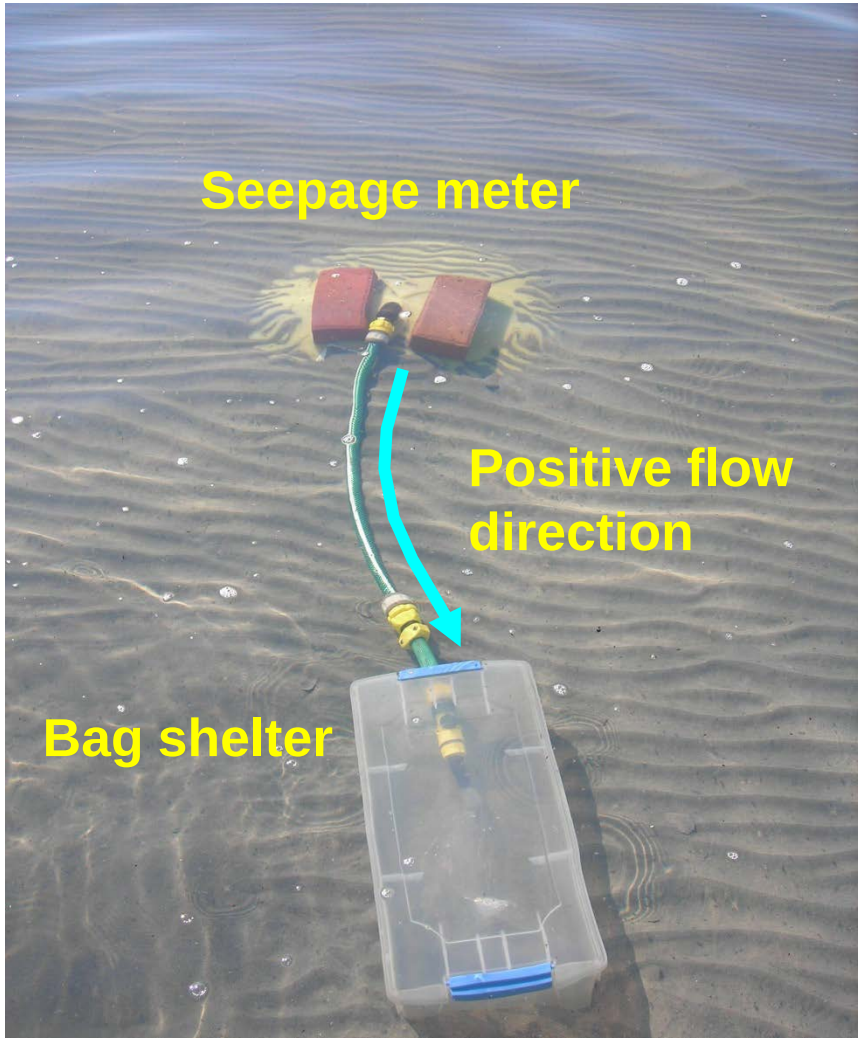
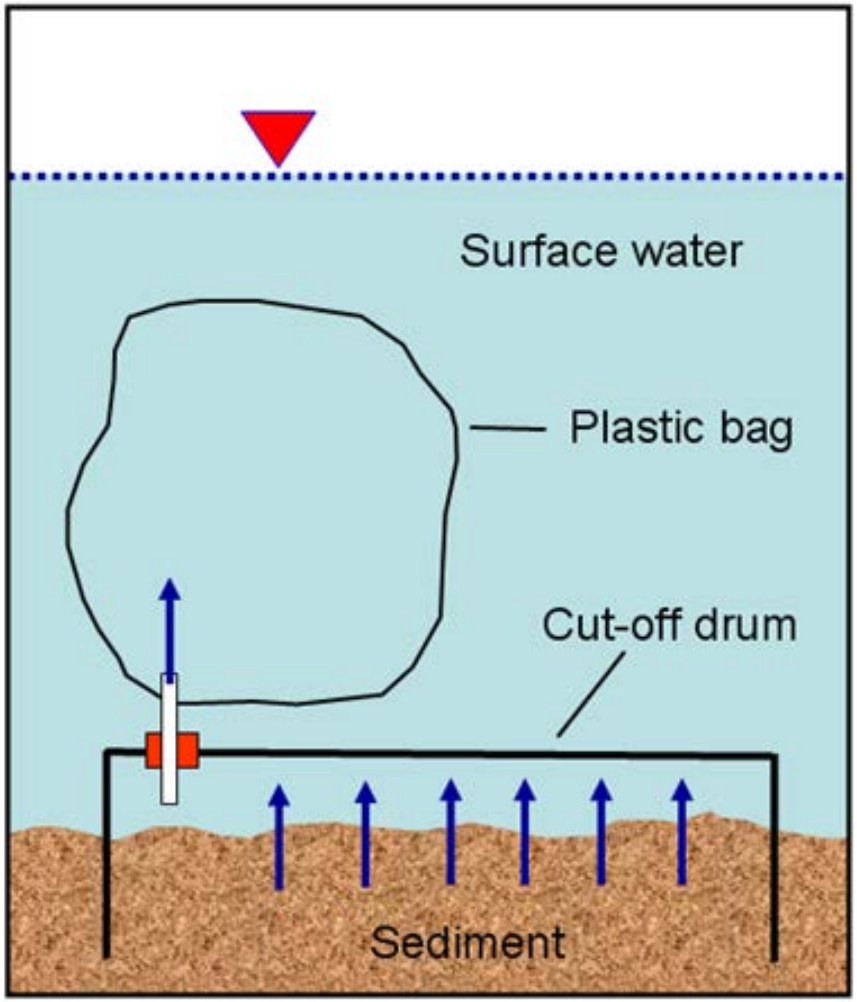
SEEPAGE METERS





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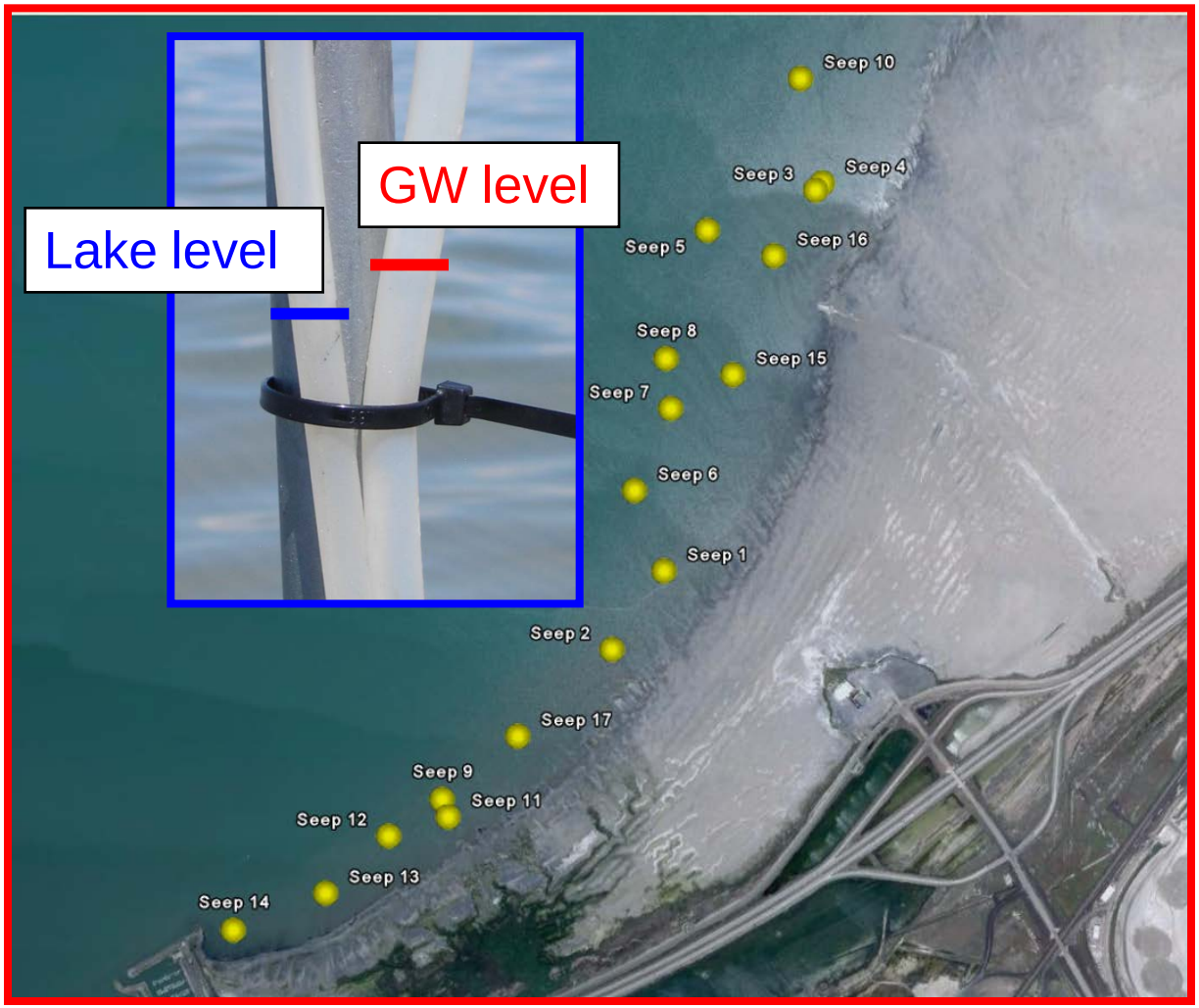
SEEPAGE METERS



Positive seepage recorded at most sites

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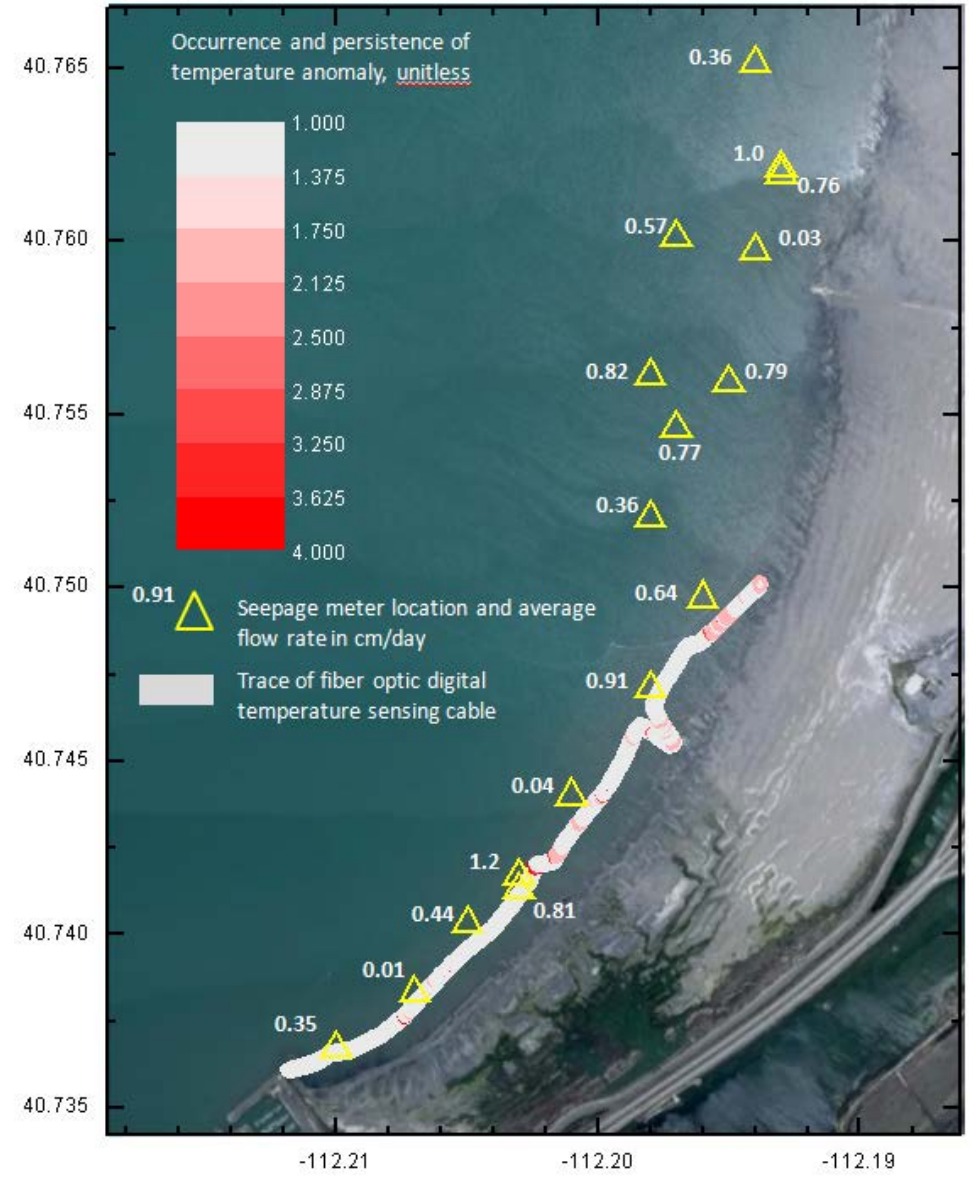
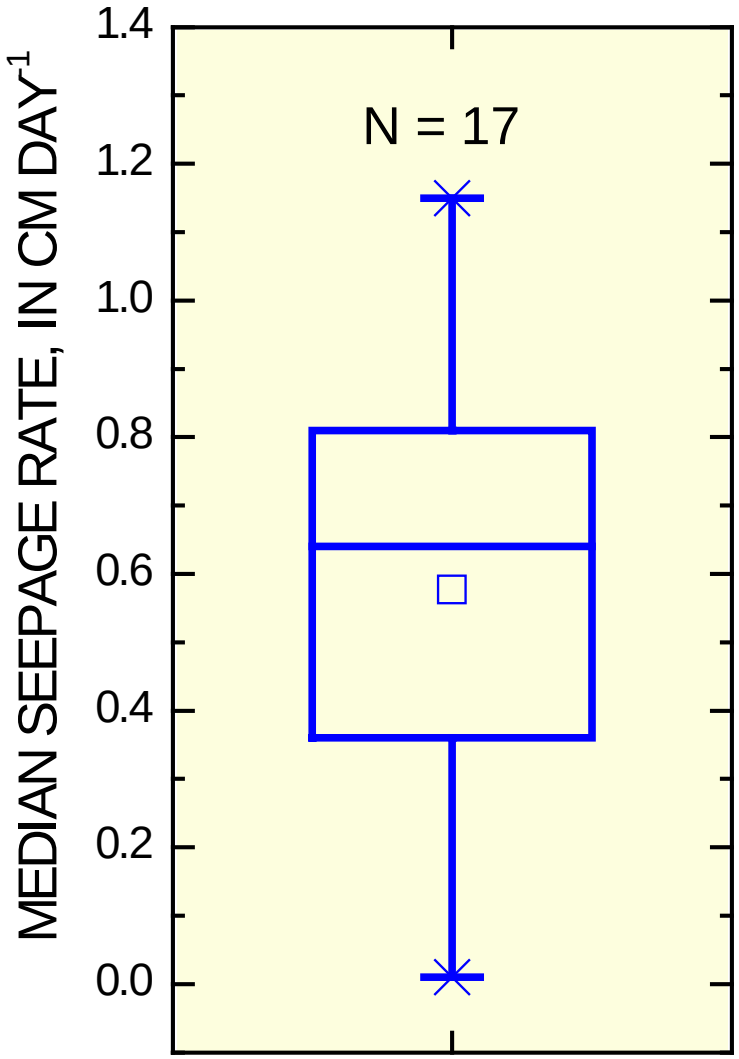
SEEPAGE METERS





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CONTINUOUS SEEPAGE MEASUREMENTS

Electromagnetic seepage meter installed on Great Salt Lake

Control box and data logger

- **Measures flow every 5 seconds**
- **Variation of seepage rates over small time steps**
- **Understand changes in seepage rates during lake seiche events**

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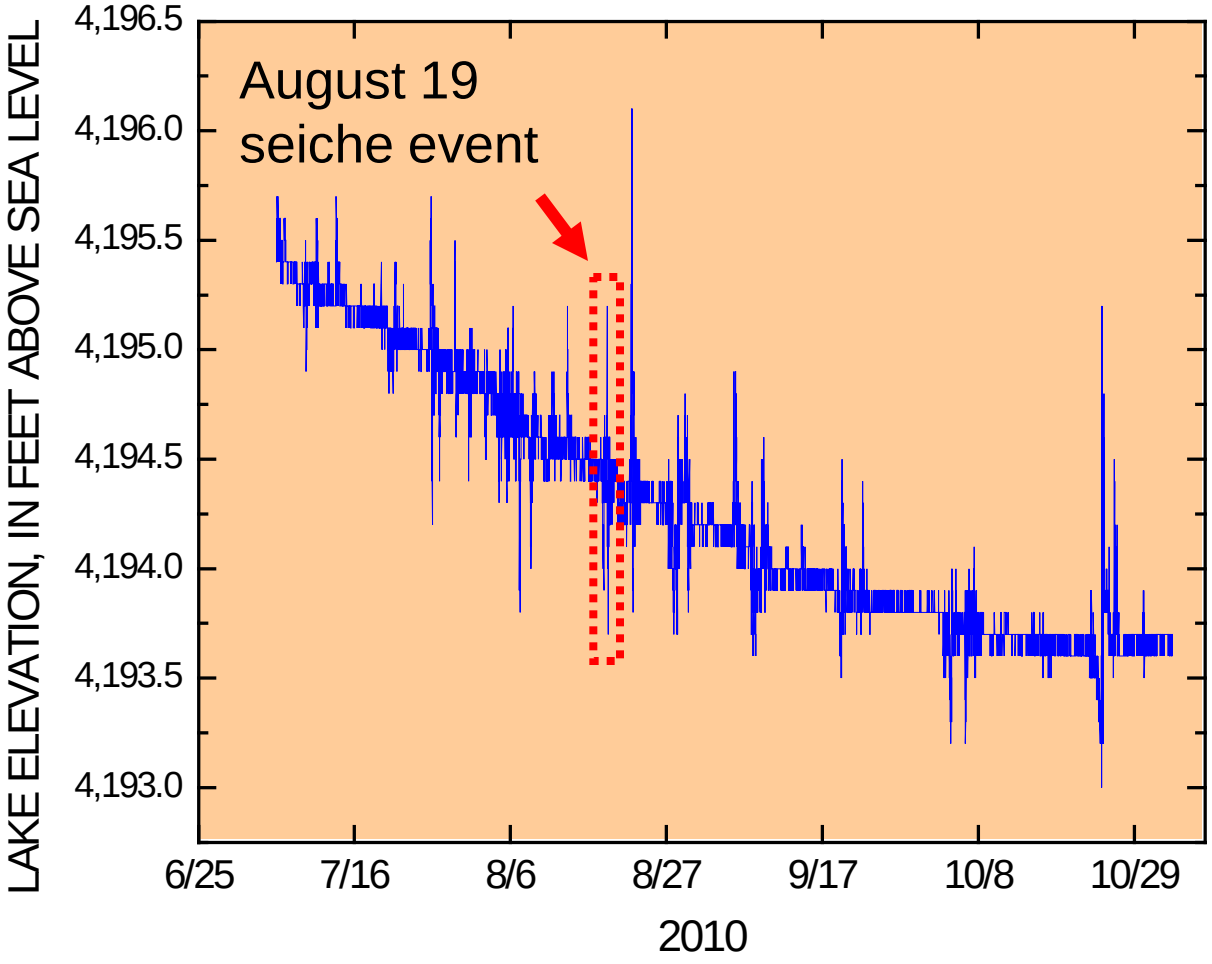
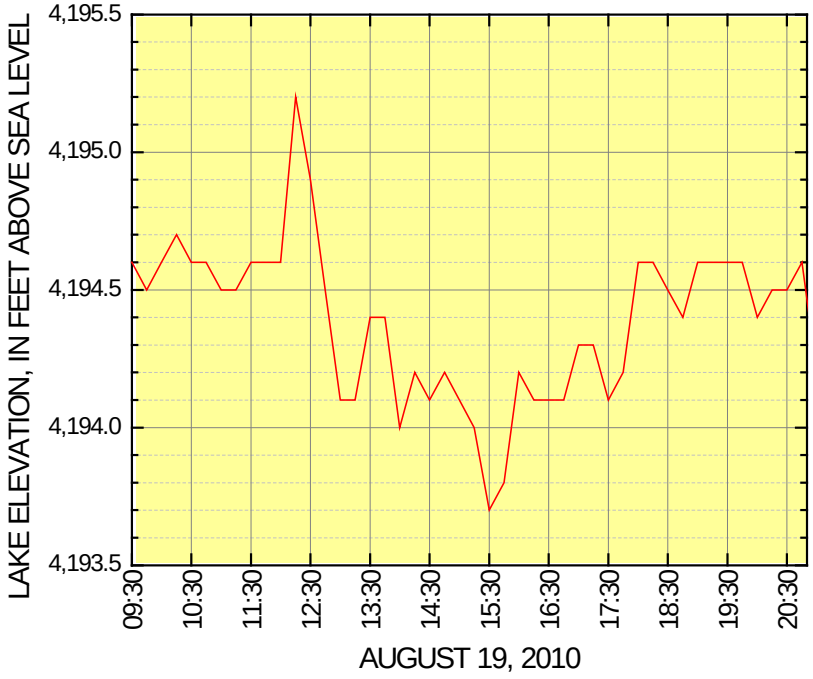
PERIODIC LAKE SEICHE



Detailed lake elevation graph



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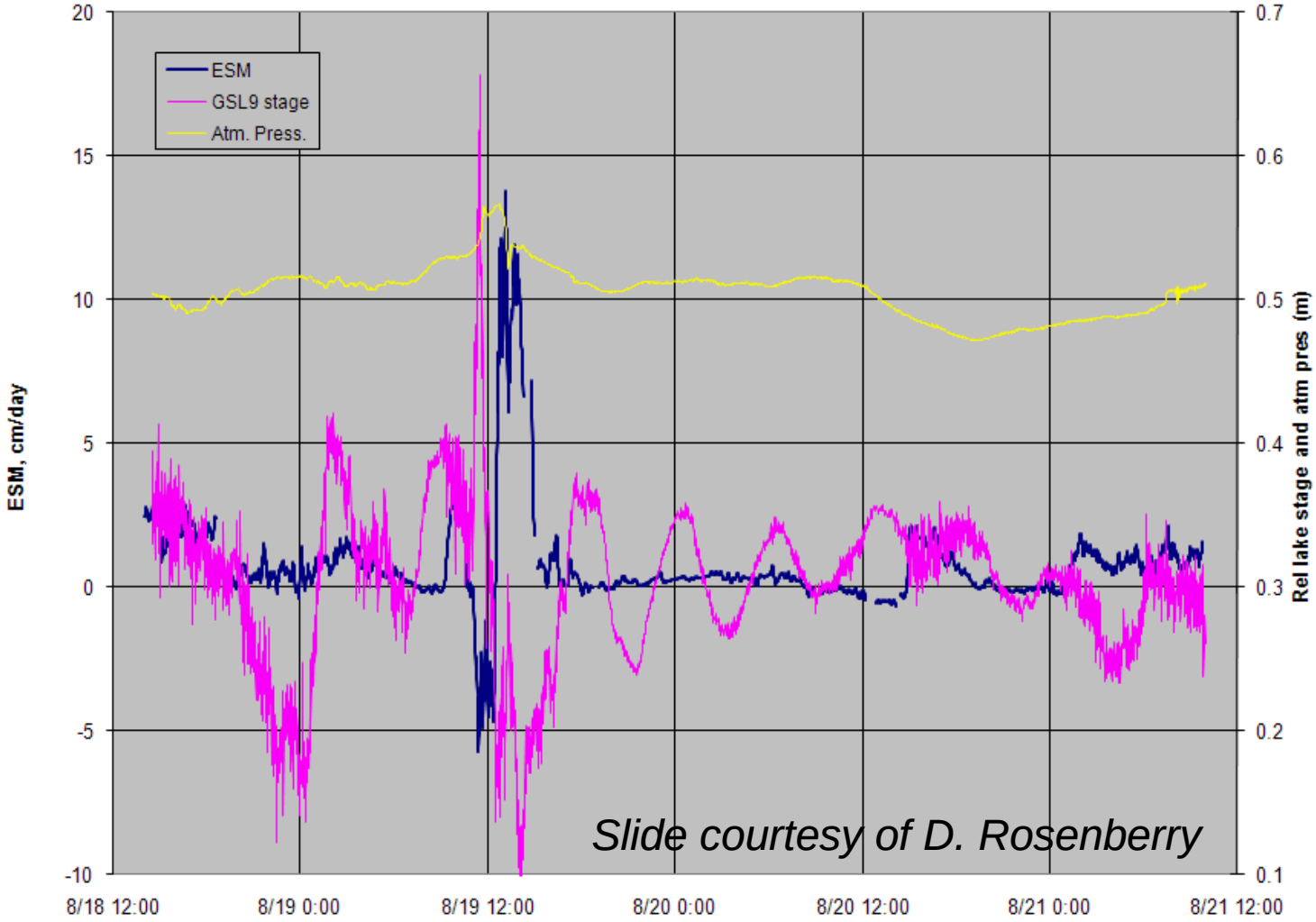
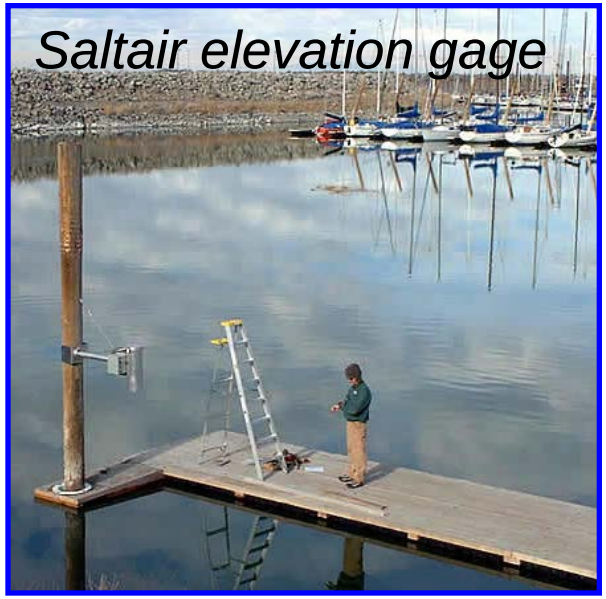
CONTINUOUS SEEPAGE MEASUREMENTS



- **Lake stage change of ~ 0.5 m**
- **Seepage rate ranges from -5 to +14 cm/day**



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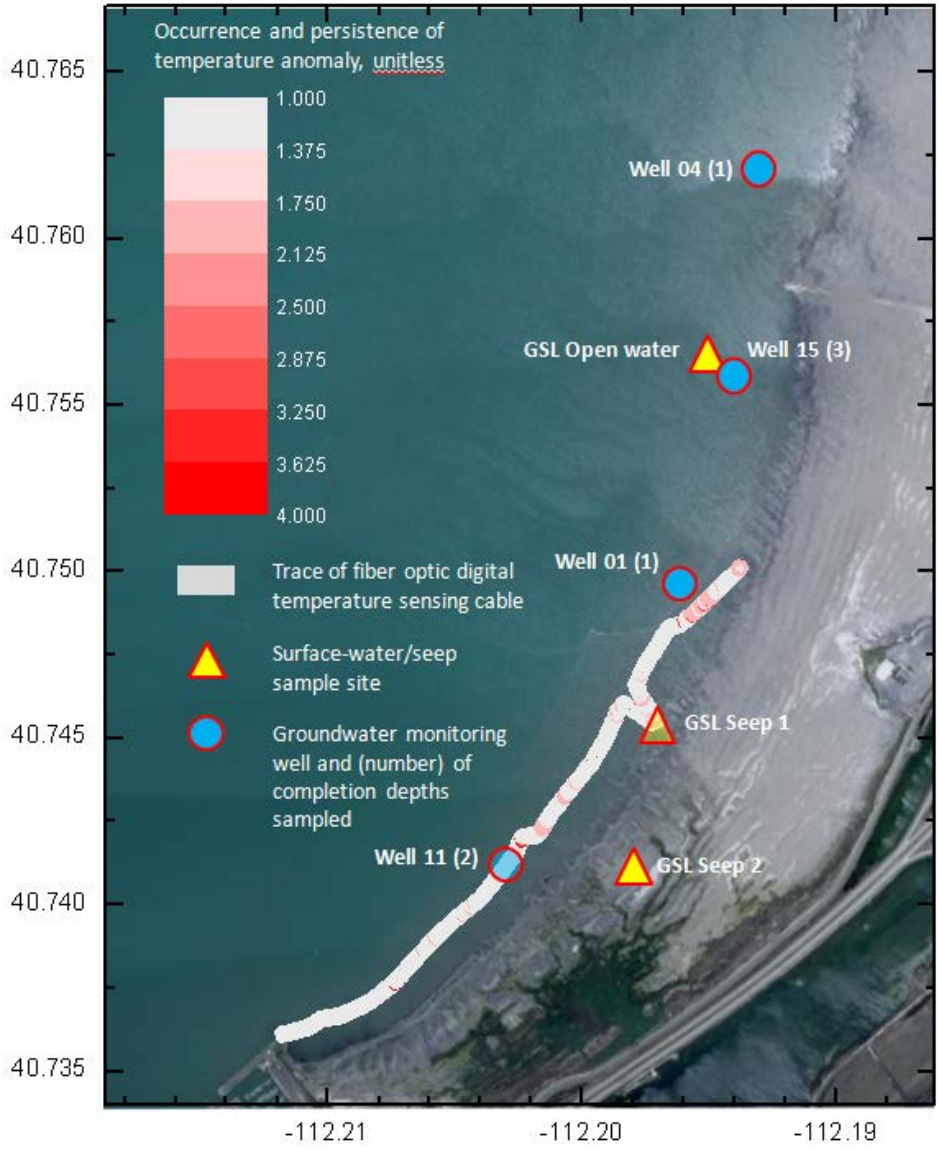
MWs INSTALLED



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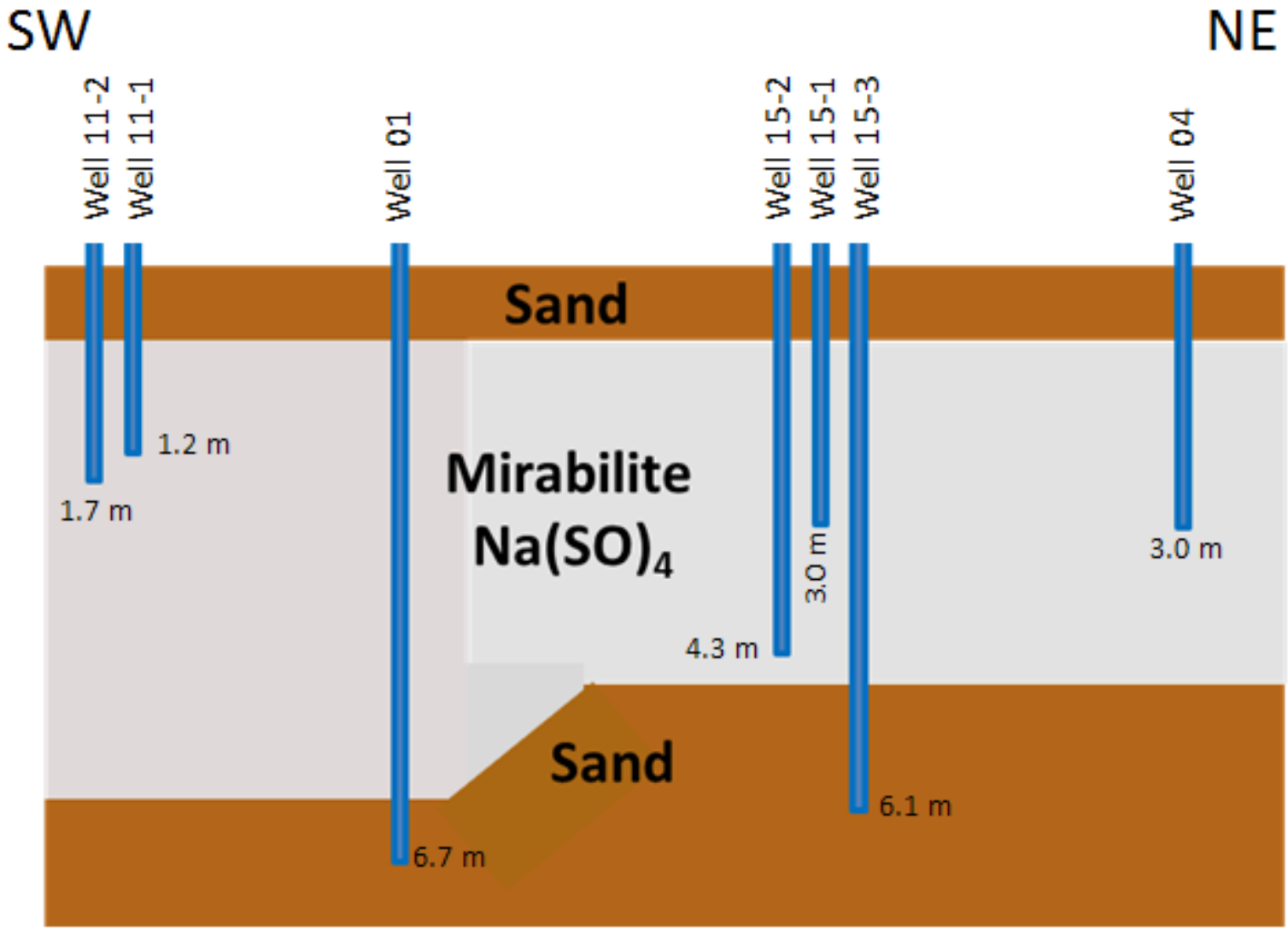
CROSS SECTION



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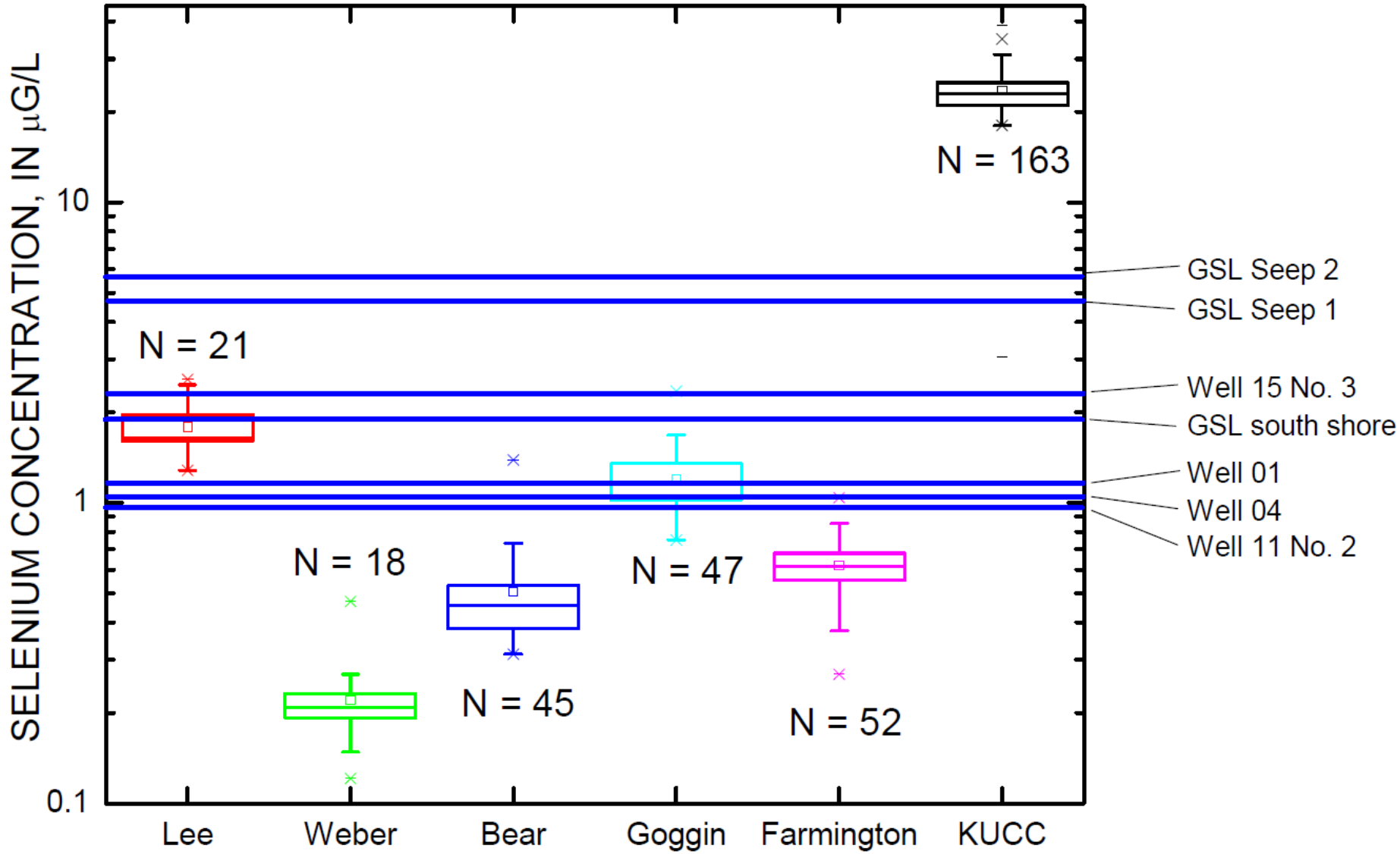
SELENIUM RESULTS



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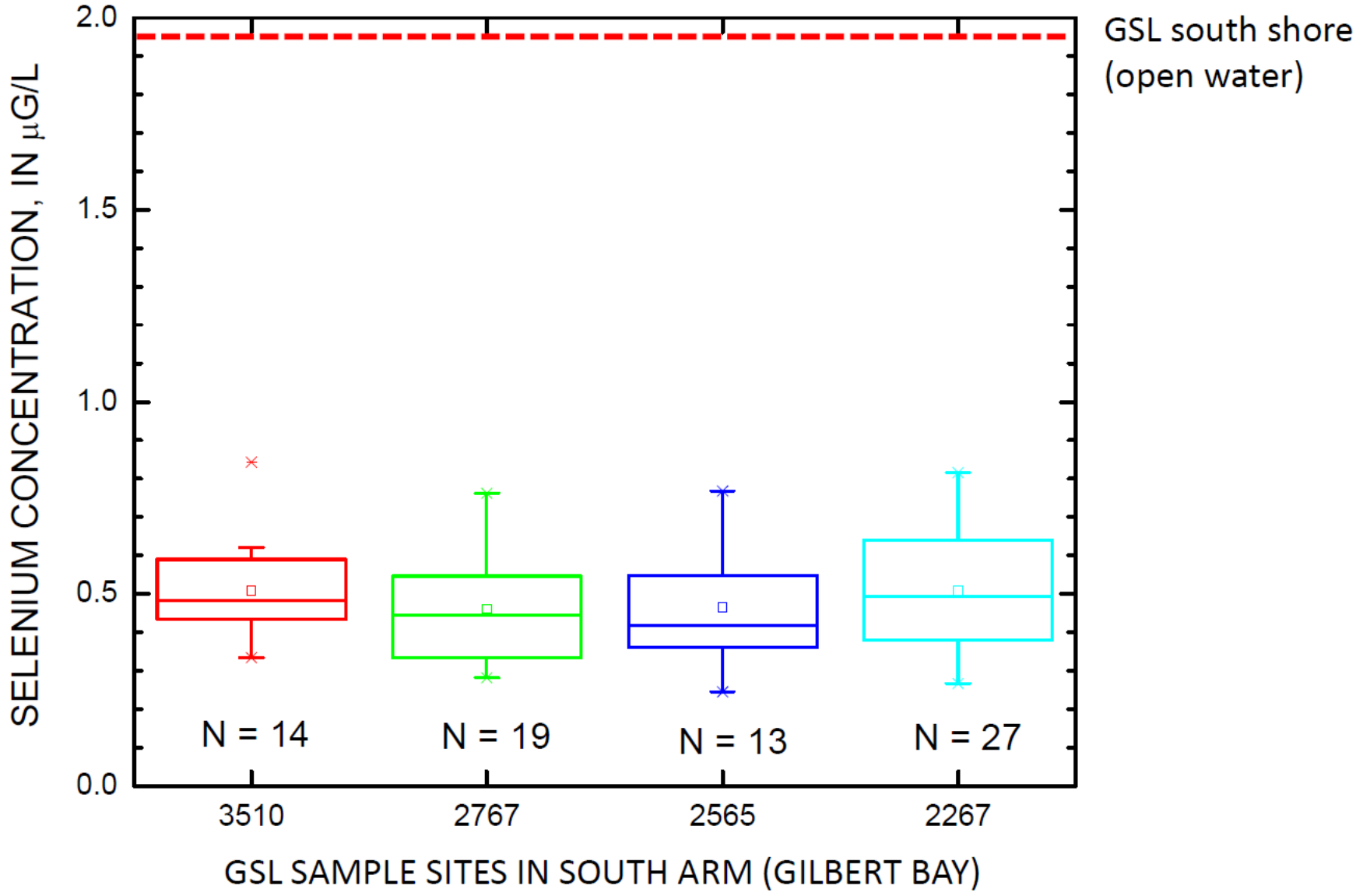

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NEW PROJECTS

UTAH DNR NATURAL RESOURCES

FORESTRY, FIRE & STATE LANDS
REQUEST FOR PROPOSALS
Cover Sheet

UTAH DNR FORESTRY

Project Title	Mapping and hydrodynamic modeling of selenium plumes along the south shore mixing zone, Great Salt Lake, Utah

Proposal Submitted to the Utah Dept. of Natural Resources

Assessing Benthic Methylmercury Production and degradation along salinity, organic and sulfur gradients of dominant aquatic habitats of the Great Salt Lake, Utah

By Mark C Marvin-DiPasquale[1] and David L. Naftz[2]

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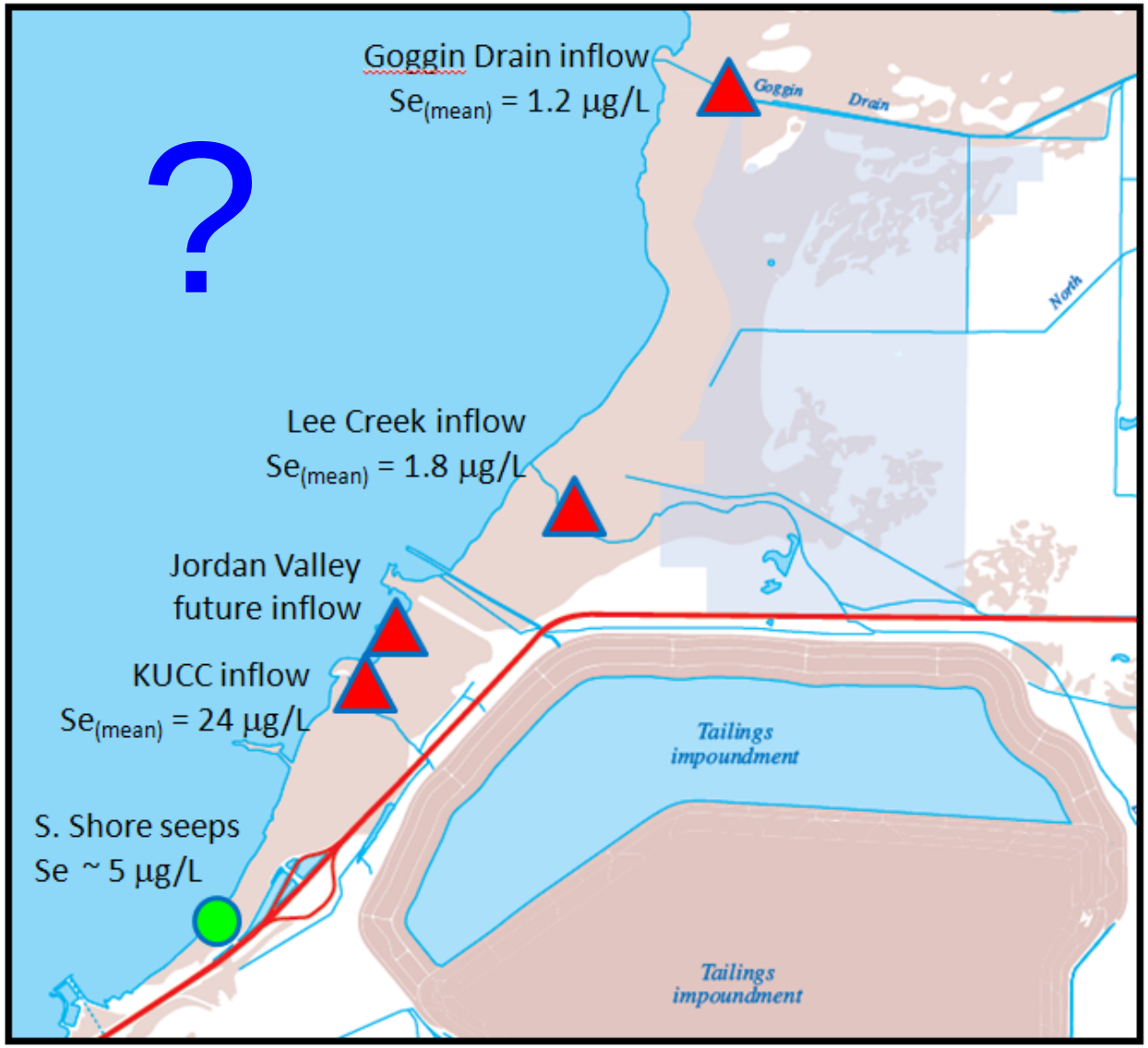
S. SHORE = ELEV. SE



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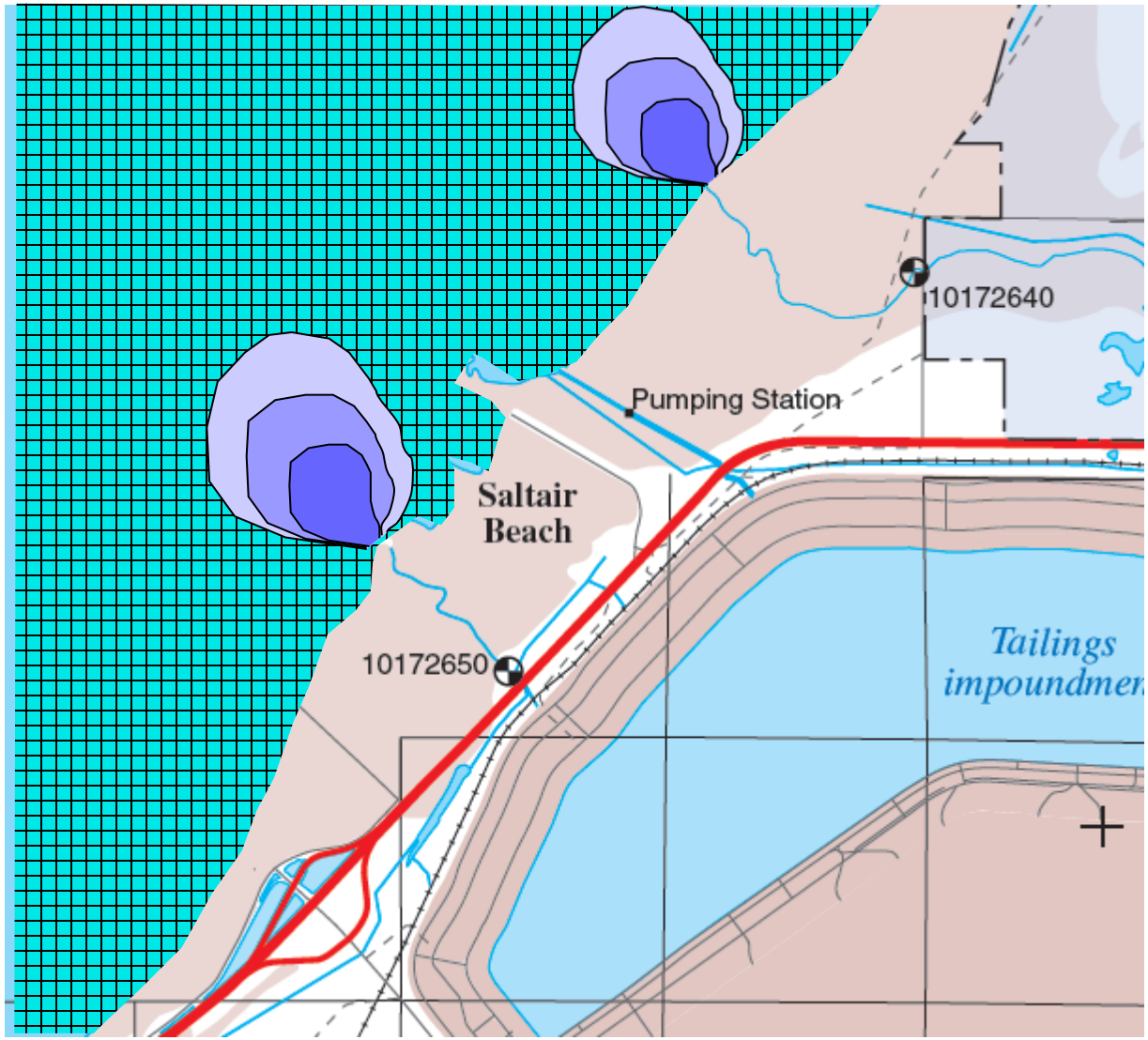
S. SHORE MIX MODEL

Objectives

1. Utilize dye tracing techniques to map the KUCC Se plume as it enters the south shore of GSL
2. Calibrate a 3-D hydrodynamic model and simulate the movement of the KUCC plume
3. Simulate the extent and concentration of Se plumes under a variety of future input/management scenarios



DYE PLUME MAPPING WITH AUV

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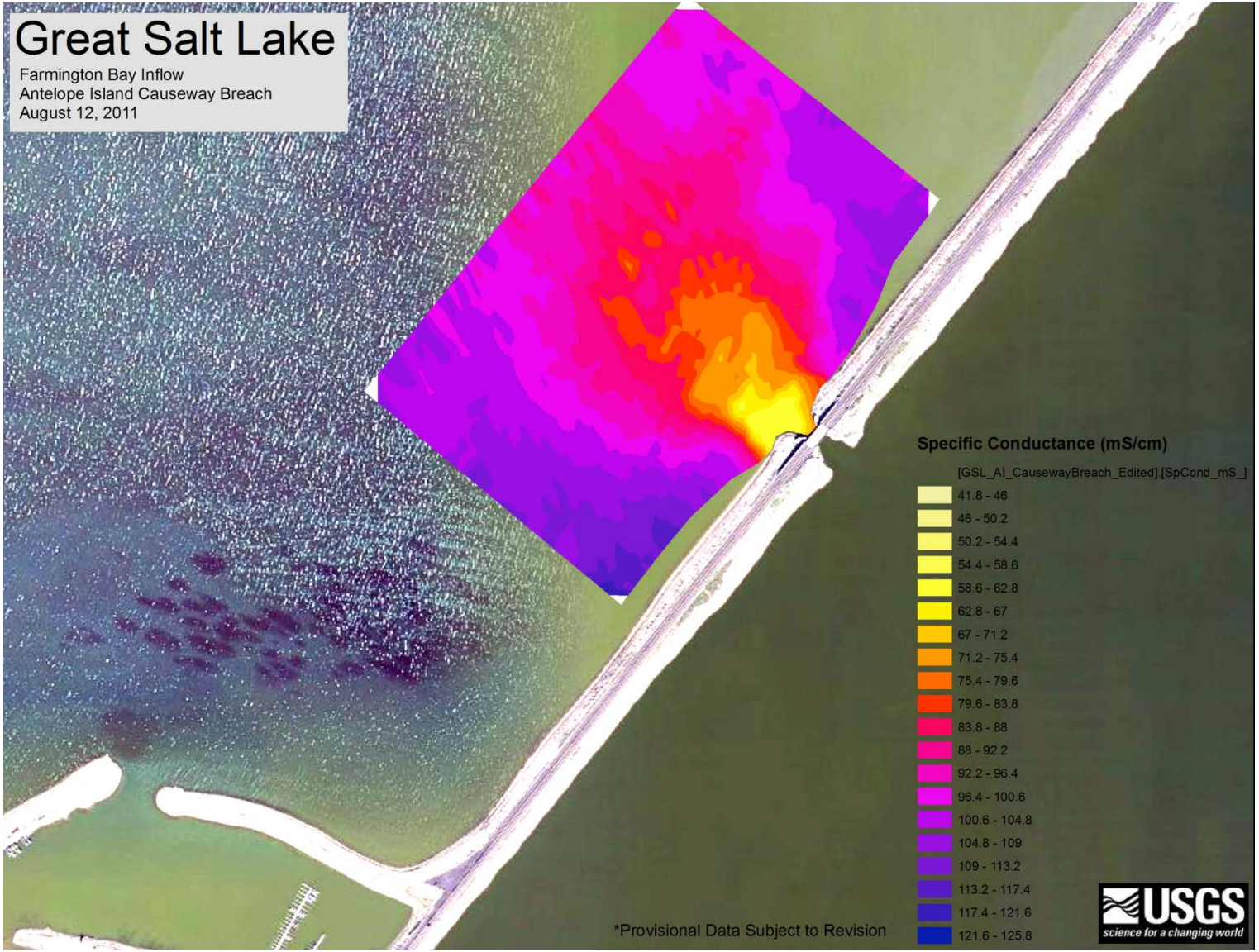
FB PLUME MAPPING

SC, in mS/cm



Ryan Jackson, USGS

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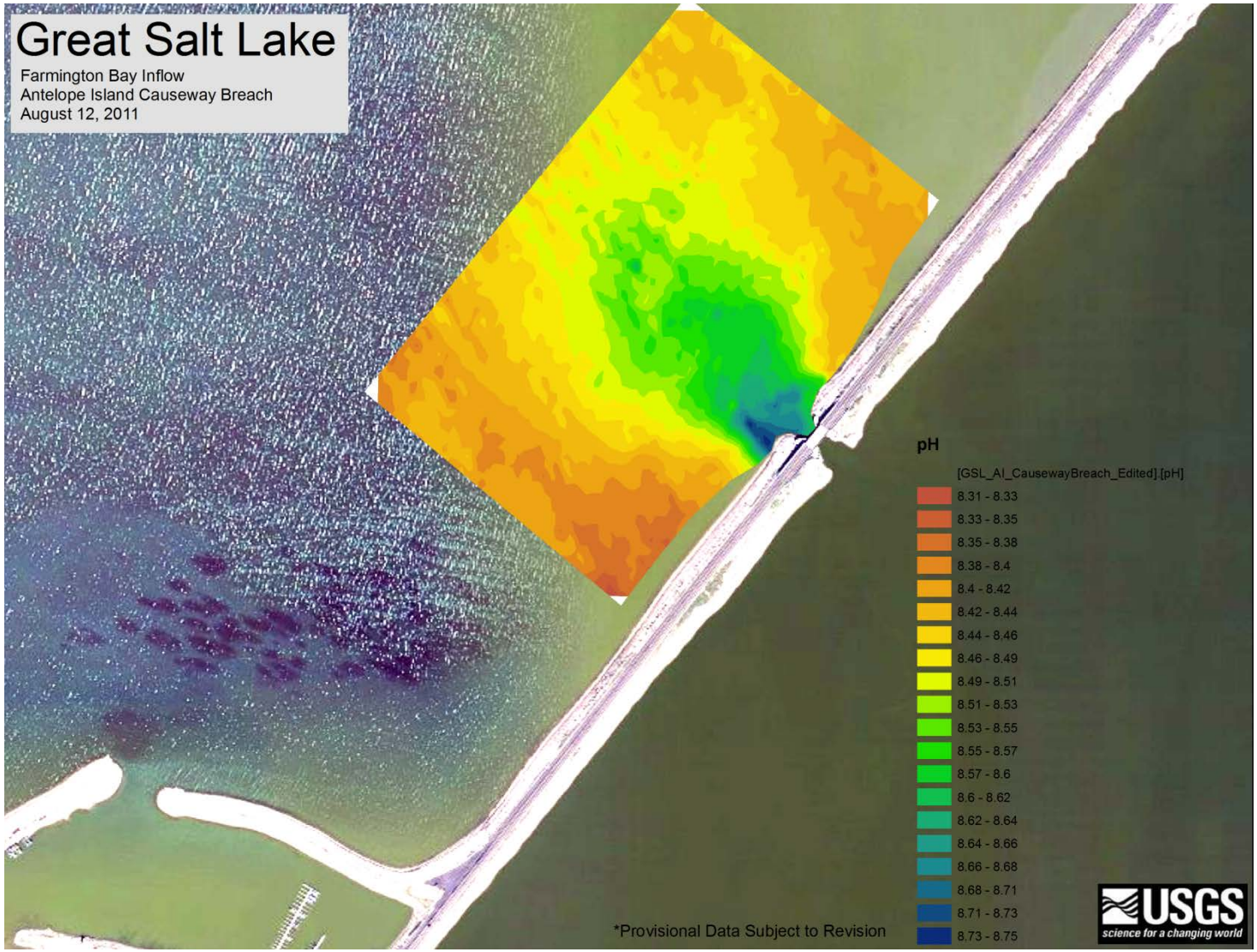
FB PLUME MAPPING

pH, in units



Ryan Jackson, USGS

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UPCOMING TRACER TEST

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UTAH DEPARTMENT OF Natural Resources

News Release

October 18, 2011 David Naftz 801-908-5053 dlnaftz@usgs.gov

Pollutant Mixing in Great Salt Lake To Be Studied by Injection of Red Dye

Weather permitting, U.S. Geological Survey scientists in cooperation with Utah Division of Forestry, Fire, and State Lands, will inject a bright red fluorescent dye into the south end of Great Salt Lake (in the vicinity of the Lee Creek outflow) sometime between Monday, October 31 and Friday, November 4, 2011.

The dye study is aimed at obtaining useful information on the dispersion, direction of movement, and travel times of potential contaminants entering the south shore area of Great Salt Lake. The south shore of the lake receives inflow from various surface water sources, some containing pollutants from sources in the Salt Lake valley. The results of the study will provide information that can be used by Federal, state, and local agencies, particularly with respect to tracking current and future inputs of pollutants (including selenium) into the south part of Great Salt Lake.

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GO UTES