Salt Chasers: Conductivity in Action

The Salt Chasers program, led by the Hampton Roads Sanitation District (HRSD), is a system-wide initiative to identify, quantify, and eliminate saltwater intrusion into the regional wastewater collection system. This effort is critical as HRSD prepares for advanced nutrient removal upgrades, which are highly sensitive to increased total dissolved solids (TDS) caused by saltwater inflow and infiltration (I/I). At the core of this initiative is the Conductivity Source Tracking (CST) program, which uses a tiered strategy of system modeling, continuous monitoring, and targeted fieldwork. The success of past CST investigations has already informed capital improvement planning, with one completed project significantly reducing saltwater intrusion and a second underway at the treatment facility scale. Current CST efforts focus on proactively preparing facilities for future advanced treatment and aquifer replenishment, ensuring system readiness and long-term resilience.

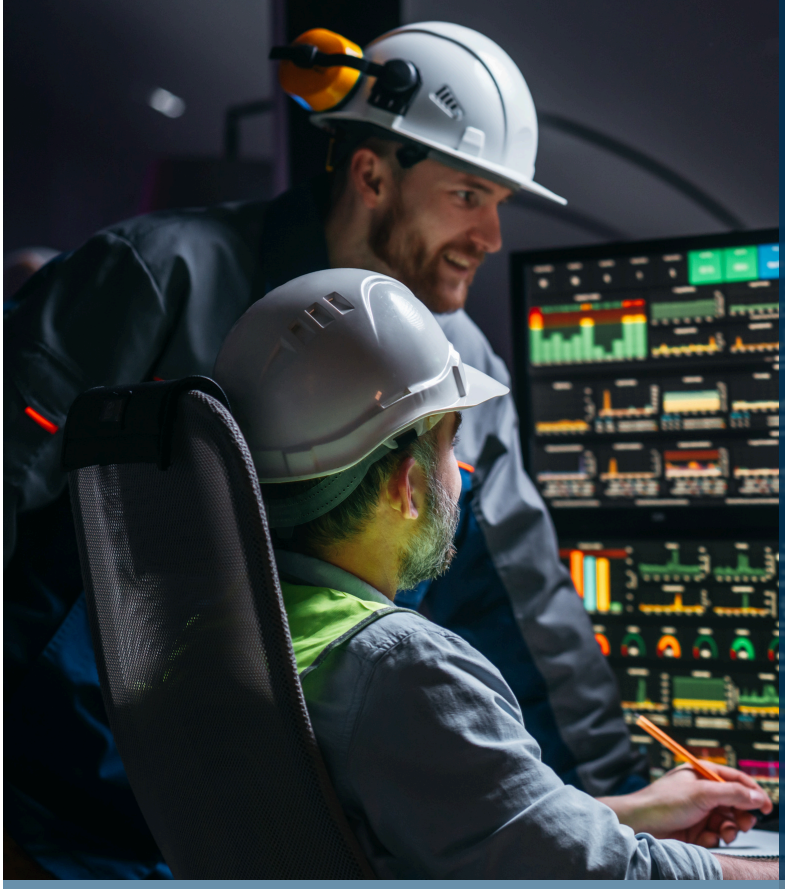
REDUCE

HAMPTON ROADS, VIRGINIA, USA

WASTEWATER

INDUSTRIAL

wef | CASE STUDY



CHALLENGES FACED

Key challenges included limited flow data at some pump stations, which affected mass balance accuracy, and the need for cross-departmental coordination. Distinguishing saltwater intrusion from other conductivity sources required careful sensor calibration and model refinement. Despite these hurdles, the approach effectively identified high-risk areas and supported capital planning.

TECHNOLOGIES & SOLUTIONS USED

The Salt Chasers initiative uses a tiered, data-driven approach to identify and eliminate saltwater intrusion into the wastewater collection system. Combining Supervisory Control and Data Acquisition (SCADA) data, conductivity sensors, field investigations, and mass balance analysis, the team pinpoints intrusion sources with precision. Innovative tools, including machine learning models and a custom Python script linked to a Power BI dashboard, help predict high risk areas and visualize the influence of tidal activity on sewer flows.

IMPACT & INSIGHTS

Targeted inflow reduction measures have successfully reduced saltwater intrusion, beginning with a pilot in Hampton University's private sewer basin and expanding to the Boat Harbor Treatment Plant service area.

Key Benefits

- Supported the Boat Harbor transition from treatment facility to pump station while protecting Sustainable Water Initiative for Tomorrow (SWIFT) operations—an indirect potable reuse program.
- Reduced risk of sanitary sewer overflows through targeted capital improvements.
- Investigated 361 sub-basins over 70 square miles (≈181 km^2), identifying >80 gravity sewer segments contributing to saltwater intrusion.

LESSONS LEARNED

Conductivity Source Tracking has evolved from labor-intensive field investigations to a more efficient, tiered diagnostic framework. Early efforts relied on handheld meters to trace saltwater intrusion, which proved the concept but were time-consuming and limited in scope. By incorporating temporary data loggers, the team was able to screen large areas with moderate-resolution data and target detailed fieldwork where it was most needed. The program now begins with broad SCADA and desktop analysis, followed by targeted monitoring and in-system investigations. Linking findings to treatment facility impacts and building predictive models have further improved efficiency, scalability, and strategic planning.

> **What sets the Conductivity Source Tracking program apart is its ability to pinpoint impactful infiltration using modest cost instrumentation and time efficient methods.**

Water Environment Federation®

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