Clean beaches and coastal waters are integral to California’s economy, environment and public health. Effective management of wastewater discharges and non-point source pollution (runoff of urban and rural surface pollution into coastal waters) is crucial for preservation of fish, wildlife and aquatic life habitats, aesthetic value, and to prevent threats to public health due to contaminated food, drinking water supplies and recreational waterways. Knowing where urban, rural and discharged surface pollution goes is essential to understanding, managing and protecting our coastal oceans.

In 2005, the State Coastal Conservancy and the State Water Resources Control Board invested $21 million from Propositions 40 and 50 funds to build the infrastructure to map ocean surface currents, primarily via installation of a comprehensive, statewide network of high-frequency (HF) radar stations which track ocean surface currents in real-time. Nearing completion, the 50 HF radar stations of the California Coastal Ocean Currents Monitoring Program (COCMP) allows managers to track the movement of planned and unplanned discharges in our coastal waters, enabling more precise and timely management decisions. An Orange County Environmental Health Engineering Specialist writes that “this real-time surface current monitoring system has allowed the San Diego County Environmental Health Agency to predict when contaminated water from the Tijuana River will impact the southern beaches of San Diego County.”

In November of 2006, the City of Los Angeles diverted the flow from Hyperion—its oldest and largest wastewater treatment plant—from an outfall five miles from the shoreline to a rarely used pipe one mile offshore to allow inspection of the five-mile pipe. The diversion lasted three days, and approximately 800 million gallons of secondary-treated wastewater was released one mile off the coast of Santa Monica. A division manager for the City of Los Angeles, Bureau of Sanitation’s Environmental Monitoring Division writes that the City’s monitoring effort greatly benefited from information provided through the HF radar system, and that “the real-time current information provided through [the program] enabled us to adaptively modify our sampling grid to better track the discharge plume and to predict the dispersion of the plume.”
In October of 2007, the end gate to the Southwest Ocean Outfall offshore Ocean Beach in San Francisco was lost; a buoyant mixture was released from the pipe 6.5 km offshore and rose to the surface. At the request of the San Francisco Public Utilities Commission (SF-PUC), COCMP provided predictions on movement of the effluents based on real-time observations of ocean surface currents from the HF radar network. “[COCMP] was able to rapidly provide daily and cumulative modeling of effluent trajectories that really demonstrated the immediate value of the existing program,” said Michael Kellogg of the SF-PUC. This information significantly improved the decision-making and response capabilities of the utilities commission. The trajectories showed a weak onshore flow, indicating that the discharge would not move toward beaches; this allowed responding agencies to better manage beach closures, offshore and onshore water quality monitoring and outfall repair.

Outfall diversions in Orange and Marin Counties have similarly used the surface currents tracking system, and the two consortia that implement and operate the HF radar stations and data delivery for the state are working with city and county managers to provide support for the tracking of future coastal discharges through tailored websites that provide real-time surface currents and plume tracking. Technologies like HF radar, combined with Internet delivery of data, are transforming management of the famous beaches and nearshore waters of California, improving the environment, fisheries and public health. Thanks to its farsighted and early investment in these technologies, California leads the nation in implementing and integrating surface currents mapping for improved management of our coastal oceans.

1Larry Honeybourne, Letter of Support to SCCOOS, October 2007
2Mas Dojiri, Letter of Support to SCCOOS, October 2007
3Thanks to the Coolroom (www.coolclassroom.org) for this description.

Images: reverse, background: Santa Monica Pier and beach courtesy kkelly2007 via flickr creative commons. This page, top left: Screen shot of the SCCOOS HF radar data page; bottom left: Mid-range transmit HF radar antenna on San Clemente Island; above: COCMP radar locations (dots) and their coverage areas (semi-circles); surface current direction and velocities are collected over the entire continental shelf. Red triangles represent wastewater outfall locations.