Dilution Study - Key West POTW Discharge KEY WEST, FL (May 9-16, 1994)

Introduction:
The Environmental Protection Agency as part of their NPDES permit review process evaluating the impacts of several municipal discharges to the coastal environment. This initiative includes a determination of appropriate measurement techniques for identification of effects to both the water column as well as the benthic communities.

As part of this process, the Water Management Division (WMD) requested the assistance of the Environmental Services Division (ESD) to identify the circulation/dilution patterns in the vicinity of the wastewater plume migration.

In processing with this request, the ESD, in conjunction with the WMD planned and subsequently conducted a hydrographic study during the period of May 9 through May 16, 1994. The study focused on defining the dilution and dispersion patterns of the Key West POTW effluent as it mixes with the maritime waters.

Conclusions:

- The outfall line appears to have separated at approximately 1000 meters from shore. In its existing configuration the discharge is through a single port at the 6 meter contour as opposed to a reported design which featured a diffuser at the 10 meter contour.
- Currents measured north of the outfall are aligned with the navigation channel paralleling the western shore of Key West. South of the outfall the current regime is dominated by the easterly flowing Florida current.
- Effluent from the Key West POTW was diluted 6:1 at the effluent boil, 93:1 750 meters from the boil ad, to 1900:1 at 4300 meters from the boil.
- Flood tides carried the traced wastewaters along te western shore of Key West via the navigation channel and continued through Garrison Bight above Flemming Key.
- On the ebb tide, currents directed the plume southeasterly for approximately 1000 meters, then the Florida current directed the flow in a more easterly direction paralleling the southern shoreline of Key West.
- Mathematical model simulations were in close agreement with the field tracer data.
- Simulation of the dilution afforded by use of a diffuser section indicates that levels of dilution at 200 meters from the outfall could be an order of magnitude greater than with the existing single port configuration.
- Nutrient levels measured in the boil and within the plume reflected enrichment above background within the fist 200 meters from the outfall.
- Algal growth potential to indicate nutrient enrichment is moderate 200 meters from the biol. The limiting nutrient was nitrogen.
- Semi-diurnal tides with a mean range of 1.3 feet was recorded during the survey.
- Winds were from the east-southeast and averaged 5 knots.