

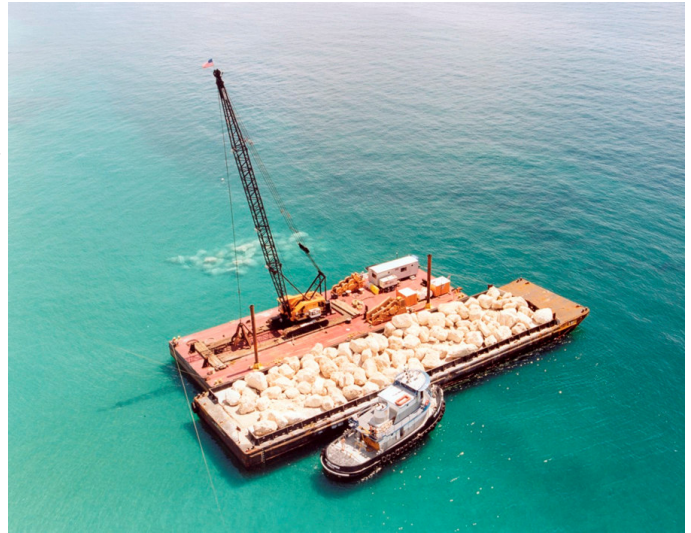


Rock Dropping Project

PROJECT SUMMARY: The project involved placing 6ft diameter boulders in predetermined locations off the coast of Broward County, FL in order to mitigate against hard-bottom impacts arising from the planned beach restoration south of Port Everglades. The limerock boulders resemble natural reef substrate and will provide a good habitat for encrusting and boring organisms as well as fish life. CSD placed 66,000 tons of these rock in close proximity to existing live hard-bottom necessitating the employment of GPS for precise positioning of rock and real-time vessel tracking over the Internet. The Trimble DGPS DSM132 performed 24 hours/day, 7days/week without any

failure for 6 months. Navigation operations were facilitated with smooth and regular position updates to tug captains, winch operators and crane operators with their discreet views of the project. The GPS electronics with associated position software were

instrumental in the timely completion of the project.



TECHNICAL SUMMARY: Trimble DSM132 DGPS receivers were utilized for submeter horizontal positioning of: the crane, the tug, and the rock drop barge; as well as to provide the orientation of the rock drop barge. Trimble HYDROPro Remote software which was installed on the crane and tug and HYDROPro Construction software which was installed on rock drop barge enabled the crane operator, tug captain and rd barge supervisor to monitor each other's position in real-time as well as send and receive anchor handling and rock dropping instructions via a graphic interface.

After each boulder placement was complete the crane operator actuated a remote pushbutton which recorded the rock's position and other user-defined information of the event to a database. UHF 900 mhz radios were used for telemetry between the three vessels.