C. Post Storm Monitoring. Surveys will be conducted to assess the erosional effects of major storms or other acute erosion events. The timing and extent of these surveys will be determined jointly by Dade County, FDEP and the Corps of Engineers. These surveys would serve to complement, not duplicate, any storm effects assessments that may be underway by other agencies.

D. Erosion Triggers and Mitigation of Adverse Impacts. Prior to the Department issuing a Notice to Proceed, the county shall provide a plan proposing criteria by which potential adverse shoreline impacts shall be evaluated and mitigated, including specific thresholds which will trigger mitigation of adverse impacts. The mitigation plan shall include time frames for evaluating impacts, along with specific mitigation actions, up to and including the removal of the breakwater structures.

VIII. REPORTING OF MONITORING DATA AND RESULTS

VIII.1 *BIOLOGICAL MONITORING AND SEDIMENTATION RATES.* Dade County DERM will submit semi-annual descriptive summary reports of the biological monitoring conducted for that period. Such reports will provide:

1. Date and personnel conducting the monitoring.
2. A descriptive summary of the monitoring conducted.
3. Any deviations from the prescribed monitoring program.
4. Available reduced data for that quarterly monitoring.
5. Any data not previously submitted for prior reporting periods.

VIII.2 *SEDIMENT ACCUMULATION AND SEDIMENT COMPACTION.* Reports of the sediment levels on the hardbottom areas adjacent to the borrow area will be submitted on a bi-weekly basis during the construction phase of the project. The report will include:

1. Date, time and personnel conducting the survey,
2. A descriptive summary of the sediment conditions on the hardbottom adjacent to the borrow area and the general health status of the benthic communities in the region as it relates to sedimentation.
3. A map of the borrow area and adjacent hardbottoms showing:
    a. the location of the fixed sediment stations and the areas of hardbottom surveyed,
    b. location and depth of any elevated levels of sediment on the hardbottom.

If indications of impacts (as described in Section III. above) are documented, the FDEP will be notified immediately by phone or fax, and a report will be forwarded within 24 hours.

VIII.3 *PIPELINE IMPACT ASSESSMENT.* A report on the impact to the reefs in association with the pipeline placement will be forwarded to the FDEP within three months after completion of completion of the corridor assessment. The report will contain:

1. Number and area (by species) of hard corals impacted.
2. Number and area of hard corals relocated due to proximity to the pipeline (i.e., shading).
3. Number of soft corals impacted.
4. Area of substrate impacted.
5. Comparison of actual area of impact to pre-project estimates.
6. Calculation of needed mitigation.

VIII.4 *BEACH FILL COMPACTION.* Measures of the beach fill compaction will be submitted quartile with the descriptive summary report for the biological monitoring.

VIII.5 *BEACH FILL SEDIMENT ANALYSIS.* Reports on the grain size analysis of material placed on the beach will be forwarded to the FDEP within one week of sampling. Reports will include:

1. Date, time and personnel conducting the survey.
2. A map of the segment of beach to be restored showing:
   a. The location of the area filled during the specified week.
   b. Locations from which the sediment samples were taken within that week's filled area.

VIII.6 *SEA TURTLE MONITORING.*

Reports detailing activities relative to the Sea Turtle monitoring and nest relocation activities will be forwarded to the FDEP:

1. Within 60 days of the completion of construction.
2. By December 31 of each year following construction.

VIII.7 *HYDROGRAPHIC PROFILES.*

1. Annual Reports. An annual report assessing the performance of the project over the prior year will be provided. The report will provide a discussion of erosion/accretion trends documented by the survey program for the entire project with a specific emphasis on recently renourished areas. Specific problem areas will be identified and possible solutions discussed.

2. Storm Monitoring Reports. A report detailing and analyzing the results from Post-Storm hydrographic monitoring conducted during the previous year will be submitted with the annual reports.

3. Data Format. Data will be provided to FDEP on 3.5" High Density diskettes within 14 days of the completion of survey activities and data compilation. DBASE IV files based on the FDEP developed MITS (Monument Information Tracking System) format will be utilized to allow direct compatibility with existing FDEP databases as well as those of the FDEP/Corps of Engineers Coast of Florida Study.

Table 1. Quarterly Biological and Sediment Monitoring Program sampling periodicity, conducted in association with the Contract-2 of the Second Nourishment of Miami Beach.*

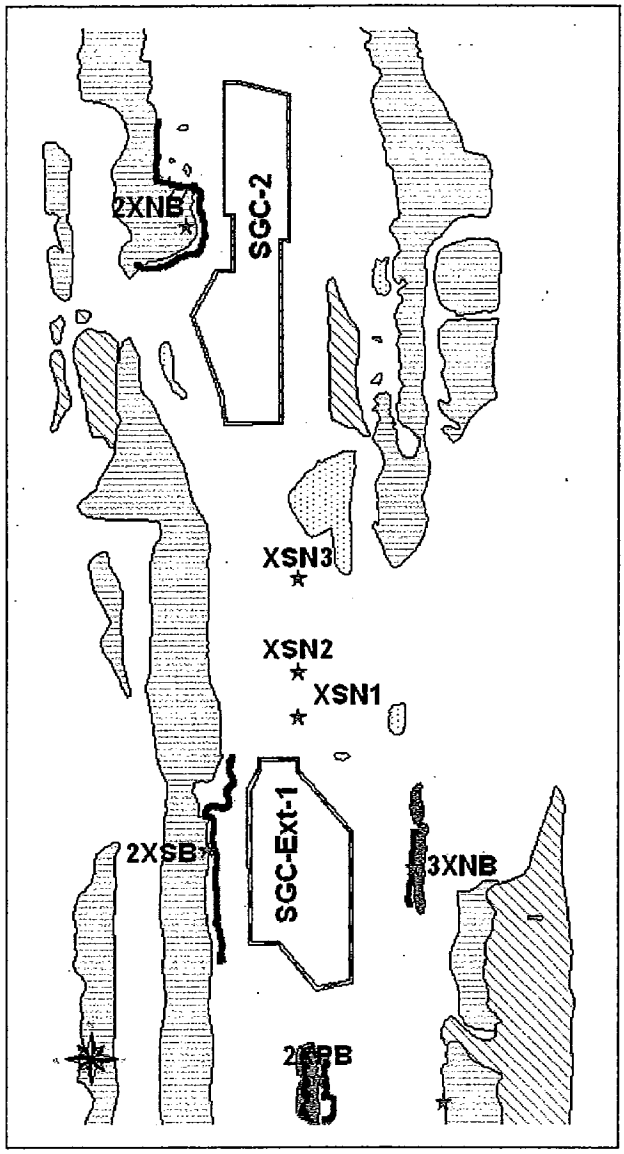
PC-Q#	Photo.	G-T	Light Profile	Turb.	Water Quality	Sed. Meas.	Fish Surveys	Sand Compact	Grain size
Pre-Const.	X	X	X	X	X	X	X	X	X
Const.			X	X		X			X
Post- Const. (PC-Q1)	X	X	X	X	X	X	X	X	X
PC-Q2	X		X	X	X	X			
PC-Q3	X	X	X	X	X	X	X	X	
PC-Q4	X		X	X	X	X			
PC-Q5	X	X	X	X	X	X	X	X	
PC-Q6	X		X	X	X	X			
PC-Q7	X		X	X	X	X	X	X	
PC-Q8	X		X	X	X	X			

* Photo. = Benthic community station photography; G-T = Ground-truthing of photography; Sed. Meas. = Sedimentation deposition rate analysis and Sediment depth measures; Sand Comp. = Penetrometer compaction measures; Turb. = Turbidity; PC-Q# = Post-Construction quarter number.

Compaction tests (cone penetrometer) will be conducted after final grading of the beach fill, and at the beginning of each quarter thereafter for three years from the time of final grading.

Tilling of beach fill will be conducted on an "as needed" bases, when indicated by the compaction tests and after consultation with the FDEP and the U.S. Fish & Wildlife Service.

Sunny Isles Design Modification
Proposed Borrow Area
Monitoring Sites



- Proposed Monitoring Sites
- Reef Edge Traces (Fall 1999)
- Shoreline
- Low Relief Patch (COFS '92)
- High Relief Patch (COFS '92)
- Low Relief Reef (COFS '92)
- High Relief Reef (COFS '92)

Point	Easting	Northing
2XNB	797201	501863
2XSB	797434	495161
2XPB	798598	492709
3XBB	799979	492470
XSN3	798400	498089
XSN2	798400	497089
XSN1	798400	496589
3XNB	799646	494974

Note: Proposed monitoring sites XSN1, XSN2, XSN3, and 2XPB will be sediment monitoring stations. The remaining sites will be both sediment and biological monitoring stations.

2000 0 2000 4000 Feet

APPENDIX F – SUBMERGED DREDGE SLURRY PIPELINE IMPACT ASSESSMENT

Submerged Dredge Slurry Pipeline Impact Assessment
Miami-Dade County 2nd Renourishment Contract II
FDEP Permit #0129419-001-JC
USACOE Contract #DACW17-98-C-0032

BACKGROUND

On August 10, 1998 the U.S. Army Corps of Engineers (USACOE) received a Joint Coastal Permit (#0129419-001-JC) from the Florida Department of Environmental Protection (FDEP). This permit provided for the renourishment of approximately 7000 feet of eroding shoreline along two stretches of Miami Beach off Surfside and South Miami Beach. Included in this permit were two fifty (50) foot wide corridors (one for the Surfside portion of the renourishment and one for South Miami Beach) for the placement of a submerged pipeline used to transport sand from the dredge offloading site across the nearshore reef and onto the beach. In conjunction with this permit, FDEP, ACOE and DERM executed a Memorandum of Agreement, identifying specific responsibilities of the local sponsor in regards to project monitoring and assessment. As stipulated in the MOA, the local sponsor (Miami-Dade County Department of Environmental Resources Management [DERM]), provided a pre-project impact assessment, comprehensive monitoring plan which included a pre-project impact assessment, as well as plans for mitigation and monitoring. The impact assessment and mitigation were based on permitted impacts associated with the submerged pipelines. Due, in part, to the public health and safety basis for the project, and the unavoidable nature of the impacts, a mitigation ratio of 1:1 was established for those impacts identified in the pre-project impact assessment.

Pre-project impact assessment reports estimated that between 157 and 473m^2 of benthic habitat would be impacted by the placement of the pipelines. The accepted mitigation plan called for construction and placement of specifically designed artificial reef modules. As described in the proposal, the effective area of each module was 27.73 m^2. Therefore, it was agreed that one artificial reef module would be placed in an already established artificial reef site for every 27.73 m^2 of benthic habitat impacted. In addition, certain hard coral protection measures were to be implemented before the project began construction in the hope that this would protect hard corals and reduce the final impact level.

METHODOLOGY

Pre-Placement Hard Coral Protection Measures

Prior to the contractor mobilizing into the area, the North and South boundaries of the pipeline corridors were marked using a Differential Global Positioning System (DGPS). Styrofoam buoys attached to cement blocks were affixed to the bottom as well as stainless steel eyebolts (drilled and cemented into the reef). Divers using diver propulsion vehicles (DPV) surveyed the length of the entire pipeline. All large (> 0.75 m^2) hard coral heads existing within the limits of the corridor were marked with a colored buoy to provide a visual marker on the surface for the contractor when placing the pipeline. When possible, these coral heads were carefully loosened and relocated out of the pipeline corridor. These corals were re-attached to the substrate using Portland cement, and their positions recorded (DGPS). Within the approximately 860 meters of pipeline corridor passing over hardground, divers relocated 14 hard coral heads (= 18.58 m^2) and marked 3 additional coral heads with colored surface buoys (see Table 1). The buoys were placed to provide a visual marker for the contractor during the pipeline placement. The contractor attempted to locate the pipeline within the corridor in such a manner to avoid the marked coral heads.

Post-Removal Damage Assessment

As in previous projects, the post construction surveys were conducted within 21 days of the removal of the pipeline. For the Surfside portion of this project the pipeline was removed on 6/22/99. Two post construction surveys were necessary for this pipeline. The first one occurred on April 20, 1999 after approximately 500' of the pipeline was removed during an equipment (booster pump) change-out. The second survey took place from July 8-14, 1999 after completion of the Surfside segment and removal of the pipeline. The location of the pipeline was marked prior to its removal. Additionally, numerous DGPS position "fixes" of the pipeline were taken prior to its removal to assist divers in relocating the exact path of the pipeline. Divers visually inspected the entire length of the pipeline corridor for indicators of physical impacts associated with the pipe.

Visual indicators of physical impact used during the assessment were:

- Broken, fractured, scraped, bleached, damaged or dislodged hard coral colonies;
- Abraded, dislodged, or broken soft corals (gorgonians), or sponges;
- Crushed, compacted, or scarified hardbottom (limerock) consistent with the general shape of the pipeline, and the buoy cables used for marking the pipeline;
- Bleaching and flattening of the algal turf and sediment layer on the reef consistent with the general shape of the tires used to hold the pipeline off of the bottom.

Procedures used for quantification of the impact identified were:

- A metered tape was used to measure physical impacts to the limerock hardground, and hard corals. Dimensions of the impacted areas were noted on an underwater slate.
- Impacts to hard corals were measured in two ways:
    a. The species and dimensions of the entire coral were noted and
    b. The dimensions, or percentage of the coral which appeared "healthy" (i.e. polyps not bleached or destroyed).
        - This "healthy" portion was recorded to provide an opportunity to track the coral's survival and/or recovery over time.
        - For purposes of calculating mitigation, the entire area of each impacted coral head was utilized, regardless of the amount of live tissue remaining on the coral head.
- Soft corals showing any abrasion or loss of branches resulting from contact with the submerged pipeline were counted as impacted. These numbers were recorded and a default impact area assigned for each coral.
- Representative video of the affected areas was taken to document field measurements.

RESULTS

Surfside Pipeline Impact Assessment

DERM Divers surveyed the entire length of the Surfside pipeline corridor over reef (859 m). A total impact area of 299.42 m^2 was tabulated. This included impacts to hard corals, soft corals, and limerock hardbottom. (See Table 2)

Impacts to soft corals were in the form of single to several abraded or broken branches. With few exceptions, the basal holdfasts of the individual corals were undamaged. Previous studies and personal observations of similarly impacted soft corals indicate that soft corals recover from this type of damage within 1 to 3 years. Because of the difficulty in quantifying the small, irregular areas of individual impact, a default area of 5 cm^2 was assigned for each individual soft coral

impacted. A total of 890 impacted soft corals were enumerated along the pipeline path, resulting in a total impact area of 4.45 m^2 (890 x .005 = 4.45 m^2).

Benthic impact for this portion of the project was mainly attributable to the "scraping" action of the buoy cables used to mark and lift the pipeline. Two areas of hardground impact associated with the pipeline marker buoy cables were located along the path of the pipeline. A total of 205.4 m^2 of impact was the direct result of pipeline buoy cables scarifying the bottom (Table 2).

Additional benthic impacts noted were the discontinuous and relatively small (<0.5m^2) areas of crushed and compacted limerock hardground where the pipeline had come in direct contact with the bottom. The total impact attributable to direct contact of the pipeline was 76.61m^2.

This project differed from previous beach renourishment projects in that an attempt was made to support the submerged pipeline off the reef bottom by placing large tractor tires around the pipeline at 100 feet intervals. Previous projects have relied on uneven bottom relief and the pipeline 'Lock Ring' collars (occurring at the junction of pipe segments: e.g., 500 feet intervals) to reduce bottom contact. Impacts resulting from these tires ranged from compacted turf algae and sediment to crushed hardbottom. A total of 6.81m^2 of benthic impact were found to have resulted from the tires.

The least common benthic impact was to hard corals. Before the pipeline was placed, a total of 17 large (> 0.75 m diameter) hard corals were noted to be in danger of impact from the pipeline. These corals were either relocated outside the corridor or marked so the contractor could avoid them. The preventive measures preserved 18.58 m^2 of hard corals, and assisted in reducing the area of possible hard coral impact. As a result of these measures, impact was reduced to 6.15 m^2 of hard corals associated with 85 corals. The impact included (as percentage of total area impacted) bleached (8.5%), loosened (7.9%), and fractured (82.1%) coral heads and 'other' (i.e., combinations of modes of impact: (0.07%)). On average, 74.9% of a coral head was impacted. However, due to the fact that many small colonies were involved, of the hard coral area impacted (6.15 m^2), 25.1% of that area (1.54 m^2) had apparent healthy, live tissue at the time of assessment.

South Miami Beach Pipeline:
Side Scan Sonar evaluation conducted in conjunction with the US ACOE Coast of Florida Erosion and Storm Effects Study (surveys conducted October, 1992 – see Figure 1), and additional surveys conducted in May of 1999 in association with this project, as well as ground-truthing surveys conducted by DERM, showed that the South Miami Beach pipeline corridor did not pass over any areas of hardground. Due to this fact, no impact survey was performed on the South Beach pipeline corridor.

DISCUSSION

The level of impact documented was slightly less than the median of the range estimated by the pre-project impact assessment. During this contract, attempts were made to reduce impacts to hardgrounds and benthic organisms associated with the placement of the dredge slurry pipeline across the offshore reef areas. During past projects it had been observed that the "ears" on the pipeline connection lock-rings (used to hold the individual pipeline segments together) held significant lengths of pipeline (+100 feet on either side of the connection) off the reef, with very minimal contact with the reef (the "ears" measured approximately 6-7 inches long and 2-3 inches wide). The ACOE and the FDEP agreed to include a requirement in the contract 'Plans and Specifications' for "Collars" to be placed at minimally 100-foot intervals along the pipeline. The

contractor elected to utilize large tractor tires that had a rim (central opening) dimension slightly larger that the size of the slurry pipeline. The tires were "slid" over the pipeline and secured in place by pieces of chain that passed through the side-wall of the tire and attached to "eyes" welded to the exterior of the pipe. Underwater surveys of the pipeline indicated that tires were successful in holding the pipe off the bottom to a much greater extent than seen in previous projects.

Previous projects (Miami Beach 2nd Renourishment Contract One, FDEP# 132344829), also required a submerged pipeline to be placed across the first reef, but did not use the tires to hold the pipeline off of the bottom. Pipeline placement associated with 'Contract-1' resulted in a benthic impact ratio of approximately 0.106 m^2:1 m (area of impact : meter of pipeline corridor) (table 3). Pipeline impact ratio from the present renourishment was 0.089 m^2:1 m, inclusive of impacts from the tires. This corresponds to a reduction of pipeline associated impact of approximately 16%. This figure is based on direct pipeline impacts only, and does not take into account impacts to hardground due to pipeline marker buoy cables. Inclusion of the marker buoy cable impacts, the impact ratio increases to 0.35 m^2:1 m.

The pre-project relocation and marking of hard corals had a definite benefit. Impacts to hard corals from the Sunny Isles portion of Contract one totaled 20.8 m^2. Impacts to hard corals for the Surfside portion of Contract two totaled only 6.15 m^2 after the relocating and marking of significant coral heads. The relocation activities were responsible for moving and preserving 18.58 m^2 of hard corals. This is a practice that should be repeated on future projects.

It was apparent in both this and the previous projects, that the greatest physical impact to the nearshore reef areas was associated with the buoy cables used to mark the location of (and lift) the pipeline. Divers noted these cables have approximately 75-100' of scope on them. It is understandable that to due to the forces on the pipeline itself from the wave and wind induced motion, the cables cannot be on a tight line. However, the present length of cable used may be excessive. The buoys on the surface respond to surface currents, wave action, and prevailing winds. As these forces change direction, the cable attached to the buoy changes its position on the bottom. In the present project approximately 70% (205.4 m^2 of the total 299.42 m^2) of the hardground area impacted was attributable to the scarifying action of the pipeline buoy cables. Just one cable was responsible for damage to the surrounding hardbottom totaling 192 m^2. In addition to the impacts to hardbottom, this incident also resulted in damage to 137 soft corals in the form of scrapes, abrasions, and in some cases, removal from the bottom. Future projects should investigate possible mechanisms for reducing impacts associated with the cable marker buoys. Suggestions for possible mechanisms to reduce these impacts are:

- Utilization of less impactive buoy line (i.e., floating, synthetic line)
- Reduction the scope of cable on the buoys, or
- Possible utilization of cable motion dampers to reduce and minimize the length and motion of the cables.

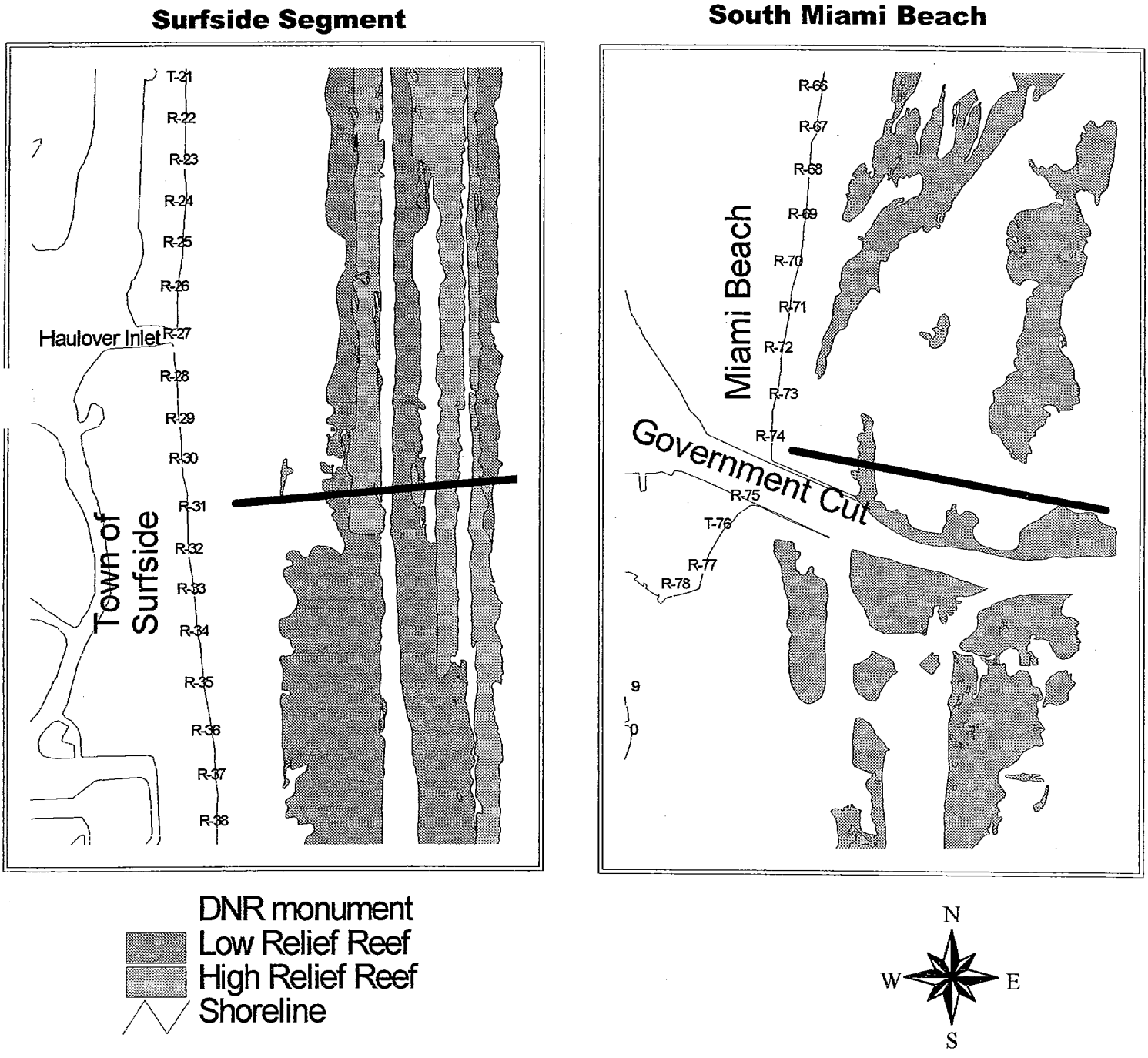
MITIGATION REQUIREMENTS:
The approved mitigation plan calls for one artificial reef module for every 27.73 m^2 of impact. In consideration of the area impacted (299.42 m^2), and the above stated ratio of area to module placement:

> **The required mitigation for the submerged pipeline impacts associated with Contract-2 of the Second Renourishment of Miami Beach is 11 Artificial Reef Modules.**

During the summer of 1994, DERM placed 24 prefabricated artificial reef modules in the Miami-Dade Co. Haulover Artificial Reef Site. The modules were placed in accordance with the accepted mitigation plan associated with FDEP Permit No. 132344829 (Miami Beach 2nd Renourishment – Contract 1). These modules were placed in anticipation of the mitigation necessary for permitted pipeline impacts that would occur during the Miami Beach 2nd Renourishment project. Mitigation requirements for two previous contracts (Contract 1a and Contract 1b) have been deducted from the amount placed. As identified in pipeline impact assessment reports for previous projects, eight modules were required as mitigation for impacts that occurred during Contract 1a, and four modules were required as mitigation for impacts that occurred during Contract 1b. Therefore, twelve modules remain to be applied as mitigation for pipeline impacts documented during the present project.

Based on the documented impacts and the previously stated mitigation ratios, a total of 10.79 modules are required to meet the mitigation requirements for the level of impact documented. Therefore, the remaining 12 modules will be assigned to, and fulfill the mitigation needs for, this project (Miami Beach 2nd Renourishment – Contract 2). This utilizes the balance of the mitigation placed for the Miami Beach 2nd Renourishment. Any future mitigation requirements will require completion/placement of additional mitigation work or materials.

Figure 1: Miami Beach 2nd Renourishment Contract 2 Pipeline Corridors Surfside and South Miami Beach



FDEP Permit #01294-001-JC
USACOE Contract #DACW17-98-C-0032

Table 1: 2nd Renourishment - Contract 2
Surfside Pipeline Hard Coral Relocation and Marking

Relocated Coral Heads

Date	Species	Dim1	Dim2	Area (m^2)	Lattitude	Longitude
12-Nov-98	MON ANNU	1.00	1.00	0.79	25 53.380 N	80 05.467 W
13-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.380 N	80 05.442 W
13-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.380 N	80 05.442 W
13-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.382 N	80 05.425 W
13-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.384 N	80 05.415 W
13-Nov-98	MON CAVE	2.00	1.00	1.57	25 53.384 N	80 05.405 W
16-Nov-98	DIP STRI	1.00	0.75	0.59	25 53.385 N	80 05.395 W
16-Nov-98	MON CAVE	1.00	0.75	0.59	25 53.385 N	80 05.390 W
16-Nov-98	MON CAVE	1.00	1.20	0.94	25 53.385 N	80 05.385 W
16-Nov-98	MON CAVE	1.00	0.75	0.59	25 53.386 N	80 05.370 W
16-Nov-98	COL NATA	1.00	1.00	0.79	25 53.387 N	80 05.356 W
16-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.390 N	80 05.315 W
17-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.400 N	80 05.170 W
17-Nov-98	MON CAVE	1.00	1.00	0.79	25 53.400 N	80 05.160 W

Marked Coral Heads

Date	Species	Dim1	Dim2	Area (m^2)	Lattitude	Longitude
12-Nov-98	DIP STRI	1.00	2.00	1.57	25 53.377 N	80 05.517 W
12-Nov-98	MON CAVE	2.00	3.00	4.71	25 53.378 N	80 05.505 W
12-Nov-98	MON CAVE	1.10	1.10	0.95	25 53.379 N	80 05.495 W

Total area of corals moved or marked: 18.58 m^2

Table 2: 2nd Renourishment - Contract 2
Summary of Impacts to Reef

Impacts to Hardbottom:		
Contact with pipeline:	76.61m^2	
Contact with tires:	6.81m^2	
Cable scrapes:	205.4m^2	
Total impact to limerock hardbottom:		**288.82m^2**
Impacts to Soft Corals:		
Number of individuals affected:	890	
Total impact to soft corals:		**4.45m^2**
Impacts to Hard Corals:		
Number of individuals affected:	85	
Total impact to hard corals:		**6.15m^2**
Impacts to reef - Surfside Pipeline:		**299.42m^2**
Linear distance of pipeline over reef:		**859m**
Area of impact per linear distance:		**0.35m^2/m**

Table 3: 2nd Renourishment - Contract 1b
Summary of Impacts to Reef

Benthic Impacts (hardbottom + coral):		
Total impact to limerock hardbottom:		**261.58m^2**
Impacts to Soft Corals:		
Number of individuals affected:	1229	
Total impact to soft corals:		**12.29m^2**
Impacts to reef - Sunny Isles Pipeline:		**273.87m^2**
Linear distance of pipeline over reef:		**1316.7m**
Area of impact per linear distance:		**0.207m^2/m**

Appendix A: Miami Beach 2nd Renourishment - Contract 2
Summary of Impacts to Reef

Survey		Hardground Impacts			Soft Corals	Hard Coral Impacts						Notes	
Date	Type	Dim 1 (m)	Dim 2 (m)	Area (m^2)	Impacted	Species	Dim 1 (cm)	Dim 2 (cm)	Area (m^2)	% Impacted	Area imp (m^2)		
7/8/99	cable	5.50	3.10	13.40	30	SOL BOUR	14	12	0.013	10	0.001	bleached	
7/8/99	pipe	1.00	1.30	1.30		SOL BOUR	10	12	0.009	10	0.001	bleached	
7/8/99	pipe	0.35	0.23	0.08		MEA MEAN	15	15	0.018	10	0.002	bleached	
7/8/99	pipe	0.30	0.35	0.11		MON CAVE	34	30	0.080	10	0.008	bleached	
7/8/99	pipe	0.55	0.23	0.13		MON CAVE	49	24	0.092	15	0.014	bleached	
7/8/99	pipe	0.87	0.27	0.23		MON CAVE	14	10	0.011	20	0.002	bleached	
7/8/99	pipe	2.00	3.00	4.71		MON CAVE	30	25	0.059	20	0.012	bleached	
7/8/99	pipe	0.60	0.27	0.16		DIC STOK	8	7	0.004	30	0.001	bleached	
7/8/99	tire	1.00	1.00	1.00	10	MON CAVE	33	20	0.052	30	0.016	bleached	
7/8/99	pipe	2.00	0.40	0.80	3	SID RADI	9	12	0.008	40	0.003	bleached	cemented
7/8/99	pipe	1.60	0.30	0.48		SID SIDE	10	11	0.009	40	0.003	bleached	
7/8/99	pipe	0.30	0.10	0.03		MON CAVE	25	12	0.024	40	0.009	bleached	
7/8/99	pipe	0.10	0.20	0.02		MON CAVE	30	35	0.083	40	0.033	bleached	
7/8/99	pipe	2.00	0.30	0.60		SOL BOUR	7	11	0.006	50	0.003	bleached	
7/8/99	pipe	0.30	0.20	0.06		SOL BOUR	7	18	0.010	50	0.005	bleached	
7/8/99	pipe	0.15	0.20	0.03	2	MEA MEAN	30	35	0.083	50	0.041	bleached	
7/8/99	pipe	0.20	0.40	0.08	1	SOL BOUR	50	25	0.098	50	0.049	bleached	
7/8/99	tire	1.00	1.00	1.00	4	DIC STOK	7	7	0.004	70	0.003	bleached	
7/8/99	pipe	0.30	0.30	0.09		MON CAVE	4	1	0.000	100	0.000	bleached	
7/8/99	pipe	0.40	0.20	0.08	5	AGA AGAR	3	5	0.001	100	0.001	bleached	
7/8/99	pipe	1.00	0.25	0.25	5	AGA AGAR	5	5	0.002	100	0.002	bleached	
7/8/99	pipe	1.00	0.50	0.50	5	AGA AGAR	3	9	0.002	100	0.002	bleached	
7/8/99	pipe	0.25	0.25	0.06	5	POR ASTE	8	6	0.004	100	0.004	bleached	
7/8/99	tire	1.00	1.00	1.00	5	MON CAVE	12	4	0.004	100	0.004	bleached	
7/8/99	pipe	1.50	0.45	0.68	10	POR ASTE	13	4	0.004	100	0.004	bleached	
7/8/99	pipe	5.00	0.50	2.50	5	MON CAVE	10	10	0.008	100	0.008	bleached	
7/8/99	pipe	3.00	1.70	5.10	5	MEA MEAN	10	15	0.012	100	0.012	bleached	
7/8/99	pipe	1.50	0.30	0.45	5	MON CAVE	10	15	0.012	100	0.012	bleached	
7/8/99	pipe	0.60	0.60	0.36	5	MEA MEAN	11	14	0.012	100	0.012	bleached	
7/8/99	tire	1.00	1.00	1.00	4	MON CAVE	15	17	0.020	100	0.020	bleached	
7/8/99	pipe	0.20	0.20	0.04		MEA MEAN	21	14	0.023	100	0.023	bleached	
7/8/99	pipe	0.60	0.30	0.18		MON CAVE	25	15	0.029	100	0.029	bleached	
7/14/99	pipe/tire	9.50	1.00	9.50	14	SOL BOUR	30	30	0.071	100	0.071	bleached	
7/14/99	tire	0.25	0.45	0.11	50	SOL BOUR	5	5	0.002	100	0.002	bleached	
7/14/99	pipe/tire	0.80	0.70	0.56	43	POR ASTE	16	13	0.016	100	0.016	dead	
7/14/99	pipe	0.10	0.20	0.02	51	MON CAVE	30	25	0.059	10	0.006	fractured	cemented
7/14/99	pipe	2.00	0.30	0.60		MON CAVE	35	35	0.096	30	0.029	fractured	cemented
7/14/99	pipe	1.00	0.25	0.25	9	MON CAVE	23	13	0.023	50	0.012	fractured	cemented
7/14/99	pipe	0.40	0.30	0.12	10	MON CAVE	44	16	0.055	50	0.028	fractured	cemented
7/14/99	pipe	8.50	0.50	4.25	4	MON CAVE	40	45	0.141	50	0.071	fractured	
7/14/99	pipe	0.20	0.20	0.04	4	MON CAVE	60	70	0.330	50	0.165	fractured	
7/14/99	cable	12.00	16.00	192.00	137	MON CAVE	50	50	0.196	80	0.157	fractured	cemented
7/14/99	pipe	2.20	4.00	8.80	57	POR ASTE	5	8	0.003	100	0.003	fractured	
7/14/99	pipe	2.50	0.20	0.50	20	POR ASTE	10	10	0.008	100	0.008	fractured	
7/14/99	pipe	1.00	0.30	0.30	30	SID RADI	15	12	0.014	100	0.014	fractured	all dead
7/14/99	pipe	4.00	0.30	1.20	20	MON CAVE	22	9	0.016	100	0.016	fractured	cemented
7/14/99	tire	1.00	0.30	0.30	12	POR ASTE	16	15	0.019	100	0.019	fractured	
7/14/99	tire	1.00	1.50	1.50	34	MON CAVE	160	200	2.514	100	2.514	fractured	cemented
7/14/99					50	MON CAVE	23	17	0.031	100	0.031	fractured	cemented
7/14/99					18	SOL BOUR	27	22	0.047	100	0.047	fractured	cemented
7/14/99						SOL BOUR	30	21	0.050	100	0.050	fractured	cemented
7/14/99						SOL BOUR	30	25	0.059	100	0.059	fractured	cemented

Appendix A: Miami Beach 2nd Renourishment - Contract 2
Summary of Impacts to Reef

Survey		Hardground Impacts			Soft Corals	Hard Coral Impacts						Notes	
Date	Type	Dim 1 (m)	Dim 2 (m)	Area (m^2)	Impacted	Species	Dim 1 (cm)	Dim 2 (cm)	Area (m^2)	% Impacted	Area imp (m^2)		
7/14/99						MON CAVE	60	70	0.330	100	0.330	fractured	
7/14/99						MON CAVE	30	28	0.066	100	0.066	fractured	cemented
7/14/99						MON CAVE	40	30	0.094	100	0.094	fractured	cemented
7/14/99						SOL BOUR	10	9	0.007	100	0.007	fractured	
7/14/99						MON CAVE	25	15	0.029	60	0.018	fractured/ scraped	
7/14/99						POR ASTE	30	40	0.094	50	0.047	fractured/bleached	
7/14/99						MON CAVE	50	50	0.196	100	0.196	fractured/bleached	
7/14/99					10	SOL BOUR	19	15	0.022	50	0.011	loose	cemented
7/14/99					94	SID SIDE	4	4	0.001	100	0.001	loose	
7/14/99					38	DIC STOK	5	4	0.002	100	0.002	loose	
7/14/99					47	STE MICH	6	5	0.002	100	0.002	loose	cemented
7/14/99					7	DIC STOK	5	6	0.002	100	0.002	loose	
7/14/99						SID SIDE	7	7	0.004	100	0.004	loose	
4/20/99	pipe	0.70	0.50	0.35	2	STE MICH	12	9	0.008	100	0.008	loose	cemented
4/20/99	pipe	0.70	0.50	0.35	10	SOL BOUR	13	9	0.009	100	0.009	loose	
4/20/99	pipe	0.60	0.25	0.15	5	SOL BOUR	13	13	0.013	100	0.013	loose	cemented
4/20/99	pipe	0.40	0.25	0.10	5	MON CAVE	15	12	0.014	100	0.014	loose	cemented
4/20/99	pipe	0.60	0.40	0.24		DIP STRI	15	13	0.015	100	0.015	loose	
4/20/99	pipe	0.80	0.25	0.20		POR ASTE	15	14	0.017	100	0.017	loose	
4/20/99	pipe	0.60	0.40	0.24		AGA AGAR	15	15	0.018	100	0.018	loose	
4/20/99	pipe	5.70	0.50	2.85		MON CAVE	30	12	0.028	100	0.028	loose	cemented
4/20/99	pipe	0.50	0.20	0.10		MON CAVE	25	25	0.049	100	0.049	loose	cemented
4/20/99	pipe	0.20	0.20	0.04		DIP STRI	25	25	0.049	100	0.049	loose	cemented
4/20/99	pipe	0.60	0.40	0.24		COL NATA	50	36	0.141	100	0.141	loose	cemented
4/20/99	pipe	1.60	0.20	0.32		SID RADI	10	9	0.007	10	0.001	loose/bleach	
4/20/99	pipe	6.30	0.20	1.26		DIP STRI	20	15	0.024	40	0.009	loose/bleach	cemented
4/20/99	pipe	1.00	0.50	0.50		DIC STOK	4	5	0.002	50	0.001	loose/bleach	cemented
4/20/99	pipe	0.40	0.30	0.12		POR ASTE	20	15	0.024	100	0.024	loose/bleach	
4/20/99	pipe	0.90	0.20	0.18		MON CAVE	90	40	0.283	1	0.003	scraped	
4/20/99	pipe	0.55	0.34	0.19		DIC STOK	11	11	0.010	10	0.001	scraped	
4/20/99	pipe	0.80	0.25	0.20		SID SIDE	22	13	0.022	90	0.020		
4/20/99	pipe	1.50	0.35	0.53		MON ANNU	13	5	0.005	100	0.005		
4/20/99	pipe	2.00	0.15	0.30		POR ASTE	10	13	0.010	100	0.010		
4/20/99	pipe	0.80	0.70	0.56			22.611765	19.858824	Tot Area	Avg Imp	Tot Imp	% Impact	
4/20/99	pipe	0.40	0.22	0.09					6.146	74.8941176	4.874		
4/20/99	pipe	1.12	0.28	0.31		Bleached					0.413	8.47536491	
4/20/99	tire	1.00	0.90	0.90		Loose					0.385	7.901474295	
4/20/99	pipe	0.50	0.30	0.15		Fractured					4.002	82.10182308	
4/20/99	pipe	0.60	0.50	0.30		Other					0.074	1.514523126	
4/20/99	pipe	4.90	5.00	24.50									

Totals:
(all areas in m2)

Impacts to Hardbottom:		Soft Coral Impacts:		Hard Coral Impacts:	
Pipeline Impacts:	76.61	Number impacted:	890	Number Impacted:	85
Tire Impacts:	6.81	SC impact area:	4.45	Total area of impact:	6.15
Cable Impacts:	205.40				
Hardground Impact	288.82				

Total impacts to reef due to Surfside pipeline: **299.42 m^2**

APPENDIX G – PRE-CONSTUCTION ASSESSMENT OF PROPOSED PIPELINE CORRIDOR

Pre-Construction Assessment of Proposed Pipeline Corridor Alternate Test Beach

Conducted by:
Miami-Dade Department of Environmental Resources Management (DERM)
Restoration and Enhancement Section

Submitted to:
US Army Corps of Engineers - Jacksonville District

Background

As part of the federally authorized Miami Beach Hurricane Protection and Erosion Control Project, a segment of beach between Dade County shoreline reference monuments R-36 and R-44 (northern Miami Beach) is scheduled for renourishment. As part of the renourishment project, a pipeline corridor must be established across the nearshore reef areas. A sand-slurry pipeline will be placed within the corridor to transport the sand from the dredge to the renourishment area. Miami-Dade County DERM conducted evaluations of the habitats and reef areas near the project site to determine the most suitable (least impactive) location for the pipeline.

The general region for the corridorevaluations was pre-selected based the location of the project, and the need to minimize the number of corridors for future projects. This region will serve as an ideal location for renourishment projects in the middle and northern end of The City of Miami Beach; including the "Sustainability of Renourishment Test Beach" area.

Multiple surveys were conducted in the area to determine, if possible, a path of least impact. Surveys were performed over what is locally known as "First Reef", the near shore hard-bottom community off of Miami Beach. These included visual surveys of the reef edges and patches to confirm extent of reef as depicted in existing side-scan coverages (USACE Coast of Florida Study – 1992). In addition, diver surveys of the western edge of first reef were conducted. These western surveys were an attempt to qualify the near-shore habitat in the project area.

Methods

Between February and May 2000 both quantitative and qualitative surveys of the proposed Alternate Test Beach pipeline corridor were performed by DERM biologists. Figure 1 shows the location of survey transects and the proposed pipeline corridor.

For all surveys, position locations were determined using a Trimble® 'Path Finder Plus', autologging GPS receiver. All GPS positions were differentially corrected via "Post processing", using the Dade County's Base Station files. The accuracy of the instrumentation is +/- 1 meter, however, in consideration of the variation introduced by the scope of the buoy line and boat positions, the accuracy of the positions is considered to be +/- 3 meters.

Qualitative survey transects were conducted by "towing" a diver from the boat in a westerly direction over the length of the proposed corridor. The diver made qualitative assessments of the habitat on the reef, assigning a numeric classification (1-4) to the habitat, depending on the quality of the benthic community being observed. A "spotter" on the boat recorded

these numbers as well as the position of the boat at the time. Relative percentages of each community class were calculated for each transect ((i.e., sum of linear distance of a community class) ÷ (total distance of Transect)*100). The benthic habitat categories used are as follows:

0 = Sand

1 = Sand covered hard-ground with sparse soft coral, sponge, and algal populations either protruding through the sand or on isolated small rock out-croppings.

2 = Low relief (<1m), exposed hard-ground with a well-developed benthic community of moderate density (7-12/m^2) soft coral, sponge and algae and low (1-2/m^2) hard coral density.

3 = Low relief (<1m), exposed hard-ground with a well-developed benthic community of moderate density (7-12/m^2) soft coral, sponge and algae and moderate density (2-3/m^2) hard coral. Also to include areas with soft coral, sponge, and algal densities consistent with a type "2" habitat, but having low density, large (>1.0m) hard coral colonies.

4 = High relief (>1m) hard-ground with well-developed benthic community, inclusive of moderate to high-density soft coral, sponge, algal, and hard coral coverage.

Quantitative surveys were performed using a "belt transect" method. The quantitative transects (0.5m wide by 25.0m long), were oriented perpendicular to (i.e., North-South), and centered on the qualitative transect QLTa (Figure 1). A total of eight evenly spaced (0.1 nm) transects were assessed by two biologists, skilled in the identification of local benthic organisms. Hard corals, soft corals, and sponges were identified and enumerated. Additionally, to quantify the area of live tissue coverage, the dimensions of each hard coral colony (major and minor axis) were measured. Approximate abundance of other benthic organisms (common algal species, hydrocorals, colonial zooanthids) was recorded as well. Video documentation was conducted by swimming the length of each transect with the camera scanning a 0.5 m wide path (pre-measured PVC pipe included in video for scale). All measurements and observations were recorded on underwater paper.

Extensive in-water surveys conducted by divers in August of 1999 revealed that side-scan data available for this area (USACE Coast of Florida Study – 1992) did not accurately define all reef areas or reef lines. Figures 1, 2, and 3 illustrate these discrepancies. Diver verified locations of reef edge and patch reef areas are overlaid on the COFS 1992 side scan information. A significant result of the diver surveys was the location of a narrow (200' wide) strip of extremely high relief (8-10') reef located between the first and second reef tracts, which was not indicated on the 1992 maps. This reef appears to have been heavily impacted by a past dredging project, as evidenced by mechanical damage (scrapes) to the limestone bedrock. Additional surveys of this reef tract revealed a break in the reef approximately 375' long. Surveys of the sand plane in this "break" showed a 75' x180' patch reef of moderate to high relief located approximately midway between the north and south reef tracts (Figure 2). In order to avoid these areas of reef, subsequent surveys focused on a corridor that would cross in the sand.

Results

Qualitative Assessments:

Results from the qualitative assessments were evaluated to select the most probable path of least impact. Factors included in this evaluation were: percent of class 3 and 4 habitats (i.e., low and high relief, well-developed benthic communities), percent sand and overall length of the transect over reef. The results from the qualitative transects are presented in Table 1. Transect QLTa had a much shorter overall distance over reef than QLTb or QLTc (Figure1). In addition, QLTa would avoid the previously unmapped reef material located east of First reef (the high relief "strip" of reef as well as the patch). In keeping with past attempts to avoid placing a pipeline over higher quality habitat, transect QLTa was selected for further evaluation, and quantitative assessments were conducted to document benthic organism composition and densities.

Quantitative Evaluation:

A total of eight quantitative transects were assessed along QLTa (Table 2). These transects covered a total of 100m^2 (25m x 0.5m x 8). Surveys indicated an overall hard coral coverage of 1.71 individuals per m^2. Of these corals, the average size was 30 cm^2. Soft coral and sponge coverage was 8.5 ind/m^2 and 7.5 ind/m^2, respectively. Summaries of findings for each transect as well as density calculations for individual species follows (Appendix).

Further study of quantitative transects served to validate qualitative survey results for the corresponding areas. Areas described in the qualitative analysis were shown by the quantitative transect to have appropriate species densities for that category. For example, quantitative transect 2 (25 51.200 N and 80 06.050 W), consists of low-density (<1 individual/m^2) hard coral coverage, with an average colony size of 9 cm^2. During the qualitative analysis, this area was described as a type 1 habitat. Transect 4 (25 51.200 N / 80 06.250 W) has a moderate density (2 ind/m^2) hard coral coverage, but the individual colonies were much larger (54 cm^2). The individual performing the qualitative analysis described this area of reef as a type 3 habitat.

Additional assessments of this area were performed by divers to determine the western extent of "Significant Habitat" (i.e, Numeric classification "1") as well as the western boundaries of continuous reef (Figure 3). To accomplish this, the boat operator followed a colored buoy, which was towed by the divers conducting the visual surveys. A Trimble® Pathfinder autologging GPS was used to document the path of the divers. The positions were processed in the same manner as described for the diver "tows" associated with the qualitative habitat assessment. Divers tracing the western edge of first reef found that the species composition and density changed along the edge from significant habitat to hardground reef edge. An attempt was made to stay on the western edge of all reef material or habitat. In addition to the reef edge survey, divers identified three significant areas shoreward of the western edge of First reef. The first, (area A) has an area of approximately 4905 m^2 (52,800 ft^2); area B, 18116 m^2 (195,000 ft^2); and area C, 1486 m^2 (16,000 ft^2). Areas A and C are patches of hardground covered with a sand veneer having moderate soft coral and sponge growth. Using the above described habitat categories, these would be classified as type 1. Area B is a low relief patch reef with dense soft coral and sponge coverage and can be classified as type 2 habitat.

Potential Impacts to Reef

Assuming a pipeline footprint width of 0.25 m along the entire path over reef, and that the pipeline is in contact for the entire 1243 m over first reef, an area of impact of 311 m^2 can be expected. Based on quantitative survey data, the potential pipeline contact path is projected to include 532 hard corals, 2637 soft corals, and 2329 sponges. Past projects have shown that the pipeline will not, in fact, be in contact with the reef along the entire path. Variability of bottom relief and permit required pipeline "collars" serve to support the pipeline for considerable distances, thus dramatically reducing the area of physical contact between the pipe and the reef. For example, past projects have shown actual impacts to reef from 18% (Miami Beach 2nd Renourishment, Contract 1b) to 83% (Contract 2) of pre-project estimated impacts. In the case of impacts associated with Contract 2, most (69%) of the impact to hard-ground was a direct result of the "scraping" action associated with the steel cables attached to the pipeline marker buoys used by the contractor, as opposed to physical impact from the pipeline itself. Thus, any and all actions that can be taken to reduce the impacts associated with the pipeline "marker" buoys and cables will serve to greatly reduce the level of impact to the benthic organisms within the pipeline corridor

The estimates provided herein are meant to provide an estimate of the magnitude of impact anticipated from placement of the pipeline on the reef, and to assist in development of mitigation planning. The actual area of impact associated with the dredge slurry pipeline will be determined from post placement and post removal surveys. These surveys will quantify the actual area and organisms impacted. The methodology to be used for the post-removal assessment has been described in the "Physical and Biological Monitoring Program For Dade County, Florida, Beach Erosion Control And Hurricane Protection SUNNY ISLES RENOURISHMENT – DESIGN MODIFICATION", as submitted to the Florida Department of Environmental Protection, April 2000.

Table 1: Summary of Qualitative Assessments - Alternate Test Beach

		Habitat Type					
Transect		0	1	2	3	4	
QLTa Length (ft)	4918	837	433	2367	975	306	Total (ft)
Dist. over reef (ft):	**4081**	17%	9%	48%	20%	6%	% of total
QLTb Length (ft)	4660	377	659	2603	973	47	Total (ft)
Dist. over reef (ft):	**4283**	8%	14%	56%	21%	1%	% of total
QLTc Length (ft)	4707	328	1035	1673	1625	46	Total (ft)
Dist. over reef (ft):	**4379**	7%	22%	36%	35%	1%	% of total

Table 2: Summary of Quantitative Transects - Alternate Test Beach

Transect	# of Hard Corals	Density (ind/m^2)	Average Size (cm^2)	# of Soft Corals	# of Sponges
1	31	2.48	20.07	43	210
2	9	0.72	9.05	44	175
3	10	0.80	136.70	229	67
4	24	1.92	53.92	85	83
5	16	1.28	38.48	109	63
6	28	2.24	10.06	96	56
7	21	1.68	22.29	180	71
8	32	2.56	11.61	62	24

Summary:	total	per m^2
Total # of Hard Corals	171	1.71
Average size (cm^2)	30.06	0.3
Total # of Soft Corals	848	8.48
Total # of Sponges	749	7.49

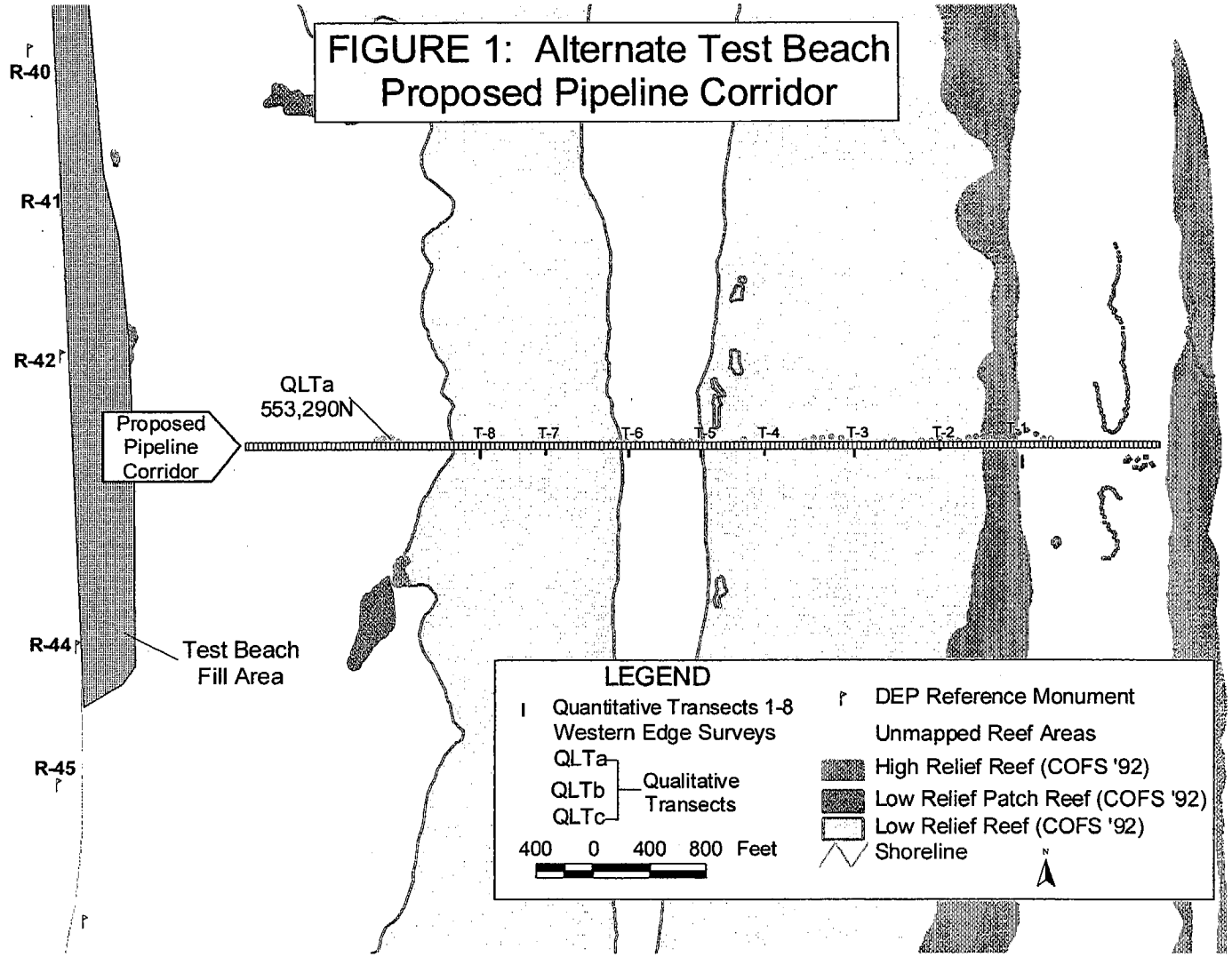


FIGURE 1: Alternate Test Beach
Proposed Pipeline Corridor
R-40
R-41
R-42
R-44
R-45
QLTa
553,290N
Proposed
Pipeline
Corridor
T-8
T-7
T-6
T-5
T-4
T-3
T-2
T-1
Test Beach
Fill Area
LEGEND
Quantitative Transects 1-8
Western Edge Surveys
QLTa
QLTb
QLTc
Qualitative
Transects
400 0 400 800 Feet
DEP Reference Monument
Unmapped Reef Areas
High Relief Reef (COFS '92)
Low Relief Patch Reef (COFS '92)
Low Relief Reef (COFS '92)
Shoreline
N

Figure 2: Alternate Test Beach
Diver's Reef Traces and Side Scan Survey Data
(Coast of Florida Study - 1992)