The Coalition To Save Our Shoreline, Inc.
(SOS)

August 1, 2013

U.S. Army Corps of Engineers
Attention: Mr. Garett Lips, Corps Regulatory Project Manager
4400 PGA Boulevard, Suite 500
Palm Beach Gardens, Florida 33410

Re: DEPARTMENT OF ARMY FILE NUMBER
The Town of Palm Beach--Reach 8 South (SAJ--2005--07908)

Dear Mr. Lips:

On behalf of the organization, the Coalition To Save Our Shoreline, Inc. (SOS), as well as the more than 6,000 people whose voices we carry and as a qualified stakeholder in these proceedings, we offer and submit the Coalition To Save Our Shoreline (SOS) Reach 8 Plan & Design to be reviewed and studied as an alternative for the Reach 8 beach nourishment project and as part of the record for the Environmental Impact Statement to be conducted for Reach 8 in the Town of Palm Beach and also to be included in Palm Beach County's Southern Palm Beach Island Comprehensive Shoreline Stabilization Project in Palm Beach County for Reaches 8, 9 and 10.

"The primary goal of this project plan (The Coalition To Save Our Shoreline, Inc. (SOS) Beach Nourishment Plan and Design for Reach 8) is the development of a preliminary design that will provide protection from a 25-year return period storm event and background erosion associated with this shoreline segment for all Reach 8 properties south of the pier. The proposed design balances the need to maximize project performance while minimizing adverse impacts to nearshore hardbottom areas."

While we realize your work will be arduous and painstaking, we feel we too have devoted a great deal of time and money to create the "right plan" for our area by balancing the interests of environmentalists, property owners, the public, governmental entities, and other interested parties. Karyn Erickson, P.E., D.CE is the highly regarded coastal engineer who designed the Coalition To Save Our Shoreline (SOS) Beach Nourishment Plan for Reach 8. Coastal engineer Erickson also designed the past Mid-Town beach project for the Town of Palm Beach which was undeniably successful as have a number of other notable coastal projects she has designed and implemented in Florida.

We respectfully submit that this plan meets the standards and criteria which are necessary to prevail. It is feasible, responsible, affordable, balanced and effective for the long term benefits for all. No other submitted proposals or plans can be said to accomplish this nor do they constitute the interests of everyone.

We sincerely thank you for your involvement in this critical study and for the opportunity to work with you.

Sincerely,

Richard G. Hunegs
Chairman of The Coalition To Save Our Shoreline, Inc.
coalitionsos@yahoo.com

cc: U.S. Representative Lois Frankel

BEACH NOURISHMENT PLAN AND DESIGN FOR REACH 8

THE COALITION TO SAVE OUR SHORELINE, INC. (SOS)

DESIGN BASIS

July 17, 2012

Project Plan Introduction

The Coalition To Save Our Shoreline, Inc. (SOS) engaged Erickson Consulting Engineers (ECE) to provide a preliminary coastal engineering design for the stabilization of Reach 8 south of Lake Worth Pier. Currently, the Reach 8 beach south of Lake Worth Pier does not provide protection to upland properties from a 25-year return period storm event; nor is the "feeder beach" to the north of the pier able to provide 25-year storm protection required for these properties. As shown in Figure 1, the design area includes the beaches fronting properties within the Town of Palm Beach limits south of the pier from the Bellaria (3000 S. Ocean Blvd) to La Bonne Vie (3475 S. Ocean Blvd) and encompasses the Florida Department of Environmental Protection (FDEP) monuments R-129 to R-134.

Project Plan Goals and Objectives

The primary goal of this project plan is the development of a preliminary design that will provide protection from a 25-year return period storm event and background erosion associated with this shoreline segment for all Reach 8 properties south of the pier. The proposed design balances the need to maximize project performance while minimizing adverse impacts to nearshore hardbottom areas. The design's principal elements include:

(1) Establish a design project baseline;
(2) Define the Project Plan area's background erosion rate, and required beach fill volumes relative for 25-year storm protection;
(3) Identify and analyze candidate sand sources;
(4) Identify hardbottom locations, geometry and characteristics;

(5) Develop and assess project plan alternatives;

(6) Assess sediment cross-shore adjustments and hardbottom impacts; and

(7) Estimate probable construction cost.

Baseline and Beach Segments

The first step in the design development process required the establishment of a project baseline for the Reach 8 area south of Lake Worth Pier. The baseline provides a consistent reference for the protective design beach based on alignment of major habitable structures and protective value of the existing upland and dune features. ECE determined that, based upon an analysis of beach widths, existing dune conditions, building locations, and storm erosion vulnerability, the crest of the dune feature as constructed by the Town in the spring of 2011 will function as the reference baseline.

In addition to the establishment of a baseline, ECE also created a building development line along three segments of the project plan length to delineate the seaward edge of similarly aligned buildings. The northernmost segment, Segment 1, encompasses the area between Bellaria at 3000 S. Ocean Blvd (approximately 300 ft north of R-129) and The Enclave of Palm Beach at 3170 S. Ocean Blvd (approximately 290 ft north of R-131). Segment 2, the middle segment, extends from 3200 Inc. Condominium at 3200 S. Ocean Blvd (approximately 290 ft north of R-131) south to The Halcyon of Palm Beach at 3440 S. Ocean Blvd (approximately 510 ft south of R-133). The area spanning from The Patrician of Palm Beach at 3450 S. Ocean Blvd (approximately 510 ft south of R-133) south to La Bonne Vie at 3475 S. Ocean Blvd (approximately 135 ft south of R-134) defines the limits of the southernmost segment, Segment 3.

Along Segment 1, the baseline lies approximately 90 ft seaward of the building development line. The baseline along Segment 2 falls approximately 65 ft seaward of the building development line. Because the building development line within Segment 3 lies along either the edge of parking structures or pool areas, the baseline and building development line within this segment coincide.

Background Erosion

Advance fill accounts for background erosion anticipated over the desired renourishment interval. The advance fill sacrificially erodes between sand placement events to prevent erosion of the design beach. Determination of appropriate advance fill volumes requires the calculation of the area's recent background erosion rate. For this design process, available data between 2001 and 2011 provide an appropriate period for assessment of the background erosion rate. Land-based surveys provide data of higher accuracy compared to hydrographic surveys, specifically in the case of the 2001 FDEP survey which appears to have undergone significant filtering/smoothing. Therefore, to utilize the 2001 data, a volume conversion factor was applied to the 2001 to 2011 shoreline change rates to estimate volume change rates, and thus background erosion rates for the design of the beach nourishment project. Table 1 provides the volume conversion factors calculated for profiles R-130 and T-131.

Table 1 – Volume Conversion Factor

2009 to 2011			
Profile	Shoreline Change Rate (ft/yr)	Volume Change Rate Above -16 ft NAVD (cy/ft/yr)	Volume Conversion Factor
R-130	-5.8	-6.6	1.1
T-131	-5.0	-4.9	1.0
Average	-5.4	-5.8	1.05

Application of the volume conversion factor of 1.05 to the shoreline change rates calculated between 2001 and 2011 yielded a representative annual volumetric change rate of -4 cy/ft/yr for the period. Subsequent multiplication of this volume change rate by the number of years desired for the renourishment frequency and the design length resulted in the required advance fill volumes. To account for dune sand placement projects in 2006 and 2011, the background erosion rates were adjusted to remove these volumes.

Of significant note in the Reach 8 project plan area is the south end "hot spot" identified between R-133 and R-134 in the "Town of Palm Beach 2011 Town-Wide Physical Monitoring Report" (Figure 3d, ATM 2012). The report also indicates a trend of long term shoreline and volumetric losses from R-130 to R-134. Notably, the south end "hot spot" occurs in Segment 3 where the building development line developed for the proposed plan lays furthest seaward.

25-Yr Storm Protection

To determine the erosion associated with a 25-yr storm event, i.e. the volume of sand the beach would lose during a 25-yr storm, ECE applied the Florida Department of Environmental Protection (FDEP) CCCLa Model to assess the beach response along four profiles — R-130 to R-133 — within the design area. As shown in Table 2, volumes of sand lost from each of the four profiles ranged between 9 and 14 cubic yards per foot (cy/ft).

Table 2 – Volume Eroded by 25-Yr Storm Event from Each Profile

Profile	Volume Eroded by 25-Yr Storm Event (cy/ft)[1]
R-130	10.9
T-131	9.0
R-132	12.1
R-133	13.7
Average	11.4

[1]Volumes based on 2011 profiles

While a 25-year storm would erode an average of nearly 12 cy/ft from the beach dune system, the 2011 dune placement provides a level of baseline protection. Applying the 2011 profiles as the "existing" condition, the placement of a portion of the design storm volume on top of the existing profile would protect the baseline from a 25-yr storm. Based upon the conditions provided by the recent dune sand placement, the total volume required for the beach nourishment plan consists of the volume eroded by the 25-yr storm landward of the baseline plus the expected background erosion between maintenance intervals (i.e. renourishment intervals). Table 3 summarizes the design volumes that eroded landward of the project baseline at each modeled profile range between 2.1 and 3.4 cy/ft. Accounting for a lesser volume at the northern and southern tapered project plan ends, a design volume of 3 cy/ft placed from the northern limit to the southern limit (a total length of 6600 ft) would result in a total design volume of 18,400 CY for the entire area based on 2011 conditions or 92,200 CY based on projected conditions in 2014 assuming average annual erosion of 4 cy/ft/yr. Based on the 2011 profiles representing the existing condition, the design volume placement would occur above mean high water (MHW = 0.35 ft NAVD).

Table 3 – Volume Eroded Landward of Baseline for 25-Yr Storm Event for Existing 2011 Profile Conditions

Profile	Volume Eroded by 25-Yr Storm Event Landward of Baseline (cy/ft)[1]
R-130	2.1
R-132	3.4

[1]Volumes based on 2011 profiles

As previously stated, the dune feature placed in 2011 provides baseline protection for the existing condition. However, given that the proposed design is expected to be implemented two years in the future, the beach and dune feature will likely undergo erosion by that time (2014). Should the erosion of the dune to the baseline occur before construction, protection from a 25-yr storm would require a greater design fill volume such as the full dune replacement of 12 cy/ft. Accounting for a lesser volume at the northern and southern tapered project plan ends, a design volume of 12 cy/ft placed along the 6600 ft design length would result in a total "storm" design volume of 73,800 CY for the entire area.

Sand Sources and Analysis

As documented in Coastal Systems International's (CSI) response to the South End Palm Beach Restoration Request for Additional Information (RAI) #1, recent April 2011 samples of the existing beach in the Reach 8 design area identify a mean grain size of 0.43 mm and sorting of 0.54 mm (Appendix I, FDEP JCP Permit Application 0250572-003 RAI #1 Response, November 14, 2011). Four sand sources were identified and analyzed for purposes of determining alternative material for a beach nourishment project plan. These sources include: Lake Worth Inlet "settling basin", Ortona upland mines, Ocean Cay aragonite and South Offshore Borrow Area 3 (ATM, 2012). Statistical sediment data for the Lake Worth Inlet "settling basin" was limited in extent for this investigation; however, available data indicates a nominal mean grain size of 0.33 mm. Recent Ortona sediment samples analyzed for the South End Palm Beach Restoration permitting process yielded a mean grain size of 0.57 mm with a sorting of 0.58 mm. Ocean Cay aragonite sand samples analyzed in February 2012 for Monroe County's Long Key Restoration Project resulted in a mean grain size of 0.42 mm and a sorting of 0.66 mm. For comparison purposes, a sample analyzed in August 2010 produced a similar mean grain size of 0.43 mm with a sorting of 0.68 mm. Offshore borrow areas identified in a sand search study for the south end of the Town of Palm Beach produced three potential borrow areas with the furthest south area providing the most logical location due to its proximity to Reach 8. The composite for the offshore borrow area yielded a mean grain size of 0.25 mm and a sorting of 0.43 mm. This sand search indicated that selective excavation to maximize coarser sediments may be feasible from the southern offshore borrow areas, however data to analyze this approach are not currently available.

ECE applied the Krumbein-James method as recommended by the Coastal Engineering Manual (CEM) to determine overfill ratios required for each candidate sand source. This involved the application of the mean grain size and sorting of native sand ($M_{\phi n}$ and $\sigma_{\phi n}$) as well as the mean grain size and sorting of the borrow sand ($M_{\phi b}$ and $\sigma_{\phi b}$). Table 4 summarizes the mean grain sizes and sorting of each candidate sand source and the native Reach 8 beach and the overfill ratios for each sand source based on the Krumbein-James method.

Table 4 – Sand Source Characteristics and Overfill Ratios

Sediment Parameters	Lake Worth Inlet	Ortona	Aragonite	Offshore/ATM
Mean mm ($M_{\phi b}$)	0.33 (1.60)	0.57 (0.81)	0.42 (1.26)	0.25 (2.00)
Sorting mm ($\sigma_{\phi b}$)	Not available	0.58 (0.78)	0.66 (0.61)	0.43 (1.22)
($M_{\phi b}$- $M_{\phi n}$)/ $\sigma_{\phi n}$ (x-axis)	0.44	-0.47	0.06	0.90
$\sigma_{\phi b}$ /$\sigma_{\phi n}$ (y-axis)	Not available	0.89	0.69	1.39
Overfill Ratio (R_A)	1.5	1	1	2.2

Notes: 1. Native Beach mean grain size equals 0.43 mm (1.21 phi).
2. Native Beach sorting equals 0.54 mm (0.88 phi).
3. Native Beach data derived from CSI (Appendix I, FDEP JCP Permit Application 0250572-003 RAI #1 Response, 2011).

Hardbottom Areas

2010 hardbottom mapping performed by CSI identifies primarily low-relief hardbottom adjacent to the Reach 8 design area with patches of significant high-relief hardbottom. As shown on Figures 2 and 3, the 2010 hardbottom, outlined in red, are located mainly between R-130 to R-131 and R-132 to R-134 in shallow water, nominally 1 to 9 ft water depths. Approximately 0.5 acres of hardbottom lies landward of the -5 ft NAVD contour (2011) while just over 1.75 acres lie seaward of the -5 ft NAVD contour (2011).

Analysis of Project Alternatives and Preferred Plan

Table 5 summarizes the estimated advance fill sand quantities required to maintain the initial beach construction assuming varying renourishment frequencies of 4-, 6- and 8-years and an overfill ratio of 1. Along the 6600 ft Reach 8 design length, including tapering at the project plan limits, a 4-yr renourishment interval requires 99,100 CY advance fill volume, a 6-yr renourishment interval would require a 148,400 CY advance fill volume, and an 8-yr renourishment interval would require a 197,800 CY advance fill volume. Table 6 presents the shoreline widths added by the advance fill volumes associated with each renourishment interval. They average about 47 ft, 62 ft and 78 ft for the 4-yr, 6-yr and 8-yr renourishment intervals, respectively.

Table 5 – Sand Placement Volumes for 4, 6 and 8-Yr Renourishment

Profile	Intervening Distance (ft)	4-Yr Volume (CY)	6-Yr Volume (CY)	8-Yr Volume (CY)
N Taper	100	800	1,200	1,600
R-129	863	13,800	20,700	27,600
R-130	1310	21,100	31,400	41,900
T-131	1227	19,600	29,400	39,300
R-132	1191	19,100	28,600	38,000
R-133	1145	18,300	27,500	36,600
S Taper (includes R-134)	800	6,400	9,600	12,800
Total	6636	99,100	148,400	197,800

Table 6 – Additional Shoreline Widths for Each Renourishment Interval

Profile	Added Shoreline Width (4-Yr) (ft)	Added Shoreline Width (6-Yr) (ft)	Added Shoreline Width (8-Yr) (ft)
R-130	52	67	82
T-131	43	58	75
R-132	59	74	89
R-133	33	47	65
Average	47	62	78

The recommended Project Plan, referred to in Figure 3 as "Option 2", calls for the placement of approximately 166,800 cubic yards (CY) — including the "storm protection" design volume and

6 years of advance fill — of high quality, beach compatible sand. Sediment characteristics of the coarser sand sources (Ortona and Aragonite) result in the least impact to the adjacent hardbottom. Depending on the condition of the beach at the time of construction, the required volume may increase. The protective dune will extend seaward from the baseline at an elevation of 14.5 ft NAVD sloping to a beach berm extending seaward at elevation 7.5 ft NAVD thereby raising the existing beach elevations 4 to 8 feet vertically and adding beach widths (the distance between the location of the 2011 7.5 ft NAVD contour to the design mean high water line) of 95 to 110 ft, as shown in Figures 4 (R-130) and 5 (R-133). The recommended Project Plan also calls for two structures — groins or T-head groins depending upon permittability — at the southern end to prevent downdrift impacts to nearshore hardbottom.

A renourishment interval of 4 years results in a modest reduction in impacts to nearshore hardbottom when compared to a 6 year maintenance cycle. For example, the 4 year renourishment interval requires an advance placement volume of approximately 99,100 CY while a 6 year renourishment interval would require an advance placement volume of 148,400 CY of material. As indicated by the location of the equilibrium toe of fill lines in Figures 2 and 3, both Project Plan Options 1 and 2 will impact between 0.75 and 1.00 acre of mainly low-relief hardbottom located adjacent to the shoreline between R-130 and R-131 and eliminate impact to significant high-relief hardbottom adjacent to the shoreline between R-133 and R-134. Based on the equilibrium toe of fill and the analysis conducted, ECE recommends considering both the Ortona and Aragonite sand as candidate sand sources during the design development phase of the Project Plan, and potentially the Lake Worth Inlet sand if a reduced renourishment interval is proposed and this source becomes available. The south offshore sand source is not recommended due to the expected performance and longevity of this sand and adverse impacts to nearshore hardbottom resources. Compared to the other candidate sand sources, the increased volume required (based on the overfill ratio of 2.2) for beach fill placement of the offshore sand source would produce a larger project footprint and result in substantial adverse impacts to offshore hardbottom located in deeper water.

Cost Analysis

The probable structure costs are estimated using the Town's estimates for the Reach 7 Phipps Park project at $1,500 per linear foot for sheeting type groin structure. Mobilization/demobilization costs, also taken from the Town's estimates for the Reach 7 Phipps Park project, are $100,000 for groin construction as well as $60,000 for beach fill requiring truck-haul (Ortona and Aragonite sand). The probable project plan costs estimated for beach fill use the estimates provided in the February 24, 2012 letter from Peter Elwell to the Shore Protection Board at $37 per CY for Ortona sand and $45 per CY for Aragonite sand and a project contingency of 30 percent. Mitigation for 0.75 to 1.00 acres will also be required depending upon the final placement volume (renourishment interval) and sand source. Total estimated cost excluding maintenance is $8,953,000 for the Ortona sand source and $10,680,000 for the Aragonite sand source. Tables 7 and 8 detail the costs for the proposed design Option 2 for both Ortona and Aragonite sand sources.

While the Offshore sand source is not recommended, Table 9 details the costs for the proposed Option 2 using the Offshore sand for comparative purposes. The Town of Palm Beach South End Sand Search study identified past mobilization/demobilization costs of $2.5 million for beach fill requiring a hopper dredge and estimated beach fill costs at $6.40 per CY for Offshore sand. Offshore sand source costs include mitigation for 2.3 acres (assuming $1,000,000 per acre) and a project contingency of 20 percent. Total estimated cost excluding maintenance is $9,386,000 for the Offshore sand source.

Table 7 – Option 2 Probable Initial Cost using Ortona Sand

Item	Description	Quantity	Unit Cost	Total Cost
1	Beach Fill Mob/Demob	1 LS	$60,000 LS	$60,000
2	Beach Fill	166,000 CY	$37 / CY	$6,142,000
3	Groin Construction Mob/Demob	1 LS	$100,000 LS	$100,000
4	Groin Construction	390 lf	$1,500 / lf	$585,000
5	Contingency (mitigation/sand added costs)	30%		$2,066,000
Total				$8,953,000

Table 8 – Option 2 Probable Initial Cost using Aragonite Sand

Item	Description	Quantity	Unit Cost	Total Cost
1	Beach Fill Mob/Demob	1 LS	$60,000 LS	$60,000
2	Beach Fill	166,000 CY	$45 / CY	$7,470,000
3	Groin Construction Mob/Demob	1 LS	$100,000 LS	$100,000
4	Groin Construction	390 lf	$1,500 / lf	$585,000
5	Contingency (mitigation/sand added costs)	30%		$2,465,000
Total				$10,680,000

Table 9 – Option 2 Probable Initial Cost using Offshore/ATM Sand

Item	Description	Quantity	Unit Cost	Total Cost
1	Beach Fill Mob/Demob	1 LS	$2,500,000 LS	$2,500,000
2	Beach Fill (166,000 CY *2.2)	365,200 CY	$6.40 / CY	$2,337,000
3	Groin Construction Mob/Demob	1 LS	$100,000 LS	$100,000
4	Groin Construction	390 lf	$1,500 / lf	$585,000
5	Mitigation (assume $1 million/ac)	2.3 ac	$1,000,000/ac	$2,300,000
6	Contingency (sand added costs)	20%		$1,564,000
Total				$9,386,000

Preferred Plan

The preferred Project Plan, referred to in Figure 3 as "Option 2", places approximately 166,800 CY of high quality, beach compatible sand such as that derived from the Ortona sand source. This volume would allow for a renourishment interval of 6 years and would impact less than one acre of primarily low-relief hardbottom. The preferred Project Plan calls for two structures (groins or T-head groins constructed of sheet pile) at the southern end to reduce sand losses from the south end. Assuming the placement of Ortona sand, the estimated project cost is $8,953,000.

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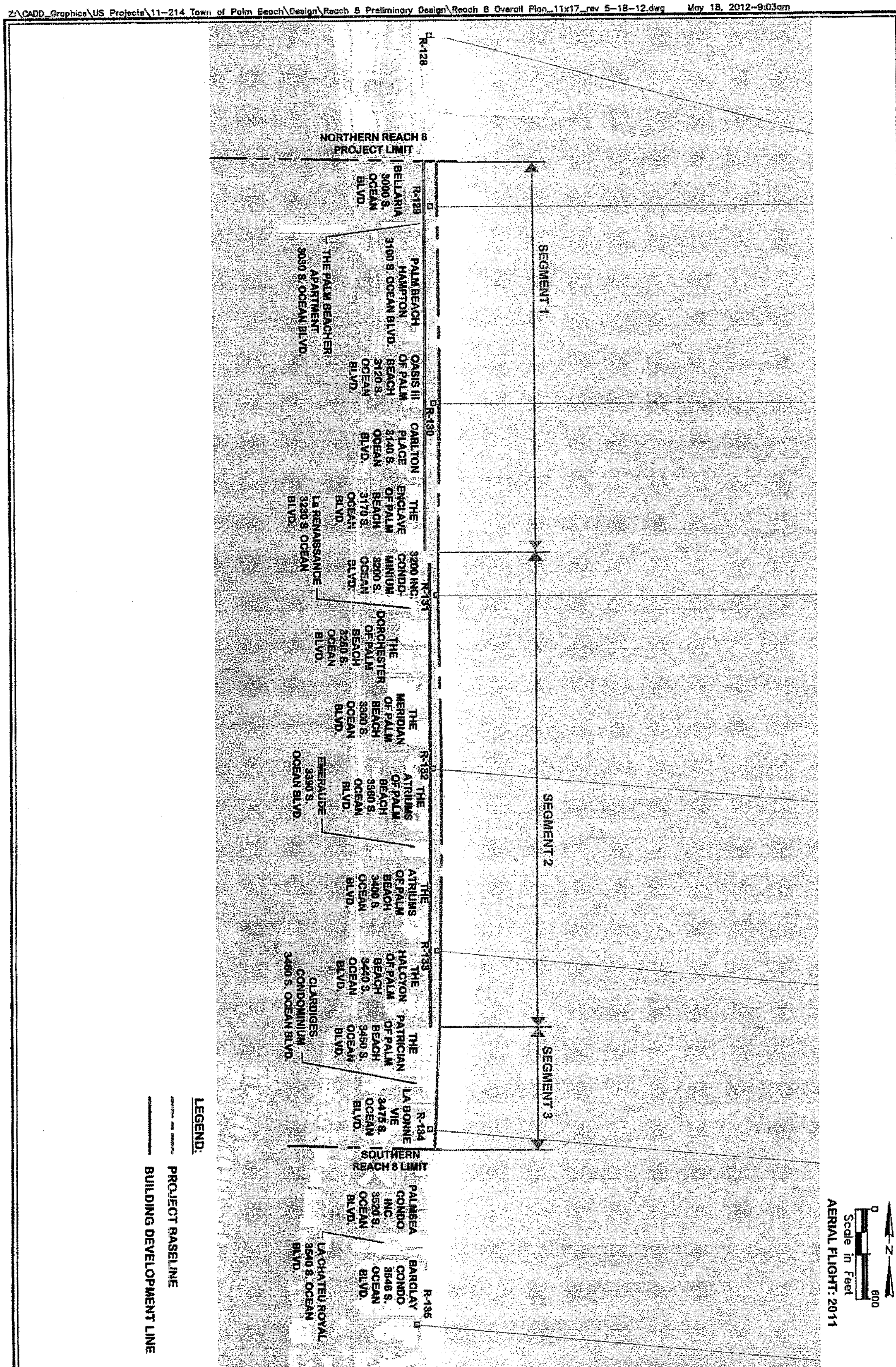

Erickson Consulting Engineers, Inc.

ECE 7201 Delainey Court Sarasota, FL 34240 (941) 373-6460

TOWN OF PALM BEACH
PALM BEACH, FLORIDA

FIGURE 1

REACH 8 - PROJECT SITE AREA

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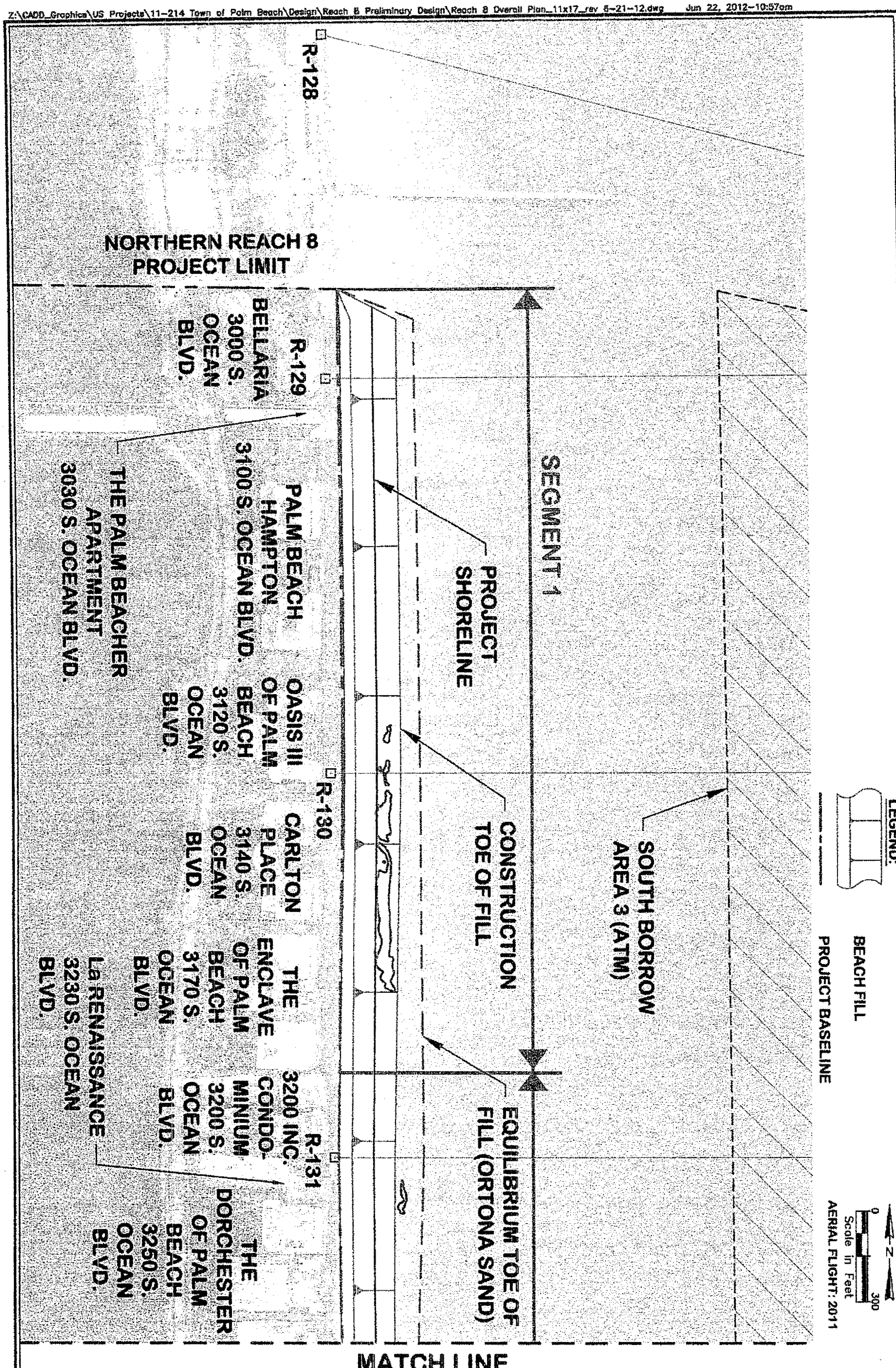

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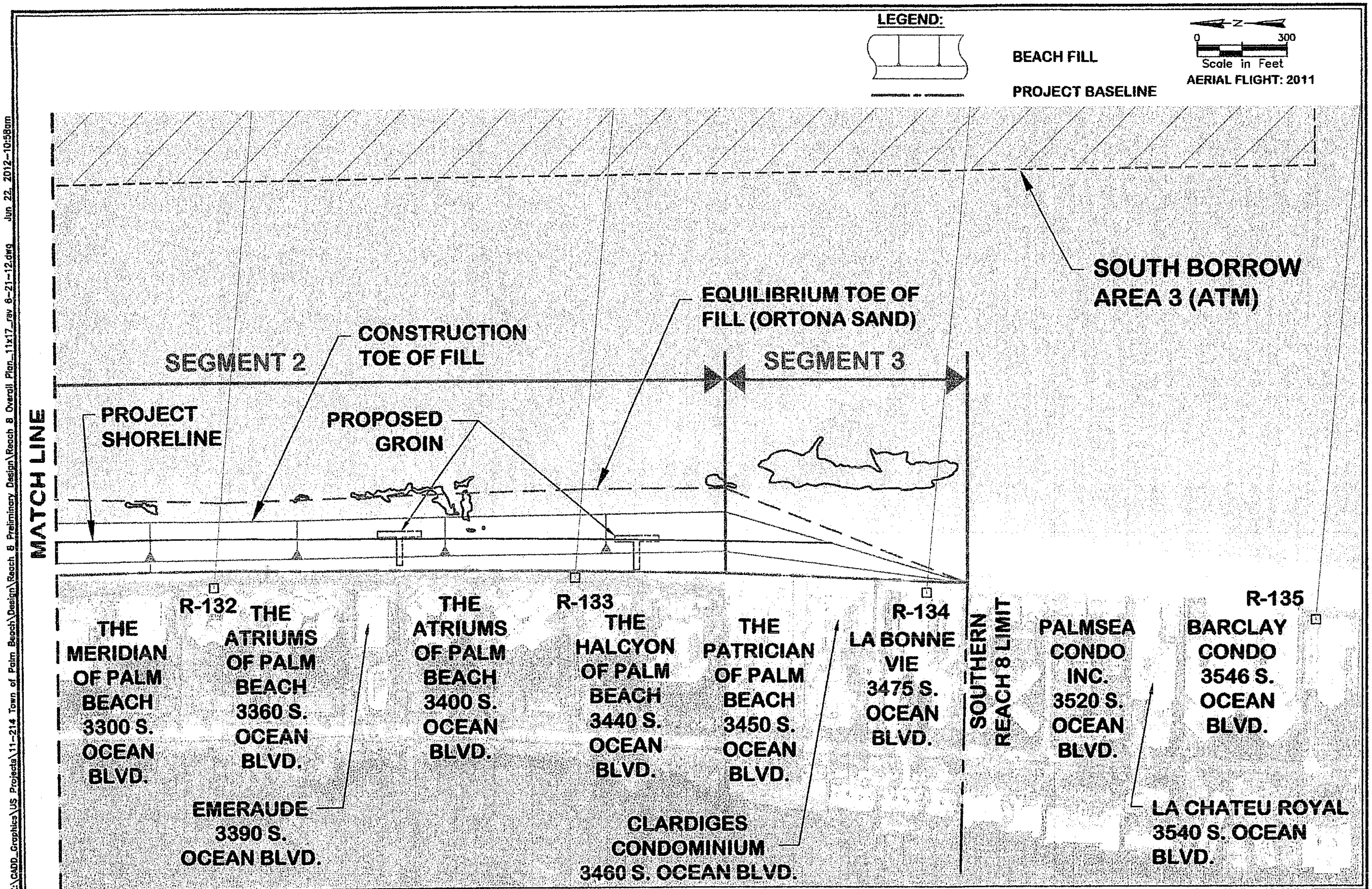
TOWN OF PALM BEACH
PALM BEACH, FLORIDA

FIGURE 2

REACH 8 - OPTION 1 (4 YEAR RENOURISHMENT INTERVAL)



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ECE 7201 Delainey Court Sarasota, FL 32420 (941) 373-6460

TOWN OF PALM BEACH
PALM BEACH, FLORIDA

FIGURE 2
REACH 8 - OPTION 1 (4 YEAR RENOURISHMENT INTERVAL)

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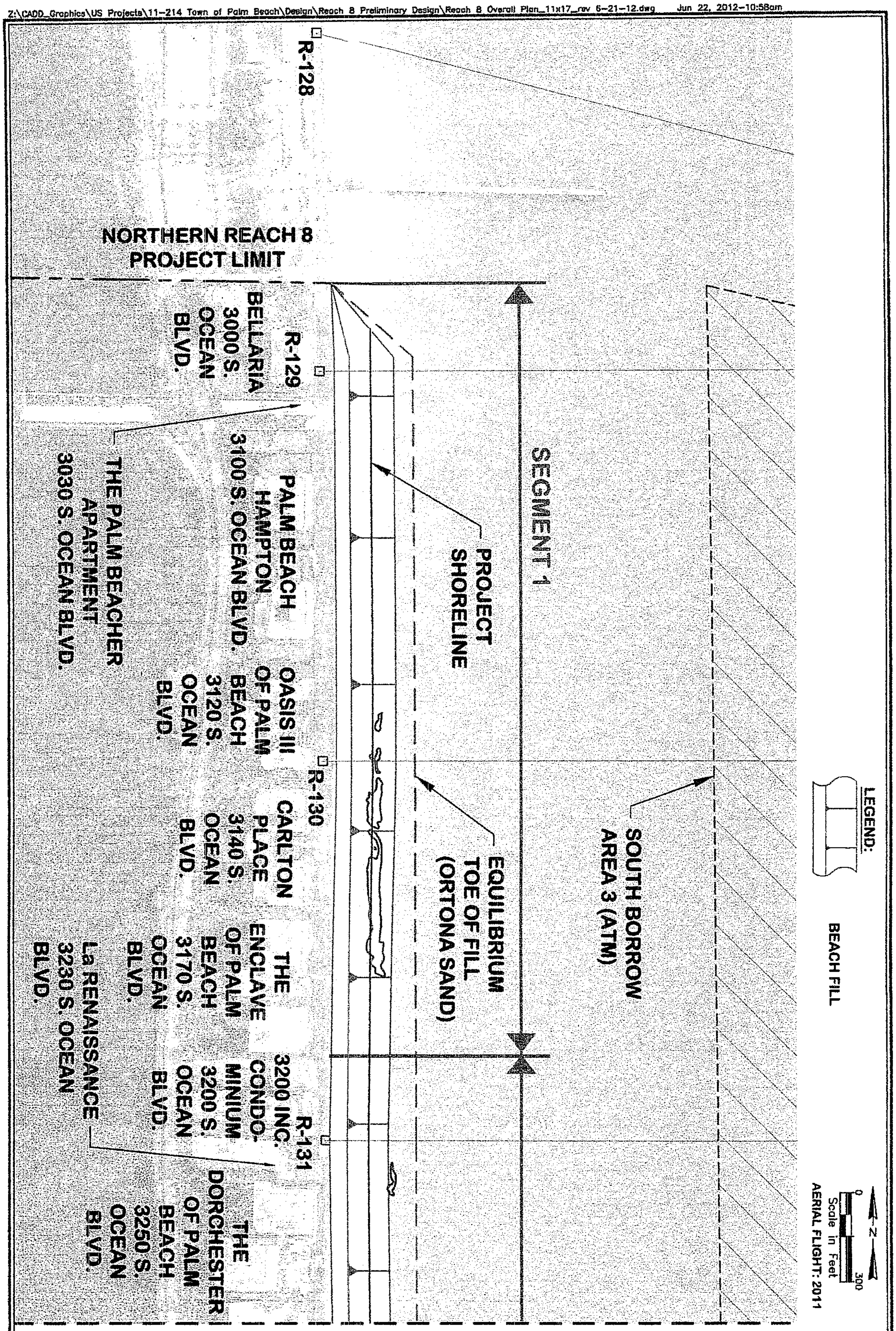
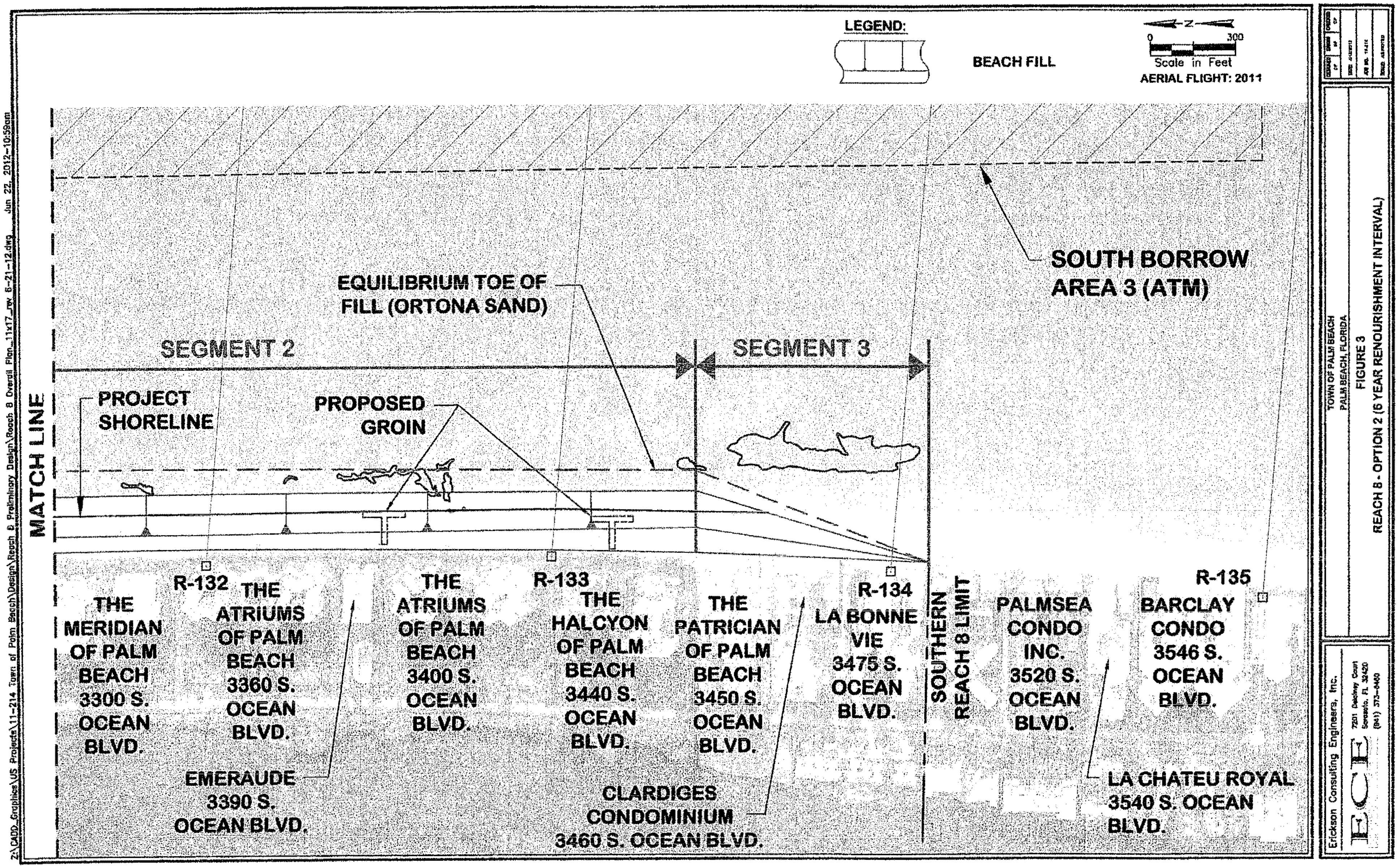


Erickson Consulting Engineers, Inc. ECE 7201 Delainey Court Sarasota, FL 34240 (941) 373-6460	TOWN OF PALM BEACH PALM BEACH, FLORIDA FIGURE 3 REACH 8 - OPTION 2 (6 YEAR RENOURISHMENT INTERVAL)	DESIGNED CF / DRAWN DF / CHECKED CF DATE 6/1/2012 JOB NO. 11-214 SCALE AS NOTED


LEGEND:
BEACH FILL
Scale in Feet
0
300
AERIAL FLIGHT: 2011
SOUTH BORROW AREA 3 (ATM)
EQUILIBRIUM TOE OF FILL (ORTONA SAND)
SEGMENT 2
SEGMENT 3
PROJECT SHORELINE
PROPOSED GROIN
MATCH LINE
R-132
R-133
R-134
R-135
THE MERIDIAN OF PALM BEACH 3300 S. OCEAN BLVD.
THE ATRIUMS OF PALM BEACH 3360 S. OCEAN BLVD.
EMERAUDE 3390 S. OCEAN BLVD.
THE ATRIUMS OF PALM BEACH 3400 S. OCEAN BLVD.
THE HALCYON OF PALM BEACH 3440 S. OCEAN BLVD.
THE PATRICIAN OF PALM BEACH 3450 S. OCEAN BLVD.
CLARDIGES CONDOMINIUM 3460 S. OCEAN BLVD.
LA BONNE VIE 3475 S. OCEAN BLVD.
SOUTHERN REACH 8 LIMIT
PALMSEA CONDO INC. 3520 S. OCEAN BLVD.
BARCLAY CONDO 3546 S. OCEAN BLVD.
LA CHATEU ROYAL 3540 S. OCEAN BLVD.
TOWN OF PALM BEACH
PALM BEACH, FLORIDA
FIGURE 3
REACH 8 - OPTION 2 (6 YEAR RENOURISHMENT INTERVAL)
Erickson Consulting Engineers, Inc.
ECE
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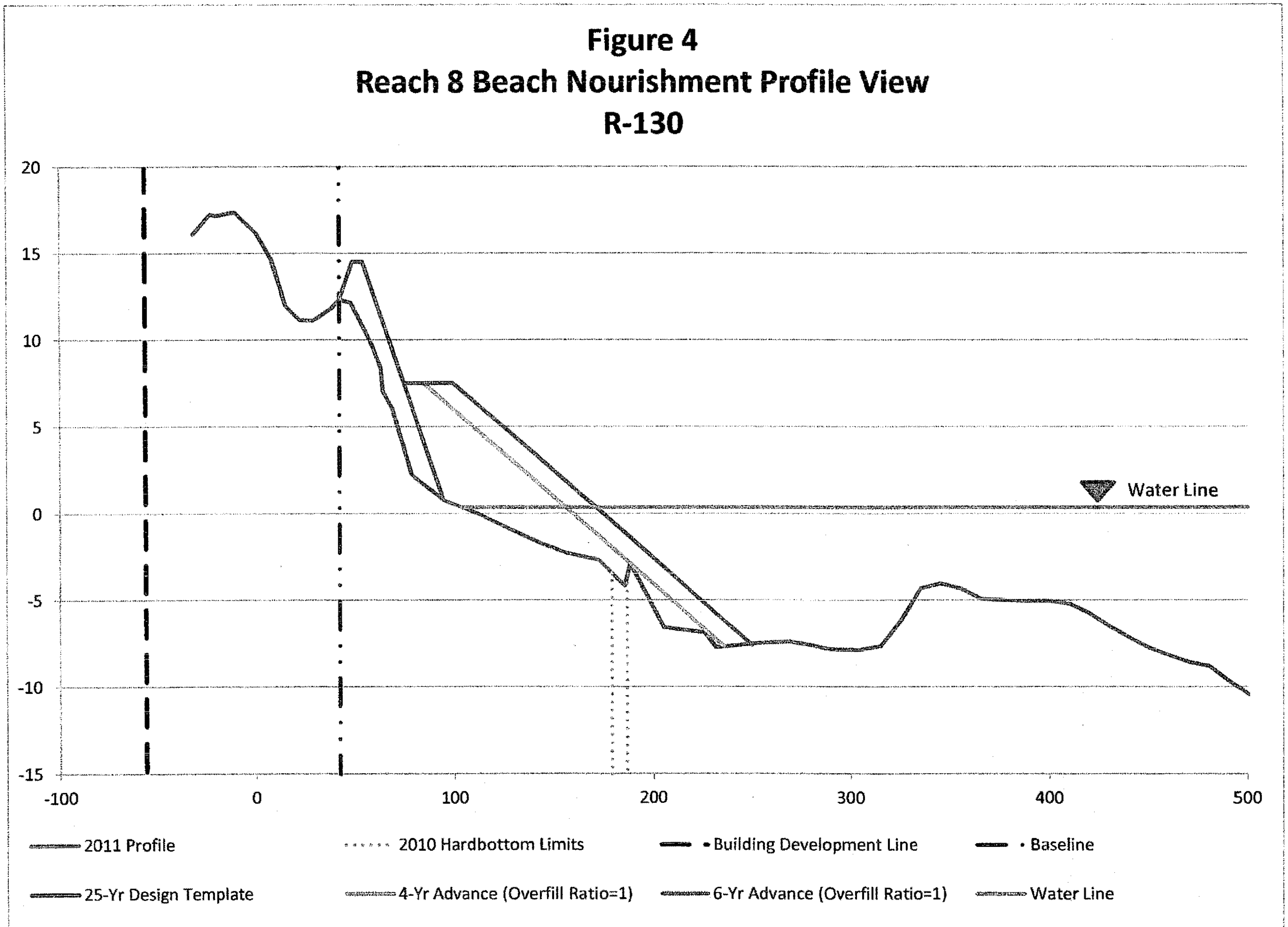

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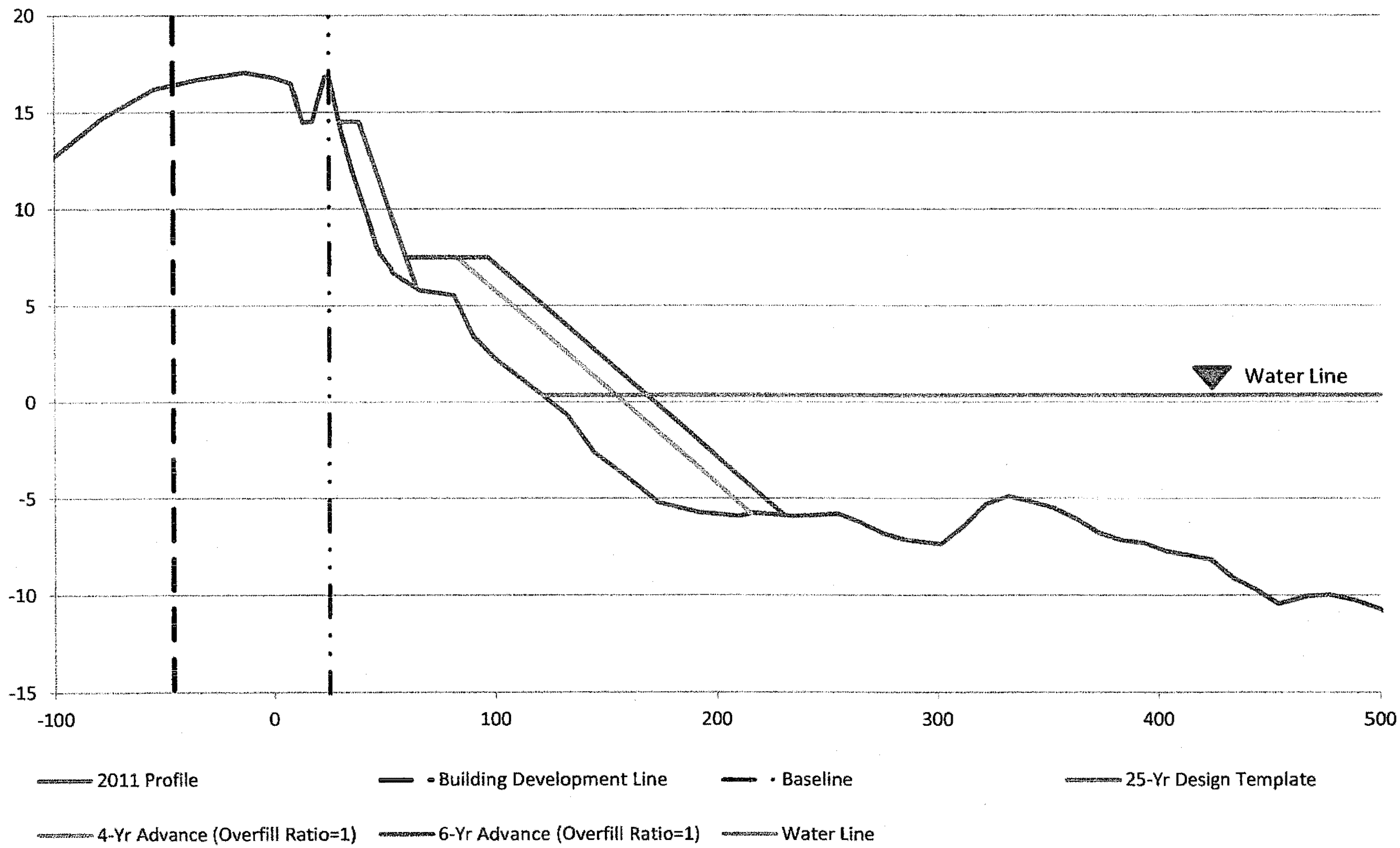
Figure 5
Reach 8 Beach Nourishment Profile View
R-133



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