ESTERO ISLAND RESTORATION

2020 ANNUAL MONITORING REPORT

(DEP Permit 0173059-001-JC)

Prepared for:

Lee County Board of County Commissioners
P.O. Box 398
Fort Myers, FL 33902-0398

July 20, 2020
CEC File No. 20.079

COASTAL ENGINEERING CONSULTANTS INC

TABLE OF CONTENTS

1.0 INTRODUCTION 1
2.0 SCOPE OF WORK 4
2.1 Physical Monitoring Plan 4
2.2 Reporting 5
3.0 SURVEYS 5
4.0 PHYSICAL MONITORING 6
4.1 Depth of Closure 6
4.2 Shoreline and Volume Change Analyses 6
4.2.1 General 6
4.2.2 Project Area 13
4.2.3 North Adjacent Shoreline 13
4.2.4 South Adjacent Shoreline 15
4.2.5 Summary 15
4.3 Project Area Performance 15
4.4 Contingent Area Performance 21
5.0 CONCLUSION 21
6.0 REFERENCES 22

LIST OF FIGURES

Figure 1. Location Map..... 3
Figure 2. 2019-2020 Shoreline Migration at MHW. 8
Figure 3. 2019-2020 Volumetric Changes Above Depth of Closure..... 10
Figure 4. 2019-2020 Volumetric Change Above MHW. 12
Figure 5. Plan View of North Adjacent Shoreline and 2016 USACE Dredging Project..... 14
Figure 6. 2012-2020 Shoreline Positions within Project Area Relative to 2011 Pre-Construction Shoreline Position..... 18
Figure 7. 2012-2020 Volumetric Changes within Project Area. 20

LIST OF TABLES

Table 1. Timing of Monitoring Activities..... 1
Table 2. Estero Island Survey Control Information. 4
Table 3. 2019-2020 Shoreline Positions at MHW. 7
Table 4. 2019-2020 Volumetric Changes Above Depth of Closure. 9
Table 5. 2019-2020 Volumetric Changes Above Mean High Water. 11
Table 6. 2011-2020 Shoreline Changes. 17
Table 7. 2012-2020 Volumetric Changes within Project Area Fill Footprint. 19

LIST OF APPENDICES

APPENDIX 1: SURVEY REPORT
APPENDIX 2: BEACH PROFILES

1.0 INTRODUCTION

In December 2011, Lee County completed construction of the Estero Island Beach Restoration Project including sand placement along the north-central segment of the island and the addition of a terminal groin on the northern end of the beach fill. This report summarizes the results of the beach fill performance during the 8th year annual monitoring conducted by Coastal Engineering Consultants, Inc. (CEC), noting that it was not required by the Permit. The physical monitoring survey was completed in accordance with the Physical Monitoring Plan (PMP) dated May 2002 as outlined in the Florida Department of Environmental Protection (FDEP) Permit No. 0173059-001-JC and Table 1. Funding for the monitoring was provided by Lee County.

Table 1. Timing of Monitoring Activities.

			Monitoring Year					
Monitoring Activity	Pre-Con	Post-Con	1st	2nd	3rd	5th	7th	**8th ***
Beach Profiles	✓	✓	✓	✓	✓	✓	✓	✓
Borrow Area Survey	✓	✓	-	-	-	✓	✓	-
Report	-	✓	✓	✓	✓	✓	✓	✓
Special Monitoring Groin and Borrow Area Effects	-	✓	✓	✓	✓	✓	✓	✓

(-) Indicates data collection is not proposed for this time period
* 8th Year Monitoring not required by Permit

The 2011 Project was constructed between April 2011 and December 2011. Approximately 403,000 cubic yards (cy) of sand were excavated and placed in the beach fill area between FDEP reference monuments (R-monuments) C-174A.5 and R-181.5. The beach was constructed to a berm height of 2.9 feet NAVD88 over a shoreline distance of approximately 6,700 feet (1.3 miles). The design berm extended seaward at the 2.9 feet NAVD88 elevation an average of 236 feet and then sloped to the -1.2 feet NAVD88 elevation at a 15H:1V slope. The design then adjusted to a 20H:1V slope seaward until it connected with existing grade. All dredging was conducted in the Primary Borrow Area. The terminal groin was constructed with approximately 3,630 tons of limestone rock for a length of 240 feet with a maximum crest width of approximately 12.7 feet. A single vinyl sheetpile row was installed along the centerline of the structure to make it sand tight. FDEP raised concerns that the groin would slow down sediment transport below a rate that will maintain the area north of project in a stable position. As a result Lee County is required to monitor this area and report on the trends observed (Lee County, 2003).

The monitoring plan covers the sand placement area and the adjacent control beaches to the north and south of the sand placement area. The monitored shoreline to the north of the fill area includes the segment between C-174A and R-175. Monuments C-174A and R-175 are monitored on two (2) separate azimuths with the azimuths of 245° (C-174A) or 248° (R-175) going out into the Gulf, and the azimuth of 10° going across the pass. The monitored shoreline to the south of the fill area includes the segment between R-182 and R-186. A graphical representation of the entire monitoring area with corresponding monument locations is shown in Figure 1. It is noted that the profile comparisons over time are confounded by differences in profile azimuths used by FDEP for historical monitoring and those used by the engineer during construction (Lee County, 2013). CEC employed an assumption and verified same as described herein to enable accurate reporting. However, some of the large-scale volume changes measured since construction may be attributed in part to these differences.

In 2016, the U.S. Army Corps of Engineers (USACE) dredged Matanzas Pass and placed dredge material (estimated quantity was 130,000 cy based on USACE Project Plans) in the nearshore area between R-182 and R-187. This USACE project is reflected in the analysis presented in this Report. In 2017, the County imported approximately 2,100 cy via truck haul to address erosion due to Hurricane Irma along the Crescent Beach shoreline in the vicinity of R-181.

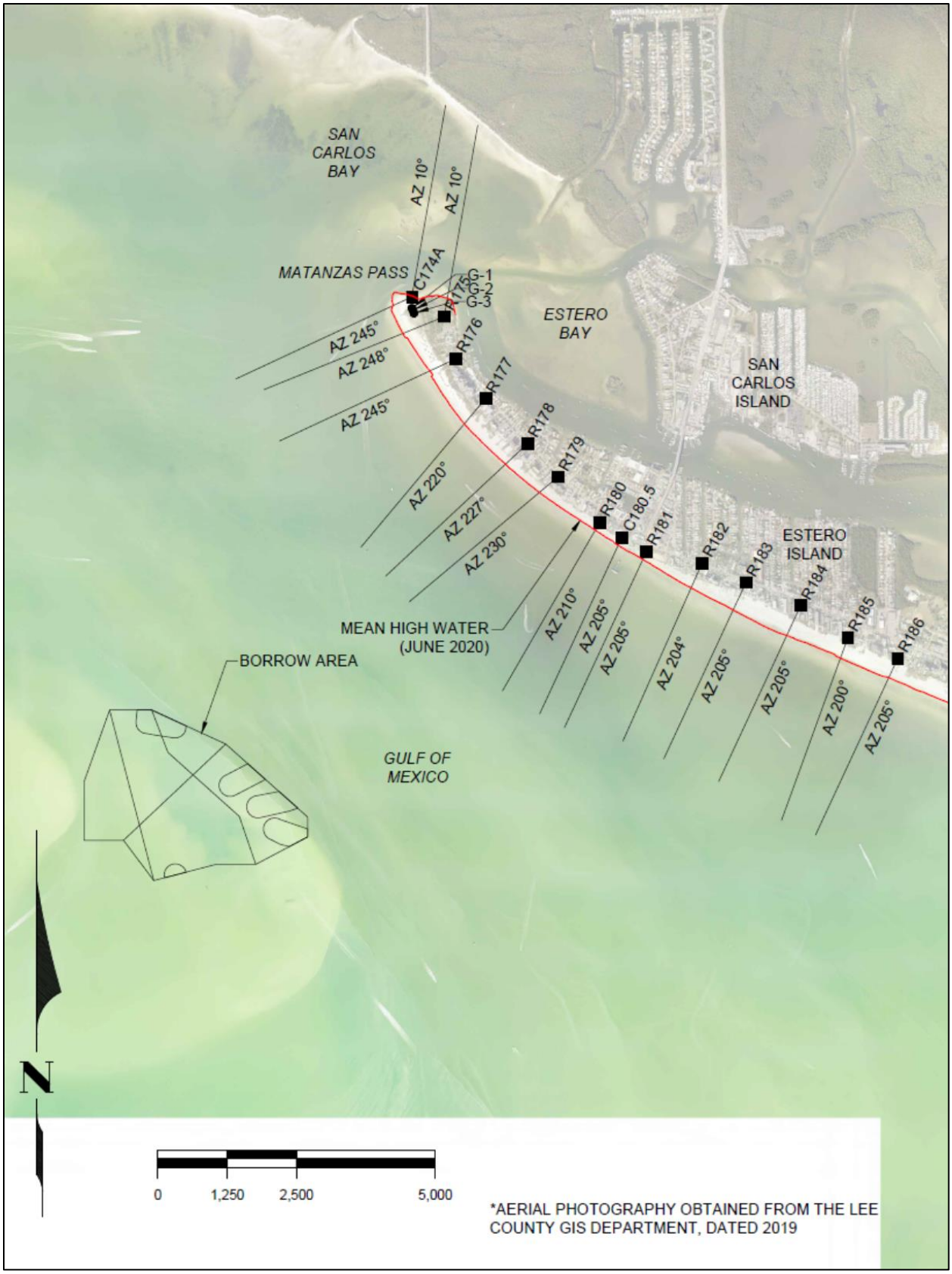


Figure 1. Location Map.

2.0 SCOPE OF WORK

The contracted Scope of Work for the monitoring includes the following components.

2.1 Physical Monitoring Plan

Establish temporary horizontal and vertical control, one-time, on the uplands within the Project. Conduct 8th year beach profile monitoring surveys of the active beach zone along the shoreline at each R-monument from C-174A to R-186 including one half monument profile at C-180.5. Three (3) additional profile lines will be surveyed at the groin. Survey control information to be used in the survey is presented in Table 1.

Table 2. Estero Island Survey Control Information.

Reference Monument	Easting (ft)	Northing (ft)	Azimuth
C-174A	666547.875	774787.688	245 & 10
R-175	667127.375	774428.125	248 & 10
Groin 1 (G-1)	666545.625	774582.125	248
Groin 2 (G-2)	666564.625	774542.875	248
Groin 3 (G-3)	666581.375	774489.813	248
R-176	667335.625	773671.125	245
R-177	667878.688	772960.313	220
R-178	668634.375	772145.125	227
R-179	669180.000	771546.125	230
R-180	669931.125	770720.500	210
C-180.5	670330.500	770449.375	205
R-181	670772.875	770198.625	205
R-182	671773.875	769985.625	204
R-183	672566.875	769642.625	205
R-184	673555.375	769229.625	205
R-185	674405.875	768650.125	200
R-186	675299.875	768269.125	205

Profile surveys shall extend landward to the DEP monument location or approximately 150 feet landward of the vegetation line, whichever is more seaward. If the point 150 feet landward of the vegetation line cannot be reached because of an obstruction, such as a building, bay water, mangroves, or other impassable vegetation or obstacle, then the survey line may be stopped at the obstacle and shall be noted as such in the survey field book. Coastal armoring is generally not an impassable obstacle and is normally to be surveyed. Upland profiles shall extend seaward to a wading depth deep enough to provide an approximate 50-foot overlap with the offshore portion of the profile survey where environmental conditions allow. Offshore profile surveys will extend

seaward to the -13.2' NAVD contour, 3,000 feet from the shoreline or to the channel center, whichever is least.

2.2 Reporting

Prepare and submit to the agencies the 8th year Physical Monitoring Report within 90 days following completion of the 8th year monitoring survey. The report shall include:

- signed and sealed survey report,
- analysis for patterns, trends, or changes between surveys and for cumulative changes over time,
- evaluation of the erosion and accretion rates occurring since post-construction survey and an assessment of the volume of fill remaining within the Project area,
- comparative review of project performance to performance expectations and identification of adverse impacts attributable to the project,
- evaluation of potential downdrift effect within the contingent area as per the August 2003 Contingency Plan, which includes the northern tip of Estero Island north and west of the terminal groin.

3.0 SURVEYS

CEC conducted the monitoring survey of North Estero Island beach on June 16, 2020. The survey report is presented in Appendix 1. All work activities and deliverables were conducted in accordance with the latest update of the FDEP Monitoring Standards for Beach Erosion Control Projects, Sections 01000, 01100, and 01200.

Bathymetric survey data collection was conducted in calm seas. Maximum wave heights during the data collection period were less than 3 feet. The data was collected at intervals not exceeding 25 feet and at all grade breaks along the profile sufficient to accurately describe the bathymetry at the profile locations.

Bathymetric survey data collection was performed as close in time as possible with the upland topographic survey data collection. This significantly increased the efficiency by conducting the work with the same base station set-up. Safety was also increased by having both crews visible to each other at all times.

The beach profile deliverables were produced by merging the upland and offshore survey data in Hypack 2017. The processed data was exported into AutoCAD and individual profiles/sections were plotted to the specified scale.

4.0 PHYSICAL MONITORING

4.1 Depth of Closure

The offshore depth beyond which the net sediment transport does not result in significant changes in mean water depth is known as the depth of closure (DOC). For consistency with the prior analyses and monitoring reports (Lee County, 2013 and Coastal Engineering, 2014), the same DOC values were utilized for these analyses and monitoring report.

4.2 Shoreline and Volume Change Analyses

4.2.1 General

Appendix 2 presents the beach profiles measured at each R-monument for the January 2012 post-construction, June 2018 6th year monitoring, July 2019 7th year monitoring and June 2020 8th year monitoring surveys. Summaries of the shoreline and volumetric changes based on the comparisons between the 2019 and 2020 monitoring surveys at the R-monuments are presented below. These comparisons serve as a baseline for determining shoreline and volume change trends.

Table 3 presents the 2019 and 2020 monitoring survey shoreline positions at MHW (= +0.21 feet NAVD88), and the 2019 to 2020 shoreline changes. The table also shows the weighted average shoreline change of 14.7 feet of advancement which is calculated by using the effective distance. The effective distance is the sum of half the length measured at MHW between the adjacent R-lines. The annualized weighted shoreline change is 15.6 feet of advancement. Figure 2 presents the shoreline changes between 2019 and 2020.

Table 4 and Figure 3 present the overall volumetric changes calculated to DOC from comparing the 2019 and 2020 monitoring surveys. Table 5 and Figure 4 present volumetric changes calculated above MHW for this period.

Table 3. 2019-2020 Shoreline Positions at MHW.

MONUMENT (AZIMUTH)	POSITION 2019 (FT)	POSITION 2020 (FT)	2019-2020 SHORELINE CHANGE (FT)	2019-2020 AVERAGE SHORELINE CHANGE (FT)		EFFECTIVE DISTANCE (FT)
R-175 (az=10)	350.6	337.5	-13.2	13.8	North Adjacent Shoreline	325.0
C-174A (az=10)	-40.3	16.4	56.7			520.0
C-174A (az=245)	405.0	402.9	-2.1			461.0
R-175 (az=248)	774.1	803.2	29.1	7.7	Project Area	676.0
R-176 (az=245)	526.0	530.8	4.7			976.5
R-177 (az=220)	580.2	603.2	23.0			1089.0
R-178 (az=227)	560.0	547.8	-12.3			918.5
R-179 (az=230)	439.8	436.8	-3.0			1006.0
R-180 (az=210)	163.8	158.6	-5.2			860.5
C-180.5 (az=205)	153.1	152.6	-0.5			505.5
R-181 (az=205)	162.0	152.6	-9.4			757.5
R-182 (az=204)	440.8	483.1	42.3			930.0
R-183 (az=205)	510.1	546.8	36.7	27.4	South Adjacent Shoreline	963.0
R-184 (az=205)	563.7	601.8	38.1			1058.0
R-185 (az=200)	383.4	393.4	10.0			993.8
R-186 (az=205)	358.3	383.1	24.7			471.3
		Weighted Avg (FT)		14.7		
		Average Annual Rate (FT/YR)		15.6		

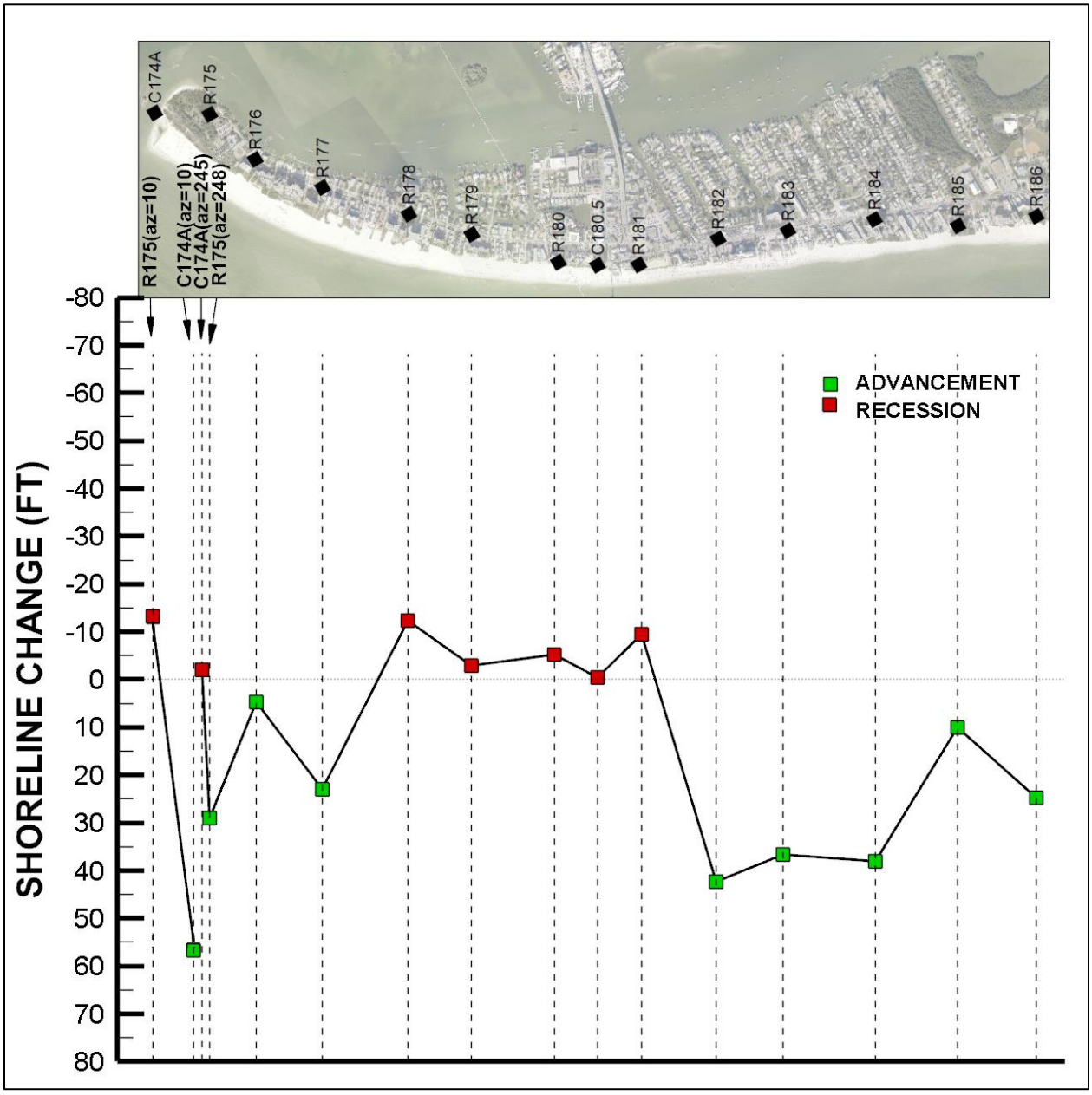


Figure 2. 2019-2020 Shoreline Migration at MHW.

Table 4. 2019-2020 Volumetric Changes Above Depth of Closure.

MONUMENT (AZIMUTH)	CELL AREA (YD^3/FT)	AVE CELL AREA (YD^3/FT)	LENGTH (FT)	VOLUME (YD^3)	DOC (FT)	TOTAL VOLUME CHANGE (CY)	
R-175 (az=10)	-2.1				-14.5	33,906	North Adjacent Shoreline
		10.0	675	6,757			
C-174A (az=10)	22.2				-14.5		
		38.0	715	27,149			
C-174A (az=245)*	53.8				-14.5	26,666	Project Area
		32.8	531	17,434			
R-175 (az=248)	11.9				-14.5		
		9.8	817	7,994			
R-176 (az=245)	7.7				-14.5		
		5.5	1,160	6,346			
R-177 (az=220)	3.3				-14.5		
		-1.0	1,033	-1,046			
R-178 (az=227)	-5.3				-14.5		
		-3.2	790	-2,564			
R-179 (az=230)	-1.2				-14.5		
		-3.3	1,244	-4,107			
R-180 (az=210)	-5.4				-12.0		
		-3.0	500	-1,501			
C-180.5 (az=205)	-0.6				-12.0		
		0.5	508	236			
R-181 (az=205)	1.5				-12.0		
		3.9	1,005	3,873			
R-182 (az=204)	6.2				-11.0		
		3.0	856	2,538		8,013	South Adjacent Shoreline
R-183 (az=204)**	-0.3				-10.5		
		-1.8	1,071	-1,960			
R-184 (az=205)**	-3.4				-10.0		
		-0.3	1,043	-277			
R-185 (az=200)	2.9				-11.0		
		8.2	945	7,713			
R-186 (az=205)	13.5				-11.0		

* 2019 and 2020 profiles did not reach DOC. The volume limit was set at their point of intersection approximately 1,000 feet seaward of Monument

** Length of 3,000 feet from MHW was surveyed before DOC was reached

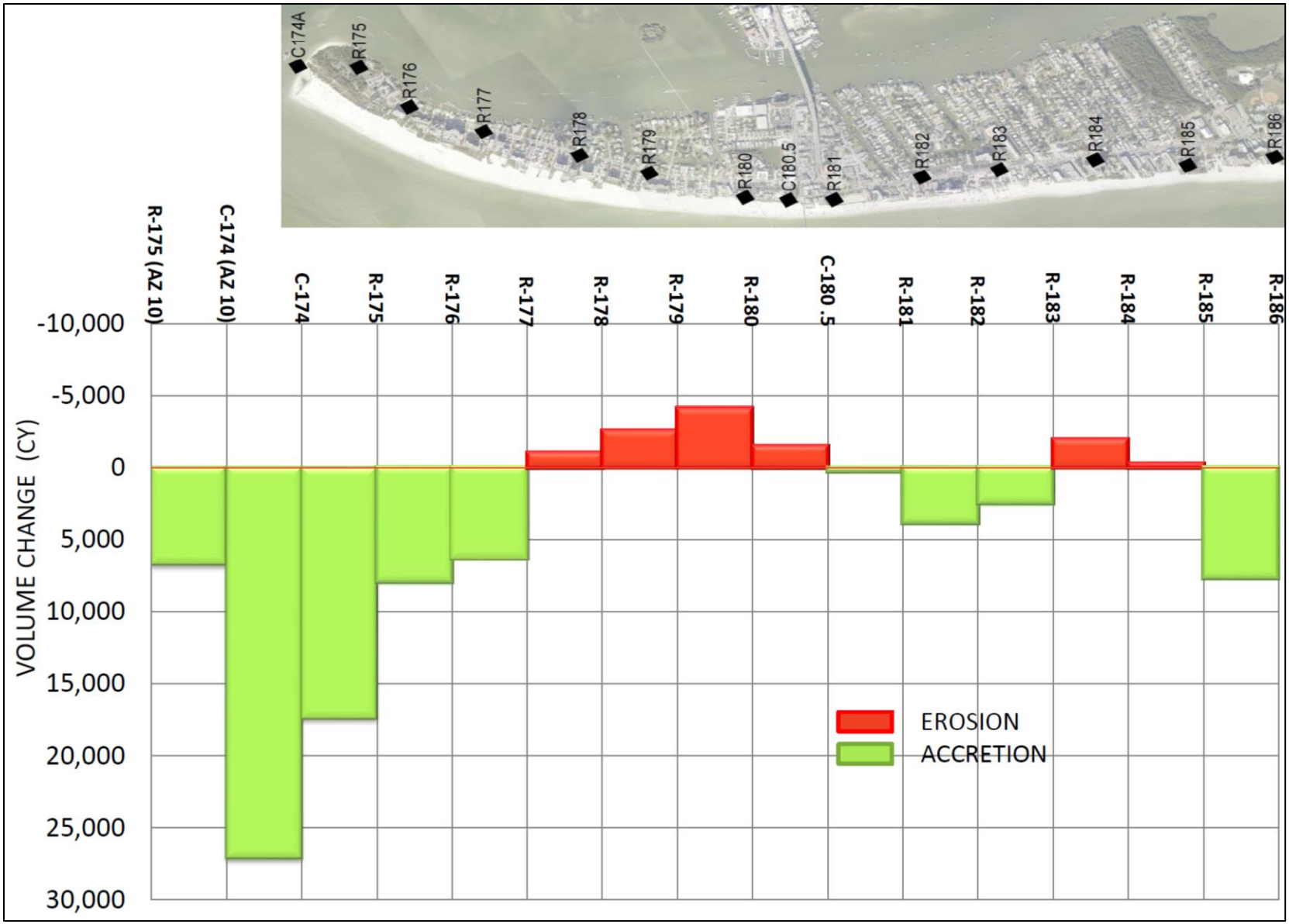


Figure 3. 2019-2020 Volumetric Changes Above Depth of Closure.

Table 5. 2019-2020 Volumetric Changes Above Mean High Water.

MONUMENT (AZIMUTH)	CELL AREA (YD^3/FT)	AVE CELL AREA (YD^3/FT)	LENGTH (FT)	VOLUME (YD^3)	TOTAL VOLUME CHANGE (CY)	
R-175 (az=10)	-0.4				8,393	North Adjacent Shoreline
		2.7	675	1,818		
C-174A (az=10)	5.8					
		16.8	391	6,575		
C-174A (az=245)	27.8				9,573	Project Area
		14.9	531	7,933		
R-175 (az=248)	2.1					
		1.7	817	1,374		
R-176 (az=245)	1.3					
		1.1	1,160	1,313		
R-177 (az=220)	1.0					
		-0.4	1,033	-447		
R-178 (az=227)	-1.8					
		-1.0	790	-812		
R-179 (az=230)	-0.2					
		-0.9	1,244	-1,119		
R-180 (az=210)	-1.6					
		-1.0	500	-483		
C-180.5 (az=205)	-0.4					
		-0.6	508	-319		
R-181 (az=205)	-0.9					
		2.1	1,005	2,133		
R-182 (az=204)	5.1				12,262	South Adjacent Shoreline
		4.2	856	3,560		
R-183 (az=204)	3.2					
		2.8	1,071	3,051		
R-184 (az=205)	2.5					
		2.5	1,043	2,564		
R-185 (az=200)	2.4					
		3.3	945	3,087		
R-186 (az=205)	4.2					

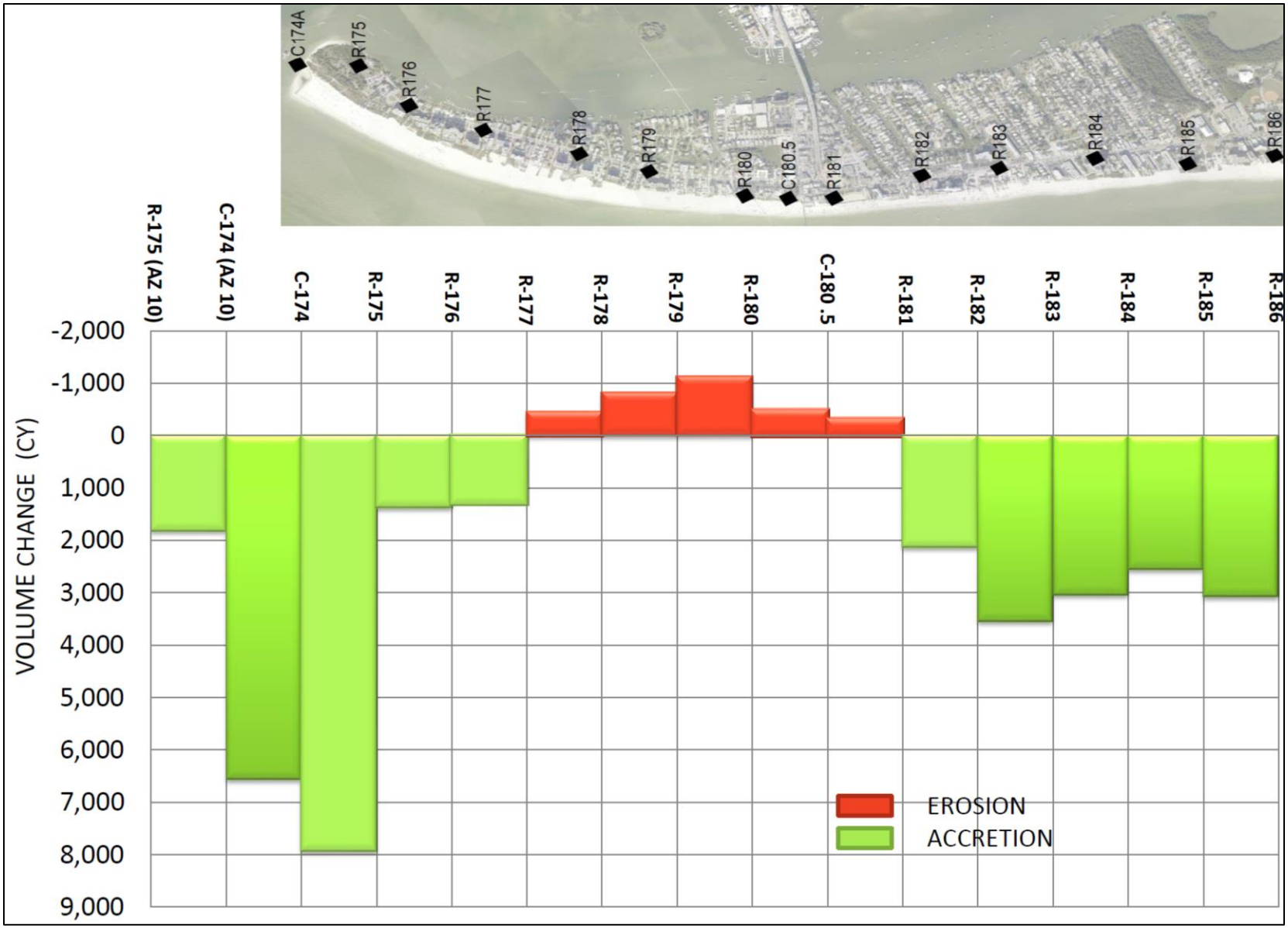


Figure 4. 2019-2020 Volumetric Change Above MHW.

4.2.2 Project Area

The Project Area from R-175 to R-182 experienced an average advancement of 7.7 feet between the 2019 and 2020 monitoring surveys. The range of shoreline change varied from 12.3 feet of recession at R-178 to 42.3 feet of advancement at R-182. Within the Project Area, the beach experienced accretion of approximately 26,670 cy above DOC. Volumetric changes above DOC ranged from 4,110 cy of erosion between R-179 and R-180 to 17,430 cy of accretion between C-174A (az=245º) and R-175 (az=248º). The majority of the net gains, approximately 17,430 cy between C-174A (az=245º) and R-175 (az=248º), were attributed to lateral transport to the north and the stabilizing effect of the terminal groin.

The Project Area experienced net accretion above MHW of approximately 9,570 cy. The changes above MHW ranged from 1,120 cy of erosion between R-179 and R-180 to 7,930 cy of accretion between C-174A (az=245º) and R-175 (az=248º).

4.2.3 North Adjacent Shoreline

The north adjacent shoreline begins at the terminal groin and wraps around the north side of Estero Island into Matanzas Pass to R-175 (az=10º). On average, the shoreline advanced 13.8 feet. The shoreline change ranged from 13.2 feet of recession at R-175 (az=10º) to 56.7 feet of advancement at C-174A (az=10º).

The net volume change above DOC between 2019 and 2020 was approximately 33,910 cy of accretion. Above MHW, the net change was approximately 8,390 cy of accretion. During the 2016 USACE's maintenance dredge project approximately 25,000 cy were removed from the North Adjacent Shoreline Monitoring Area (CEC, 2018). Figure 5 presents a plan view of the North Adjacent Shoreline Monitoring Area between C-174A (az=10º) and R-175 (az=10º) along with the 2016 dredge project (bottom of cut) and survey lines. The 2015-2017 volumetric analysis yielded approximately 33,710 cy of erosion above DOC (CEC, 2018a). The 2017-2018 volume changes indicated the area recovered 32,060 cy (CEC, 2018b). The infilling of the dredged limits continued through the present survey period. The MHW positions located in June 2018, July 2019 and June 2020 presented in Figure 5 illustrate the progressive shoreline migration to the north and encroachment into the navigation channel in Matanzas Pass.

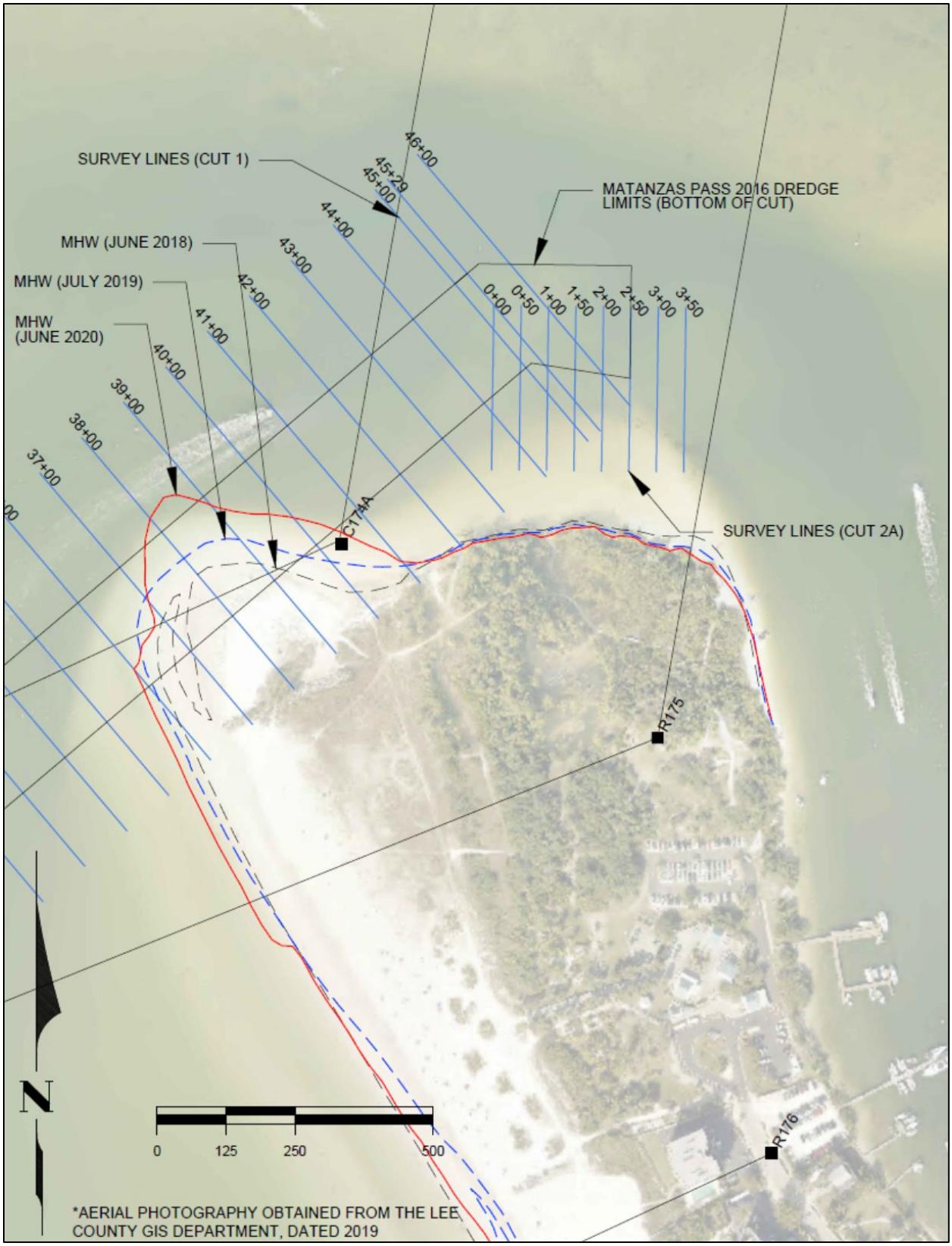


Figure 5. Plan View of North Adjacent Shoreline and 2016 USACE Dredging Project.

4.2.4 South Adjacent Shoreline

The south adjacent shoreline begins at R-182 and extends south to R-186. This stretch of beach experienced average advancement of approximately 27.4 feet between 2019 and 2020. The shoreline advancement ranged from 10.0 feet at R-185 to 38.1 feet at R-184.

The net volume change above DOC between 2019 and 2020 was approximately 8,010 cy of accretion. Above MHW, the net change was approximately 12,260 cy of accretion.

During the 2016 USACE's maintenance dredge project, approximately 130,000 cy were placed in the nearshore between R-182 and R-186 (CEC, 2018a). The 2017-2018 volume change analysis indicated that 44,660 cy were lost due to fill equilibration (CEC, 2018b). Approximately 21,000 cy were recovered during 2018-2019 (CEC, 2019). This recovery continued during 2019-2020.

4.2.5 Summary

The monitoring area extending from C-174A to R-186 experienced significant gains. Overall, between July 2019 and June 2020, the shoreline within the monitoring area accreted on average at an annual rate of approximately 15.6 feet per year. The total volume change within the monitoring area was approximately 68,590 cy of accretion above DOC and approximately 30,230 cy of accretion above MHW.

4.3 Project Area Performance

Table 6 presents the 2011 pre-construction, 2012 post-construction and 2018 through 2020 monitoring survey shoreline positions at MHW. In addition to the positions, the table includes shoreline change rates calculated for the 2012-2020 time period representing the eight-year post-construction monitoring period. For consistency, the same effective distances as in Table 3 were utilized to determine the weighted average. Between 2012 and 2020, the Project Area shoreline experienced an average recession of 11.9 feet. The areas adjacent to the Project Area experienced 1.8 feet of recession on the north side and 14.2 feet of advancement on the south side. The weighted average shoreline change rate for the entire monitoring area between 2012 and 2020 equated to 3.3 feet per year of recession.

Figure 6 presents the 2012, 2018, 2019 and 2020 MHW positions relative to the 2011 pre-construction MHW positions which were utilized as the baseline for the Project Area.

Table 7 and Figure 7 present the volumetric changes from the pre-construction survey in 2011 to the post-construction survey in 2012 within the fill footprint. In addition, the table presents the volumetric changes between 2012 post-construction and each of the 2018 through 2020

monitoring surveys. In summary, the net volume change between 2012 and 2020 within the fill footprint was approximately 168,120 cy of erosion.

Table 6. 2011-2020 Shoreline Changes.

MONUMENT (AZIMUTH)	POSITION (FT)					2012-2020 SHORELINE CHANGE RATE (FT/YR)	2012-2020 AVERAGE SHORELINE CHANGE RATE (FT/YR)	
	2020	2019	2018	POST-CON 2012	PRE-CON 2011			
R-175 (az=10)	337.5	350.6	373.4	352.8	N/A	-1.8	-1.8	North Adjacent Shoreline
C-174A (az=10)	16.4	-40.3	-83.4	N/A	N/A	N/A		
C-174A (az=245)	402.9	405.0	356.4	N/A	N/A	N/A		
R-175 (az=248)*	803.2	774.1	770.1	759.7	439.6	5.1	-11.9	Project Area
R-176 (az=245)	530.8	526.0	549.6	673.0	347.8	-16.8		
R-177 (az=220)*	603.2	580.2	555.0	739.8	455.8	-16.2		
R-178 (az=227)*	547.8	560.0	576.5	656.2	472.2	-12.8		
R-179 (az=230)*	436.8	439.8	460.9	564.7	353.7	-15.1		
R-180 (az=210)*	158.6	163.8	166.8	332.1	117.3	-20.5		
C-180.5 (az=205)	152.6	153.1	175.3	323.9	132.8	-20.3		
R-181 (az=205)	152.6	162.0	165.5	331.9	113.1	-21.2		
R-182 (az=204)*	483.1	440.8	457.4	394.8	398.4	10.5		
R-183 (az=205)	546.8	510.1	493.6	449.6	N/A	11.5	14.2	South Adjacent Shoreline
R-184 (az=205)	601.8	563.7	513.6	469.5	N/A	15.6		
R-185 (az=200)*	393.4	383.4	335.1	229.1	N/A	19.4		
R-186 (az=205)	383.1	358.3	347.1	296.9	N/A	10.2		
N/A = profile below MHW	Avg Annual Rate (FT/YR)					-3.3		

*2012 Line was shifted from adjacent azimuth

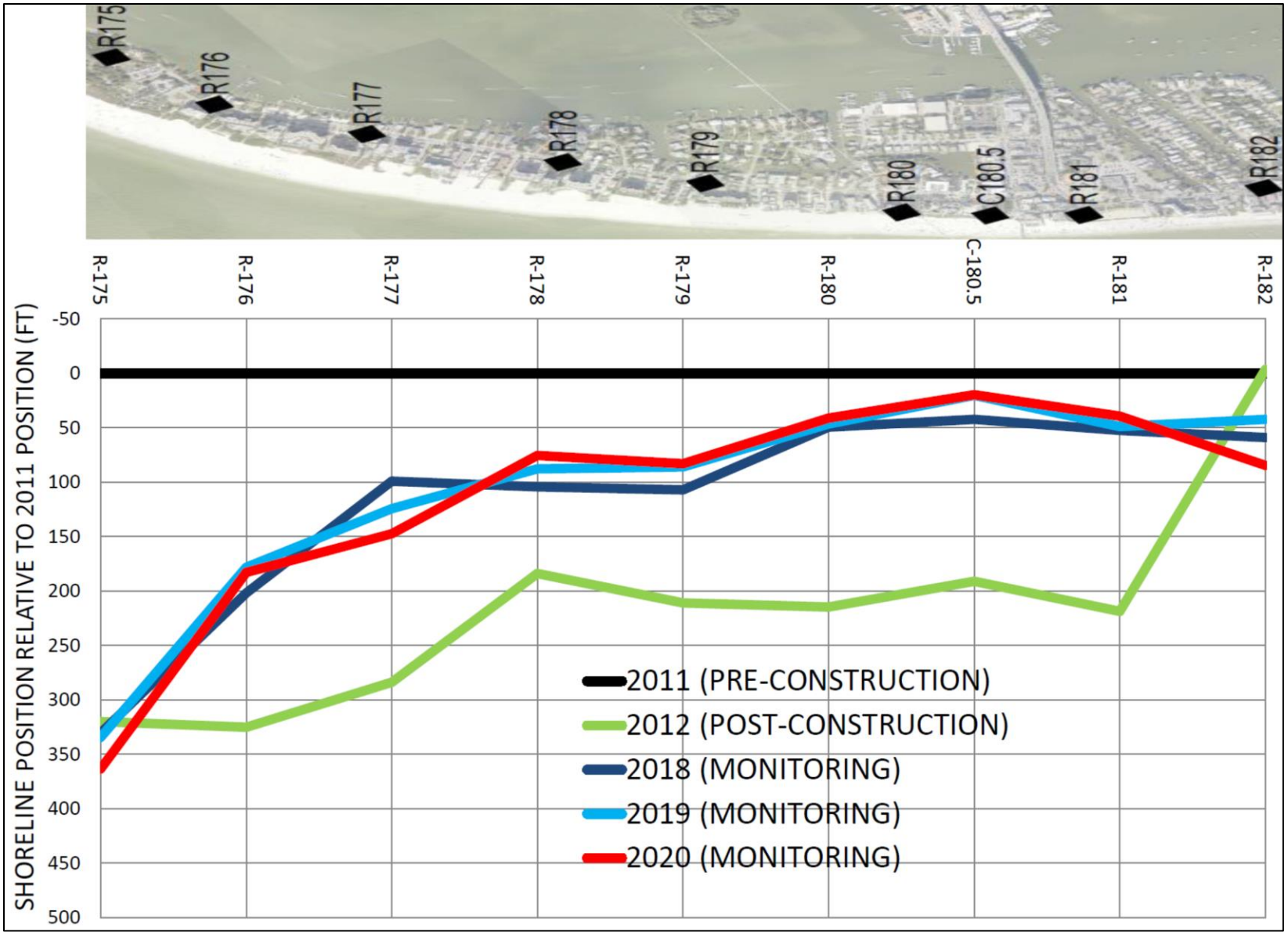


Figure 6. 2012-2020 Shoreline Positions within Project Area Relative to 2011 Pre-Construction Shoreline Position.

Table 7. 2012-2020 Volumetric Changes within Project Area Fill Footprint.

MON (AZIMUTH)	2011 to 2012			2012 to 2018			2012 to 2019			2012 to 2020		
	CELL AREA (YD^3)	AVE CELL AREA (YD^3/FT)	VOL (YD^3)	CELL AREA (YD^3/FT)	AVE CELL AREA (YD^3/FT)	VOL (YD^3)	CELL AREA (YD^3)	AVE CELL AREA (YD^3/FT)	VOL (YD^3)	CELL AREA (YD^3)	AVE CELL AREA (YD^3/FT)	VOL (YD^3)
R-174 (az=245)	0			0.0			0.0			0.0		
		37.9	20,143		2.4	1,257		4.0	2,142		5.1	2,728
R-175 (az=248)*	40,975			4.7			8.1			10.3		
		79.8	65,199		-7.0	-5,707		-7.9	-6,441		-5.2	-4,251
R-176 (az=245)	45,226			-18.7			-23.8			-20.7		
		79.4	92,107		-25.2	-29,236		-27.5	-31,856		-25.7	-29,823
R-177 (az=220)*	40,560			-31.7			-31.1			-30.8		
		55.9	57,707		-19.2	-19,844		-19.8	-20,456		-23.0	-23,744
R-178 (az=227)*	19,801			-6.7			-8.5			-15.2		
		41.8	32,973		-10.6	-8,378		-14.3	-11,320		-18.9	-14,953
R-179 (az=230)*	25,289			-14.5			-20.1			-22.6		
		49.9	62,113		-25.5	-31,698		-30.0	-37,295		-33.0	-41,055
R-180 (az=210)*	28,629			-36.5			-39.8			-43.4		
		50.3	25,132		-35.7	-17,857		-39.6	-19,789		-41.7	-20,826
C-180.5 (az=205)	25,703			-35.0			-39.4			-40.0		
		48.3	24,541		-33.2	-16,870		-36.5	-18,545		-37.2	-18,903
R-181 (az=205)	26,479			-31.4			-33.6			-34.4		
		24.5	24,631		-15.7	-15,774		-16.8	-16,880		-17.2	-17,291
R-182 (az=204)*	0			0.0			0.0			0.0		
Totals			**404,545**			**-144,106**			**-160,441**			**-168,120**

*2012 Line was shifted from adjacent azimuth

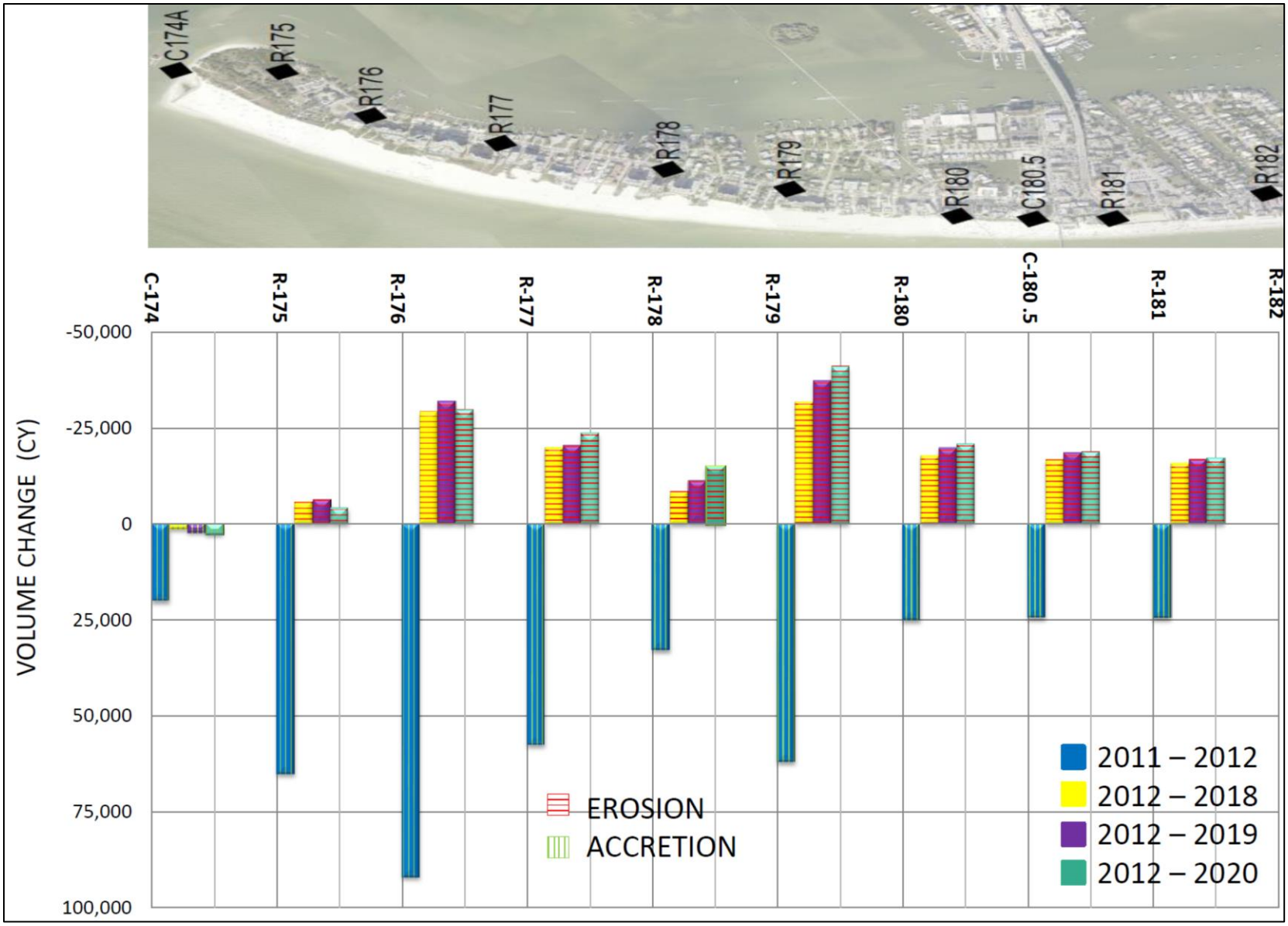


Figure 7. 2012-2020 Volumetric Changes within Project Area.

In order to calculate the percent loss and remaining fill within the Project Area, CEC calculated the volume placed by comparing the 2011 pre-construction survey to the 2012 post-construction survey. The limits of the volume calculations were from the landward extent of the 2011 pre-construction survey to the toe of fill of the 2012 post-construction survey. In addition, some 2012 post-construction lines where shifted from an adjacent azimuth by holding a control point at the elevation of +4 feet NAVD88 to enable volume computations due to varying profile azimuths measured over time. These lines are denoted with an asterisk (*) in Tables 6 and 7. The volume placed between the 2011 pre-construction and 2012 post-construction survey was calculated to be approximately 404,550 cy. This volume was then compared to the volume recorded in the pays surveys during construction (Lee County, 2013), approximately 403,000 cy, which is within one percent, which confirms the profile adjustments employed and analysis performed herein.

The volumetric changes for 2018, 2019 and 2020 were then calculated by comparing the monitoring surveys to the 2012 post-construction survey maintaining the 2012 toe of fill as the seaward limit. Between 2012 and 2018, the Project Area experienced approximately 144,110 cy of erosion (CEC, 2018). Between 2012 and 2019, the Project Area experienced approximately 160,440 cy of erosion (CEC, 2019). Between 2012 and 2020, the Project Area experienced approximately 168,120 cy of erosion. The volume remaining within the Project Area equated to approximately 236,430 cy or 58% of the volume placed in the 2011-2012 event.

Accounting for the time period between the surveys, the annualized erosion rates for the Project Area for the 2018-2019 and 2019-2020 monitoring periods equate to approximately 16,330 cy/year (CEC, 2019) and 8,360 cy/year, respectively.

4.4 Contingent Area Performance

The area of contingency includes the northern tip of Estero Island north and west of the terminal groin (Lee County, 2003). This area is monitored to evaluate the potential of downdrift effect as a result of the terminal groin. Between 2019 and 2020 the area experienced an average advancement of 13.8 feet. The segment gained approximately 8,390 cy above MHW and approximately 33,910 cy to DOC. A review of the groin G-line profiles also indicates shoreline accretion between 2019 and 2020 (Appendix 2). Further, the 2020 MHW shoreline at the groin location is still seaward of its 2012 post-construction and 2013 positions. Based on that, it is concluded that during the 2019-2020 monitoring period no terminal groin related adverse impacts to the contingent shoreline were documented.

5.0 CONCLUSION

This report describes the 8th year annual monitoring results of the Estero Island Restoration Project. The information presented herein provides the necessary data for Lee County to observe and assess, with quantitative measurements, the performance of the project, any adverse effects

which have occurred, and the need for any adjustments, modifications, or mitigative response to the Project. The scientific monitoring processes also provides the County information necessary to plan, design, and optimize subsequent follow-up projects, potentially reducing the need for and costs of unnecessary work, as well as potentially reducing any environmental impacts that may have occurred or be expected. While the assumption on profile adjustments employed herein was verified, some of the large-scale volume changes measured since construction may be attributed in part to differences in profile azimuths measured over time.

Between July 2019 and June 2020, the shoreline within the monitoring area advanced on average at an annual rate of approximately 15.6 feet per year. The total volume change was approximately 68,590 cy of accretion above DOC and approximately 30,230 cy of accretion above MHW.

During the same period, the Project Area from R-175 to R-182 experienced an average accretion of 7.7 feet. Within the Project Area, the beach experienced net accretion of approximately 26,670 cy above DOC and net accretion of approximately 9,570 cy above MHW.

The Project Area which received fill in 2011 experienced erosion of approximately 16,330 cy per year between 2018 and 2019 (CEC, 2019) and 8,360 cy between 2019 and 2020, as measured within the fill template. There was approximately 236,430 cy or 58% remaining within the design template from the original volume placed. These values are with respect to each survey event and computed within the 2011 fill footprint.

Monitoring of the contingency area, adjacent to and downdrift of the terminal groin, indicated there were no documented impacts to the contingency shoreline from the terminal structure. The shoreline segment between C-174A (az=10º) and R-174A (az=245º) experienced an average advancement of 13.8 feet. It gained approximately 8,390 cy above MHW and approximately 33,910 cy to DOC.

Based on the monitoring, there were no unanticipated or documented adverse impacts to the natural resources or coastal system within the Project Area or adjacent control beaches.

6.0 REFERENCES

Lee County. (2003). Estero Island, Lovers Key & Bonita Beach restoration; contingency plan. DEP permit 0173059-JC & 0200803-JC. Fort Myers.

Lee County. (2013). “Estero Island Restoration 1st Year Annual Monitoring Report.” Lee County Division of Natural Resources, Fort Myers.

Coastal Engineering. (2014) “Estero Island Restoration 2nd Year Annual Monitoring Report.” Coastal Engineering Consultants Inc., Naples.

Coastal Engineering. (2018a) "Estero Island Restoration 2017 Annual Monitoring Report." February 12, 2018. Coastal Engineering Consultants Inc., Naples.

Coastal Engineering. (2018b) "Estero Island Restoration 2018 Annual Monitoring Report." August 22, 2018. Coastal Engineering Consultants Inc., Naples.

Coastal Engineering. (2019) "Estero Island Restoration 2019 Annual Monitoring Report." September 17, 2019. Coastal Engineering Consultants Inc., Naples.

APPENDIX 1

SURVEY REPORT

COASTAL ENGINEERING CONSULTANTS INC.

A CECI GROUP COMPANY

CECI Group Services
Coastal and Marine Engineering
Environmental and Geological Services
Land and Marine Survey and Mapping
Website: www.coastalengineering.com

2020 ESTERO ISLAND ANNUAL MONITORING SURVEY

SURVEY REPORT

Coastal Engineering Consultants (CEC) conducted the Monitoring Survey of Estero Island performed on June 16, 2020. The survey was conducted utilizing multiple Trimble Real Time Kinematic (RTK) Global Positioning Systems (GPS). All GPS control during this survey was referenced from previously established Florida Department of Environmental Protection (FDEP) Bureau of Beaches and Coastal Systems (BBCS) and meets or exceeds Geospatial Positioning Accuracy Standards, Range VIII.

All "R monument" and intermediate beach profiles were collected on the State Plane Coordinate System Grid, Florida West Zone and survey data was collected along FDEP established grid bearings as outlined in the project Scope of Work. The horizontal and vertical datums were North American Datum (NAD) of 1983/2011 Adjustment and North American Vertical Datum (NAVD) of 1988, Geoid 2012A, respectively.

All survey control was established as part of the upland topographic survey control work and conducted in accordance with the FDEP Monitoring Standards for Beach Erosion Control Projects. These surveys meet the requirements set forth in Chapter 5J-17 (F.A.C.) Florida Administrative Code. The following published FDEP vertical control was used during the surveys:

ACOE ESTERO 101 2015 JAX DIST, PID No. BBDV83
Northing: 764427.976'
Easting: 681535.064'
Elevation = 4.73' NAVD 1988

FDEP 1283-A25-2
Northing: 770456.326'
Easting: 670763.371'
Elevation = 3.37' NAVD 1988

Equipment

Upland: CEC employed two Trimble Real Time Kinetic (RTK) GPS rover receivers with GLONASS capability systems for the upland surveys. These systems are capable of delivering RTK positions with coordinate accuracy of ±10mm+2ppm. Wireless Bluetooth technology allows our surveyors to collect data seaward of the Mean High Water line in the "surf zone" up to 5 feet deep.

O*ffshore:* The survey vessel used for this work was a 20-foot fiberglass hull powered by an outboard motor. A CEE ECHO single beam echo sounder was used with a side mounted transducer. A Trimble R8 GPS antenna with GLONASS capability was installed on the side mount bracket directly above the transducer. The Trimble R8 receiver was integrated with the on-board computer system. Hypack 2017 software package was the hydrographic guidance program utilized.

QA/QC Procedures

CEC employs an advanced QA/QC program to ensure work performed by us meets the FDEP accuracy standards. CEC upland field crews utilize RTK systems for data collection. CEC also incorporates the necessary equipment on the survey vessel to collect bathymetric survey data "Real-Time". To meet the specification calling for an approximate 50-foot overlap in data between the boat and the upland crew, CEC implements the following procedure. Utilizing "Real-Time" data collection, the boat crew immediately accounts for the tide correction, as well as the draft, and reports measured water depth in NAVD88 at each profile with the upland crew. This gives the upland crew, who simultaneously collects the upland and nearshore profile data, the necessary information to achieve the "overlap" specification.

Upland Data Collection: CEC mobilized one operator and GPS rover unit to collect survey data from the approximate MHW line landward while an additional operator and unit collected data just landward of MHW seaward to wading depth or approximately –5 feet NAVD88. The recorded data was maintained within tolerances of ±3.00 feet horizontal and ±0.16 feet vertical. QA/QC procedures were maintained by both comparison of values with higher accuracy and by repeat measurement.

An electronic list of R-monument coordinates and profile azimuths was loaded into the rover units and measurements were recorded along the azimuth line at intervals no greater than 25 feet or wherever geographical features dictated. The measurements were taken landward along the azimuth line to a minimum of 150 feet landward of the R-monument or to the edge of a building or road, whichever is the most seaward. When possible, a measurement was taken on the R-monument. The extent of the vegetation line and prominent features such as seawalls were also noted in the data collection. The measurements were taken seaward along the azimuth line to a minimum depth of –5 feet NAVD88 or as far as conditions dictated, to maintain a minimum of 50 feet of overlap with the data being collected by the offshore survey crew. This data was then compiled and merged with the offshore data to produce the profile drawings.

Offshore Data Collection: All survey equipment was properly calibrated and operated in accordance with FDEP standards. Bar checks to calibrate the fathometer were performed periodically throughout the survey. Bathymetric survey data collection was conducted in calm seas. Maximum wave heights during the data collection period were less than 3 feet. The data was collected at intervals not exceeding 25 feet and at all grade breaks along the profile sufficient to accurately describe the bathymetry at the profile locations. The beach profile survey extended seaward to a minimum of 3,000 feet from MHW.

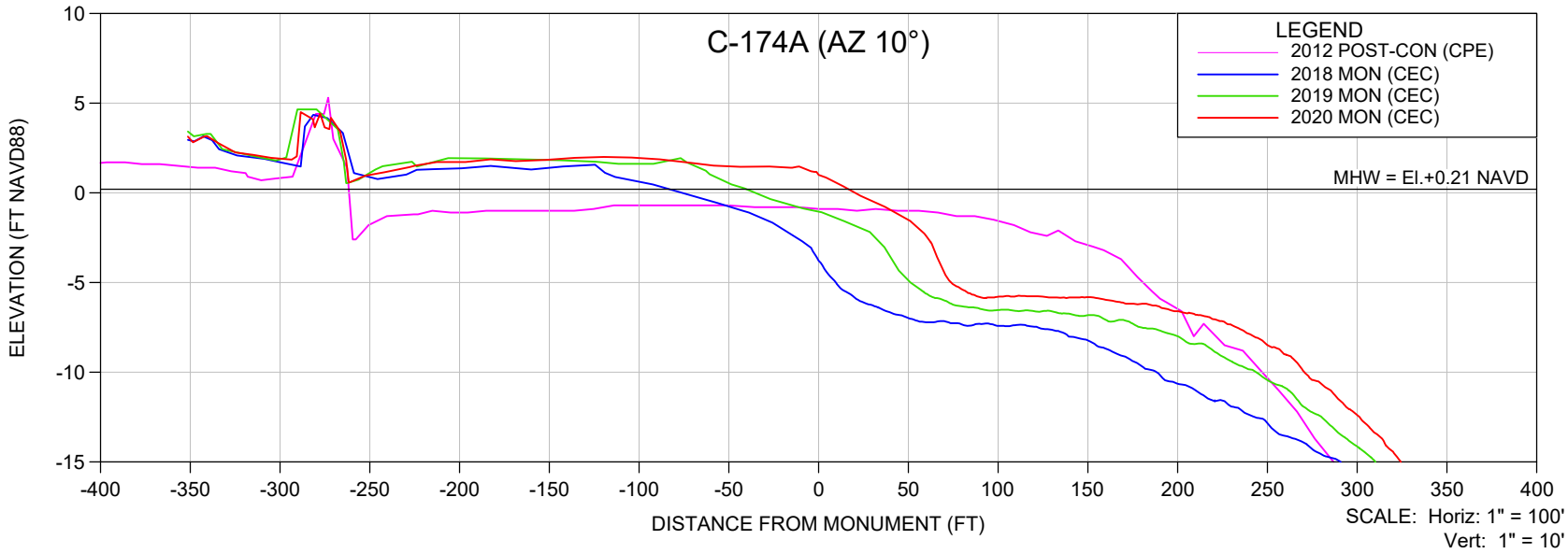
COASTAL ENGINEERING CONSULTANTS, INC.
FLORIDA BUSINESS AUTHORIZATION NO. LB 2464

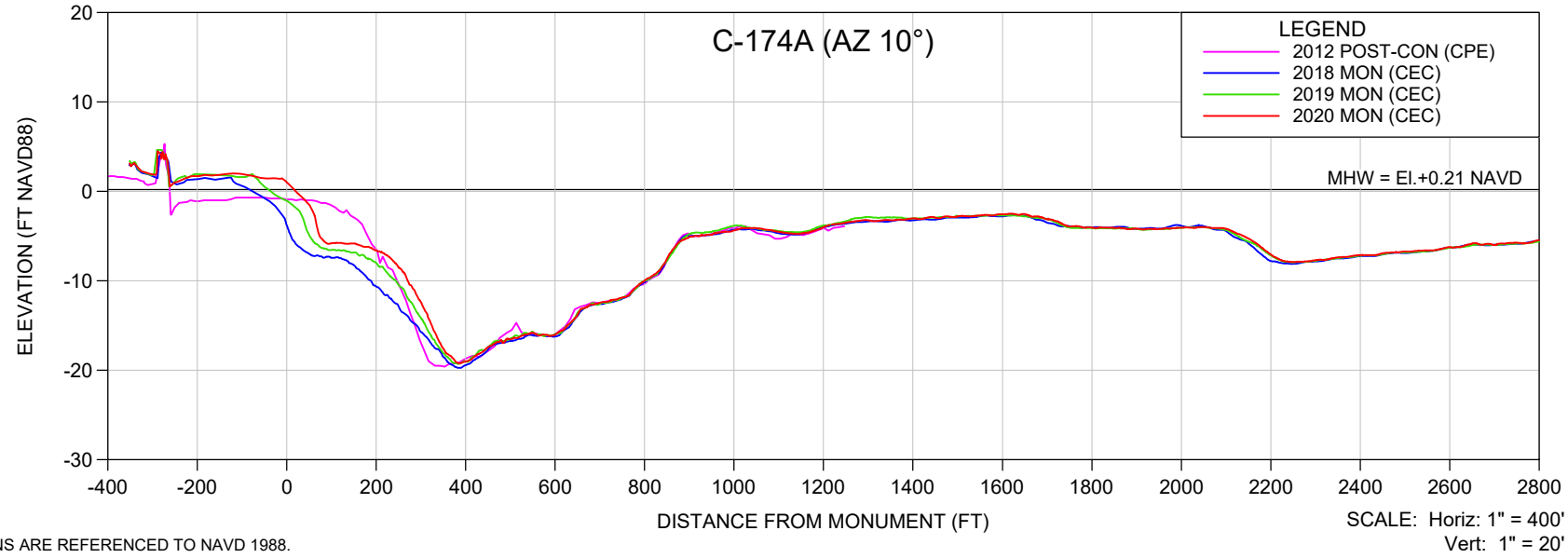
Digitally signed by Richard J. Ewing, PSM
DN: cn=Richard J. Ewing, PSM, o=Coastal Engineering Consultants, Inc., ou=Survey and Mapping, email=rewing@cecifl.com, c=US
Date: 2020.07.20 11:26:42 -04'00'

Richard J. Ewing, P.S.M.
Professional Surveyor and Mapper
Florida Certificate No. 5295
NOT VALID WITHOUT THE SIGNATURE AND
THE ORIGINAL RAISED SEAL OF A FLORIDA
LICENSED SURVEYOR AND MAPPER
CEC FILE NO. 20.079
DATE OF SIGNATURE:

APPENDIX 2

BEACH PROFILES





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

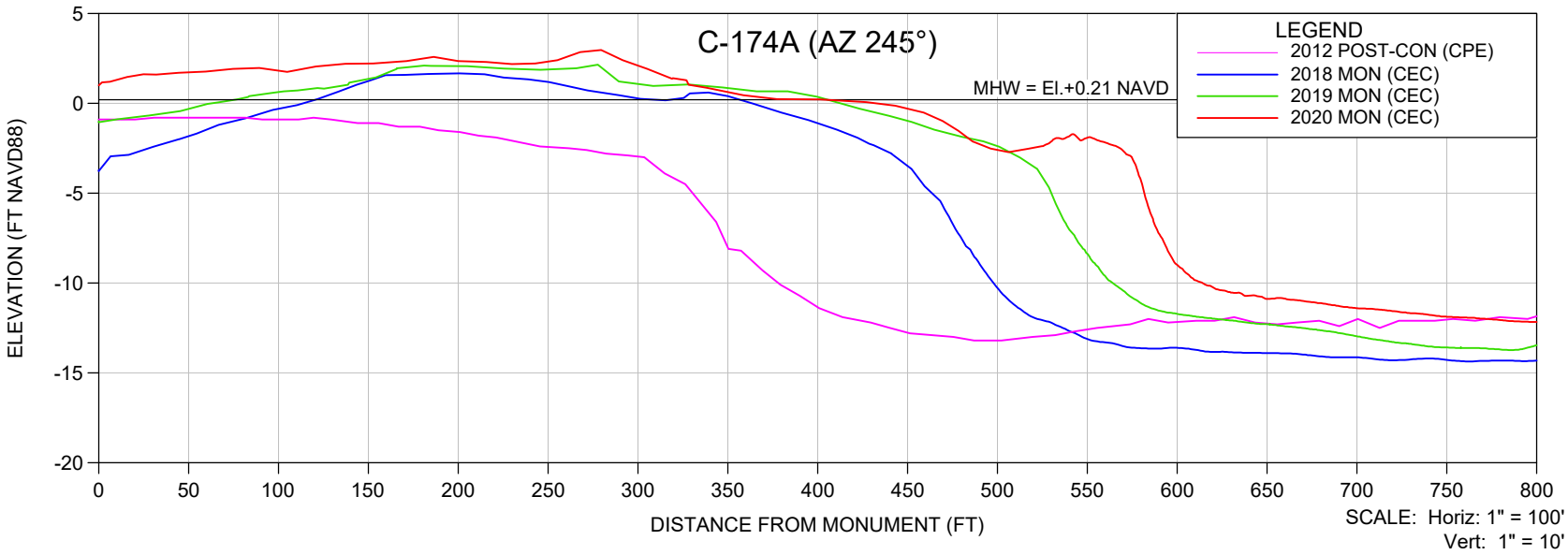
SHEET 1
FILE NO.: 20079-R-174 AZ 10

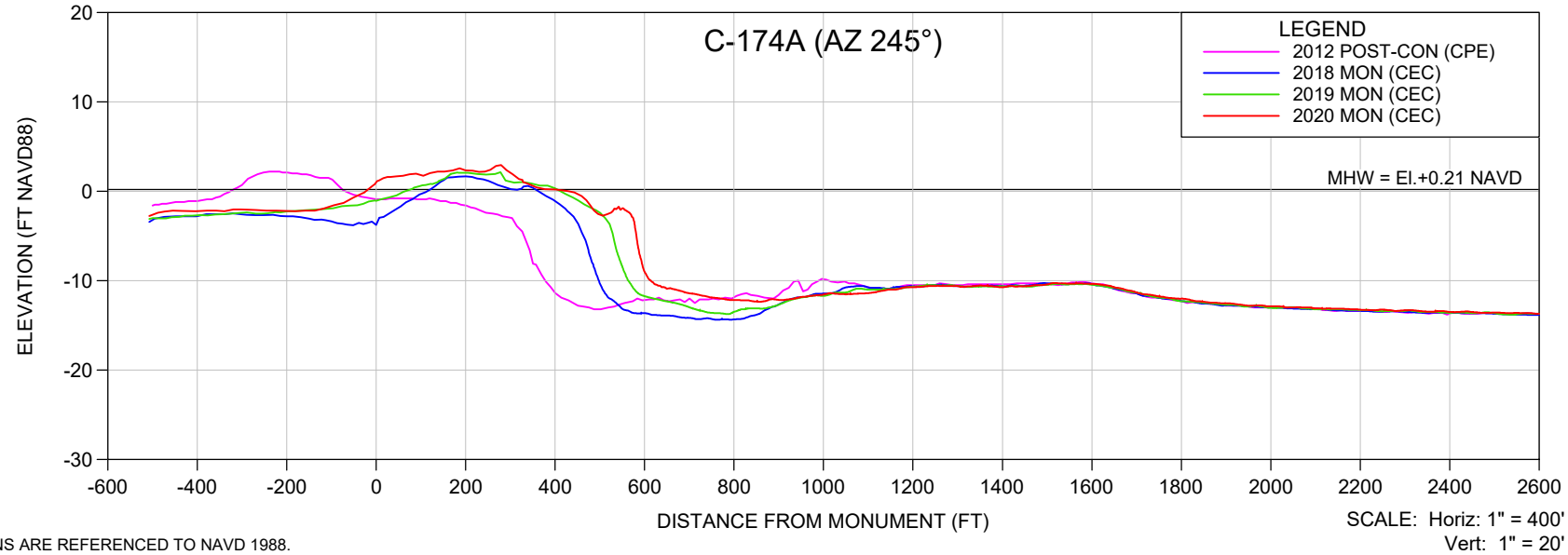
CLIENT: LEE COUNTY

TITLE: C-174A (AZ 10°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

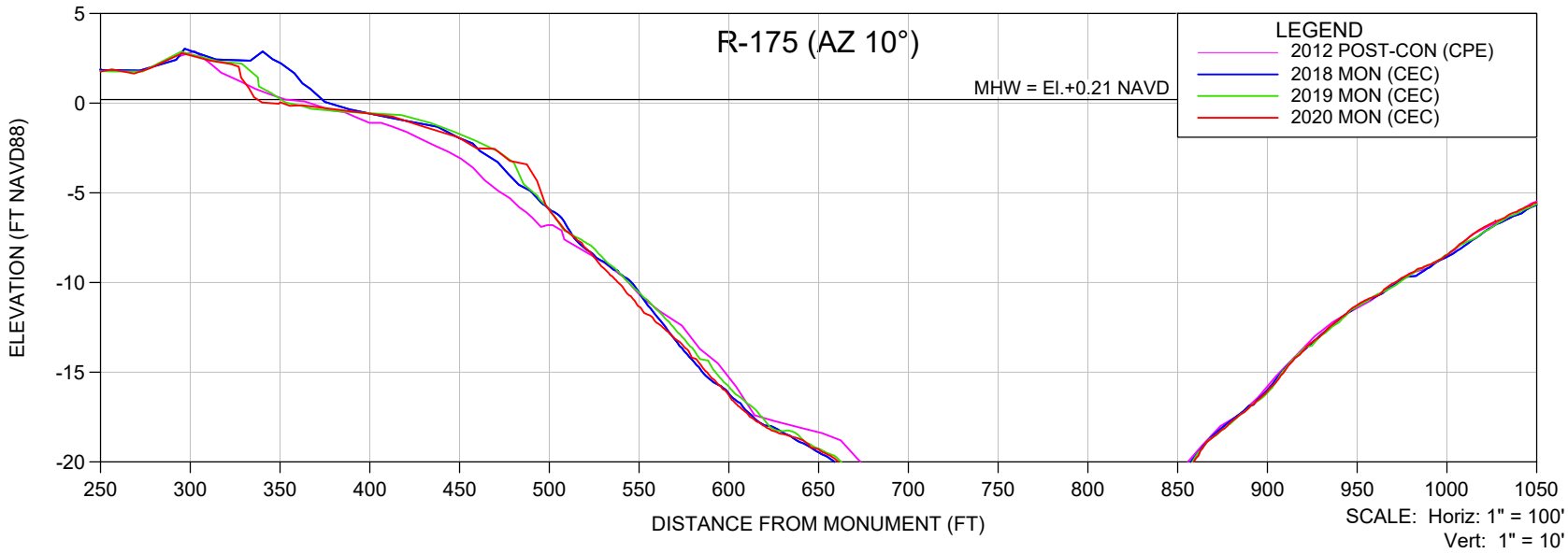
SHEET 2
FILE NO.: 20079-R-174 AZ245

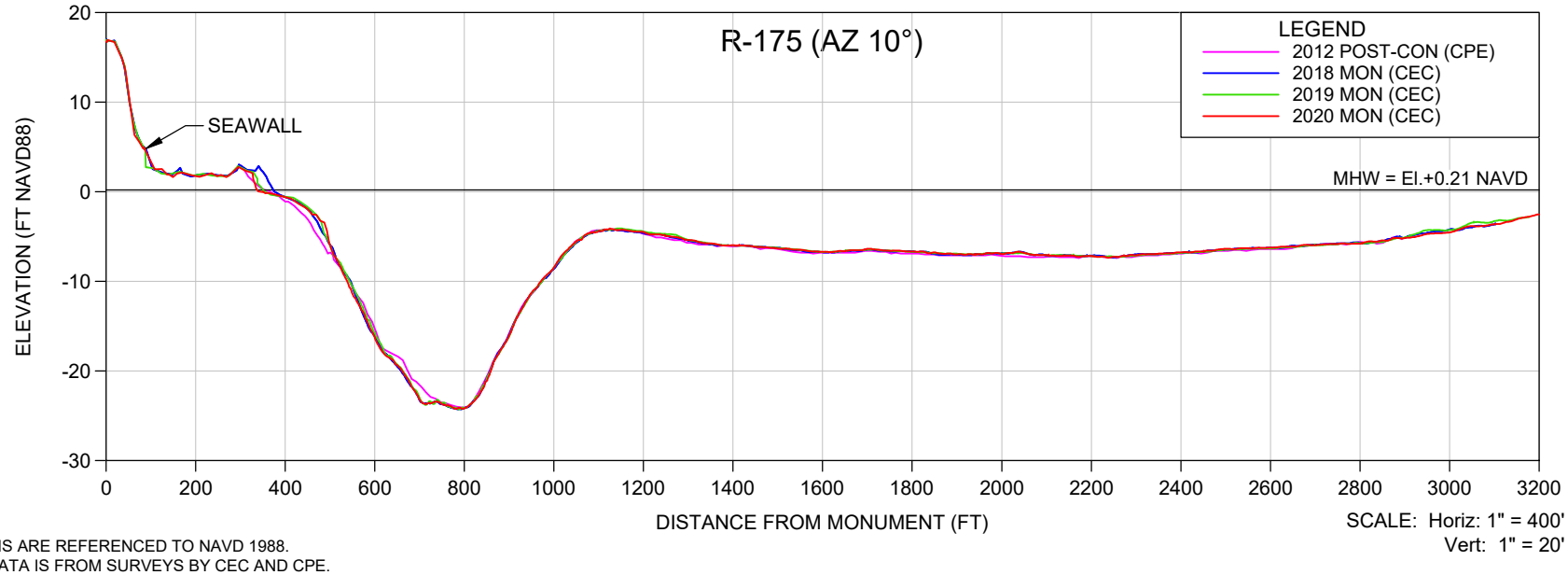
CLIENT: LEE COUNTY

TITLE: C-174A (AZ 245°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

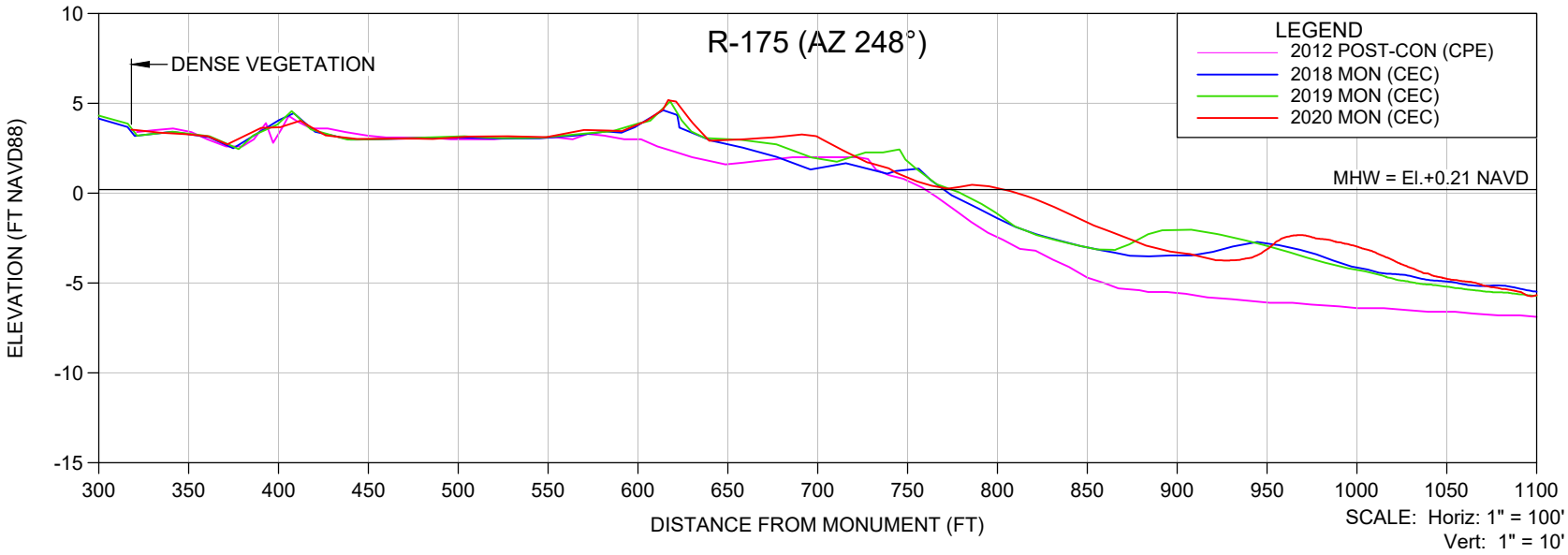
SHEET 3
FILE NO.: 20079-R-175 AZ10

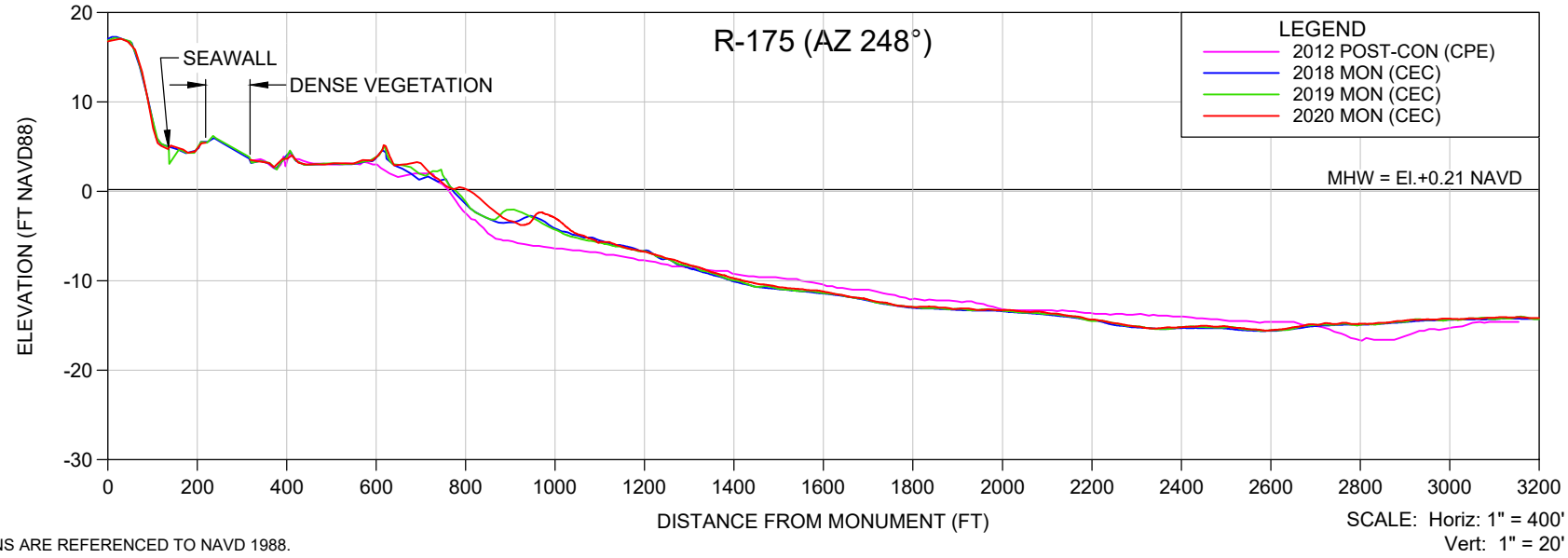
CLIENT: LEE COUNTY

TITLE: R-175 (AZ 10°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

SHEET 1 4
FILE NO.: 20079-R-175 AZ248

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

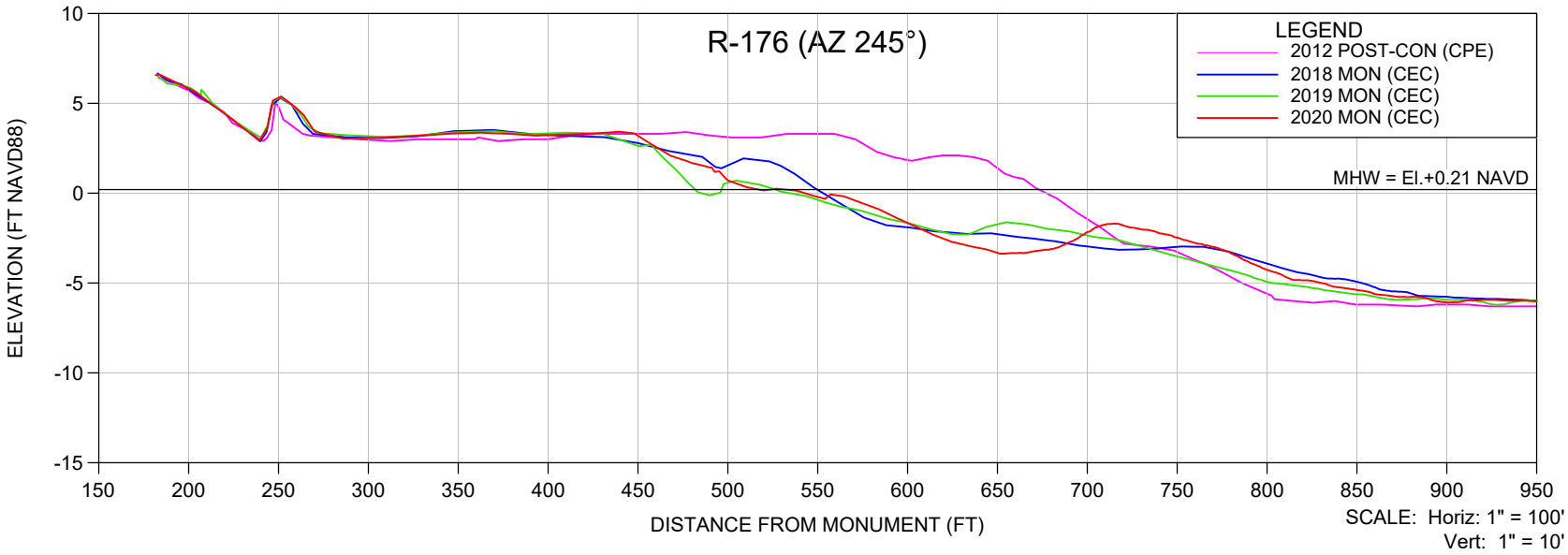
COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

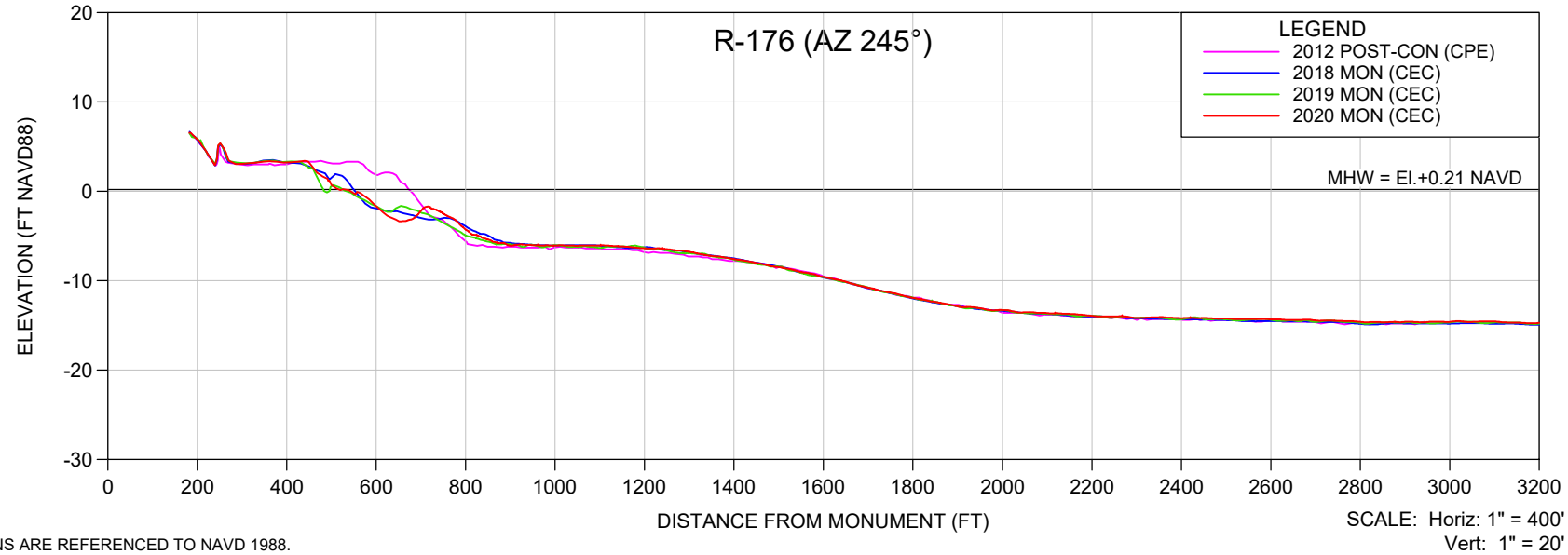
CLIENT: LEE COUNTY

TITLE: R-175 (AZ 248°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

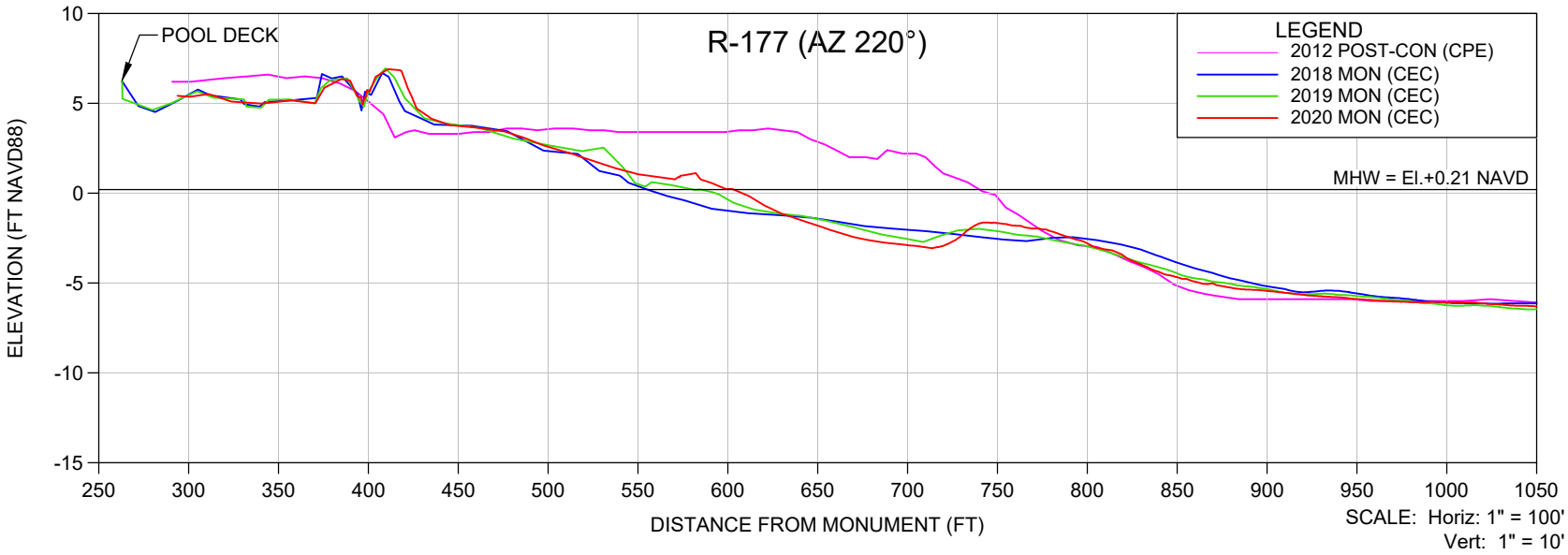
SHEET 5
FILE NO.: 20079-R-176

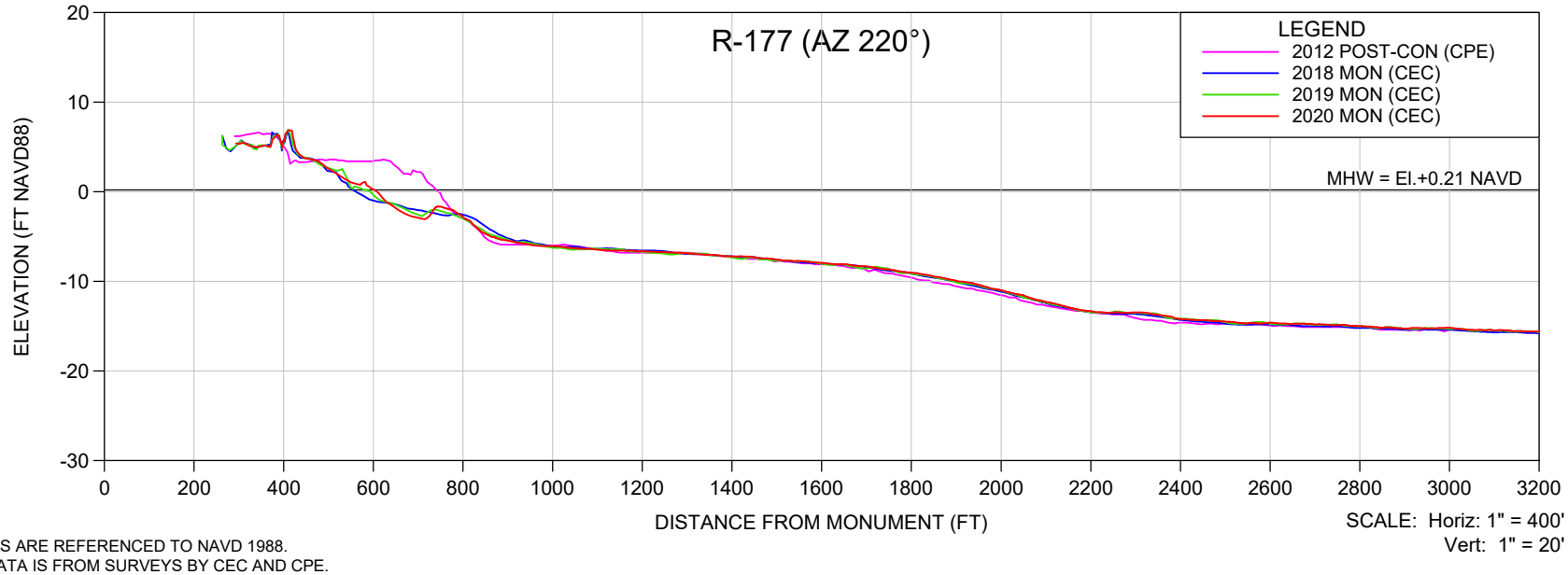
CLIENT: LEE COUNTY

TITLE: R-176 (AZ 245°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

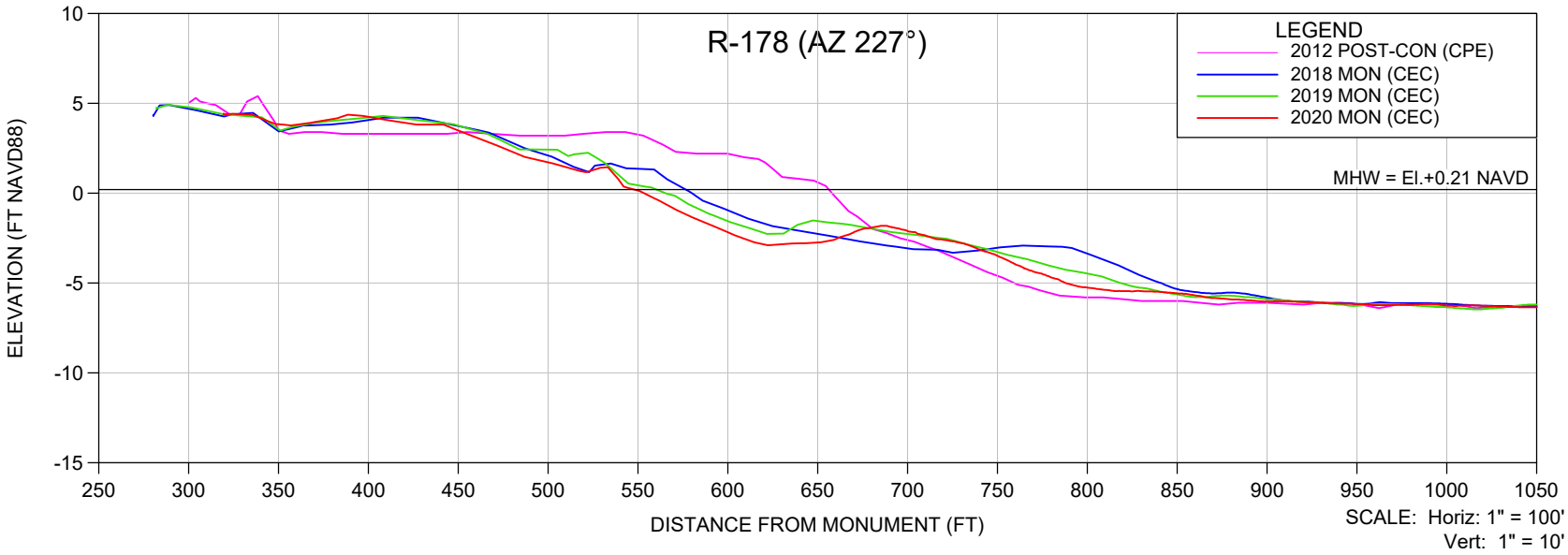
CLIENT: LEE COUNTY

TITLE: R-177 (AZ 220°) MONITORING SURVEY

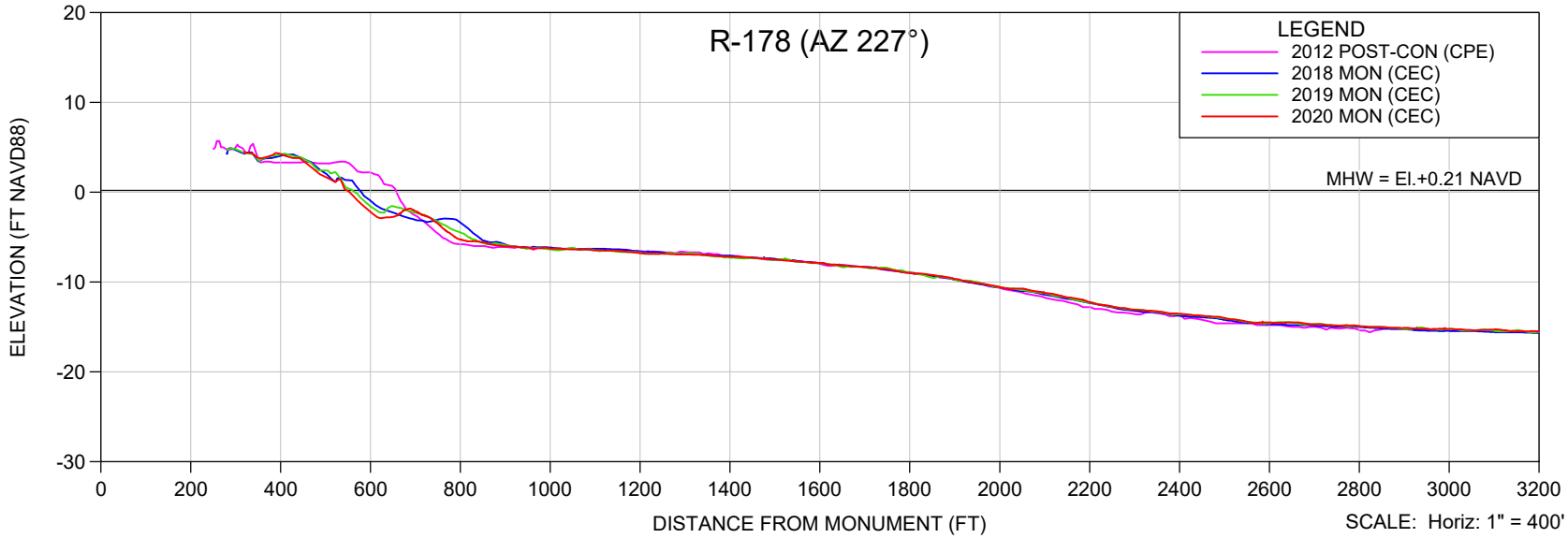
DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 6
FILE NO.: 20079-R-177 AZ220



SCALE: Horiz: 1" = 100'
Vert: 1" = 10'



SCALE: Horiz: 1" = 400'
Vert: 1" = 20'

NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

SHEET 7
FILE NO.: 20079-R-178 AZ227

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

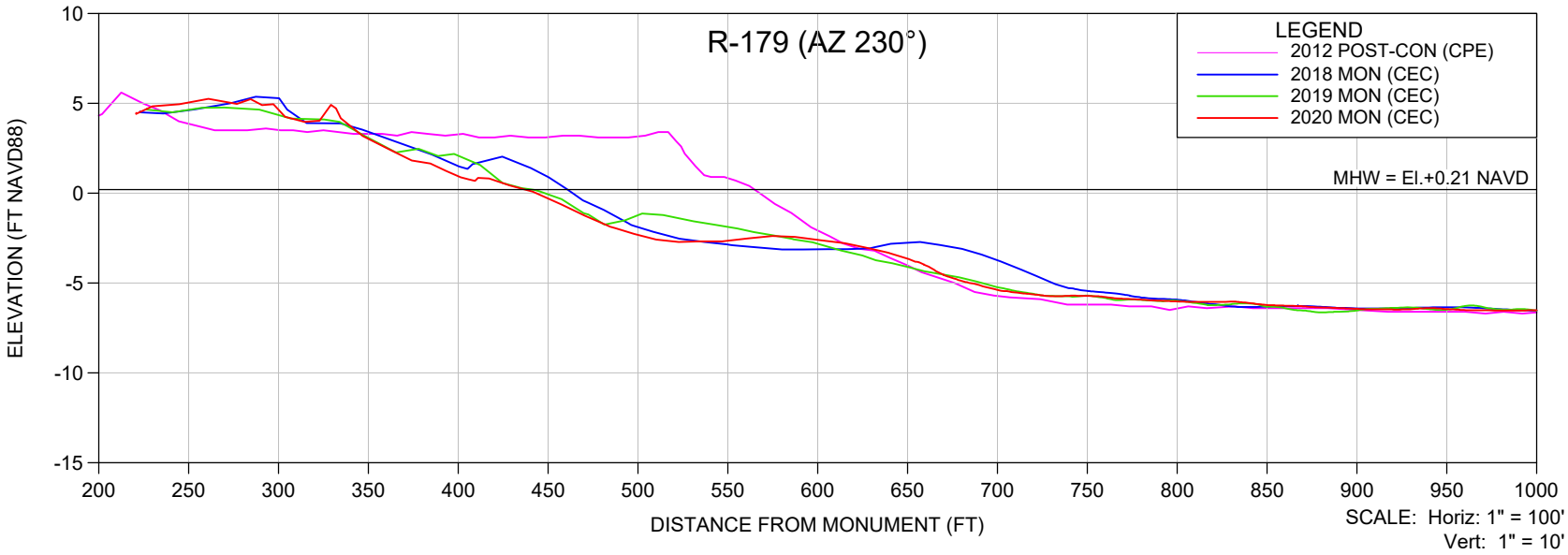
COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

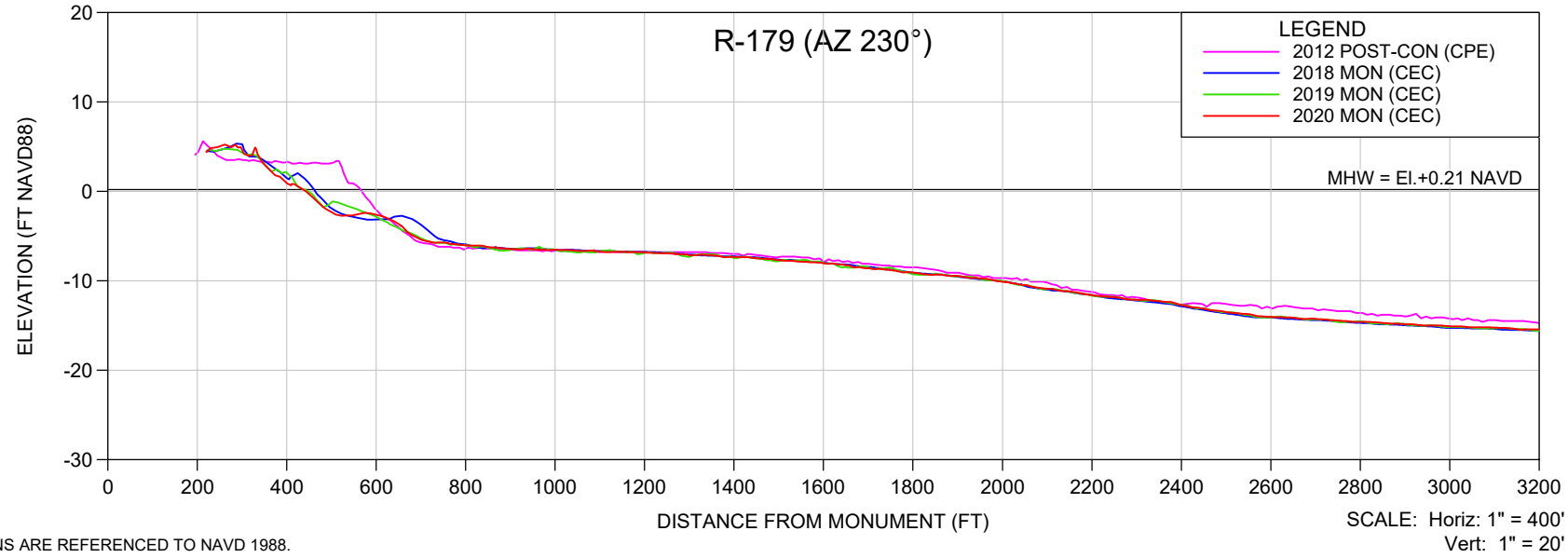
CLIENT: LEE COUNTY

TITLE: R-178 (AZ 227°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

SHEET 1 8

FILE NO.: 20079-R-179 AZ230

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

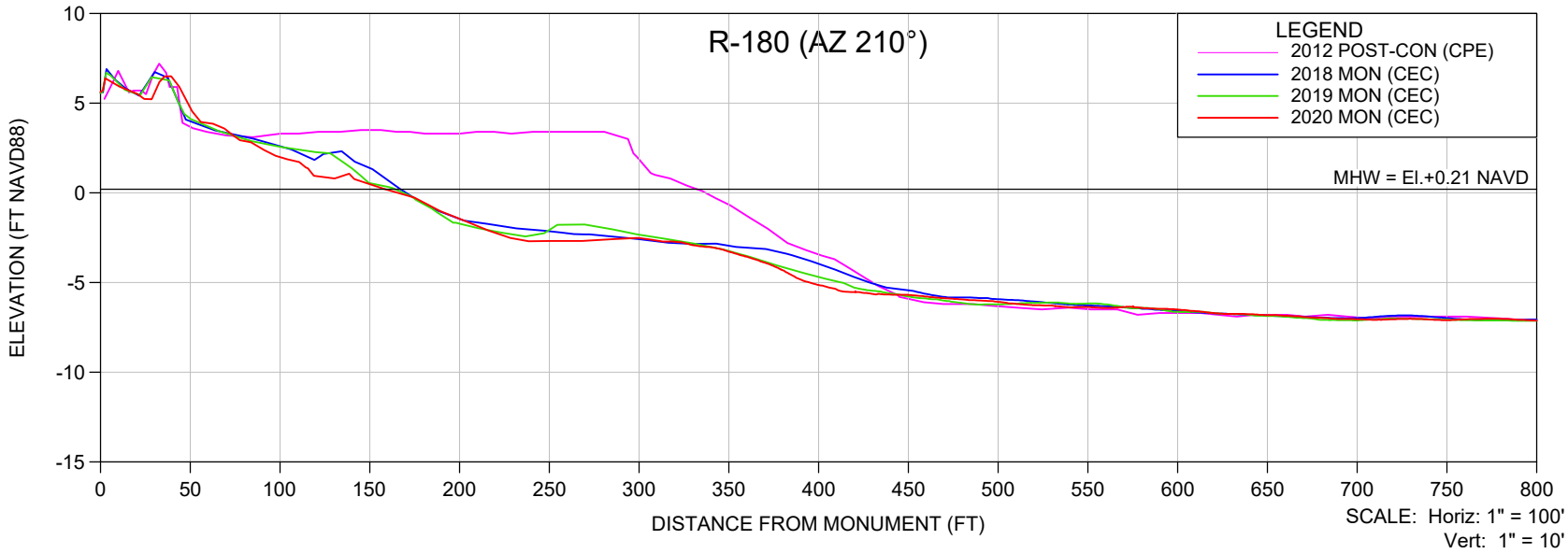
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

CLIENT: LEE COUNTY

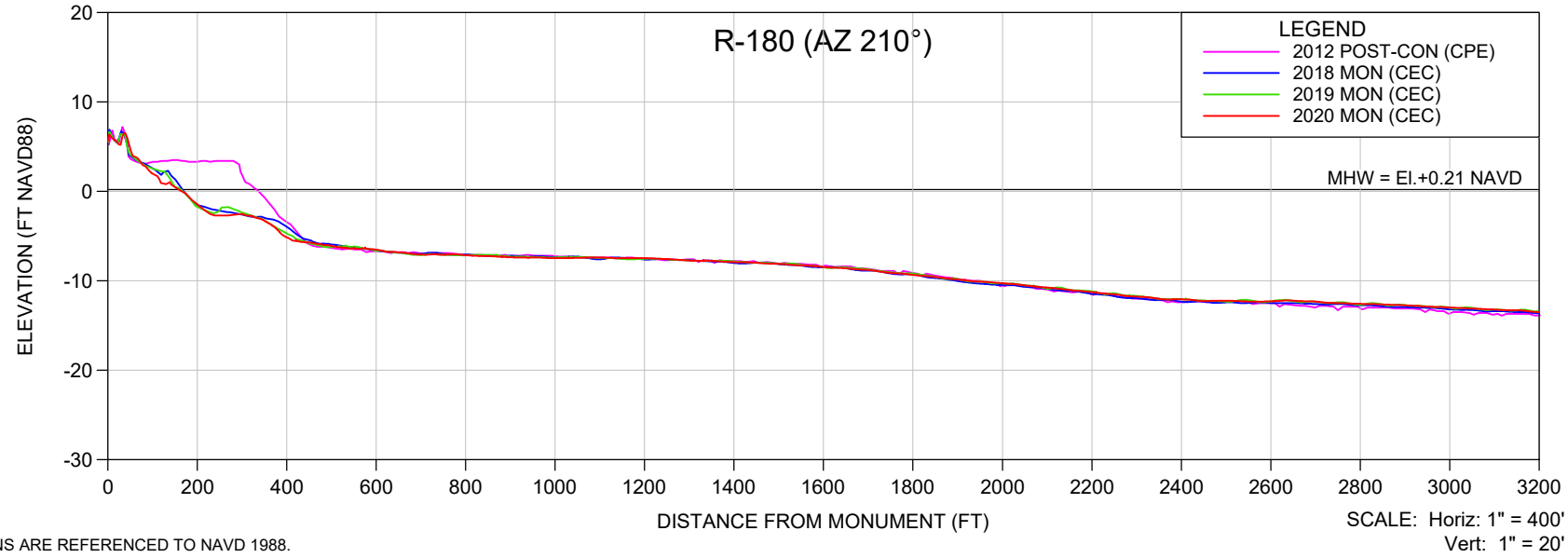
TITLE: R-179 (AZ 230°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION



SCALE: Horiz: 1" = 100'
Vert: 1" = 10'



SCALE: Horiz: 1" = 400'
Vert: 1" = 20'

NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

SHEET 9
FILE NO.: 20079-R-180 AZ210

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

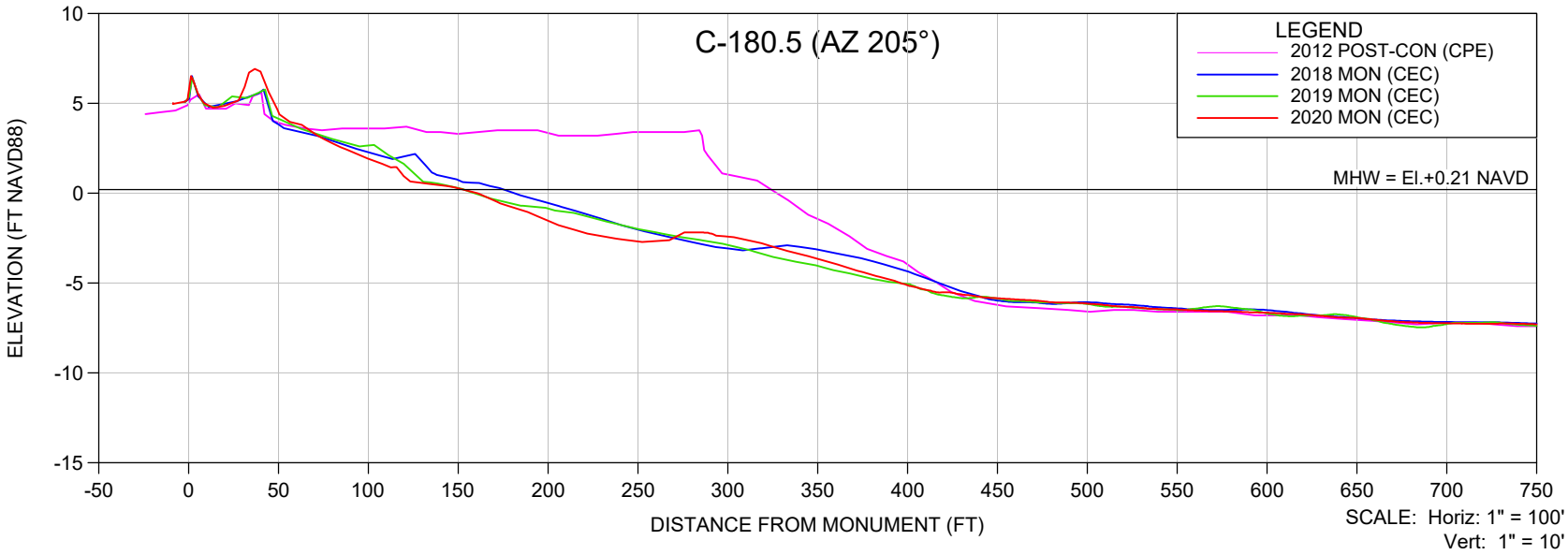
COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

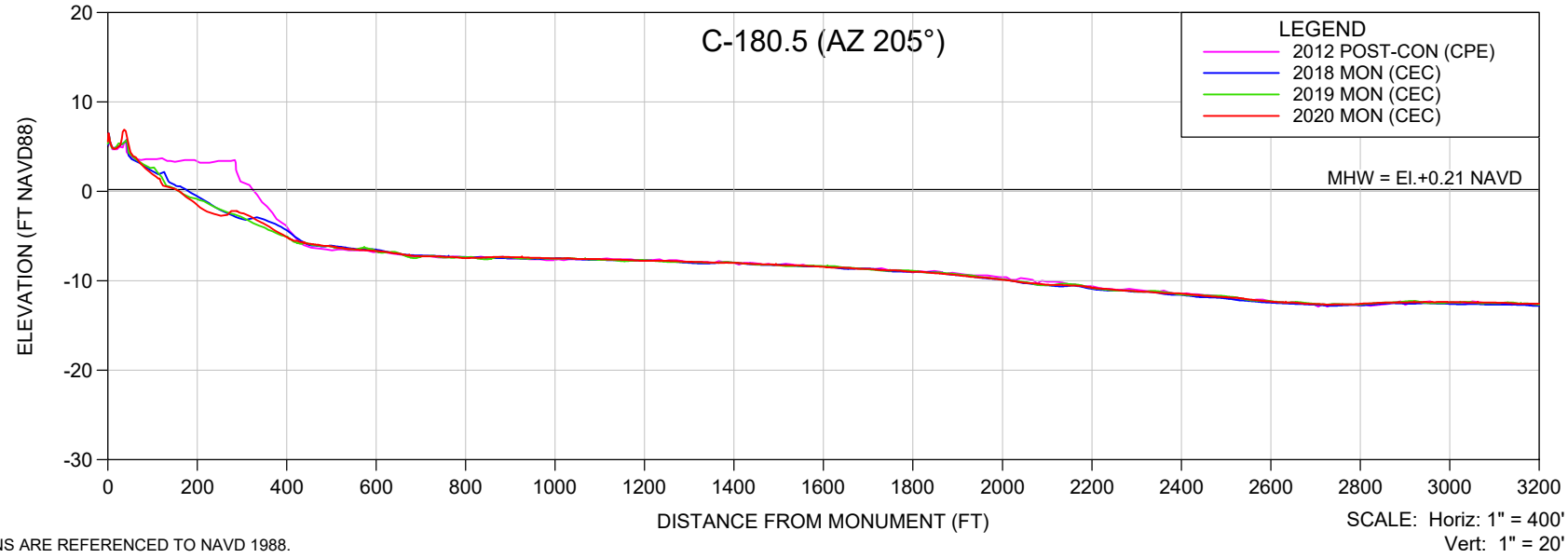
CLIENT: LEE COUNTY

TITLE: R-180 (AZ 210°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

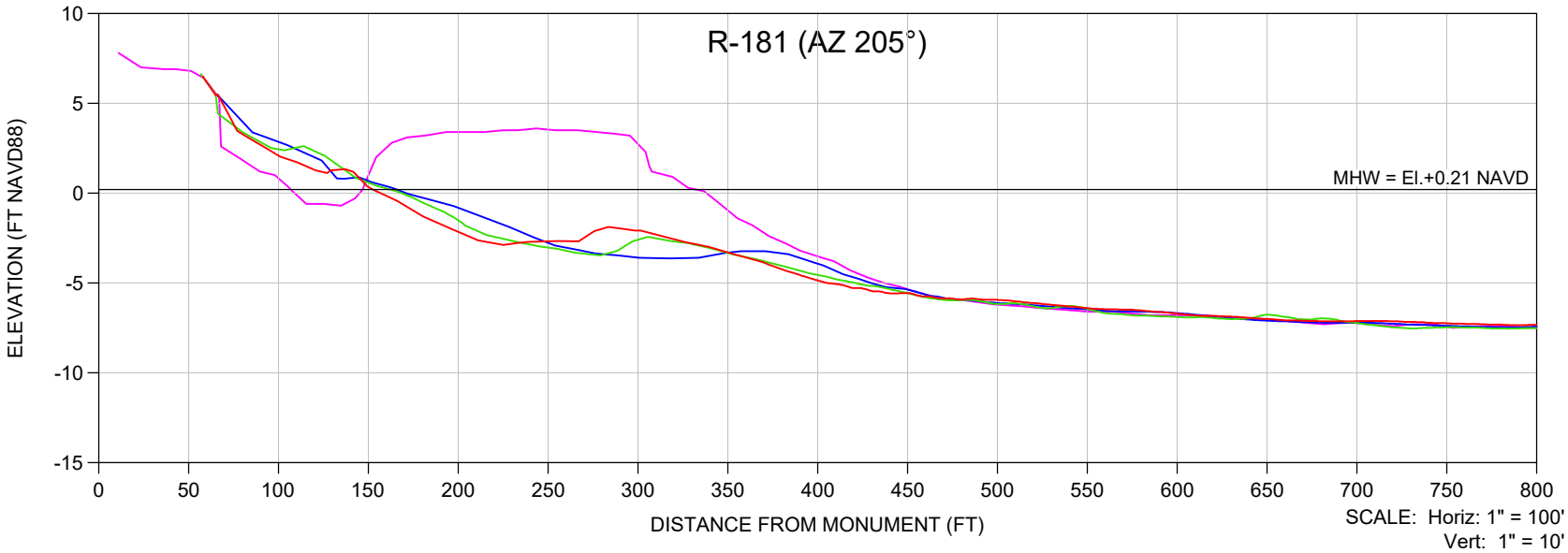
CLIENT: LEE COUNTY

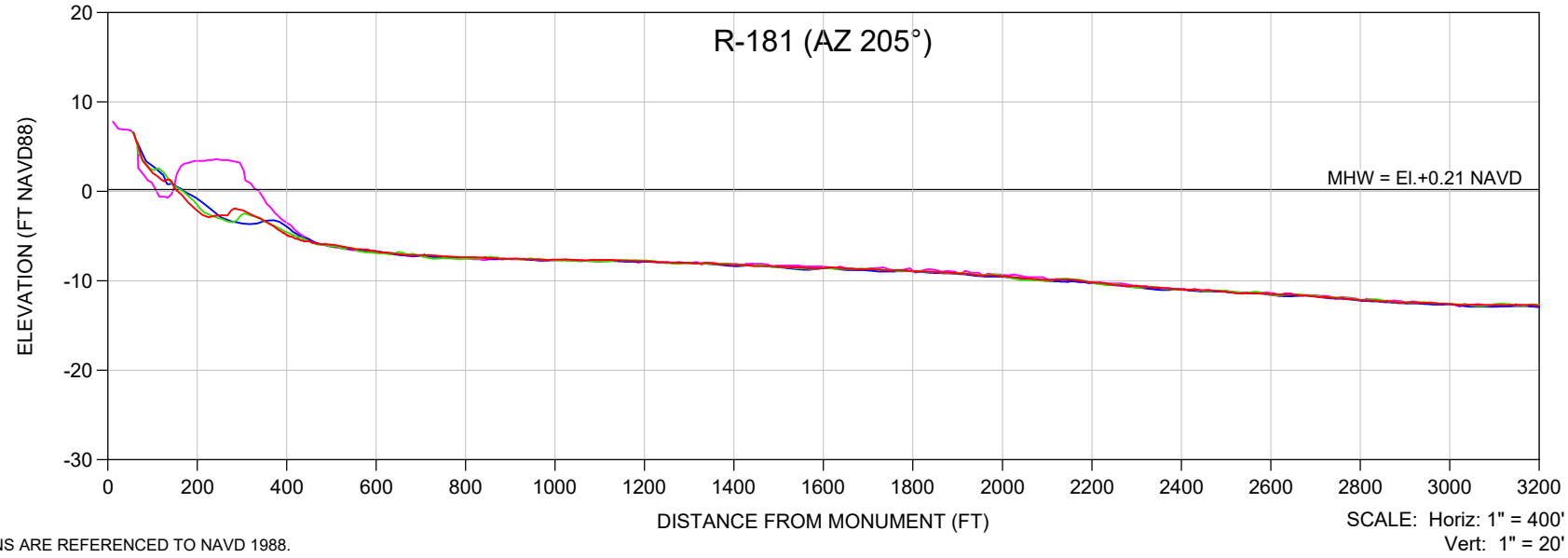
TITLE: C-180.5 (AZ 205°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 10
FILE NO.: 20079-R-180.5





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

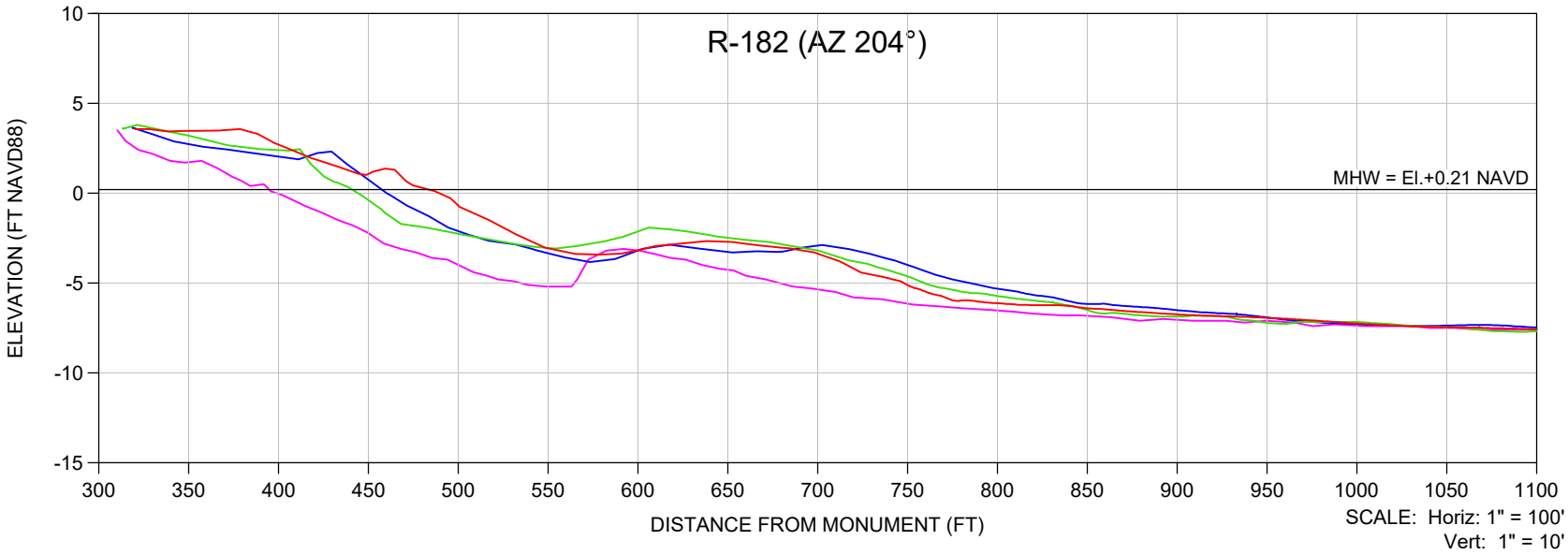
CLIENT: LEE COUNTY

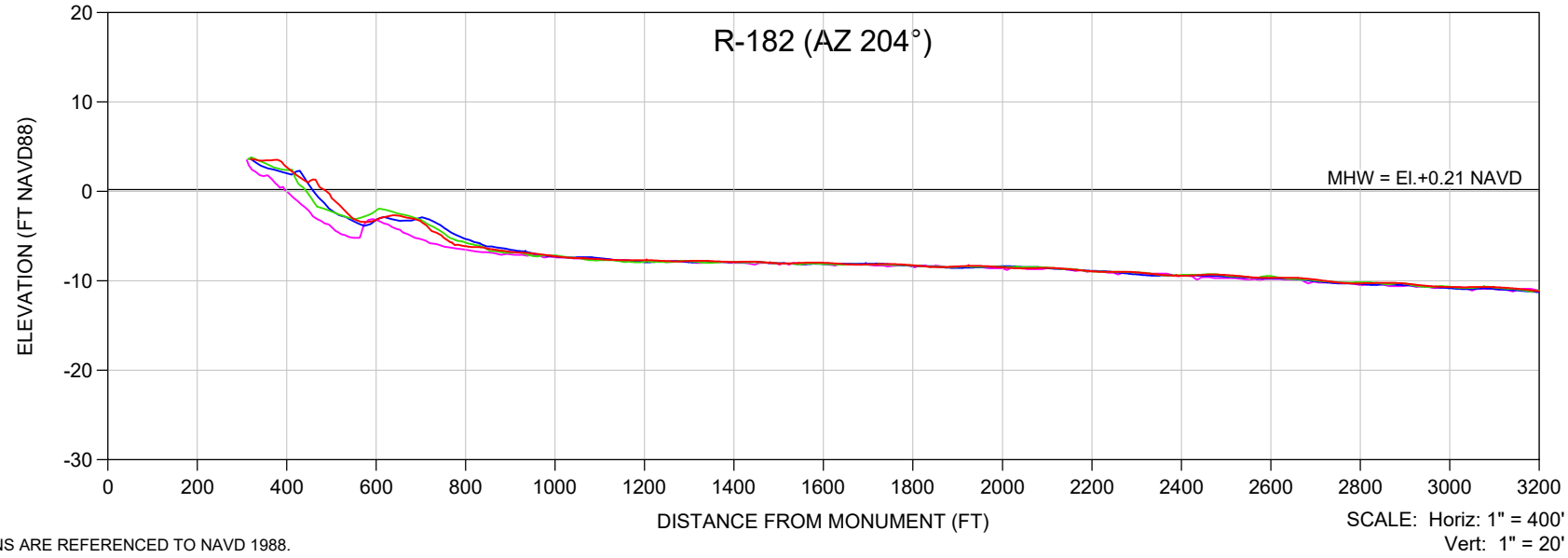
TITLE: R-181 (AZ 205°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 11
FILE NO.: 20079-R-181 AZ205





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

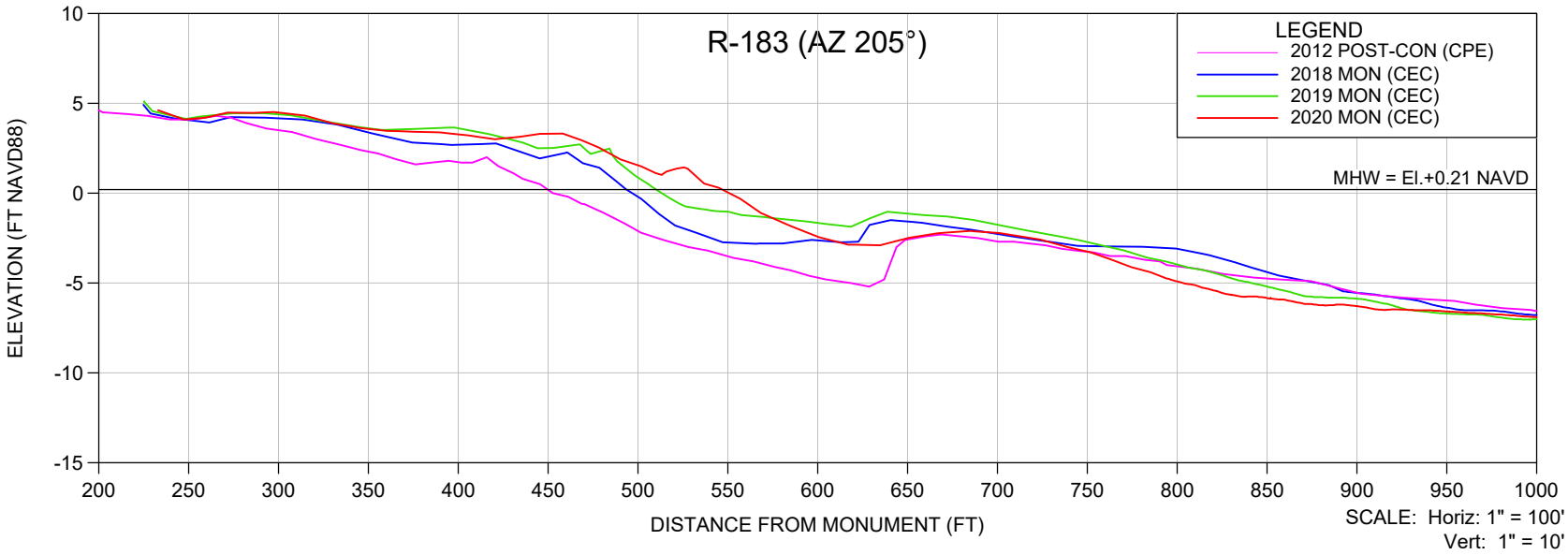
CLIENT: LEE COUNTY

TITLE: R-182 (AZ 204°) MONITORING SURVEY

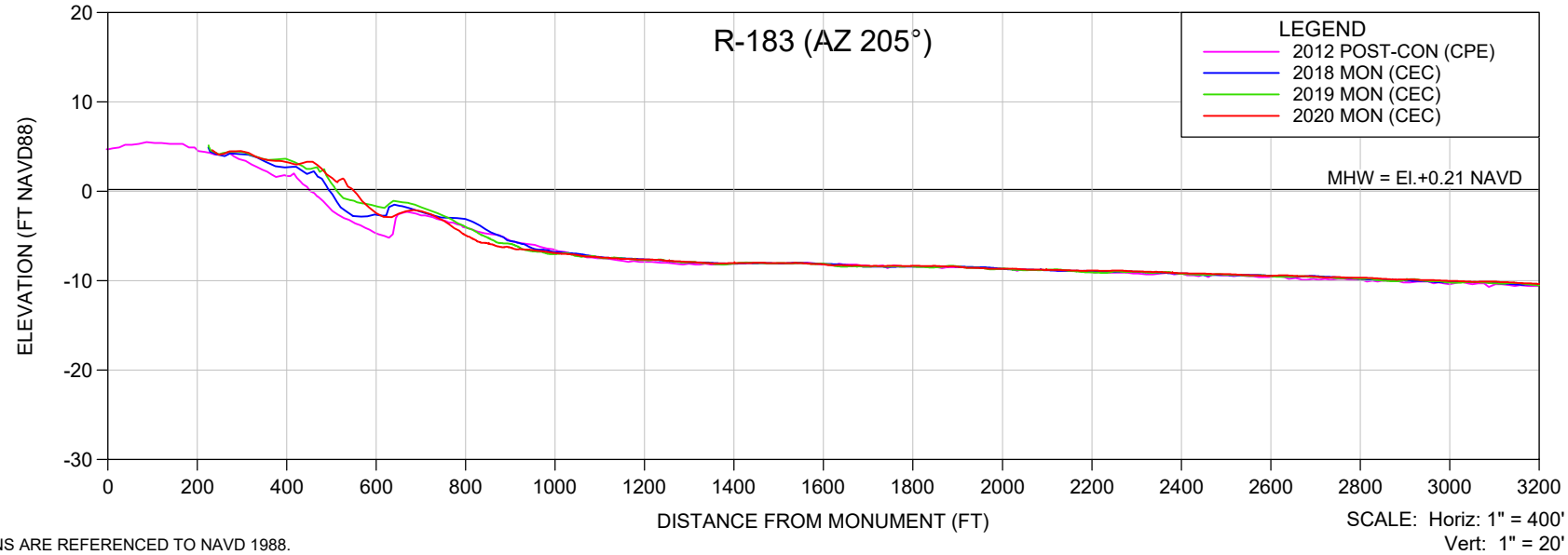
DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 12
FILE NO.: 20079-R-182 AZ204



SCALE: Horiz: 1" = 100'
Vert: 1" = 10'



SCALE: Horiz: 1" = 400'
Vert: 1" = 20'

NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

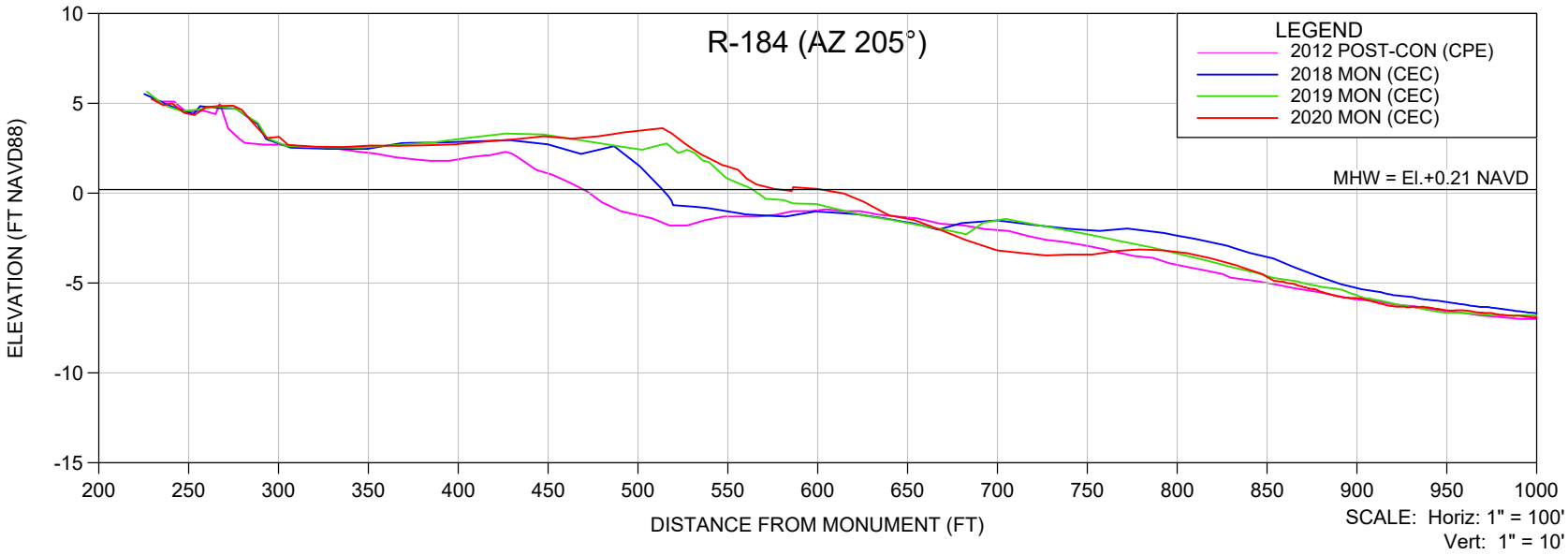
CLIENT: LEE COUNTY

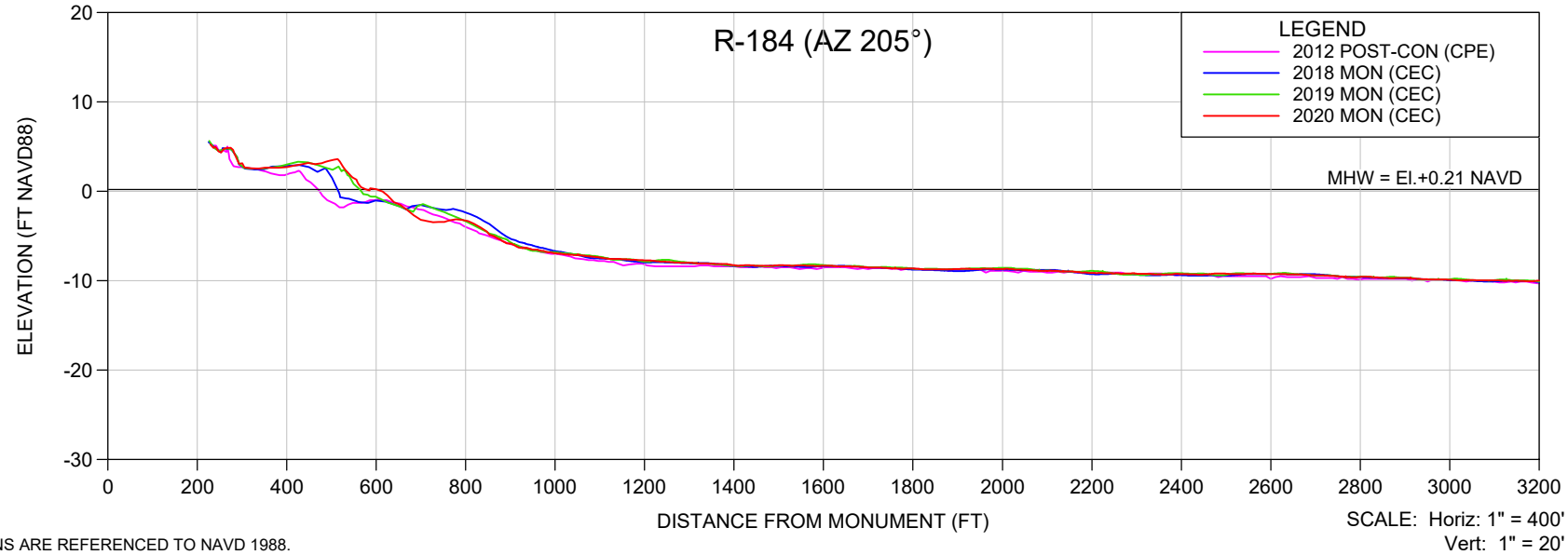
TITLE: R-183 (AZ 205°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 13
FILE NO: 20079-R-183





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

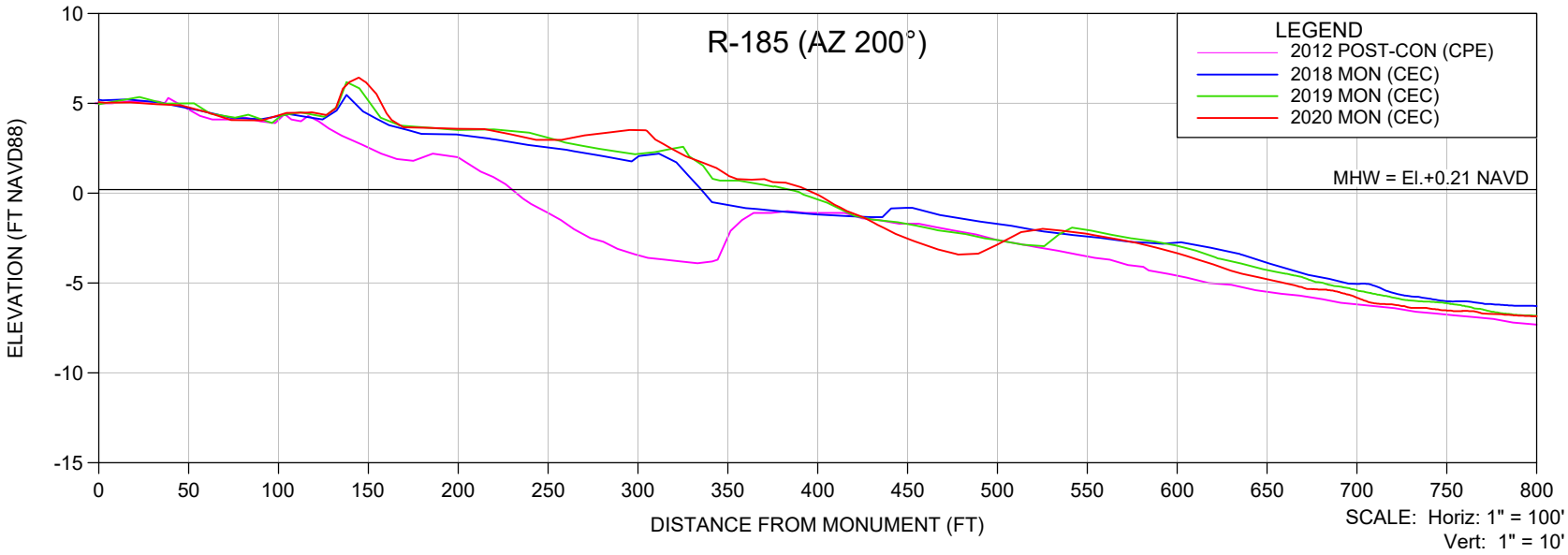
CLIENT: LEE COUNTY

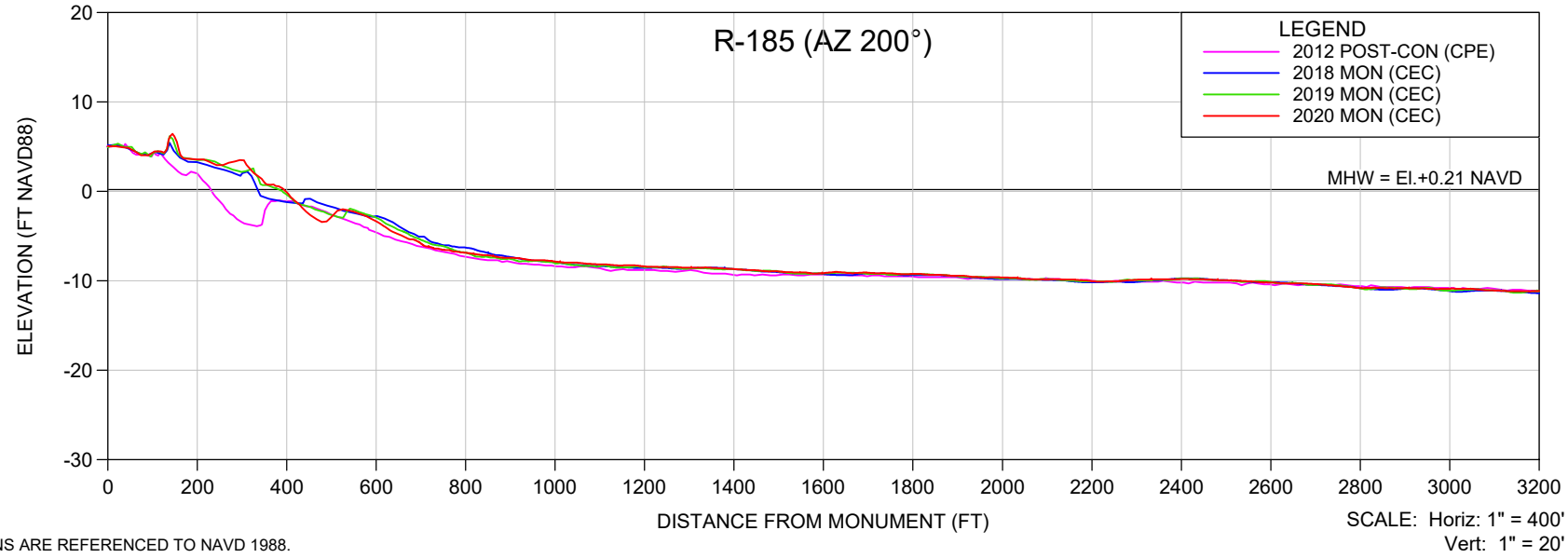
TITLE: R-184 (AZ 205°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 14
FILE NO.: 20079-R-184 AZ205





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

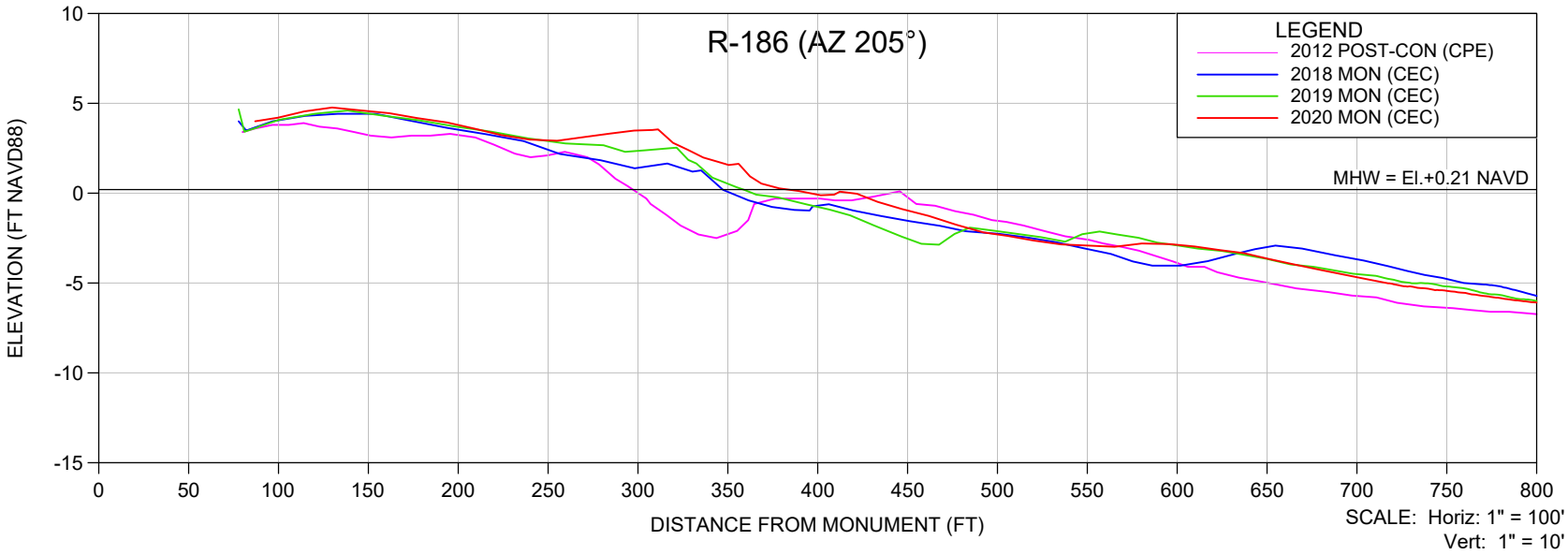
SHEET 15
FILE NO.: 20079-R-185 AZ200

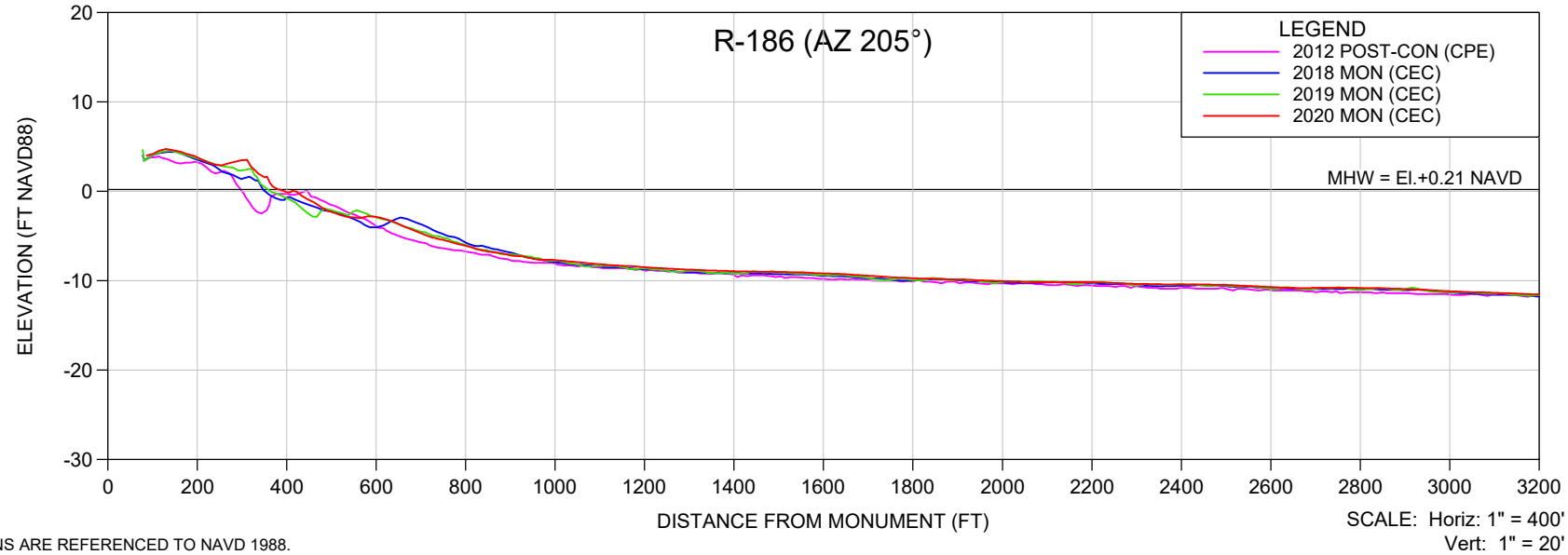
CLIENT: LEE COUNTY

TITLE: R-185 (AZ 200°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

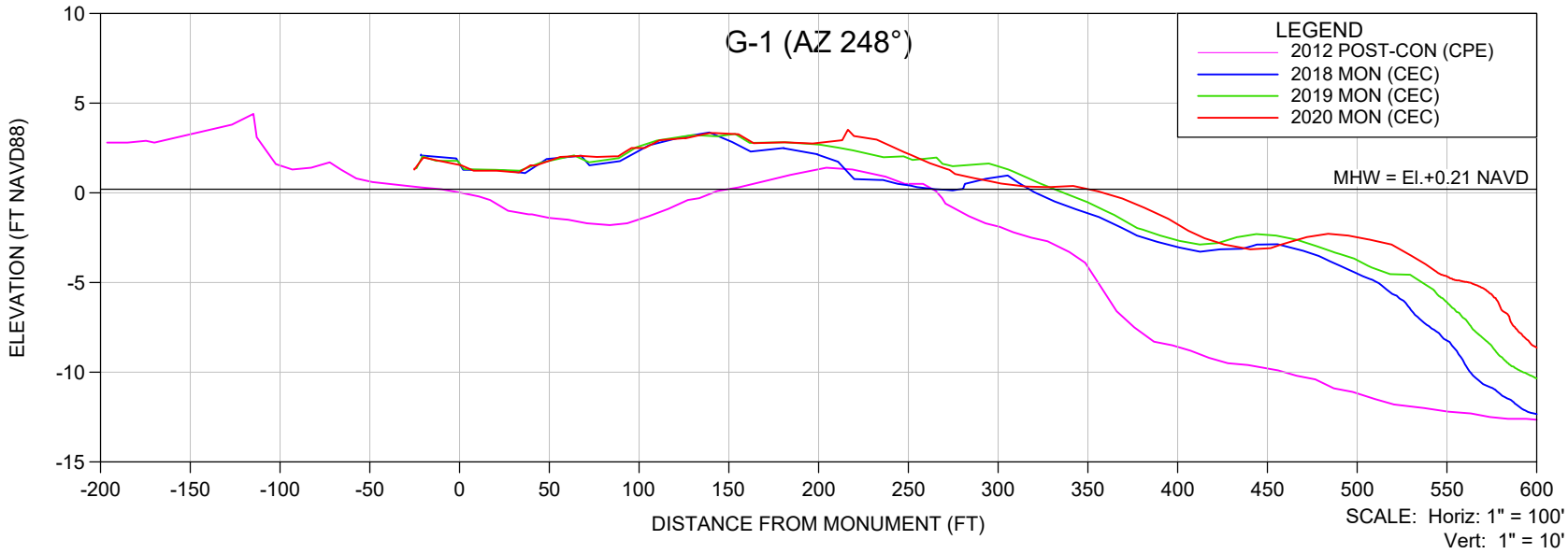
SHEET 16
FILE NO.: 20079-R-186

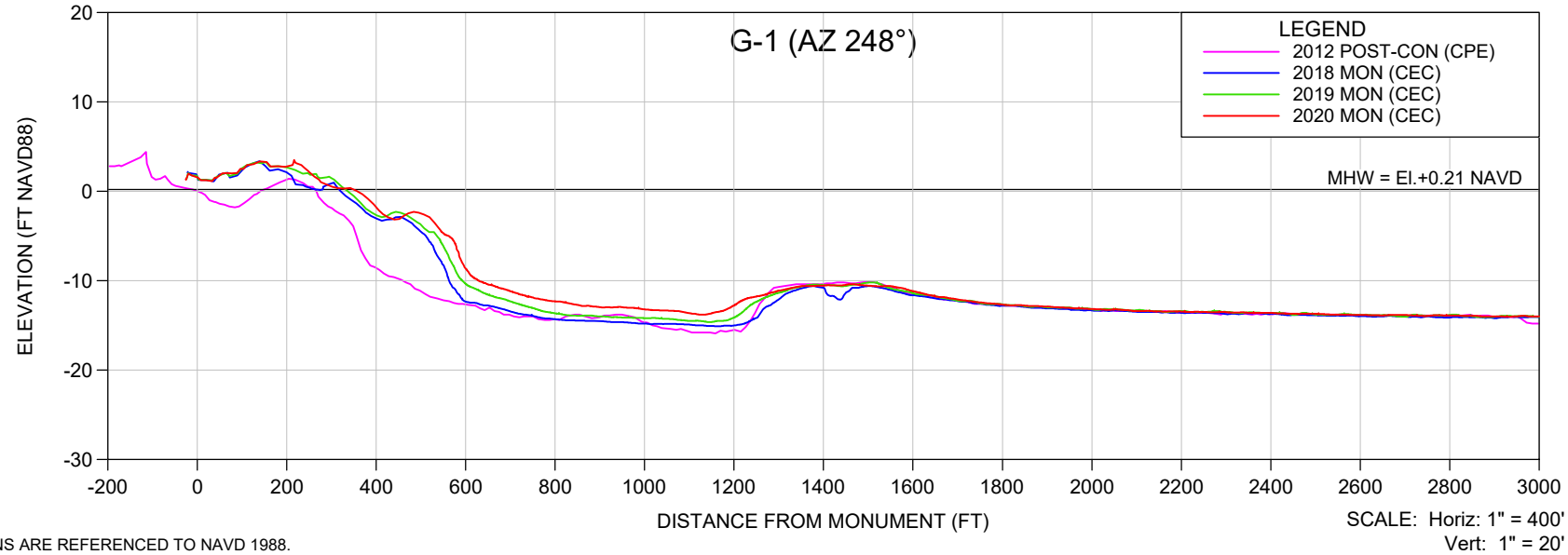
CLIENT: LEE COUNTY

TITLE: R-186 (AZ 205°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

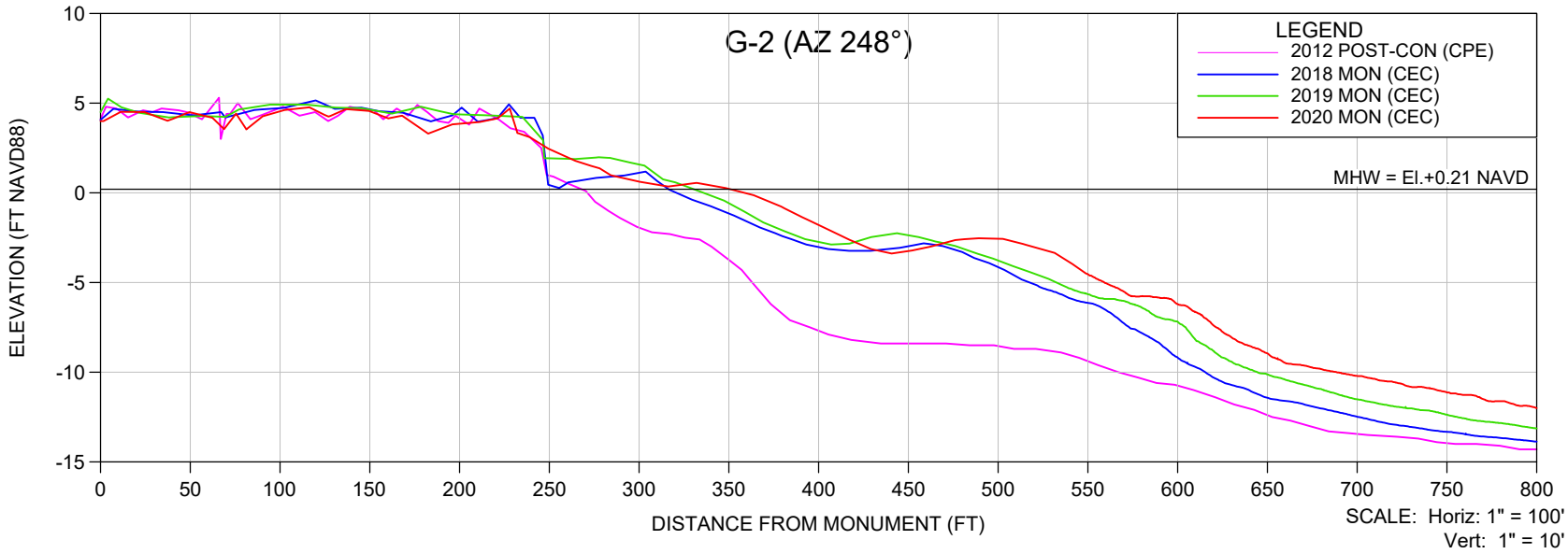
CLIENT: LEE COUNTY

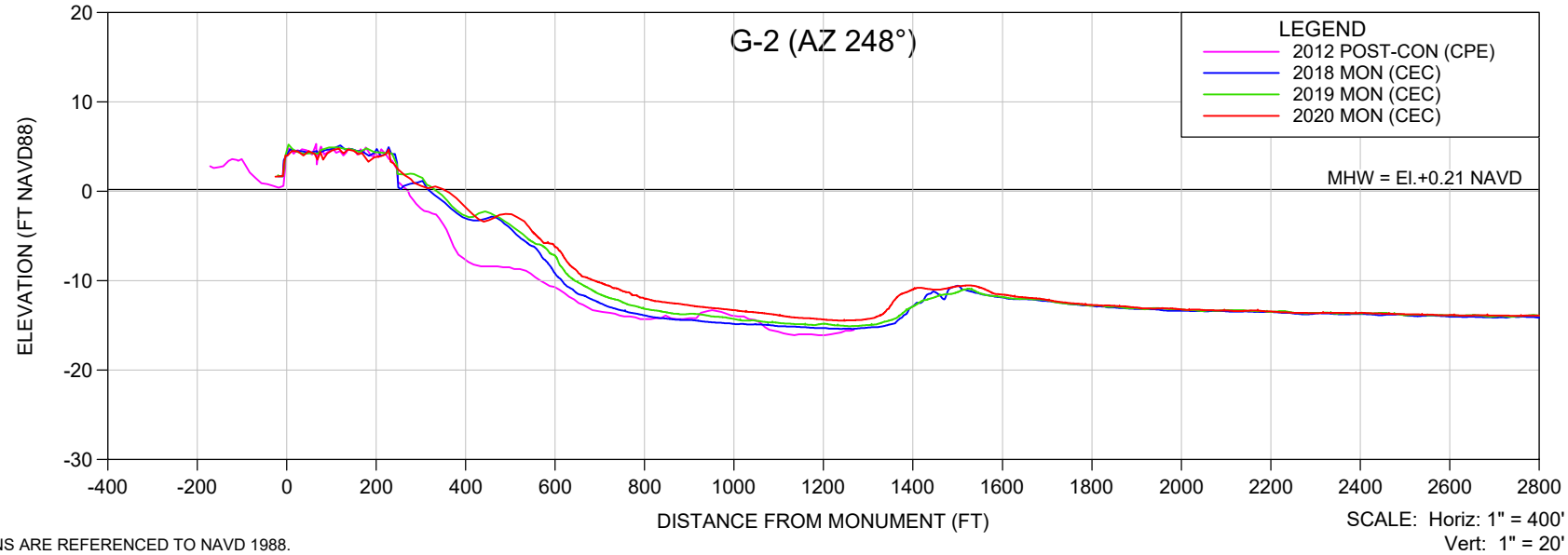
TITLE: GROIN 1 (AZ 248°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 17
FILE NO.: 20079-GROIN-1





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

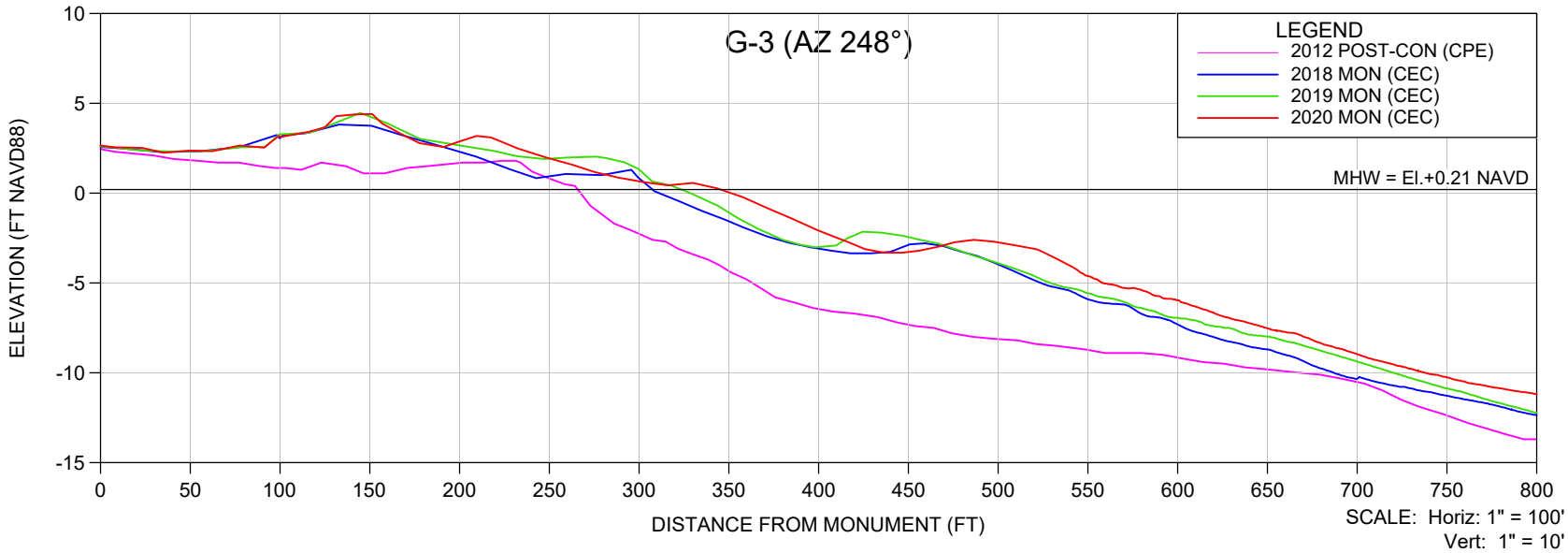
CLIENT: LEE COUNTY

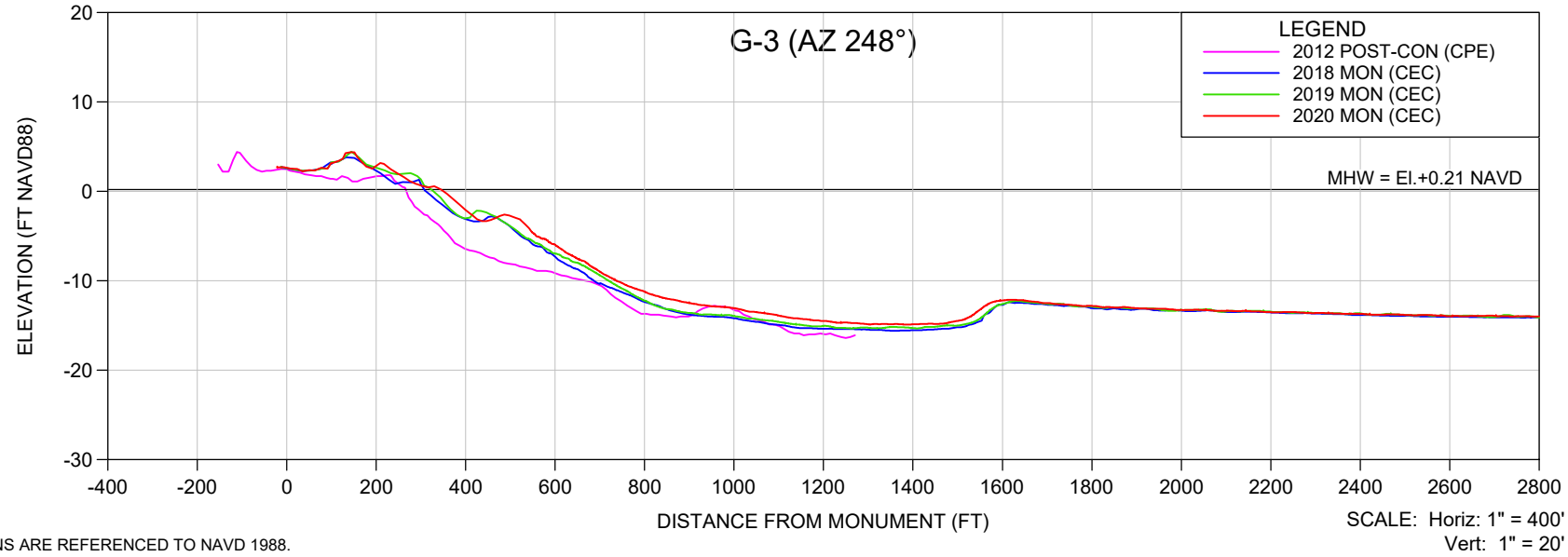
TITLE: GROIN 2 (AZ 248°) MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 18
FILE NO.: 20079-GROIN-2





NOTES:

1. ELEVATIONS ARE REFERENCED TO NAVD 1988.
2. PROFILE DATA IS FROM SURVEYS BY CEC AND CPE.

COASTAL ENGINEERING CONSULTANTS INC.
A CECI GROUP COMPANY
Serving Florida Since 1977
28421 BONITA CROSSINGS BLVD
BONITA SPRINGS, FLORIDA 34135

COASTAL & MARINE ENGINEERING
ENVIRONMENTAL & GEOLOGICAL SERVICES
SURVEY & MAPPING
ENGINEERING: CA 2464
SURVEYING: LB 2464

PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

CLIENT: LEE COUNTY

TITLE: GROIN 3 AZ 248° MONITORING SURVEY

DATE:	6/19/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20079-Estero-Mon Profiles.dwg		
REF. NO.	20.079		

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 19
FILE NO.: 20079-GROIN-3