BLIND PASS MAINTENANCE DREDGING PROJECT

2020 THIRD YEAR MONITORING REPORT

Prepared for:

Lee County Government
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Fort Myers, FL 33901

and

Florida Department of Environmental Protection
3900 Commonwealth Boulevard
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October 27, 2020
CEC File No. 20.030

Prepared by:

COASTAL ENGINEERING CONSULTANTS INC

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1 INTRODUCTION

Blind Pass was originally opened through hydraulic dredging during the 2009 restoration project. In June 2013, Lee County completed the first maintenance dredging of the pass. In June 2017, the second maintenance dredging of the pass was completed. This report summarizes the results of the third year monitoring survey. The work was performed by Coastal Engineering Consultants (CEC).

An overall location map of the project area which includes R-monument survey lines is presented in Figure 1. Figure 2 presents a location map of Blind Pass and depicts ebb shoal and dredge template survey lines.

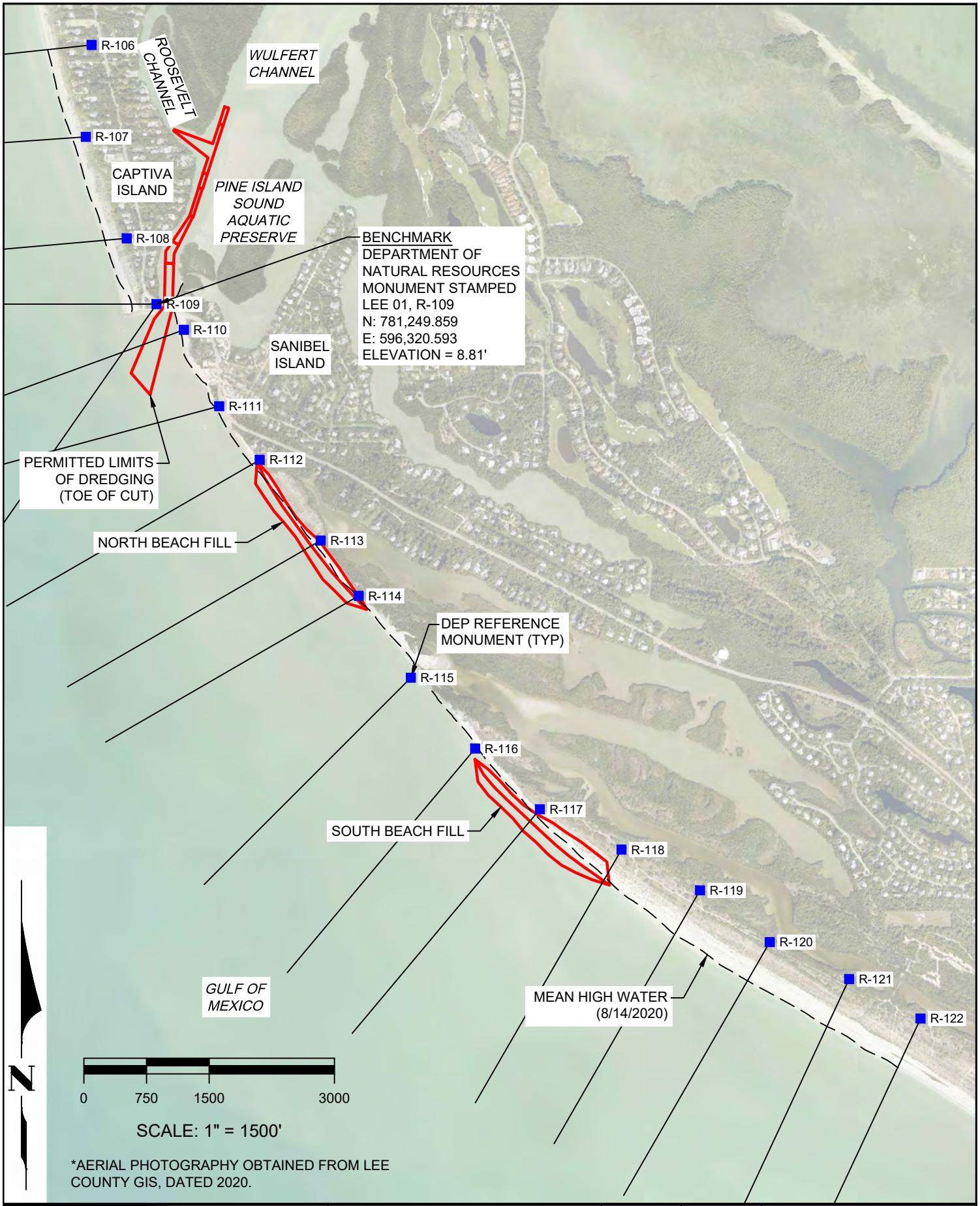
During the project completed on June 3, 2017, approximately 89,700 cubic yards were excavated from the permitted dredge template between Stations 0+00 to 35+16 within Wulfert Channel and between Stations 100+50 to 105+26 within Roosevelt Channel. Approximately 67,060 cubic yards were placed within the North Beach fill area between R-112 and R-114+200 and approximately 22,640 cubic yards were placed within the South Beach fill area between R-116 and R-118.

The post-construction survey was conducted by CEC on June 26-27, 2017 (CEC, 2017). The first year monitoring survey was conducted by CEC on June 7-12, 2018 (CEC, 2018). The second year monitoring survey was conducted by CEC on June 6, 2019 (beach and ebb shoal) and June 24, 2019 (ebb shoal, pass and interior) (CEC, 2019).

An inlet management study was initiated in 2016 and completed in 2018 (APTIM, 2018). The Florida Department of Environmental Protection (FDEP) developed the Blind Pass Inlet Management Plan (IMP) which was adopted in August 2019 to implement best management strategies for the inlet and the adjacent eroding beaches (FDEP, 2019).

In May 2020, a project to protect Sanibel Captiva Road was completed by the City of Sanibel along the beach segment between R-110.5 and R-111.5. An approximate 540-foot long seawall with a buried revetment was installed seaward of the road, and approximately 5,000 cubic yards of sand were placed via truck hauls to restore the beach and dune area seaward of the seawall.

This report summarizes the 2020 third year monitoring survey. By comparing the 2019 and 2020 surveys, CEC computed shoreline and volumetric changes along the Project area's beach and volumetric changes within the permitted dredge template to assess Project performance.



SHEET 1
FILE NO. 20030-FIG 1

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CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: FIGURE 1
OVERALL PROJECT LOCATION MAP

DATE: 9/2/2020	SCALE: AS NOTED		
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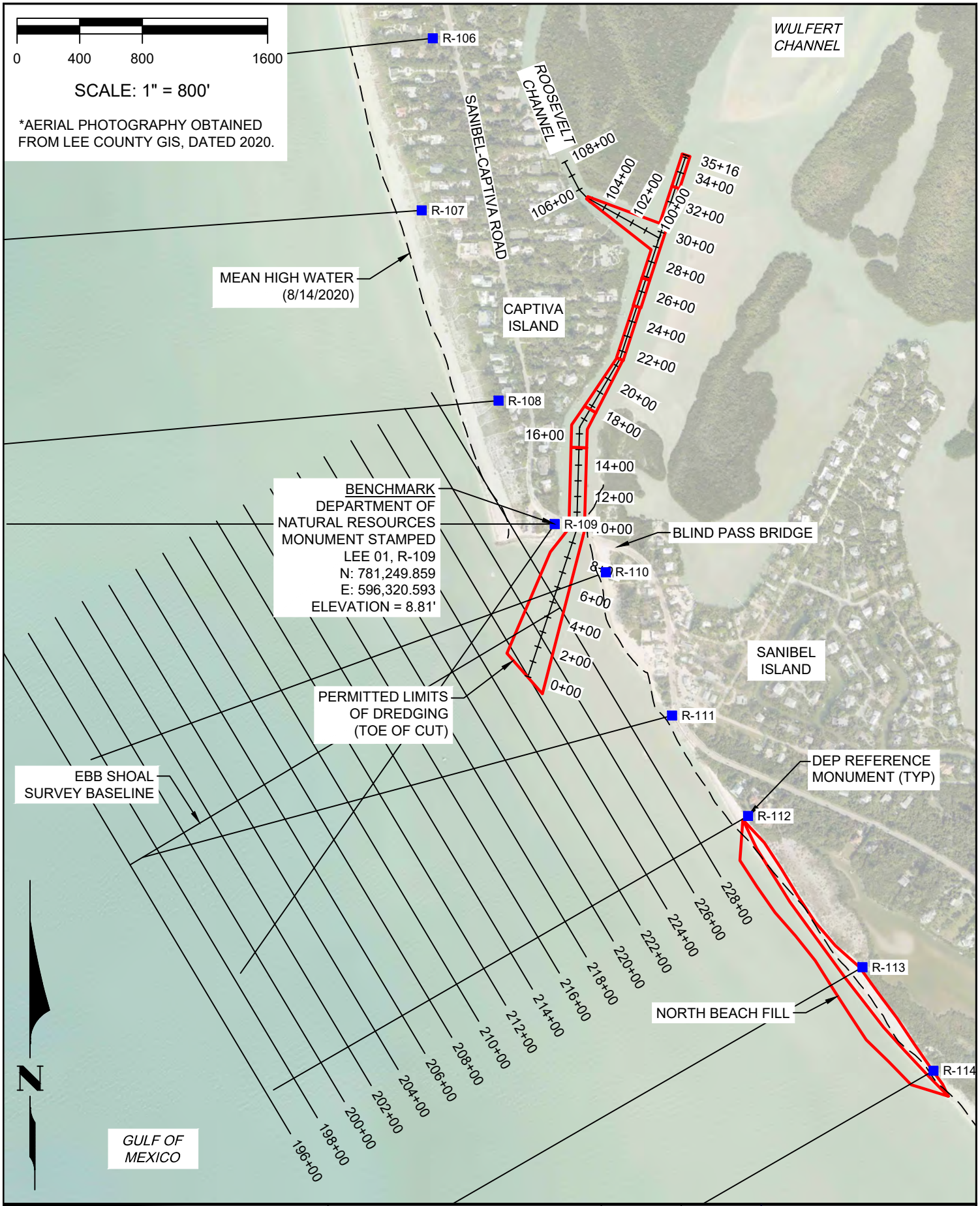

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TITLE: FIGURE 2
BLIND PASS LOCATION MAP

DATE: 9/2/2020	SCALE: AS NOTED		
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SEC.	TWP.	RNG.	
ACAD NO. 20030-LOC MAP.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 1
FILE NO. 20030-LOC MAP

2 SCOPE OF WORK

The following Scope of Work was conducted to address the monitoring requirements of FDEP Permit No 0265943-003-JM and recommendations of the IMP.

Blind Pass: Conduct third year monitoring survey of Blind Pass, Wulfert Channel and Roosevelt Channel as described herein. The survey lines shall be spaced no greater than 200 feet apart and shall be aligned parallel to the shoreline. The alignment spacing shall be sufficient to document the channel position and any potential flood shoal formation. The work shall extend 1,000 feet either side of the pass or to the Mean High Water (MHW) line, whichever is less. The landward extent of the survey shall be 600 feet inland past the work area. Data points shall be collected at a maximum spacing of 25 feet. The inlet shoreline position (MHW) shall also be measured for analyses described in the reporting section.

Ebb Shoal Survey: Conduct third year monitoring survey of the ebb shoal as described herein. The survey lines shall be spaced no greater than 200 feet apart, and shall be aligned parallel to the shoreline. The alignment spacing shall be sufficient to document the channel position and shoal formation. The work shall extend 1000 feet either side of the pass or to MHW, whichever is less. The seaward extent of the surveys shall be a minimum of 3,000 feet offshore. Data points shall be collected at a maximum spacing of 25 feet.

Beach Profiles: Conduct third year monitoring survey of the beach profiles as described herein. Profile surveys of the active beach zone will be collected along the shoreline at each reference monument (R monument) from R-106, north of Blind Pass, to R-122, south of the fill area and will include half monuments from R-110.5 to R-118.5. The surveys shall be utilized to identify the shoreline position, average beach width and sediment transport rates in the vicinity of Blind Pass. The beach portion of the profile survey shall extend from a minimum of 150 feet landward of the monument or from the edge of a building or road, whichever is the most seaward, to a wading depth deep enough to provide a 50-foot overlap with the offshore portion of the profile survey where environmental conditions allow. Profile data points along the beach portion of the profile survey shall be collected at a maximum interval of 25 feet and at all breaks in grade. The offshore portion of the profile survey shall extend from as close to shore as safely possible to provide at least a 50-foot overlap with the beach portion of the profile survey where environmental conditions allow to length of at least 3,000 feet from the MHW line or an elevation of -30 feet NAVD, whichever is more landward. Profile data points along the offshore portion of the profile survey shall be collected at a maximum interval of 25 feet.

Blind Pass Interior: Conduct Blind Pass interior survey to include Dinken Channel south and east of Albright Key, Wulfert Channel north of Runyan Key, and a 400-foot extension of Roosevelt Channel. The survey lines shall be spaced no greater than 200 feet apart and follow the channel alignment. The alignment spacing shall be sufficient to document the channel position and any potential flood shoal formation. Locate existing aids to navigation.

Hydraulic Monitoring: Conduct hydraulic monitoring for a four (4) week period which shall be timed as close as practicable with the annual monitoring survey. Deploy three (3) tide gauges, one in the Gulf of Mexico seaward of Blind Pass, one inside Blind Pass and one near Blind Pass above water to collect atmospheric pressure which will be used for data processing of the other two tide gauges to account for variation in atmospheric pressure during the deployment period. Deploy three (3) ADCP current meters, one inside Blind Pass, one in Roosevelt Channel and one at the

entrance to Dinken Bayou. Pull the ADCP gauges after two (2) weeks of deployment to download the data and re-deploy them at the same locations for another two (2) weeks. Post-process gauge data and compute hydraulic parameters. Compare measured data to historical data.

3 SURVEYS

CEC conducted the third year monitoring survey of the Blind Pass project area on August 14, 2020 (beach and ebb shoal) and August 18, 2020 (pass and interior). 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, ebb shoal and channel section 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 PHYSICAL MONITORING

4.1 Depth of Closure

Based on the Birkemeier depth of closure (DOC) formulation (Birkemeier, 1985), CEC estimated DOC near Blind Pass to be -13.3 feet NAVD88 (CEC, 2011). It is consistent with DOC values reported by others, e.g., Coastal Planning & Engineering (CPE) used DOC equal to -13.0 feet NAVD88 for their Captiva and Sanibel Islands Beach Renourishment Project (CPE, 2007).

4.1 Beach Profiles

Appendix 2 presents the beach profiles measured between R-106 and R-122 at each R-monument and also includes half R-monuments from R-110.5 to R-118.5 for the June (CB&I) and August (CEC) 2016, June 2017, June 2018, June 2019 and August 2020 surveys.

Table 1 presents the 2019 and 2020 shoreline positions at Mean High Water (MHW = +0.28 feet NAVD88) along with the shoreline changes between the two surveys.

Table 1. Shoreline Positions and Changes at MHW between June 2019 and August 2020 Monitoring Surveys.

Mon	Monitoring Position June 2019 (ft)	Monitoring Position August 2020 (ft)	2019-2020 Shoreline Change (ft)	2019-2020 Average Shoreline Change (ft)	
R-106	550.2	530.0	-20.3	**-5.9**	**Updrift of Blind Pass**
R-107	162.6	162.0	-0.6		
R-108	256.8	263.8	7.0		
R-109	309.0	299.2	-9.8		
Blind Pass					
R-110	75.7	53.2	-22.5	**8.1**	**Downdrift of Blind Pass**
R-110.5	56.2	118.0	61.8		
R-111	59.6	47.9	-11.7		
R-111.5	152.1	157.0	4.9		
R-112	123.0	112.6	-10.4	**-22.1**	**North Beach Fill**
R-112.5	482.2	414.1	-68.1		
R-113	122.9	80.2	-42.7		
R-113.5	41.2	46.0	4.7		
R-114	20.4	26.5	6.1		
R-114.5	-71.8	-55.3	16.5	**4.8**	**Downdrift of North Beach Fill**
R-115	-103.5	-118.1	-14.7		
R-115.5	-74.6	-62.0	12.6		
R-116	-34.7	-31.2	3.6	**-27.0**	**South Beach Fill**
R-116.5	42.1	48.2	6.1		
R-117	125.5	87.8	-37.7		
R-117.5	302.3	232.4	-69.9		
R-118	424.1	387.0	-37.0		
R-118.5	521.5	494.5	-27.0	**-1.9**	**Downdrift of South Beach Fill**
R-119	611.6	608.7	-2.8		
R-120	536.2	533.3	-2.9		
R-121	614.0	625.5	11.5		
R-122	635.6	647.1	11.5		

A summary of the shoreline changes based on the comparisons between the 2019 and 2020 monitoring surveys at the R-monuments is presented below.

Updrift of Blind Pass: The beach segment north of Blind Pass, extending from R-106 to R-109, receded on average approximately 5.9 feet. The range of shoreline change measured at MHW was from 20.3 feet of recession at R-106 to 7.0 feet of advancement at R-108.

Downdrift of Blind Pass: The beach segment south of Blind Pass, extending from R-110 to R-112, advanced on average approximately 8.1 feet. The range of shoreline change measured at MHW was from 22.5 feet of recession at R-110 to 61.8 feet of advancement at R-110.5.

North Beach Fill: This fill segment extended from R-112 to R-114+200 (Figure 1), within which approximately 67,060 cubic yards were placed during the 2017 construction project. The

segment's shoreline measured at MHW receded on average approximately 22.1 feet. The range of shoreline change was from 68.1 feet of recession at R-112.5 to 6.1 feet of advancement at R-114.

Downdrift of North Beach Fill: The beach segment extending from R-114+200 to R-116 advanced on average approximately 4.8 feet. The range of shoreline change measured at MHW was from 14.7 feet of recession at R-115 to 16.5 feet of advancement at R-114.5.

South Beach Fill: This fill segment extended from R-116 to R-118 (Figure 1), within which approximately 22,640 cubic yards were placed during the 2017 construction project. The segment's shoreline measured at MHW receded on average approximately 27.0 feet. The range of shoreline change ranged from 69.9 feet at of recession R-117.5 to 6.1 feet of advancement at R-116.5.

Downdrift South Beach Fill: The beach segment extending from R-118 to R-122 receded on average approximately 1.9 feet. The range of shoreline change measured at MHW was from 27.0 feet of recession at R-118.5 to 11.5 feet of advancement at R-121 and R-122.

Figure 3 presents a schematic of the historic annual MHW shoreline positions relative to the 2012 dredging project pre-construction positions that serves as a baseline.

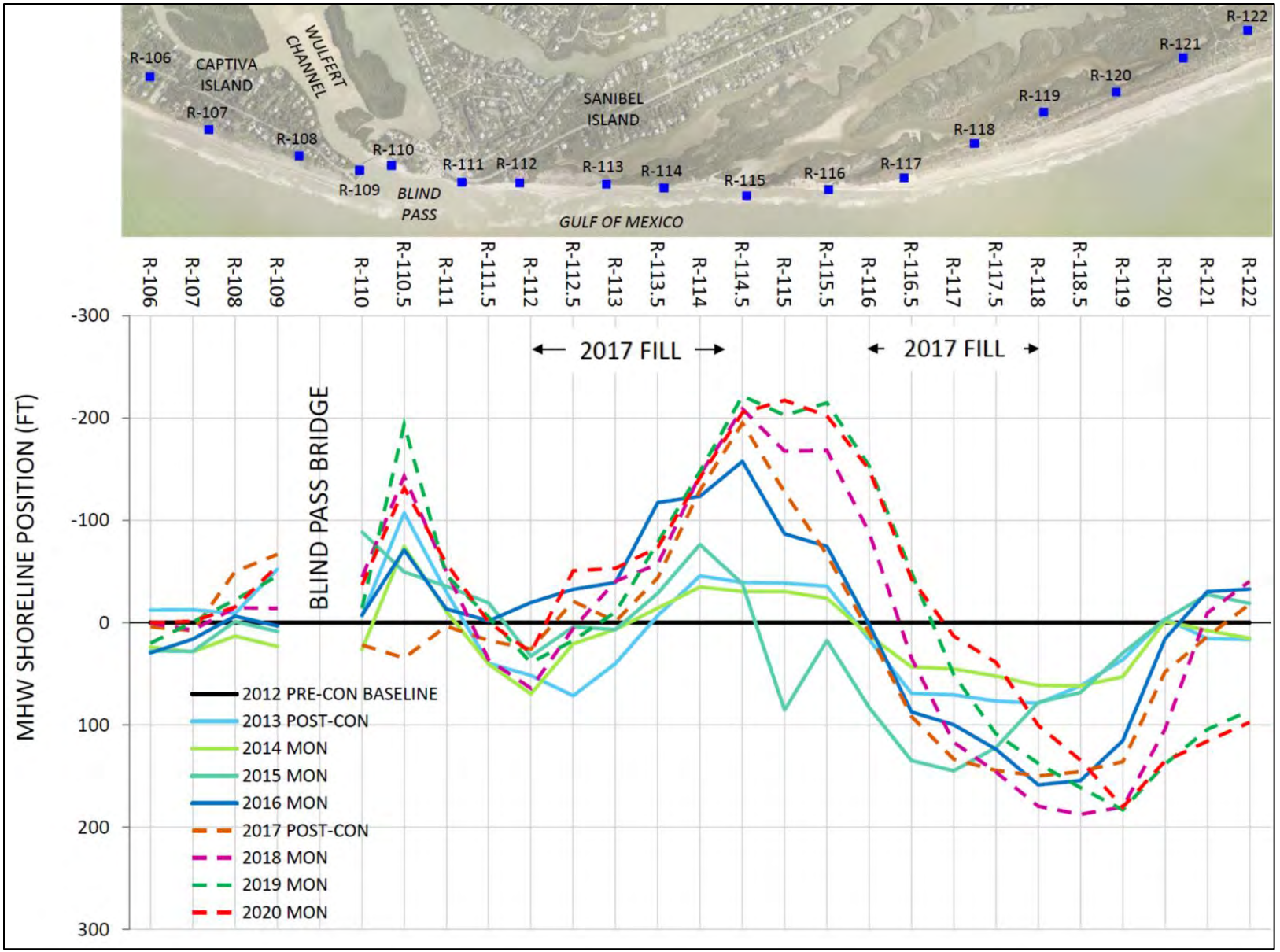

Figure 3. 2020 and Historic MHW Shoreline Positions Relative to 2012 Pre-Construction MHW Shoreline.

Tables 2 and 3 present volumetric changes to MHW and DOC, respectively, calculated from comparing the 2019 and 2020 monitoring surveys. A summary of the volumetric changes to MHW and DOC is presented below.

Updrift of Blind Pass: The beach segment north of Blind Pass, extending from R-106 to R-109, gained approximately 900 cubic yards above MHW and lost approximately 8,090 cubic yards to DOC.

Downdrift of Blind Pass: The beach segment south of Blind Pass, extending from R-110 to R-112, gained approximately 7,040 cubic yards above MHW and gained approximately 17,690 cubic yards to DOC.

North Beach Fill: The fill segment extending from R-112 to R-114+200, within which approximately 67,060 cubic yards were placed in 2017, lost approximately 3,840 cubic yards above MHW and lost approximately 13,490 cubic yards to DOC.

Downdrift of North Beach Fill: The beach segment extending from R-114+200 to R-116 gained approximately 5,870 cubic yards above MHW and lost approximately 22,120 cubic yards to DOC.

South Beach Fill: The fill segment extending from R-116 to R-118, within which approximately 22,640 cubic yards were placed in 2017, lost approximately 4,220 cubic yards above MHW and lost approximately 27,950 cubic yards to DOC.

Downdrift of South Beach Fill: The beach segment extending from R-118 to R-122 gained approximately 7,280 cubic yards above MHW and gained approximately 30,870 cubic yards to DOC.

Figures 4 and 5 present bar charts of the 2019-2020 volumetric change rates to MHW and DOC, respectively, noting that they were annualized to be consistent with prior years' monitoring reports.

Table 2. Volumetric Changes above MHW between 2019 and 2020 Monitoring Surveys.

Mon	Area (cy/ft)	Average Area (cy/ft)	Length (ft)	Volume (cy)	Total Volume (cy)	
R-106	-0.6					
		-0.1	1,095	-68		
R-107	0.5					
		1.0	1,287	1,344	**900**	**Updrift of Blind Pass**
R-108	1.6					
		-0.5	830	-375		
R-109	-2.5					
Blind Pass						
R-110	-1.5					
		7.0	527	3,692		
R-110.5	15.5					
		7.7	495	3,793	**7,042**	**Downdrift of Blind Pass**
R-111	-0.2					
		-0.3	409	-122		
R-111.5	-0.4					
		-0.8	403	-322		
R-112	-1.2					
		-2.9	611	-1,790		
R-112.5	-4.7					
		-2.9	605	-1,775		
R-113	-1.2				**-3,838**	**North Beach Fill**
		-0.6	450	-253		
R-113.5	0.1					
		-0.1	360	-19		
R-114	-0.2					
		2.4	587	1,415		
R-114.5	5.0					
		3.2	560	1,818		
R-115	1.5				**5,867**	**Downdrift of North Beach Fill**
		1.9	579	1,089		
R-115.5	2.3					
		2.7	572	1,546		
R-116	3.1					
		1.3	543	706		
R-116.5	-0.5					
		-2.6	536	-1,419		
R-117	-4.8				**-4,221**	**South Beach Fill**
		-3.3	528	-1,760		
R-117.5	-1.9					
		-2.9	597	-1,749		
R-118	-4.0					
		-3.8	535	-2,059		
R-118.5	-3.7					
		-3.3	538	-1,755		
R-119	-2.8					
		-1.2	1,034	-1,288	**7,281**	**Downdrift of South Beach Fill**
R-120	0.3					
		3.7	1,098	4,099		
R-121	7.2					
		8.5	978	8,284		
R-122	9.8					

Table 3. Volumetric Changes to DOC between 2019 and 2020 Monitoring Surveys.

Mon	Area (cy/ft)	Average Area (cy/ft)	Length (ft)	Volume (cy)	Total Volume (cy)	
R-106	-14.5					
		-5.3	1,095	-5,856		
R-107	3.8					
		0.2	1,287	229	**-8,093**	**Updrift of Blind Pass**
R-108	-3.5					
		-3.0	830	-2,466		
R-109	-2.5					
Blind Pass						
R-110	10.7					
		10.5	527	5,542		
R-110.5	10.3					
		11.2	495	5,562	**17,689**	**Downdrift of Blind Pass**
R-111	12.1					
		10.1	409	4,122		
R-111.5	8.0					
		6.1	403	2,463		
R-112	4.2					
		-12.0	611	-7,330		
R-112.5	-28.2					
		-17.6	605	-10,665		
R-113	-7.1				**-13,485**	**North Beach Fill**
		4.1	450	1,867		
R-113.5	15.4					
		7.4	360	2,644		
R-114	-0.7					
		2.5	587	1,453		
R-114.5	5.6					
		-11.4	560	-6,368		
R-115	-28.4				**-22,119**	**Downdrift of North Beach Fill**
		-18.3	579	-10,619		
R-115.5	-8.3					
		-11.5	572	-6,585		
R-116	-14.7					
		-7.4	543	-4,021		
R-116.5	-0.1					
		-7.9	536	-4,248		
R-117	-15.8				**-27,945**	**South Beach Fill**
		-20.4	528	-10,751		
R-117.5	-24.9					
		-14.9	597	-8,925		
R-118	-4.9					
		-3.8	535	-2,016		
R-118.5	-2.6					
		2.4	538	1,304		
R-119	7.4					
		5.4	1,034	5,563	**30,868**	**Downdrift of South Beach Fill**
R-120	3.3					
		9.1	1,098	10,041		
R-121	15.0					
		16.3	978	15,976		
R-122	17.7					

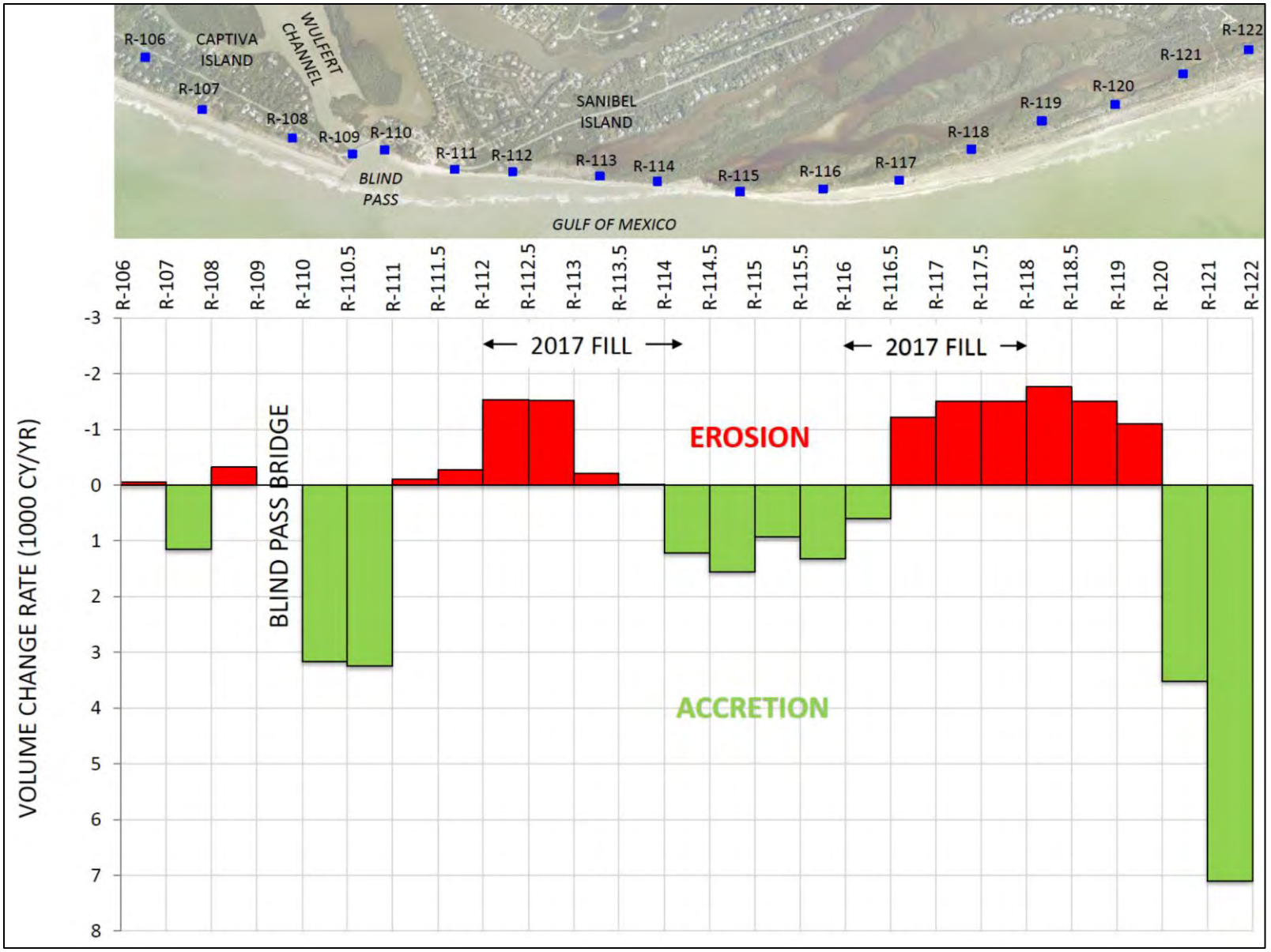

Figure 4. Annualized Volumetric Change Rates above MHW between 2019 and 2020 Surveys.

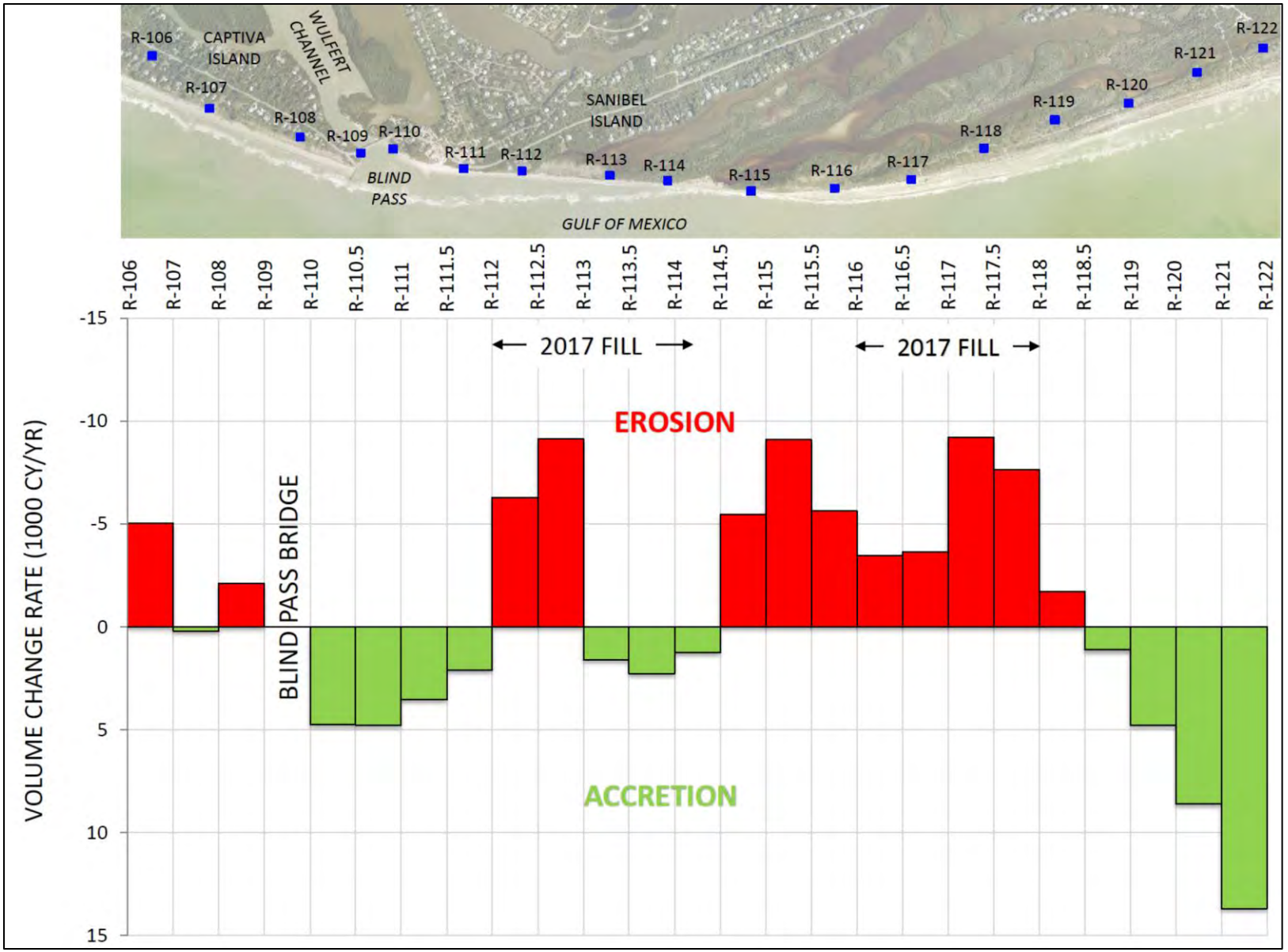

Figure 5. Annualized Volumetric Change Rates to DOC between 2019 and 2020 Surveys.

Figures 6 and 7 present contour maps based on the 2019 and 2020 monitoring survey data, respectively. The figures depict the limits of dredging and fill placement.

Figure 8 presents a morphology change map depicting changes in elevations that occurred between the two surveys. It illustrates a slight growth of the ebb shoal, scouring of the channel near the bridge, beach accretion between R-110.5 and R-111 due to the fill placed there in May 2020, beach erosion within the fill limits between R-112 and R-113 and between R-117 and R-118.

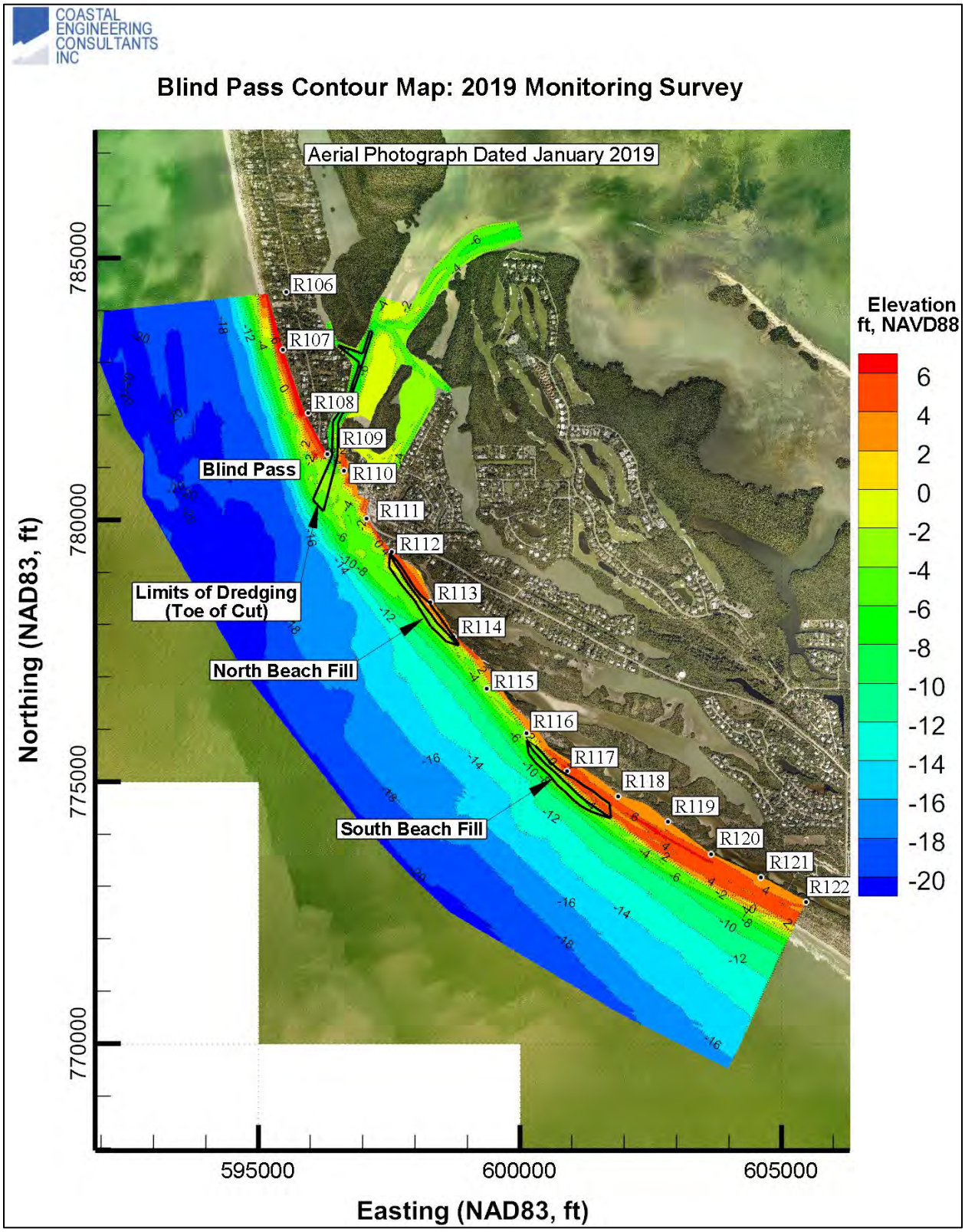

Figure 6. 2019 Monitoring Survey Contour Map.

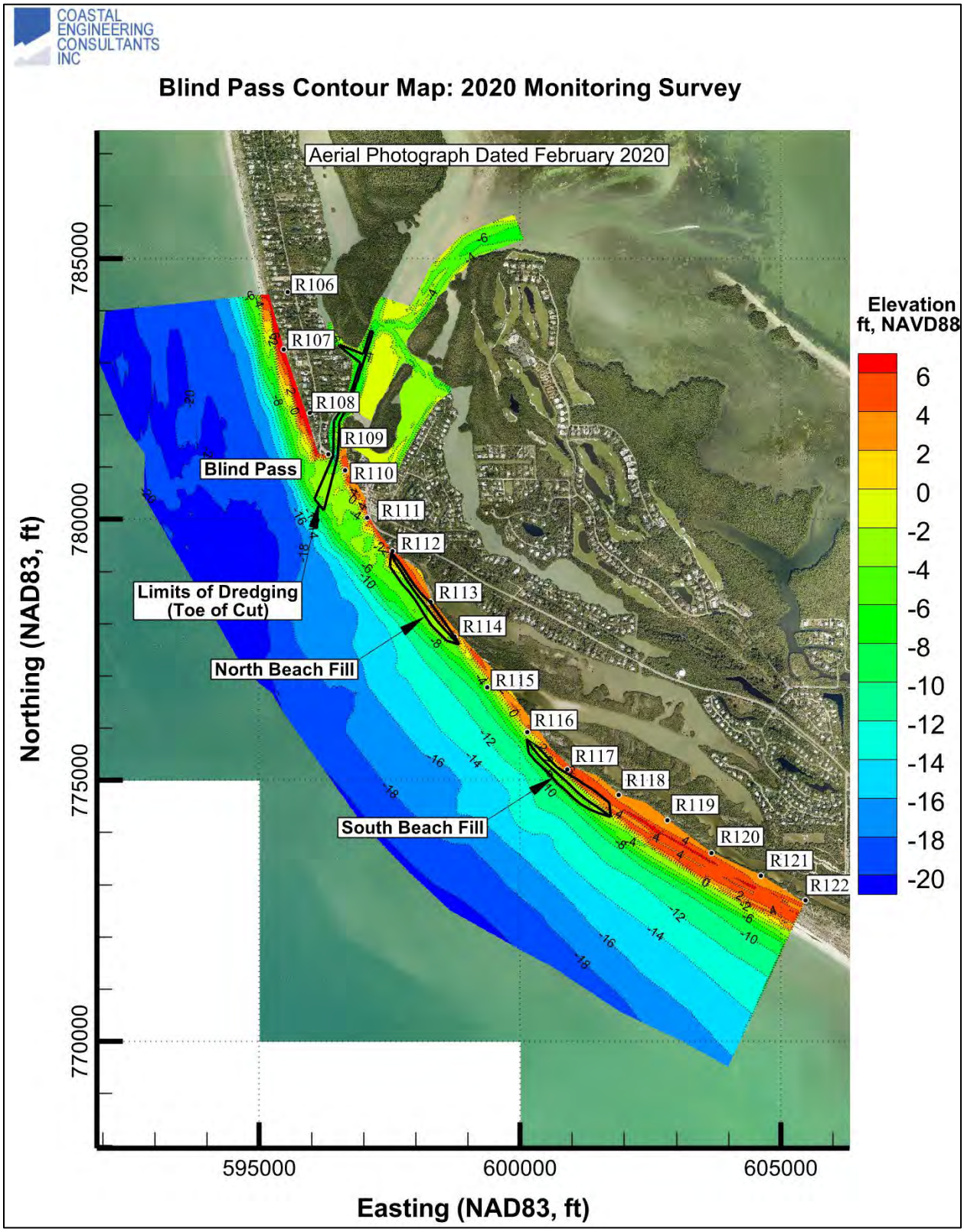

Figure 7. 2020 Monitoring Survey Contour Map.

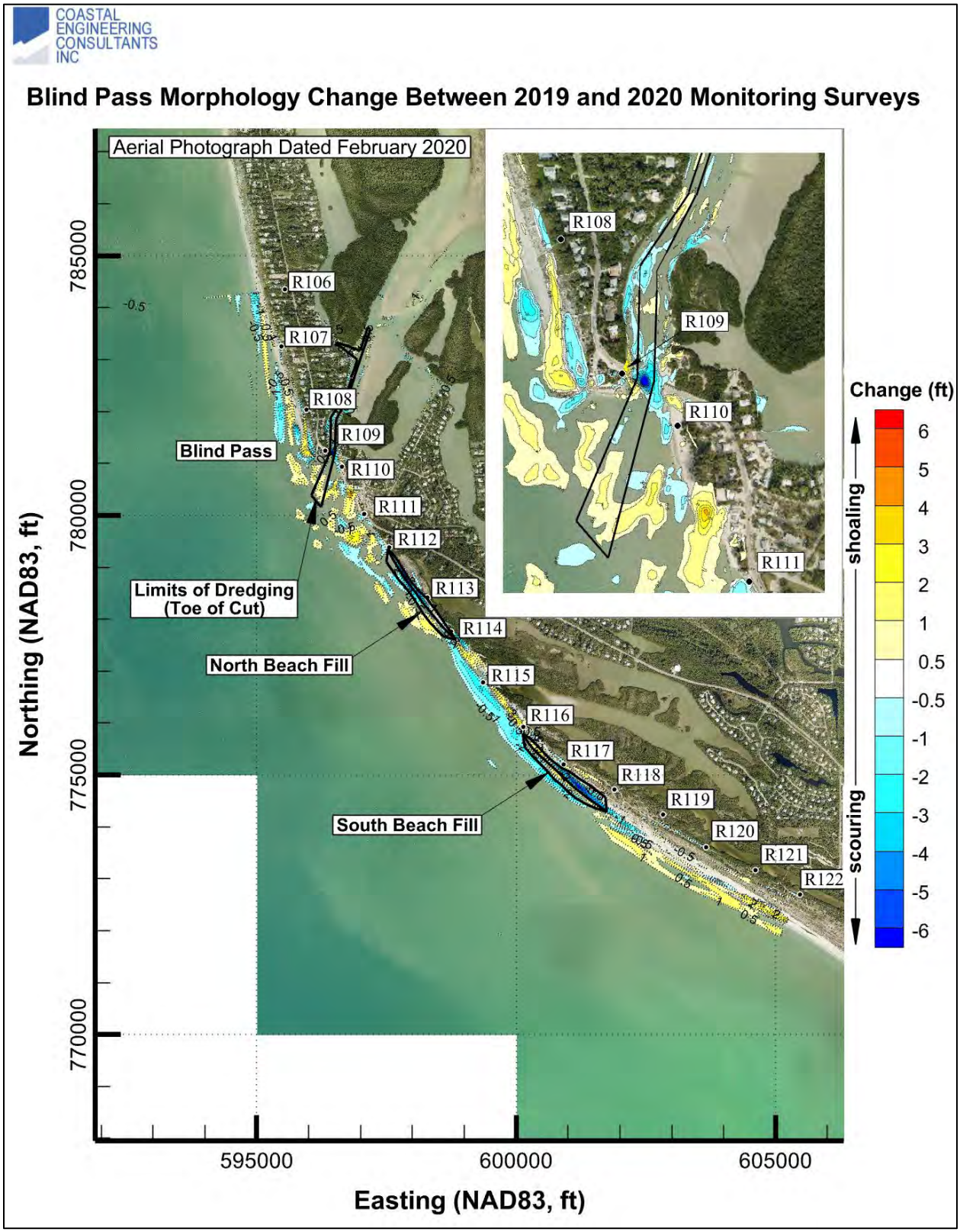

Figure 8. 2019 – 2020 Morphologic Changes.

4.2 Ebb Shoal

Appendix 3 presents the ebb shoal cross sections surveyed at 200-foot increment from Station 196+00 through Station 228+00 (Figure 2). The ebb shoal was surveyed in August 2016 (pre-construction survey), June 2017 (post-construction survey), June 2018 (monitoring), June 2019 (monitoring), and August 2020 (monitoring) noting that the dredge template's seaward end was located along Station 224+00. The survey data comparison indicated no significant changes seaward of Station 218+00. Station 220+00 indicated that the ebb shoal shoaled slightly, up to 1 foot in elevation, compared to the 2019 survey. Further landward, along Stations 222+00 and 224+00, the sections showed minor shoal growth of up to 1.5 feet and migration to the north (left side along the baseline). Station 226+00 indicated ebb shoal growth of up to 2.0 feet. Station 228+00 indicated erosion immediately north of the terminal groin of up to 4.5 feet and ebb shoal growth of up to 2.2 feet across the channel.

4.3 Blind Pass

Appendix 3 presents the Blind Pass cross sections surveyed in February 2017 (pre-construction survey), June 2017 (post-construction survey), June 2018 (monitoring), June 2019 (monitoring), and August 2020 (monitoring). The dredge template and stations are depicted in Figure 2. It should be noted that the bridge precludes accurate surveying of Station 10+00 due to its orientation, instead two offset stations were surveyed, Stations 9+50 and 10+50, to monitor changes near the bridge.

Table 4 presents the volume change within the channel which was calculated from comparing the June 2019 and August 2020 monitoring surveys. The total volume change within the dredge template including the 1-foot tolerance indicated channel infilling and was computed to be approximately 1,070 cubic yards utilizing the 200-foot station survey lines with the addition of Stations 9+50 and 10+50 due to the presence of the bridge. Near the bridge between Stations 8+00 and 12+00, the channel experienced scouring of approximately 2,070 cubic yards.

Figure 9 presents a bar chart of the annualized volumetric changes within the dredge template between the 2019 and 2020 monitoring surveys.

Based on the August 2020 survey, the total volume remaining within the Blind Pass dredge template was approximately 90,730 cubic yards (Table 5), of which approximately 72,630 cubic yards were within the design cut and 18,100 cubic yards were within the overdredge tolerance.

The 2019 Blind Pass IMP includes a strategy to modify the dredge template by truncating the seaward end to limit intrusion into the natural sand bypassing bar. Using Station 5+00 in Table 5 as the modified seaward limit, this would reduce the total volume remaining within the modified template including the overdredge tolerance by approximately 37,040 cubic yards, which is the volume between Stations 0+00 and 4+00 and half the volume between Stations 4+00 and 6+00 noting that Station 5+00 was not surveyed in 2020. The total volume remaining within the modified Blind Pass dredge template would be approximately 53,690 cubic yards.

Table 4. Volume Change within Dredge Template between 2019 and 2020 Monitoring Surveys.

Station	Area (cy/ft)	Average Area (cy/ft)	Length (ft)	Volume (cy)
Wulfert Channel				
0+00	1.8			
		5.2	200.00	1,045
2+00	8.7			
		6.9	200.00	1,374
4+00	5.0			
		1.7	200.00	350
6+00	-1.5			
		-1.5	200.00	-291
8+00	-1.4			
		-3.7	150.00	-552
9+50	-6.0			
		-7.1	100.00	-706
10+50	-8.1			
		-5.4	150.00	-811
12+00	-2.7			
		0.6	200.00	126
14+00	4.0			
		-0.3	200.00	-52
16+00	-4.5			
		-3.1	200.00	-621
18+00	-1.7			
		0.1	200.00	27
20+00	2.0			
		1.2	200.00	237
22+00	0.4			
		0.7	200.00	137
24+00	1.0			
		1.2	200.00	243
26+00	1.4			
		1.0	200.00	192
28+00	0.5			
		0.4	200.00	75
30+00	0.2			
		-0.3	200.00	-51
32+00	-0.8			
		-0.5	200.00	-104
34+00	-0.3			
		-0.2	100.00	-20
35+00	-0.1			
Roosevelt Channel				
101+00	1.0			
		1.7	100.00	171
102+00	2.4			
		1.4	200.00	276
104+00	0.4			
		0.3	100.00	26
105+00	0.2			
Total				**1,071**

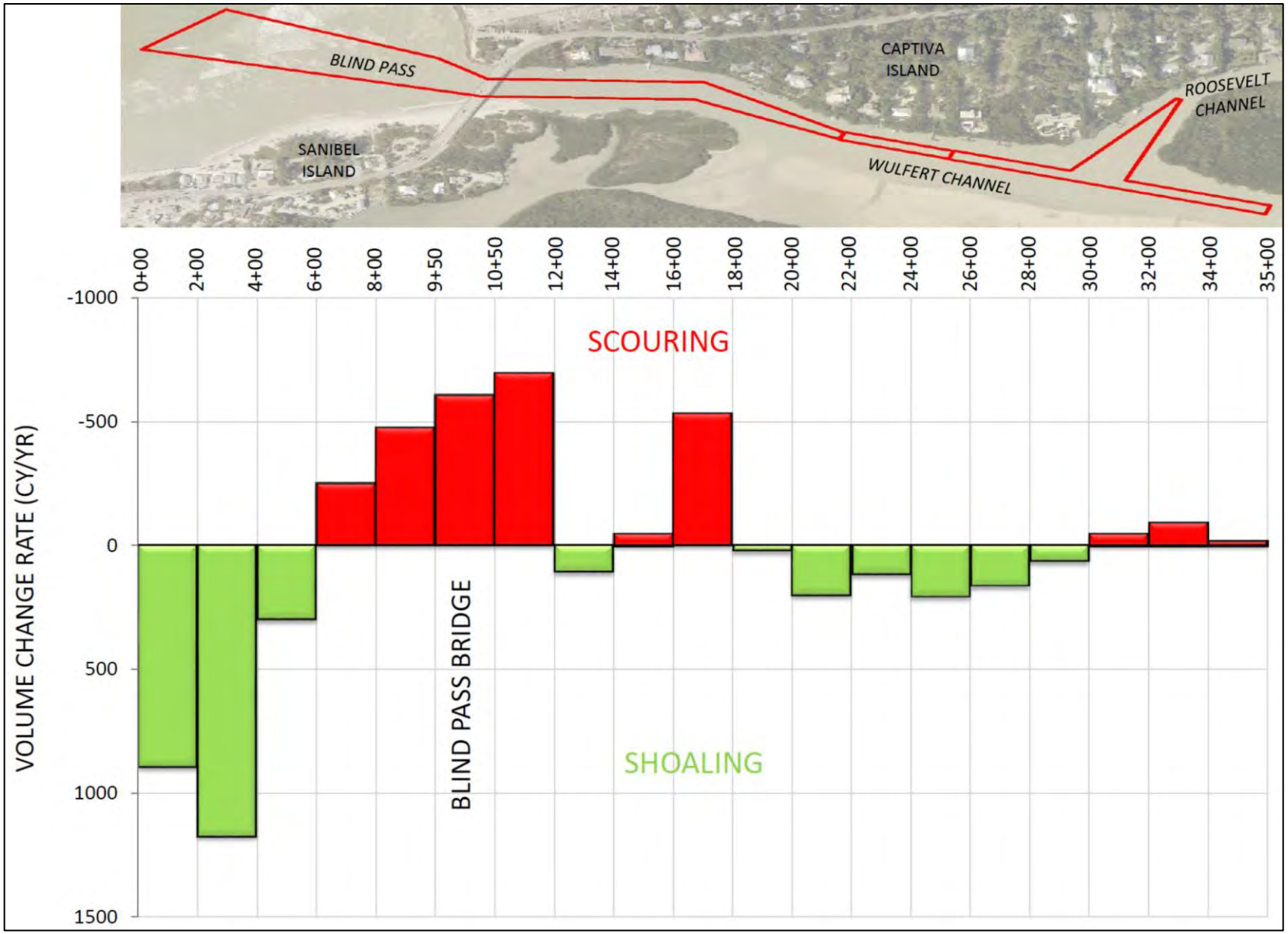

Figure 9. Annualized Volumetric Changes within Dredge Template between 2019 and 2020 Surveys.

Table 5. Volume Remaining within Dredge Template after August 2020 Survey.

Station	Area (cy/ft)	Average Area (cy/ft)	Length (ft)	Volume (cy)
Wulfert Channel				
0+00	40.8			
		63.4	200	12,680
2+00	86.0			
		84.6	200	16,919
4+00	83.2			
		74.4	200	14,878
6+00	65.6			
		55.5	200	11,093
8+00	45.4			
		28.0	150	4,206
9+50	10.7			
		11.7	100	1,167
10+50	12.6			
		19.6	150	2,934
12+00	26.5			
		31.1	200	6,215
14+00	35.6			
		25.8	200	5,167
16+00	16.0			
		13.4	200	2,680
18+00	10.8			
		8.9	200	1,783
20+00	7.1			
		7.0	200	1,402
22+00	7.0			
		7.2	200	1,430
24+00	7.3			
		6.5	200	1,291
26+00	5.6			
		4.4	200	875
28+00	3.2			
		4.2	200	832
30+00	5.1			
		5.1	200	1,027
32+00	5.1			
		2.9	200	578
34+00	0.7			
		0.6	100	65
35+00	0.6			
Roosevelt Channel				
101+00	17.0			
		14.5	100	1,449
102+00	12.0			
		8.4	200	1,686
104+00	4.9			
		3.7	100	368
105+00	2.5			
Total				**90,725**

5 HYDRAULIC MONITORING

5.1 Hydraulic Monitoring Data

Hydraulic monitoring was performed from August 24 to September 22, 2020 for a 29-day data collection. Water elevation data were collected at 10-minute intervals using Onset HOBO Water Level Loggers at two locations: 1) in the Gulf of Mexico approximately 3,500 feet southwest of the Blind Pass bridge (W82º11'7.9797", N26º28'25.0423") in 19.0 feet of water and 2) in Wulfert Channel approximately 200 feet north of the bridge (W82º10'58.1501", N26º29'0.2964") in 7.2 feet of water. Current velocity data were collected at 10-minute intervals using Nortek Aquadopp current profilers at three locations: 1) approximately 200 feet north of the Blind Pass bridge (W82º10'58.3672", N26º29'0.4715") in approximately 9.6 feet of water, 2) in Roosevelt Channel approximately 2,000 feet north of the bridge (W82º10'55.3212", N26º29'18.0553") in approximately 8.4 feet of water and 3) between Albright Key and Runyan Key approximately 2,300 feet northeast of the bridge (W82º10'40.3782", N26º29' 15.1688") in approximately 6.6 feet of water. The profilers were installed 0.5-1.0 feet above the bottom. A location map for the instrument deployment is presented in Figure 10.

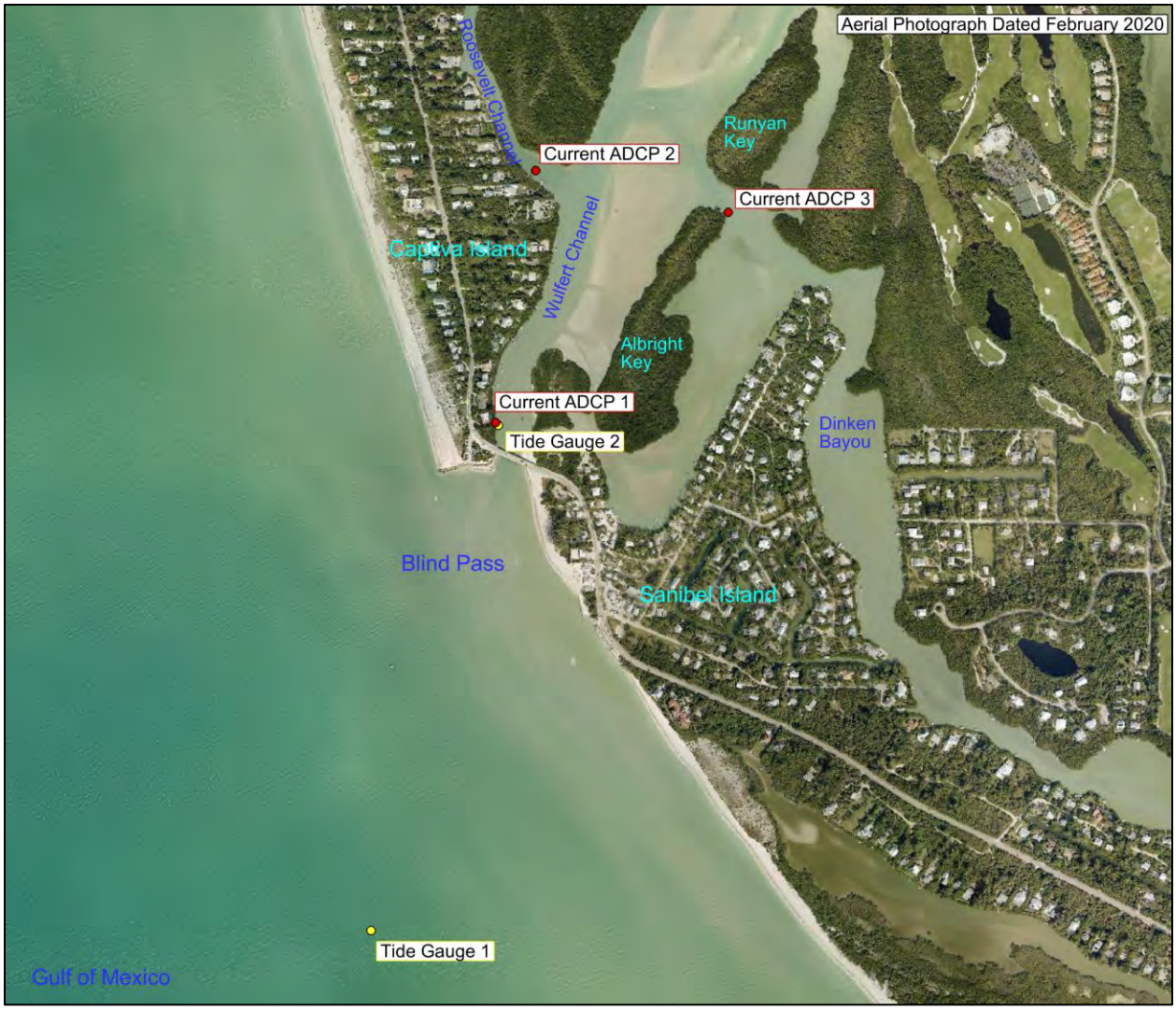

Figure 10. Location Map of Tide Gauges and Current Profiler.

On September 10, the ADCPs were retrieved to download the data to confirm they were operational and had sufficient battery level to continue data collection. Upon confirmation which lasted approximately 30 minutes, the instruments were re-deployed in the exact same locations.

The water level data was converted to the NAVD88 vertical datum and plotted in Figure 11. A Full Moon was observed on September 2, 2020 and a New Moon was observed on September 17, 2020. Two storm events, Hurricane Laura and Tropical Storm Sally, passed the Southwest Florida coast in relative proximity August 24-26, 2020 and September 13-15, 2020. These events resulted in some noise which was mostly evident in the water level measured in the Gulf of Mexico noting that a little noise was also observed in the water level recorded in Wulfert Channel inside Blind Pass. To eliminate the noise, a low-pass filter was applied to both series of water levels. The filtered water levels are presented in Figure 12.

Over the deployment period, the water elevation in the Gulf of Mexico location fluctuated between -1.9 feet NAVD88 to 2.0 feet NAVD88. The maximum tidal range of 3.2 feet was observed on September 16 during the New Moon and after the passage of Tropical Storm Sally. The minimum tidal range of 1.7 feet was observed on September 5. The water elevation in Wulfert Channel inside Blind Pass had similar peaks but higher troughs resulting in smaller tidal ranges. The maximum tidal range of 2.9 feet inside the pass was observed on September 13 during the passage of Tropical Storm Sally. During the New Moon, the range was 2.4 feet. The minimum tidal range of 1.4 feet was observed on September 4.

The depth averaged currents measured in Wulfert and Roosevelt Channels and Dinken Bayou are presented in Figure 13. In Wulfert Channel, the typical ranges of current velocities were 1.5 – 2.0 feet/sec during the ebb flow (negative current in the figure) and 2.0 – 2.5 feet/sec during the flood flow (positive current in the figure). The maximum current velocity, 4.2 feet/sec, occurred on September 13 during the passage of Tropical Storm Sally. During the Full Moon and New Moon, the maximum current reached 2.5 feet/sec.

In Dinken Bayou, the typical peak current was 0.5 feet/sec during both ebb and flood flow. Similar patterns were observed in Roosevelt Channel.

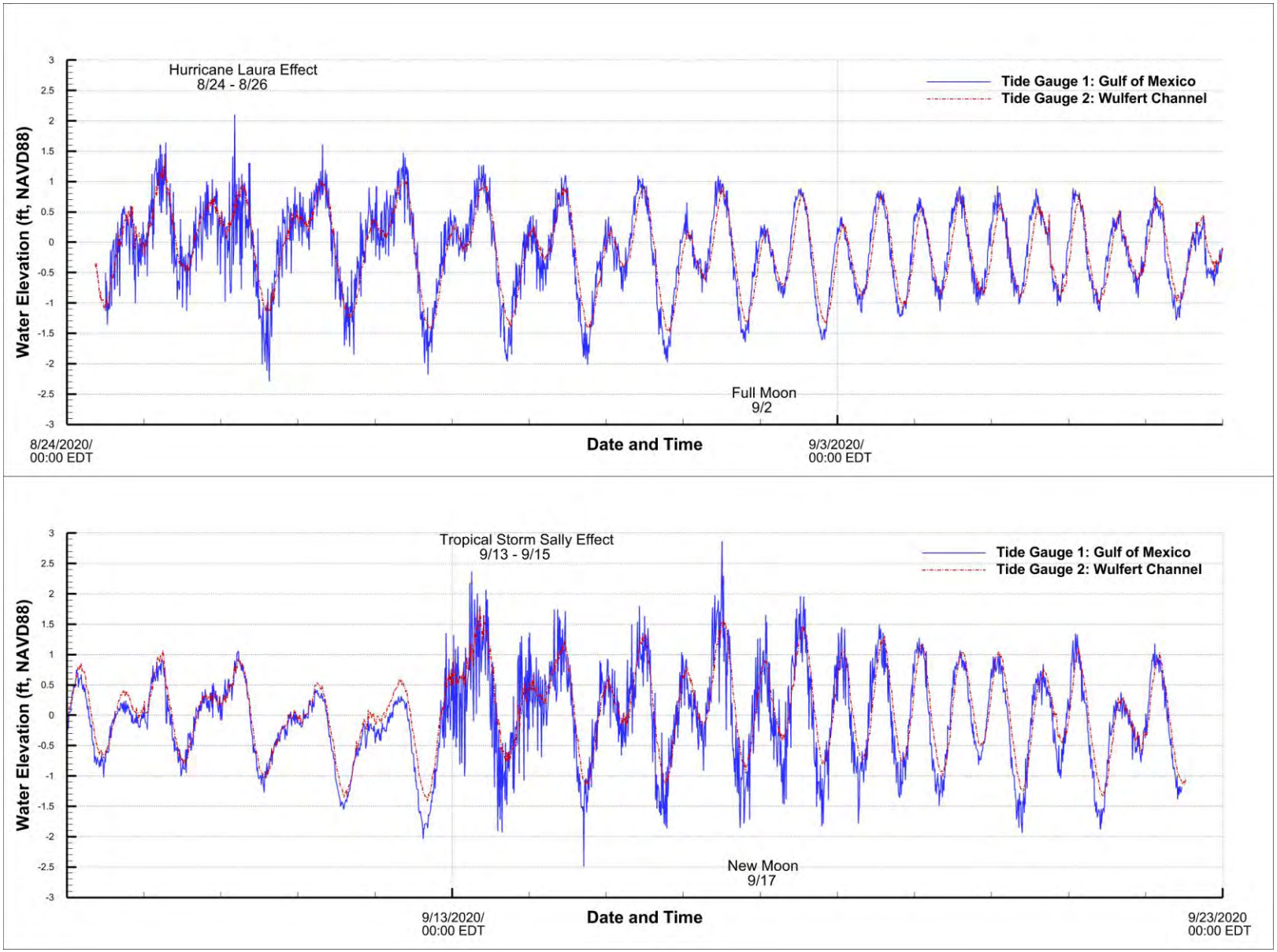

Figure 11. Water Surface Elevations Measured in Gulf of Mexico and Wulfert Channel.

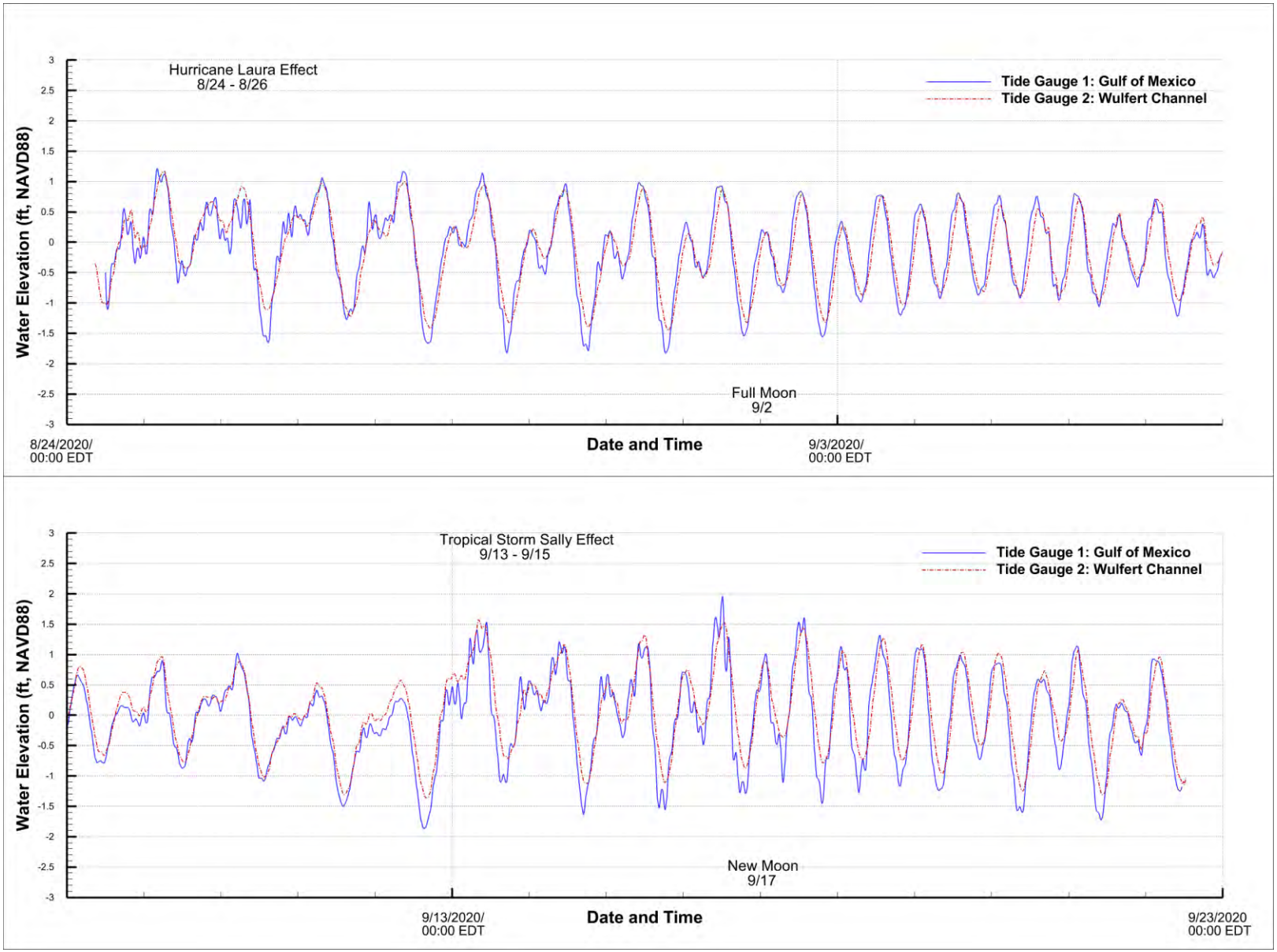

Figure 12. Water Surface Elevations Measured in Gulf of Mexico and Wulfert Channel after Applying Low-Pass Filter.

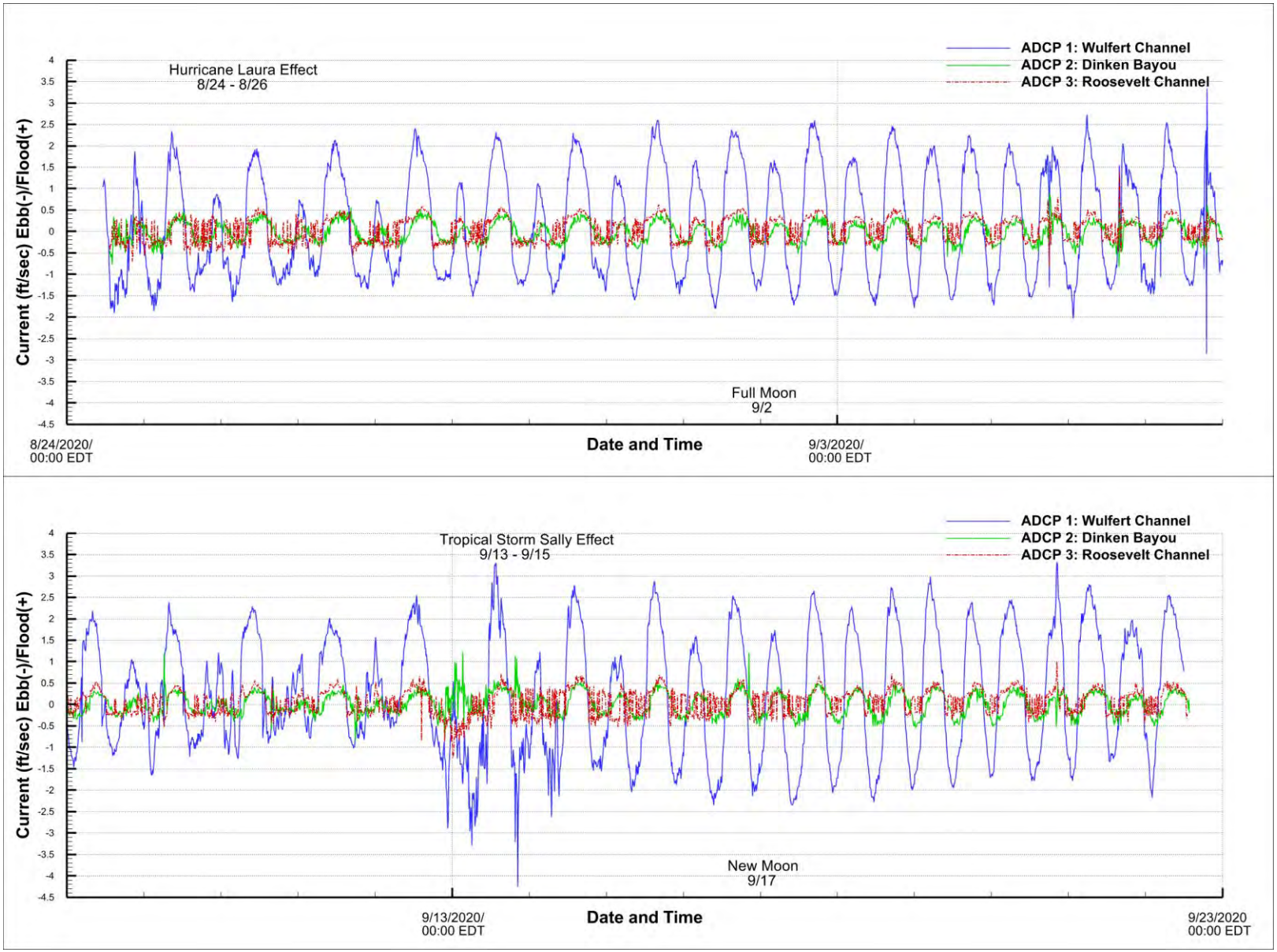

Figure 13. Depth Averaged Ebb(-)/Flood(+) Currents Measured in Wulfert and Roosevelt Channels and Dinken Bayou.

5.2 Summary of Hydraulic Measurements

Tide near Blind Pass is of a mixed nature which can be thought of as a transitional tide occurring between areas of semi-diurnal and diurnal tides. Table 6 presents major tidal constituents in the area based on ADCIRC tidal database.

Table 6. Dominant Tidal Constituents.

CONSTITUENT	PERIOD (HR)	AMPLITUDE (FT)
M_2	12.4206	0.77
K_1	23.9345	0.48
O_1	25.8193	0.47
S2	12.0000	0.31

Table 7 provides a summary of the hydraulic conditions observed between August 24 and September 22, 2020. The tidal prism for this period was calculated using the following Keulegan (1951) expression:

$$P = \left(\frac{TV_{\max} A_c}{\pi C} \right) \quad (2)$$

where

P = tidal prism (ft^3)
T = tidal period (s)
V_{max} = maximum velocity (ft/s)
A_c = cross-sectional area (ft^2) below Mean Sea Level (MSL = -0.6 ft NAVD88).
C = parameter (0.86)

Table 7. Summary of Hydraulic Parameters.

Parameter	2020 Monitoring
Maximum Tidal Range† (ft)	3.5
Maximum Tidal Range†† (ft)	2.4
Peak Current Velocity†† (ft/s)	2.5
Cross-sectional Area††† (ft^2)	1,253
Tidal Prism†† (ft^3)	5.2E+07

† Gulf of Mexico
†† inside Blind Pass
††† near ADCP 1 location – Station 12+00

Erickson Consulting Engineers (ECE) designed the Blind Pass restoration project in 2006 (ECE, 2006) and recommended Alternative F as the "preferred alternative" that was constructed in 2009. ECE performed a tidal hydraulics analysis to predict post-construction hydraulic parameters including an "average tidal prism" at Blind Pass which was defined as the average daily tidal prism over a 14-day period which included the spring and neap tidal cycles.

In 2014, one year after the first maintenance dredging of the pass, CEC (2014) utilized hydraulic measurements over a 4-day period between July 25 and 29, 2014 to compute the average ebb and flood tidal prisms and compare them to the average ebb and flood tidal prisms predicted by ECE (2006). Using the 2020 hydraulic monitoring data collected over a 29-day period, the same calculation was performed.

Equation 2 was used to compute the average ebb and flood tidal prisms for the 2020 monitoring conditions with the exception of the V_{max} velocity parameter which was replaced with the average peak ebb and flood velocities, respectively. Table 8 presents a comparison analysis between the predicted and actual hydraulic parameters measured in 2014 and 2020.

Table 8. Comparison Analysis of Hydraulic Parameters.

Parameter	Predicted Construction Design†	2014 Monitoring Measured (CEC, 2014)	2020 Monitoring Measured	Design – 2020 Difference %	2014 – 2020 Difference %
Average Peak Flood Current Velocity (ft/s)	3.8	2.0	2.5	-34%	+25%
Average Peak Ebb Current Velocity (ft/s)	4.1	1.3	1.9	-54%	+46%
Cross-sectional Area (ft^2)	1,500	1,044	1,253	-16%	+20%
Average Flood Tidal Prism (ft^3)	9.0E+07	3.5E+07	5.2E+07	-42%	+49%
Average Ebb Tidal Prism (ft^3)	11.0E+07	2.2E+07	3.9E+07	-65%	+77%

† According to ECE (2006)

The comparison analysis demonstrates that the daily average peak flood and ebb current velocities measured in 2020 were 34% and 54% less than predicted for the constructed design by ECE (2006). Further, the average flood tidal prism computed based on the measured hydraulic parameters was approximately 42% smaller than the predicted construction design average flood tidal prism. Similarly, the computed average ebb tidal prism was approximately 65% smaller than the predicted one. The cross-sectional area based on the 2014 monitoring survey was 16% smaller compared to the construction design cross-sectional critical area.

The hydraulic parameters measured in 2020 were improved compared to 2014 conditions. The daily average peak flood and ebb current velocities measured in 2020 were 25% and 46% higher compared to 2014. The average flood and ebb prisms in 2020 were 49% and 77% larger compared to 2014. Also, the cross-sectional area in 2020 increased by 20% compared to 2014.

According to Mehta et al. (1991), the stable cross-sectional area at Blind Pass is about 1,345 square feet and 1,615 square feet based on average and more extreme conditions, respectively. CEC calculated a critical cross-sectional area by identifying the minimal cross-sectional area within Wulfert Channel. Based on the 2020 survey, the critical cross-section was located at Station 10+50, its cross-sectional area below MSL was approximately 1,185 square feet.

Table 9 presents historical critical cross-sectional areas including the 2009, 2013 and 2017 dredging projects. It should be noted that the interior channel within which the critical cross-sectional area is located was dredged during Phase 2. There was a reduction in the critical cross-sectional area of approximately 47% between the Phase 2 post-construction and first annual monitoring. This resulted from the time delay of approximately 8 months between the time the

outer channel was dredged (Phase 1) to the time the inner channel was dredged (Phase 2), allowing sediment to accumulate within the recently dredged outer channel thereby reducing the hydraulic efficiency of the subsequent interior channel dredging (CEC, 2014).

While the 2020 monitoring critical cross-sectional area, 1,185 square feet, does not fall within Mehta's stable cross-sectional area range, a comparison with the historical measurements indicates the inlet throat section measured in 2020 is comparable to prior measurements.

Table 9. Historical Comparisons of Critical Cross-Sectional Areas.

Parameter	2009 Post-Con	2010 1-Year Mon	2011 2-Year Mon	2012 Phase 1 Post-Con	2013 Phase 2 Post-Con	2014 1-Year Mon	2017 Post-Con	2018 1-Year Mon	2019 2-Year Mon	2020 3-Year Mon
Cross-Sectional Area (ft^2)	1,165	1,105	1,160	1,009	1,957	1,044	1,261	729	991	1,185

6 CONCLUSION

This report describes the third annual physical monitoring results of Lee County's Blind Pass restoration project completed in June 2017. The information presented herein provides the necessary data for both Lee County and FDEP to regularly 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 monitoring process also provides the County and FDEP 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.

The data used in the analysis included surveys conducted by CEC in February 2017 (pre-construction), June 2017 (post-construction), June 2018 (monitoring), June 2019 (monitoring) and August 2020 (monitoring).

Based on the 2019 and 2020 monitoring surveys, the total volume change within the dredge template including the 1-foot tolerance indicated channel infilling equal to approximately 1,070 cubic yards.

As of August 2020, the total volume remaining within the Blind Pass dredge template was approximately 90,730 cubic yards cubic yards.

Based on the shoreline change analysis conducted by comparing MHW positions between the 2019 and 2020 surveys at the R-monuments:

- beach segment north of Blind Pass, extending from R-106 to R-109, receded on average approximately 5.9 feet;
- beach segment south of Blind Pass, extending from R-110 to R-112, advanced on average approximately 8.1 feet;
- North Beach Fill segment extending from R-112 to R-114+200 receded on average approximately 22.1 feet;

- beach segment downdrift on North Beach Fill extending from R-114+200 to R-116 advanced on average approximately 4.8 feet;
- South Beach Fill segment extending from R-116 to R-118 receded on average approximately 27.0 feet; and
- beach segment downdrift on South Beach Fill extending from R-118 to R-122 receded on average approximately 1.9 feet.

Based on the beach volumetric change analysis conducted by comparing volume changes above MHW and to DOC between the 2019 and 2020 surveys at the R-monuments:

- beach segment north of Blind Pass, extending from R-106 to R-109, gained approximately 900 cubic yards above MHW and lost approximately 8,090 cubic yards to DOC;
- beach segment immediately south of Blind Pass, extending from R-110 to R-112, gained approximately 7,040 cubic yards above MHW and gained approximately 17,690 cubic yards to DOC;
- North Beach Fill segment extending from R-112 to R-114+200 lost approximately 3,840 cubic yards above MHW and lost approximately 13,490 cubic yards to DOC;
- beach segment downdrift on North Beach Fill extending from just south of R-114+200 to R-116 gained approximately 5,870 cubic yards above MHW and lost approximately 22,120 cubic yards to DOC;
- South Beach Fill segment extending from R-116 to R-118 lost approximately 4,220 cubic yards above MHW and lost approximately 27,950 cubic yards to DOC; and
- beach segment downdrift on South Beach Fill extending from R-118 to R-122 gained approximately 7,280 cubic yards above MHW and gained approximately 30,870 cubic yards to DOC'
- overall change downdrift of Blind Pass, between R-110 and R-122, gained approximately 12,130 cubic yards above MHW and lost approximately 14,990 cubic yards to DOC.

Based on the monitoring, there were no documented adverse impacts to the natural resources or coastal system within the Project area as a result of construction.

7 REFERENCES

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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

BLIND PASS MAINTENANCE DREDGING PROJECT
2020 MONITORING

SURVEY REPORT

All Surveys were conducted utilizing multiple Trimble Real Time Kinematic (RTK) Global Positioning Systems (GPS).

The monitoring survey of the beach (R-106 to R-122) and ebb shoal was performed on August 14, 2020. The Blind Pass channel was surveyed on August 18, 2020.

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 1983/2012 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 survey:

FLDEP TIDAL 872 5383B 2008
Northing 781,240.63 feet
Easting 596,183,11 feet
Elevation: 5.18 feet NAVD88

FLDEP TIDAL 872 5383 TIDAL 1
Northing 780,464.97 feet
Easting 597,100.36 feet
Elevation: 3.25 feet NAVD88

Equipment

Upland: CEC employed two Trimble R10 Real Time Kinematic (RTK) Global Positioning Systems (GPS) with GLONASS capability for the upland surveys along with a Trimble R8 base receiver installed on an established control point. These systems are capable of delivering RTK positions with coordinate accuracy of ±10mm+2ppm. The standard 2-meter antenna rod allows for data collection seaward of the mean high water line up to 5 feet deep while protecting the equipment from the elements.

Offshore: The CEC 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. The GPS antenna was mounted directly above the transducer. A Trimble R8 GLONASS RTK GPS receiver was integrated with the on-board computer system. The HYPACK 2017a software package was the hydrographic guidance program utilized.

QA/QC Procedures

CEC employs an advanced QA/QC program to ensure our work 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 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 near shore 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 mean high water line landward while an additional operator and unit collected data just landward of the mean high water 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 for verification of accuracy at

the beginning of each survey day. A direct depth measurement check was conducted and recorded at both shallow and maximum depths relative to the work area at the beginning of each survey day, and more frequently if necessary.

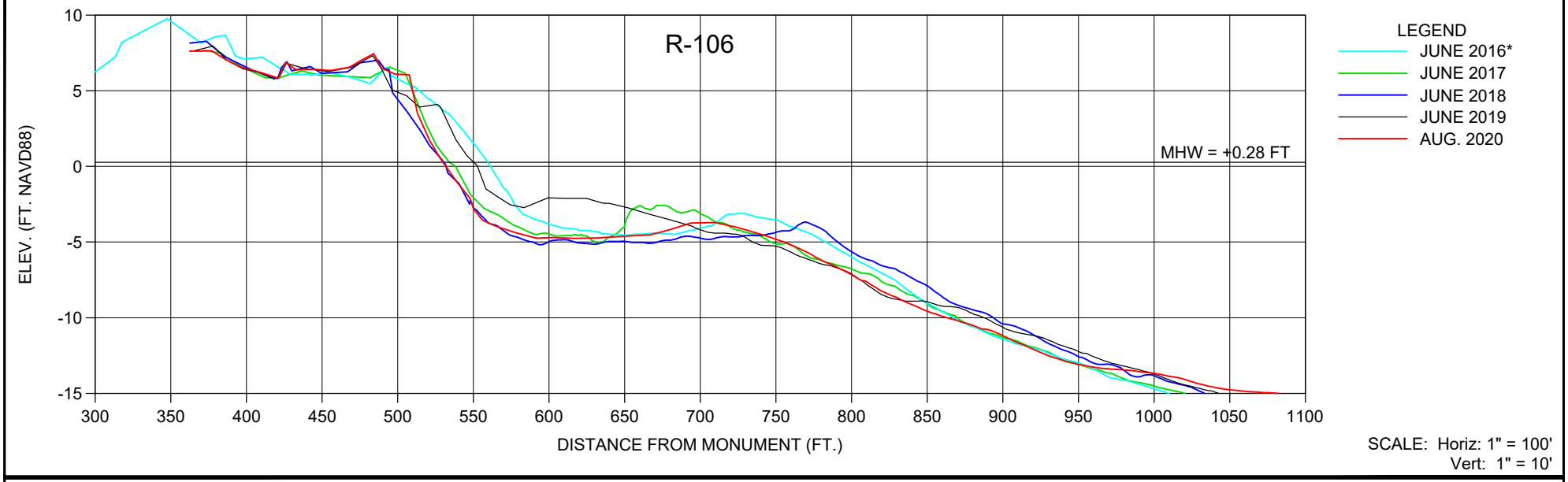
COASTAL ENGINEERING CONSULTANTS, INC.
FLORIDA BUSINESS AUTHORIZATION NO. LB 2464

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: 2020.10.01 09:29:49 -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. 20.030
DATE OF SIGNATURE:

APPENDIX 2

BEACH PROFILES



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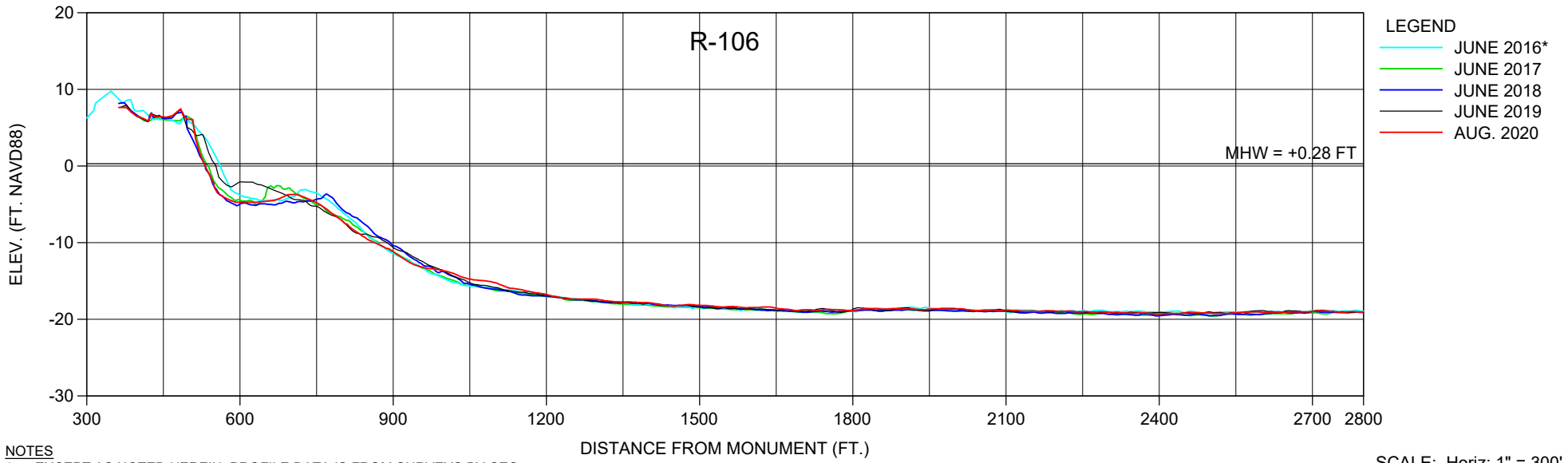

SCALE: Horiz: 1" = 300'
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NOTES
1. EXCEPT AS NOTED HEREIN, PROFILE DATA IS FROM SURVEYS BY CEC.
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SHEET 1
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E-Mail: info@cecifl.com

CLIENT: LEE COUNTY

TITLE: R-106 MONITORING SURVEY

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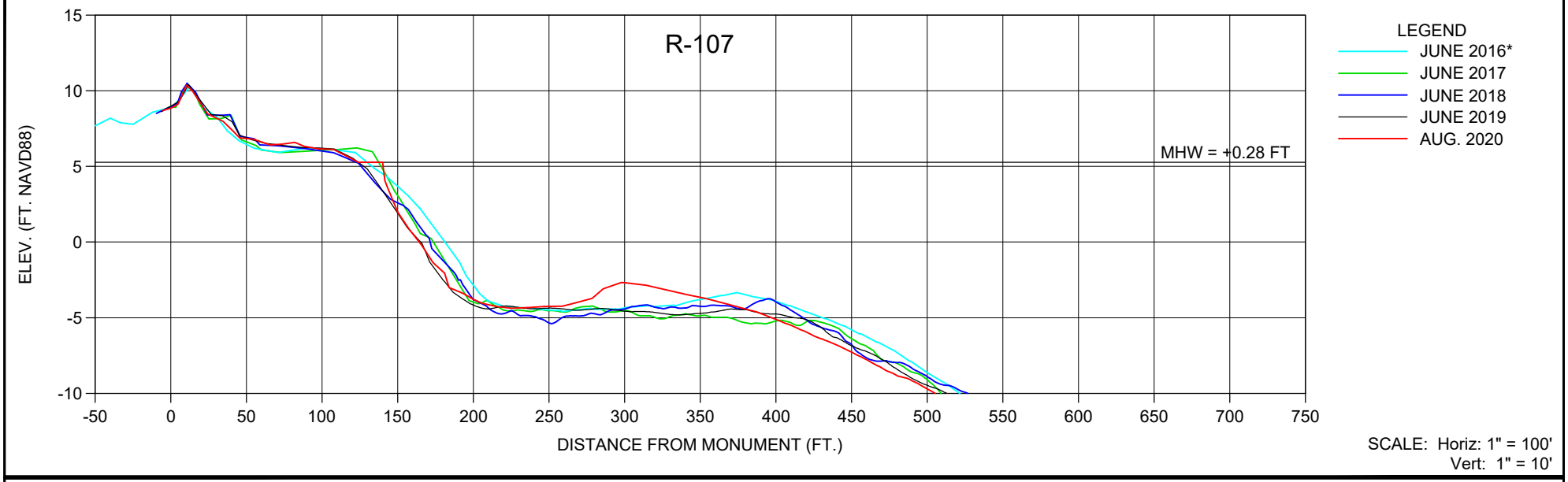

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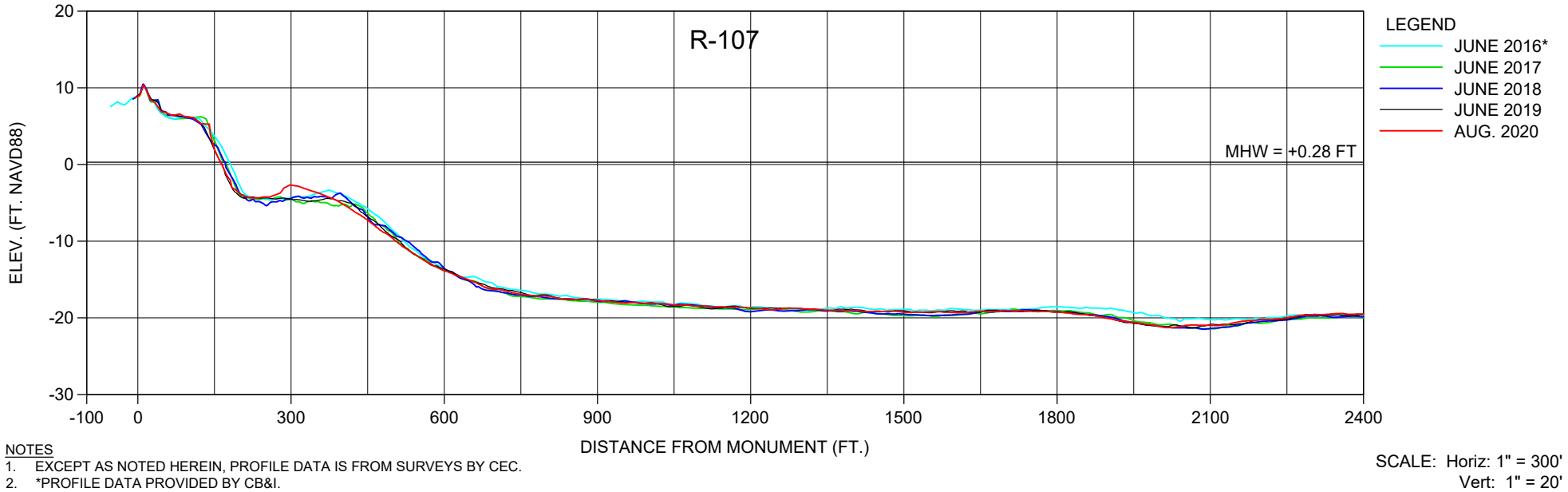

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CLIENT: LEE COUNTY

TITLE: R-107 MONITORING SURVEY

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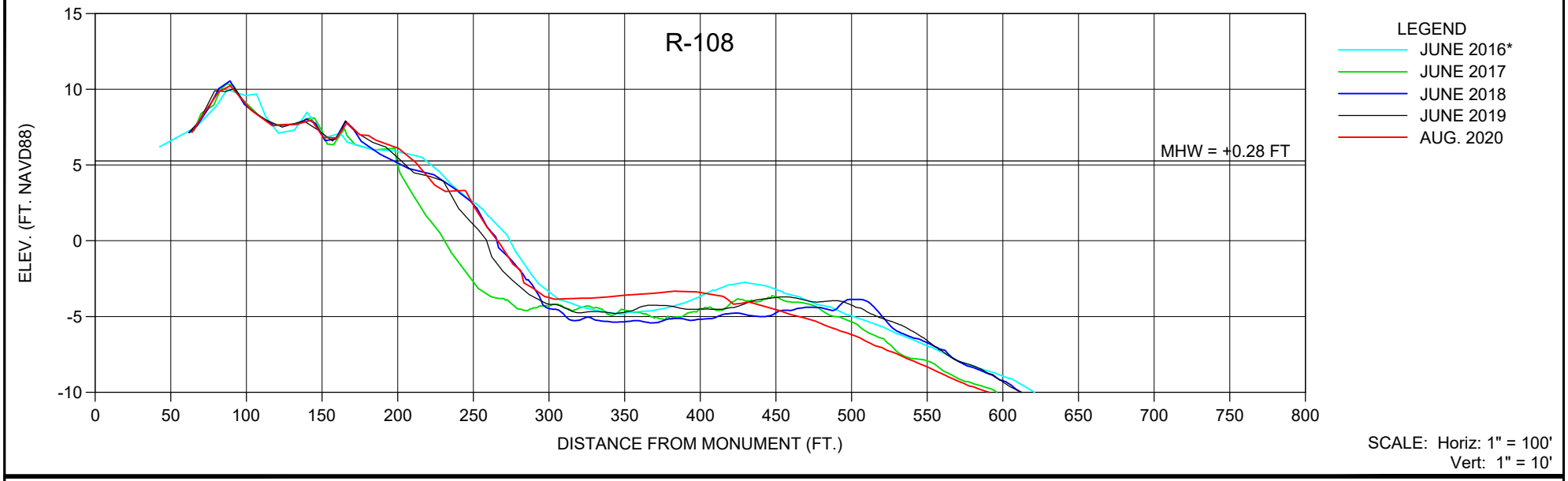

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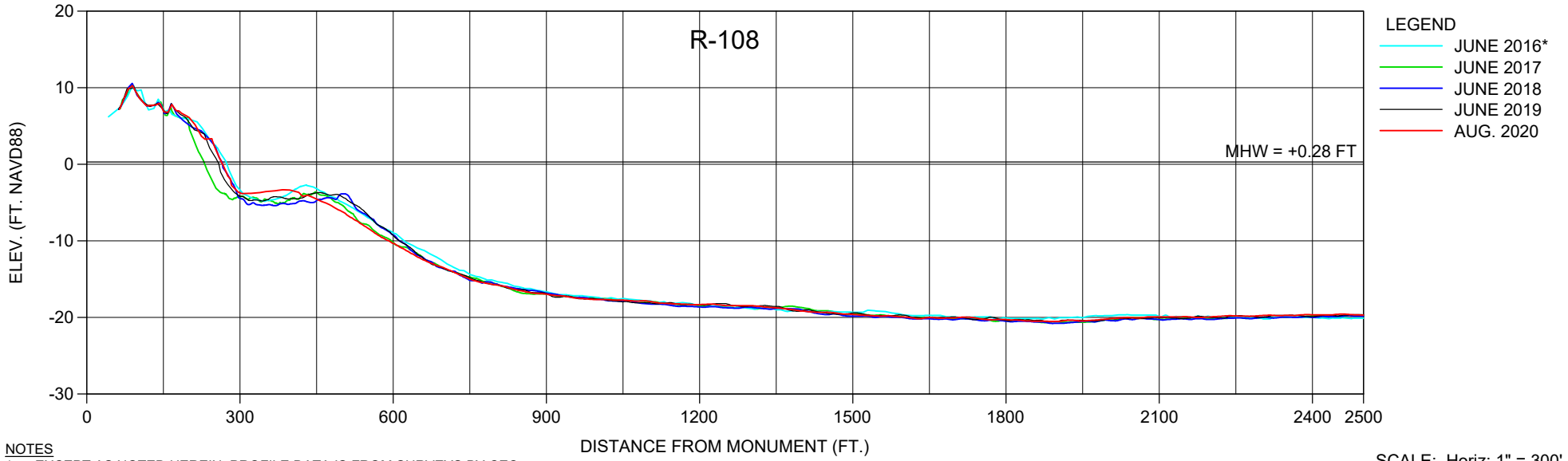

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SHEET 13
FILE NO.: 20030-R-108

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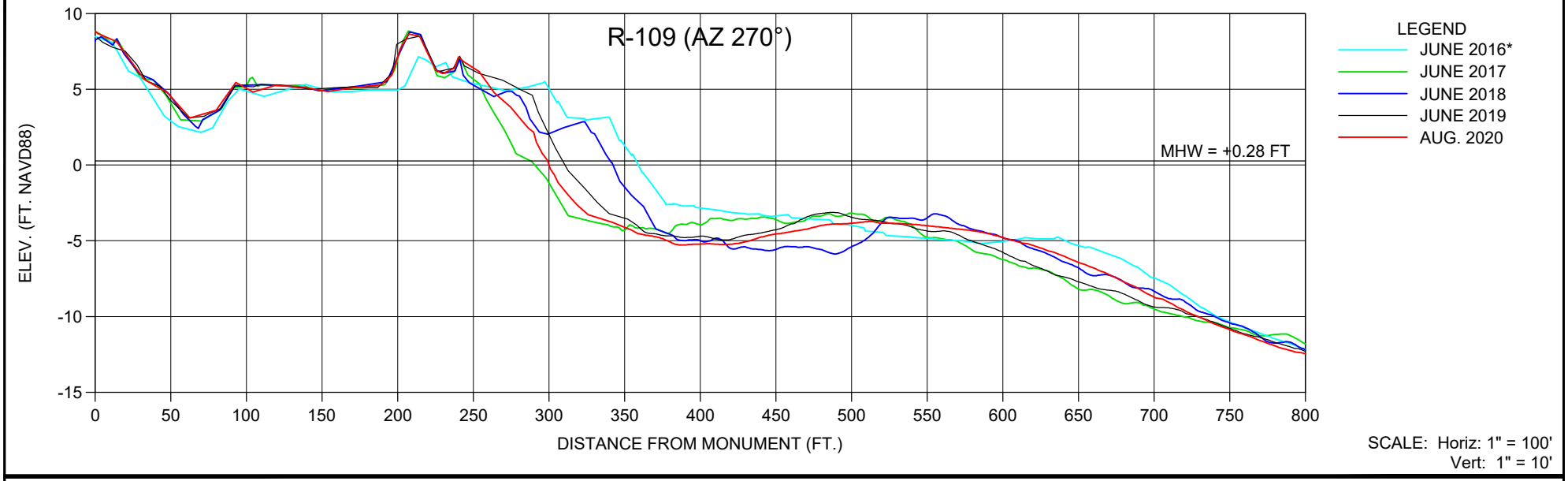
SURVEYING: LB 2464
PHONE: (239)643-2324
FAX: (239)643-1143
www.coastalengineering.com
E-Mail: info@cecifl.com

CLIENT: LEE COUNTY

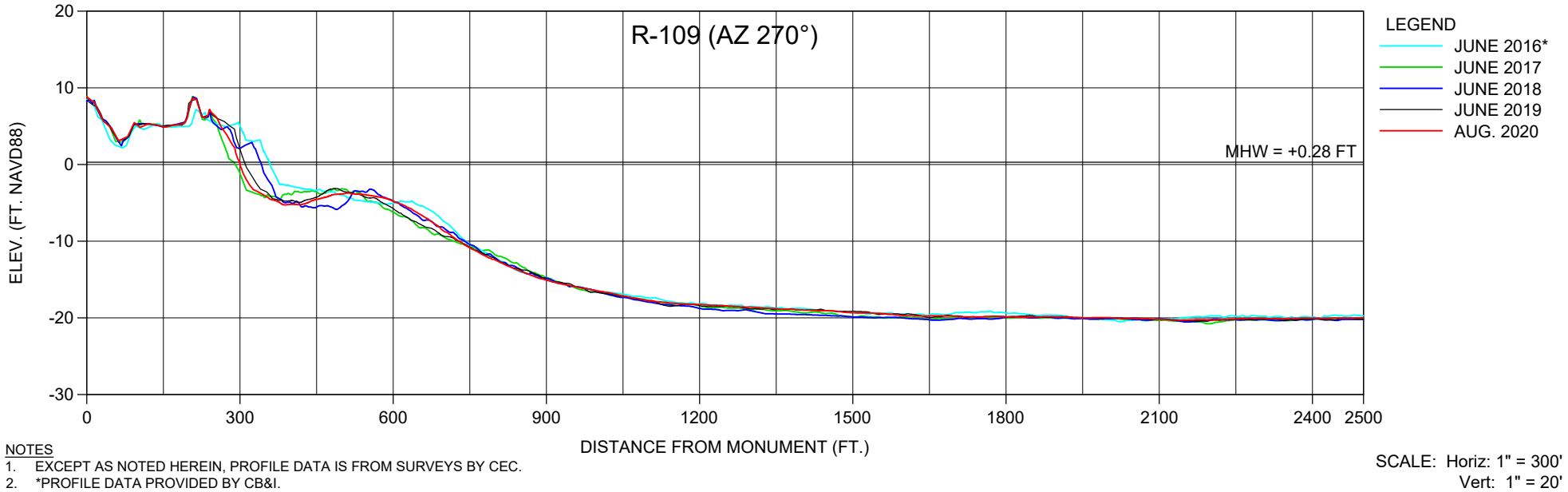
TITLE: R-108 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

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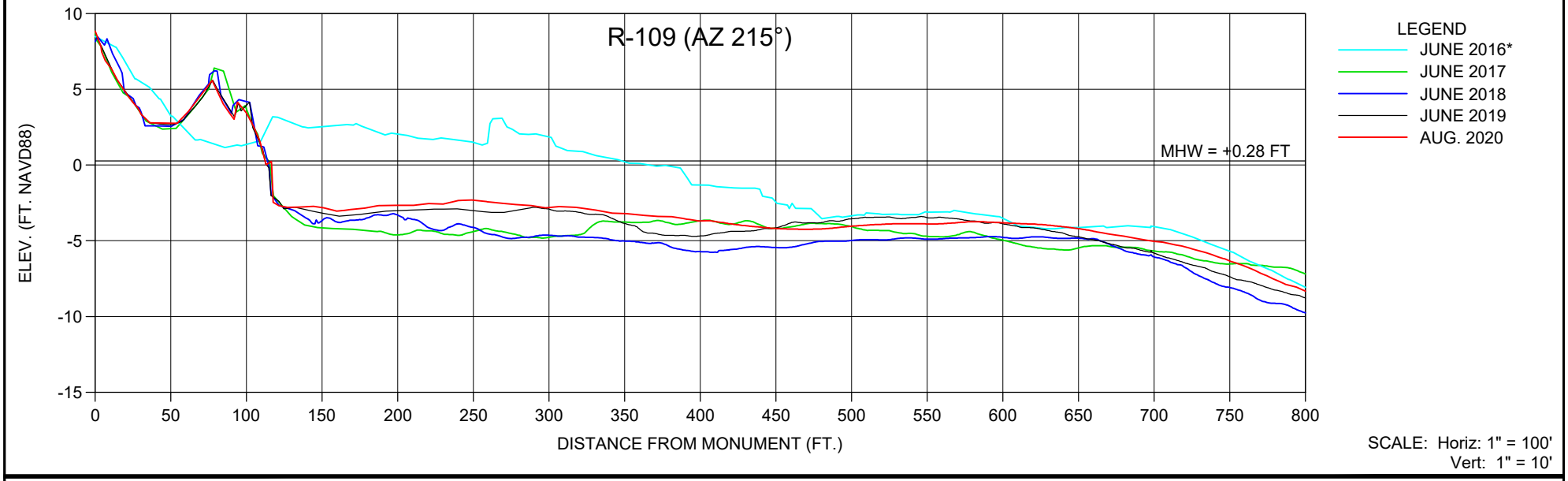
SHEET 4
FILE NO.: 20030-R-109

CLIENT: LEE COUNTY

TITLE: R-109 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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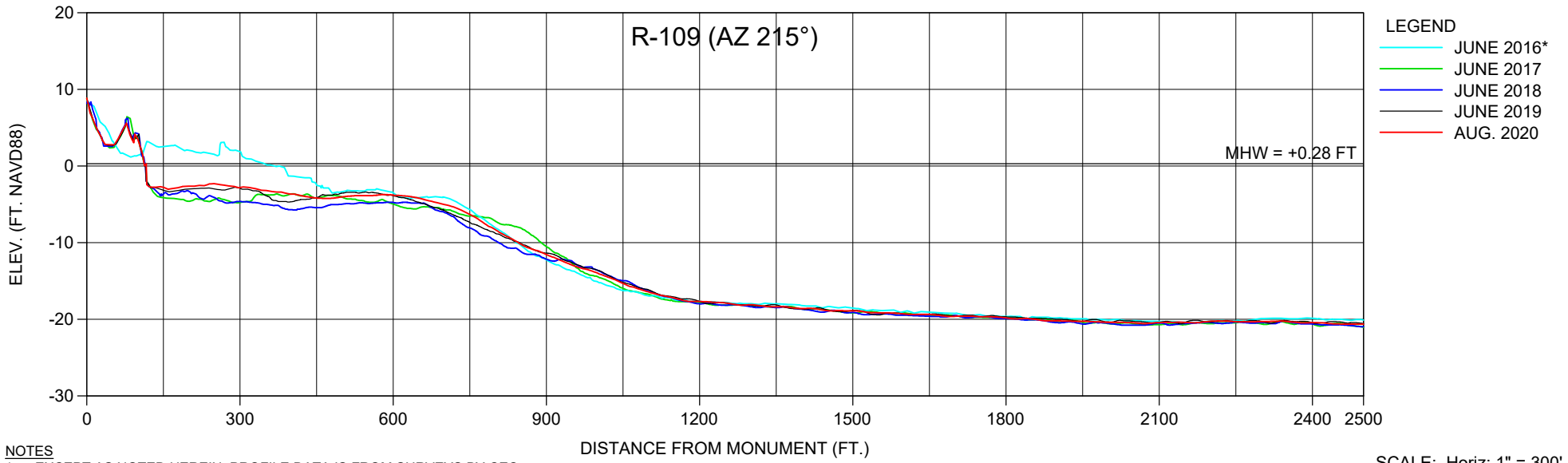

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 5
FILE NO.: 20030-R-109

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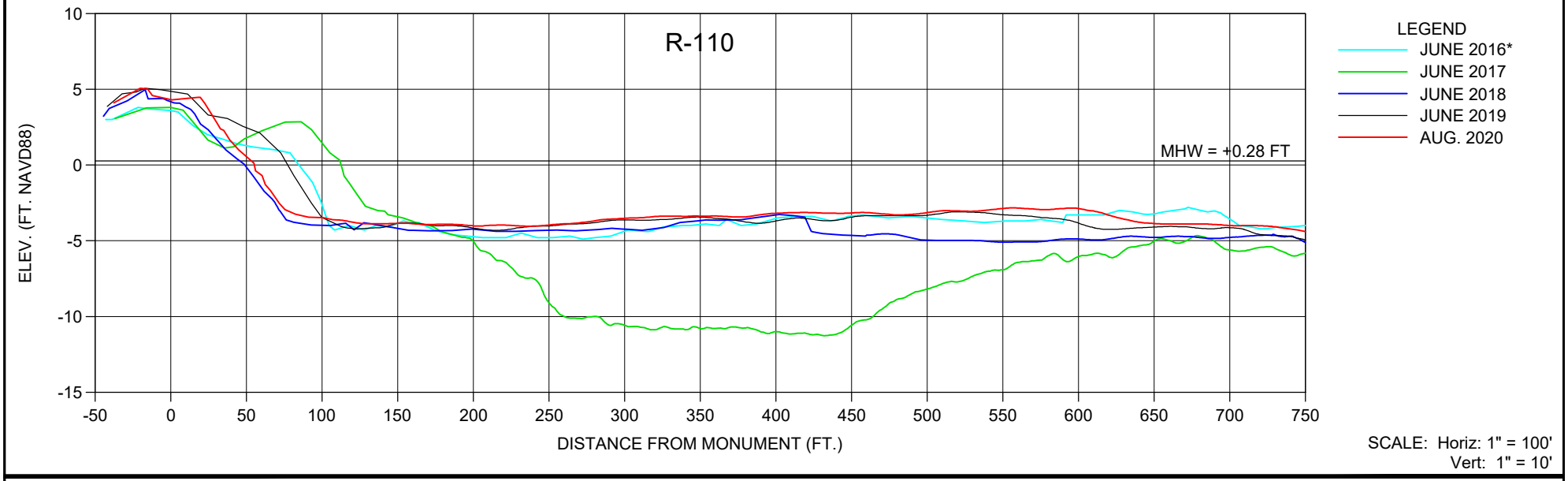
CLIENT: LEE COUNTY

TITLE: R-109 MONITORING SURVEY

DATE:	8/20/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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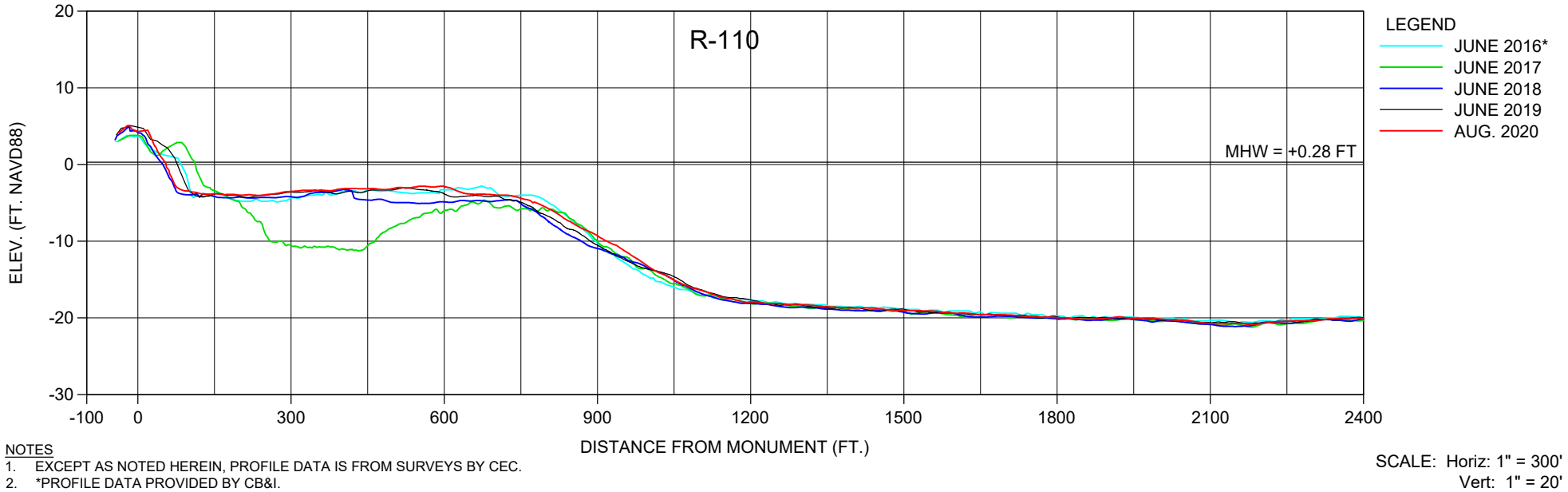

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 6
FILE NO.: 20030-R-110

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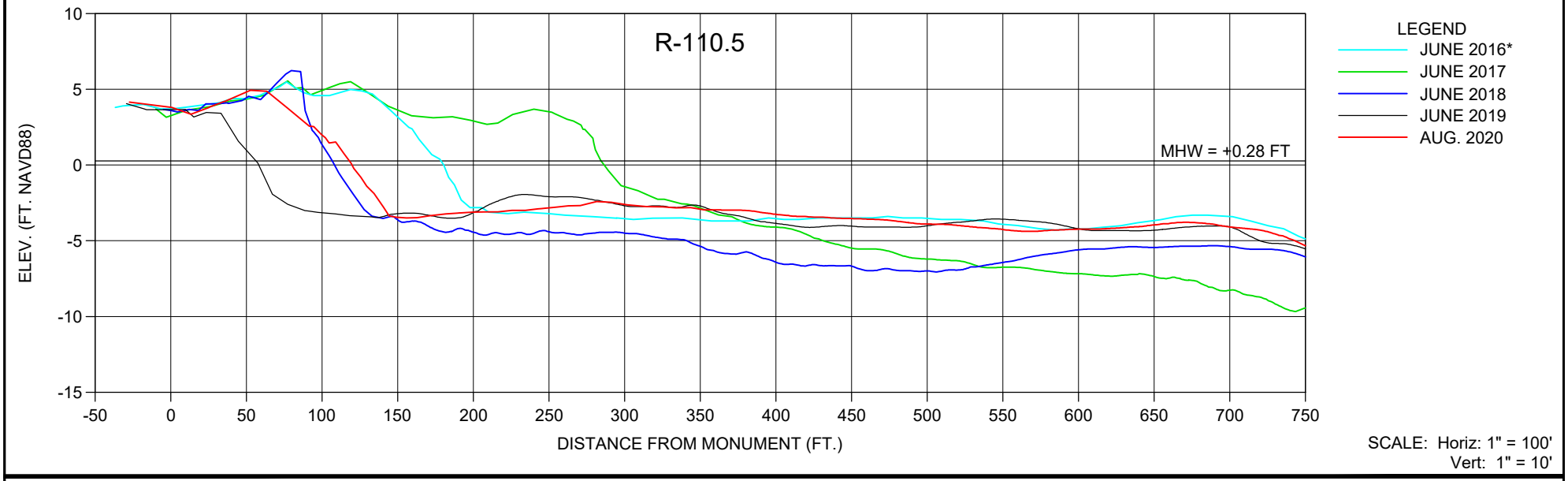
CLIENT: LEE COUNTY

TITLE: R-110 MONITORING SURVEY

DATE:	8/20/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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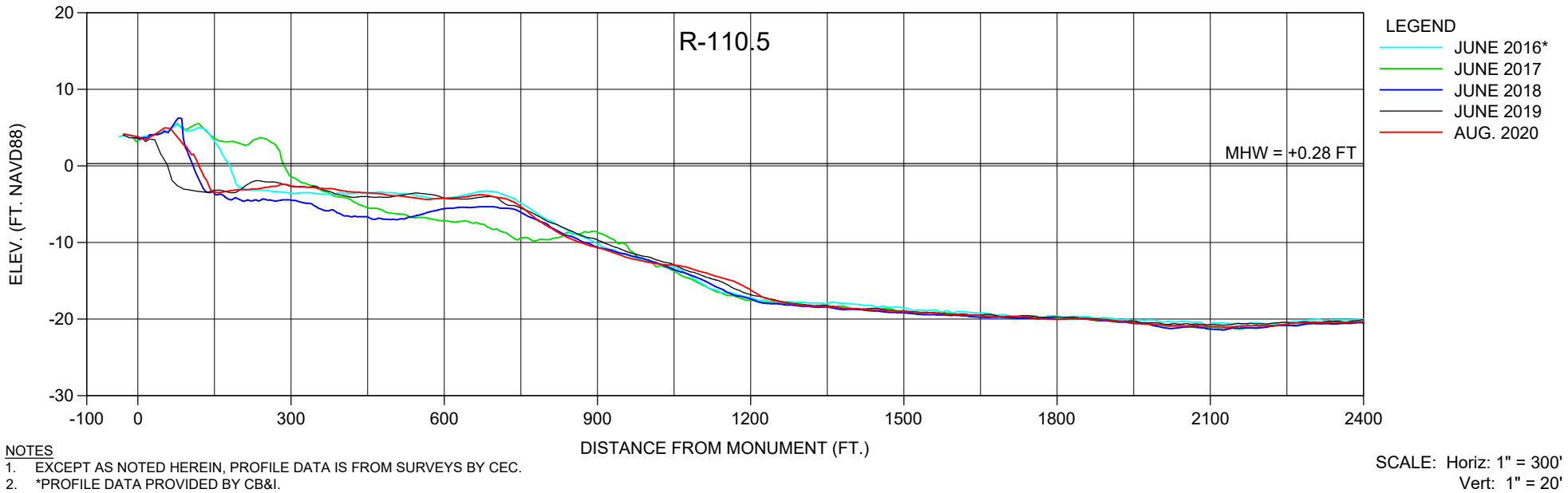

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 7
FILE NO.: 20030-R-110.5

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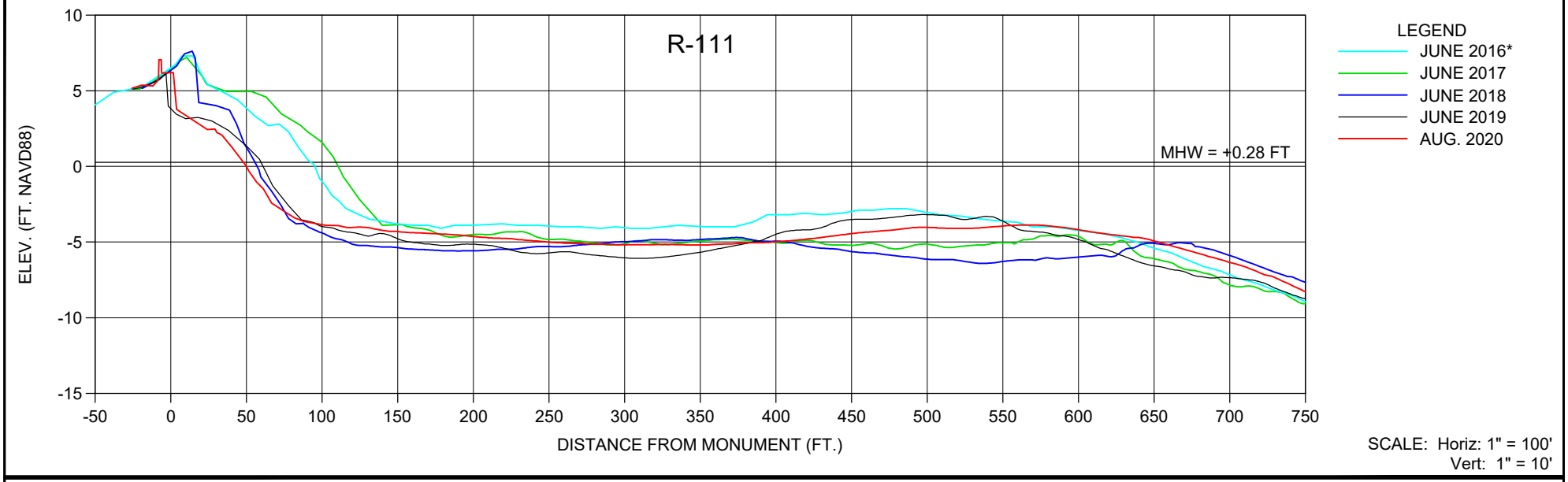
TITLE: R-110.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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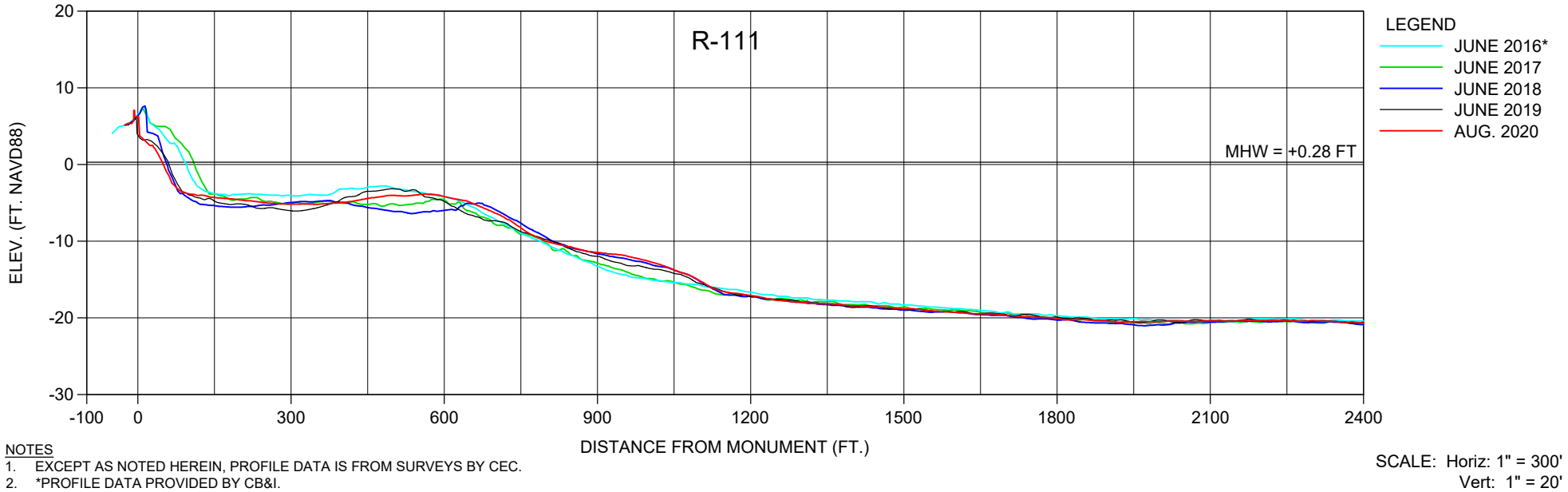

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 1 8
FILE NO.: 20030-R-111

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TITLE: R-111 MONITORING SURVEY

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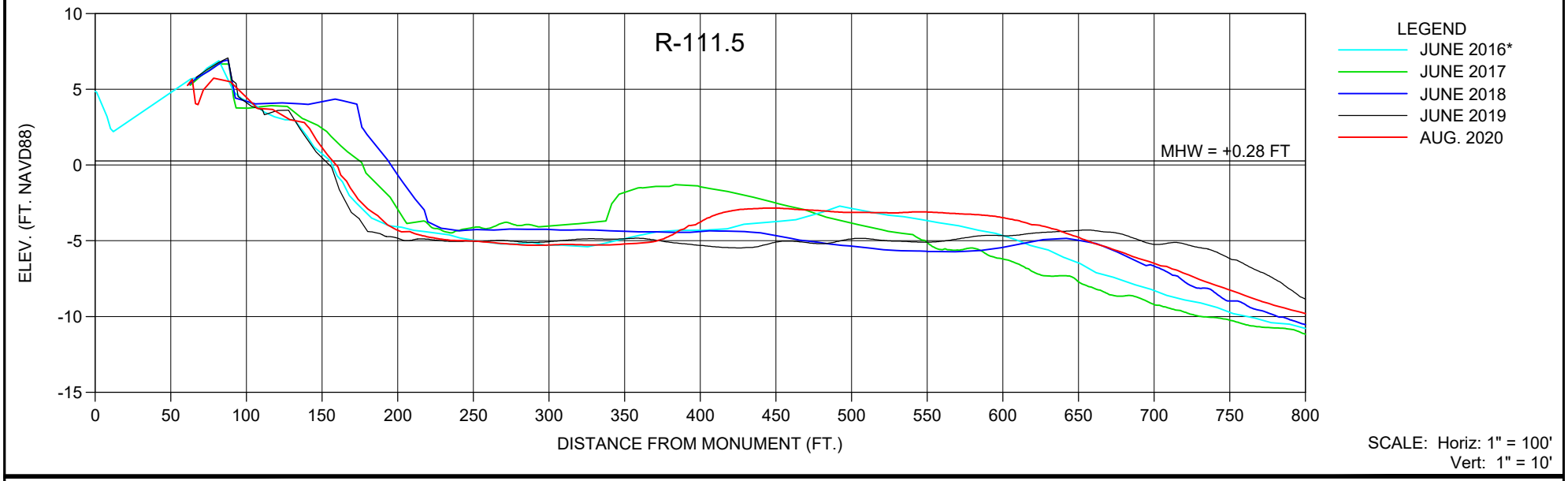
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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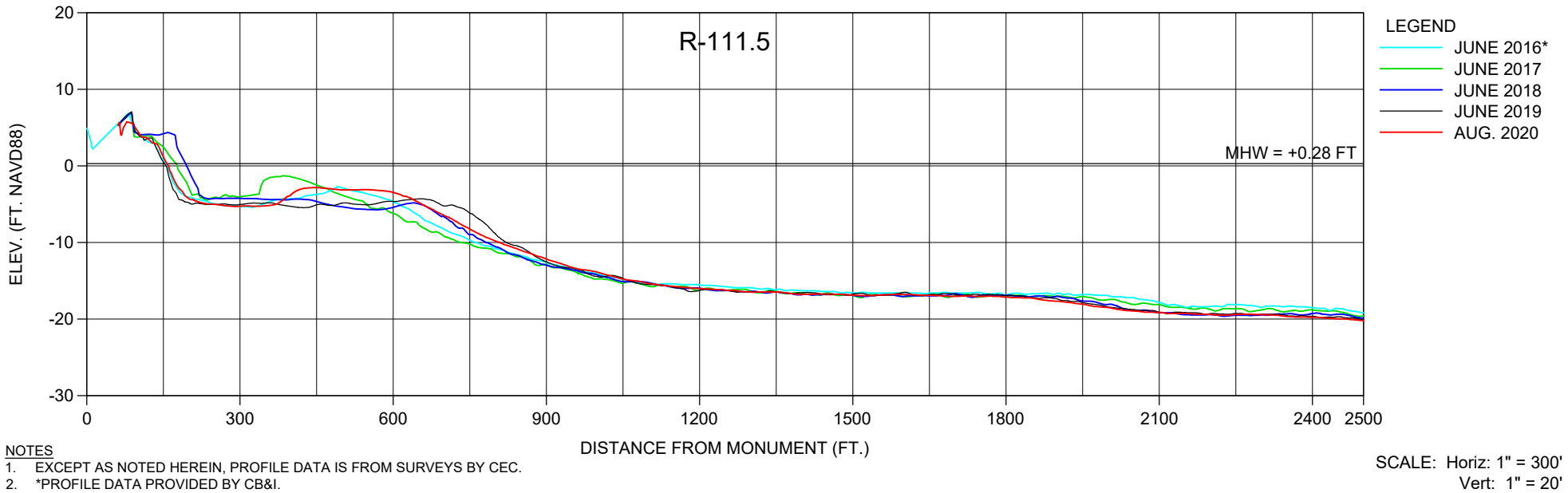

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 9
FILE NO.: 20030-R-111.5

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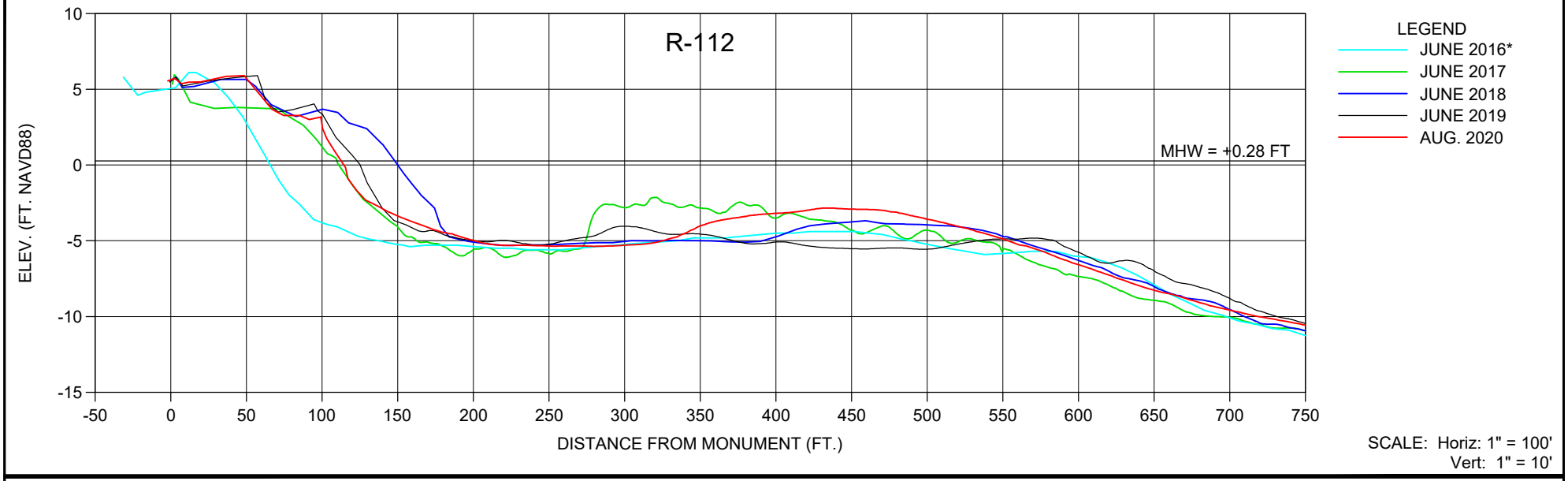
CLIENT: LEE COUNTY

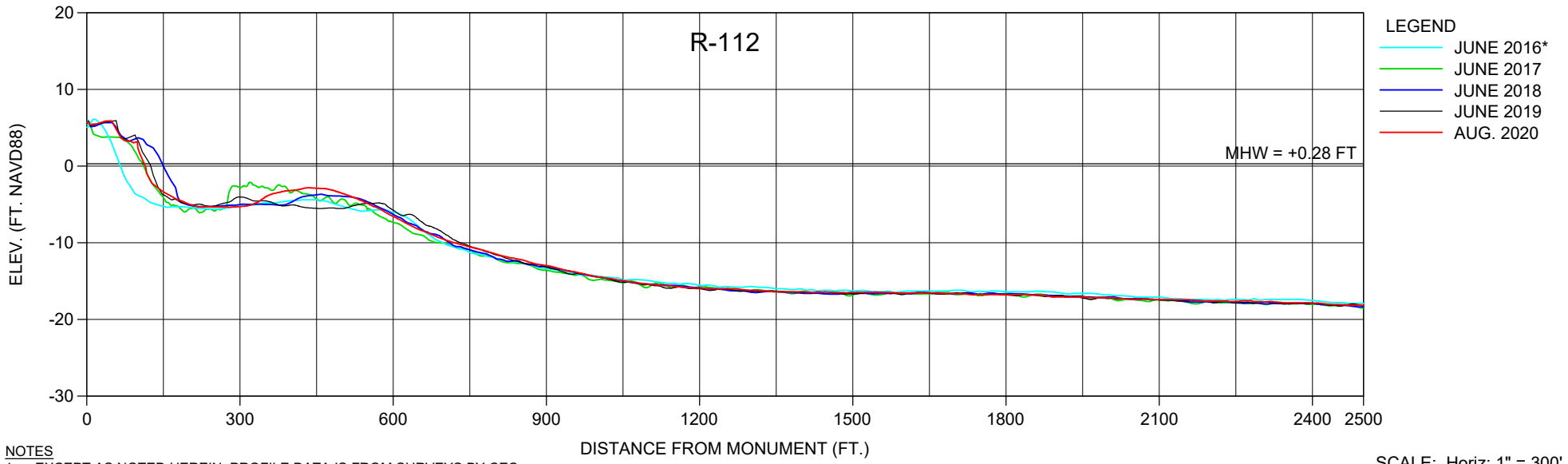
TITLE: R-111.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



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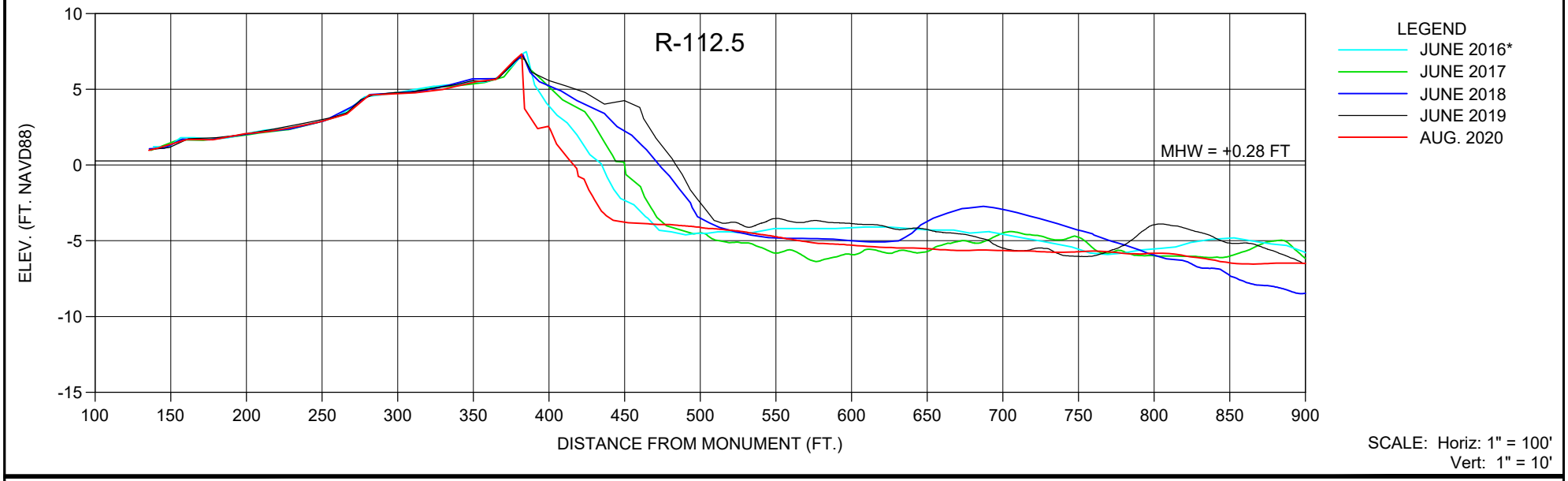
SHEET 10
FILE NO.: 20030-R-112

CLIENT: LEE COUNTY

TITLE: R-112 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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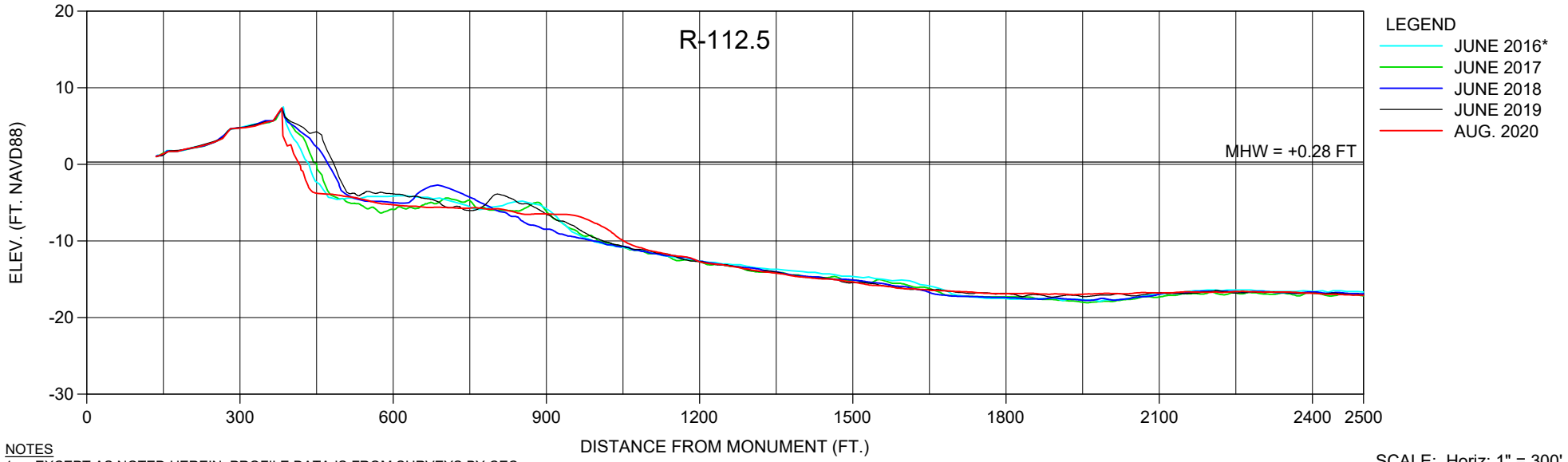
Vert: 1" = 10'



SCALE: Horiz: 1" = 300'
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FILE NO.: 20030-R-112.5 SHEET 1 1

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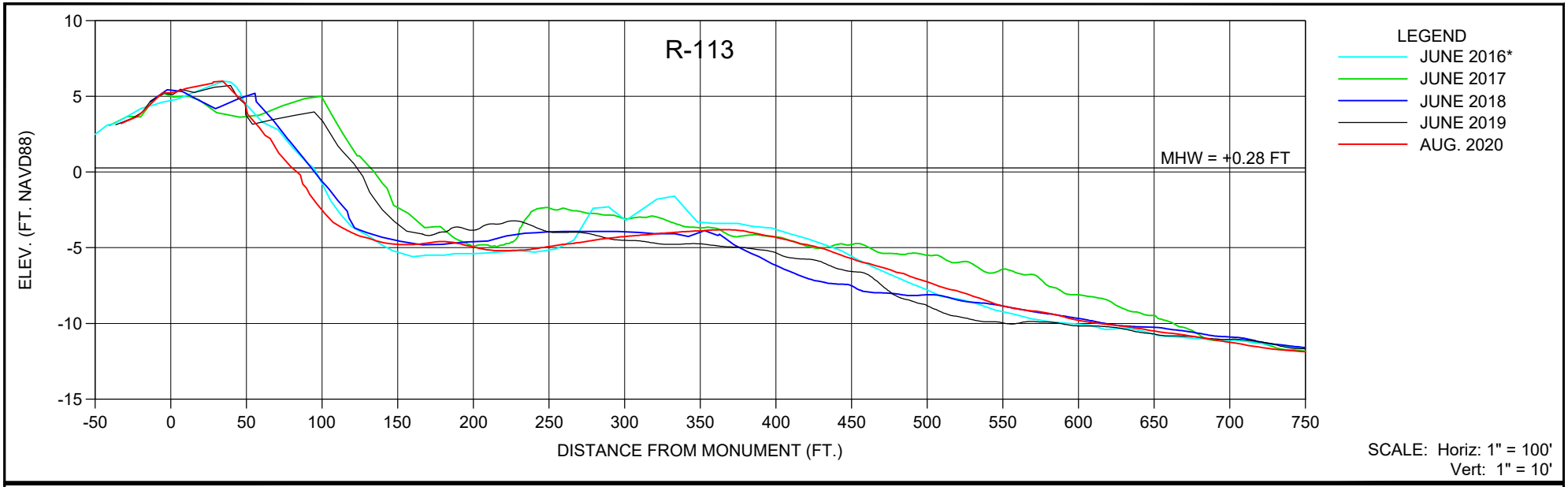
TITLE: R-112.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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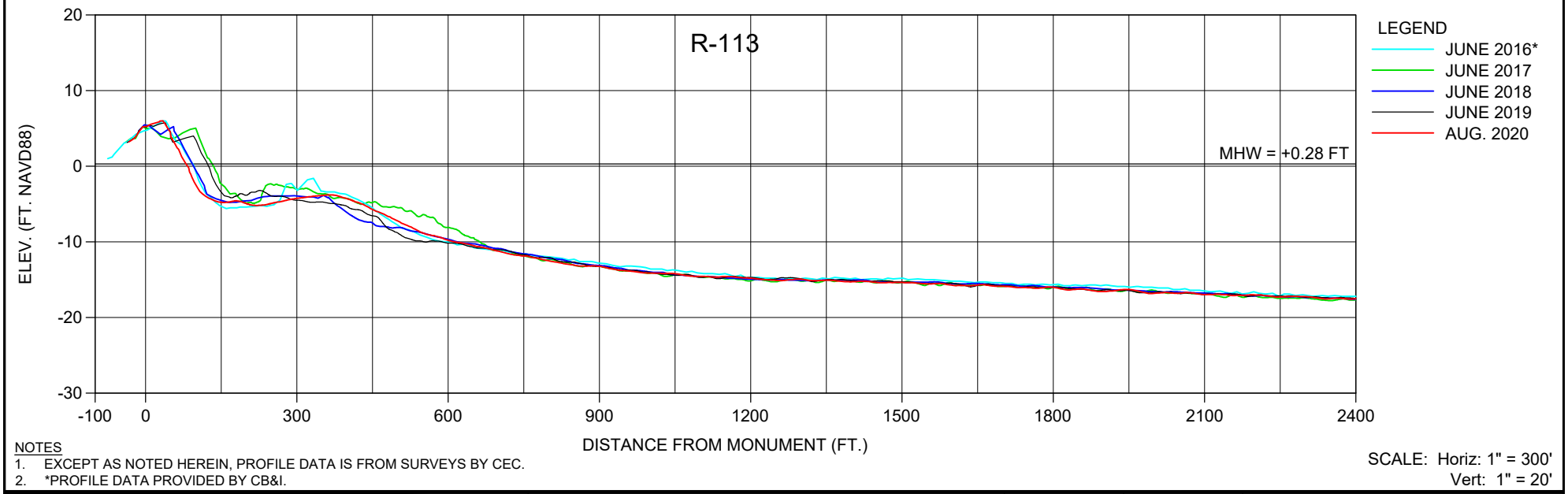

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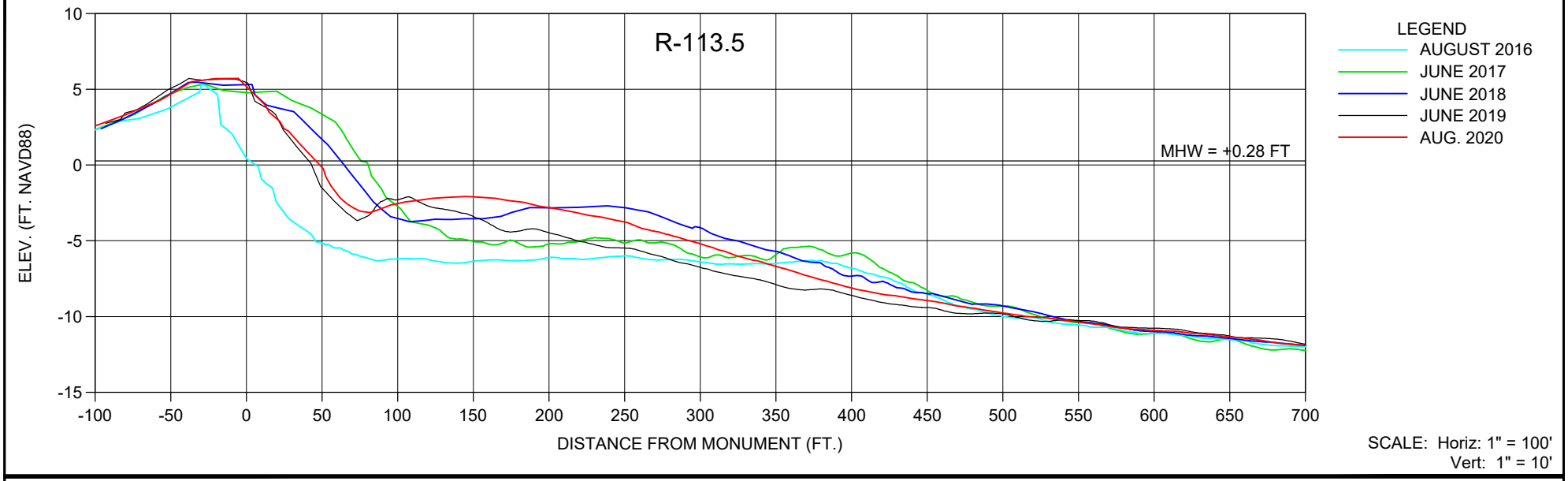
SHEET 12
FILE NO.: 20030-R-113

CLIENT: LEE COUNTY

TITLE: R-113 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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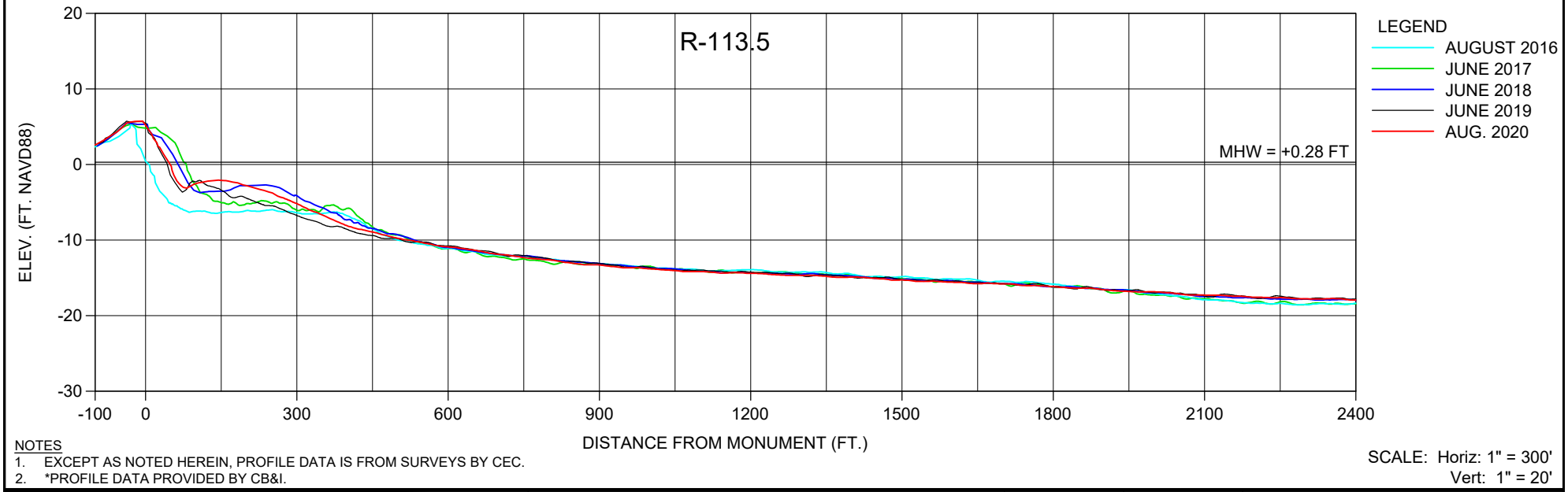

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

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SHEET 13
FILE NO.: 20030-R-113.5

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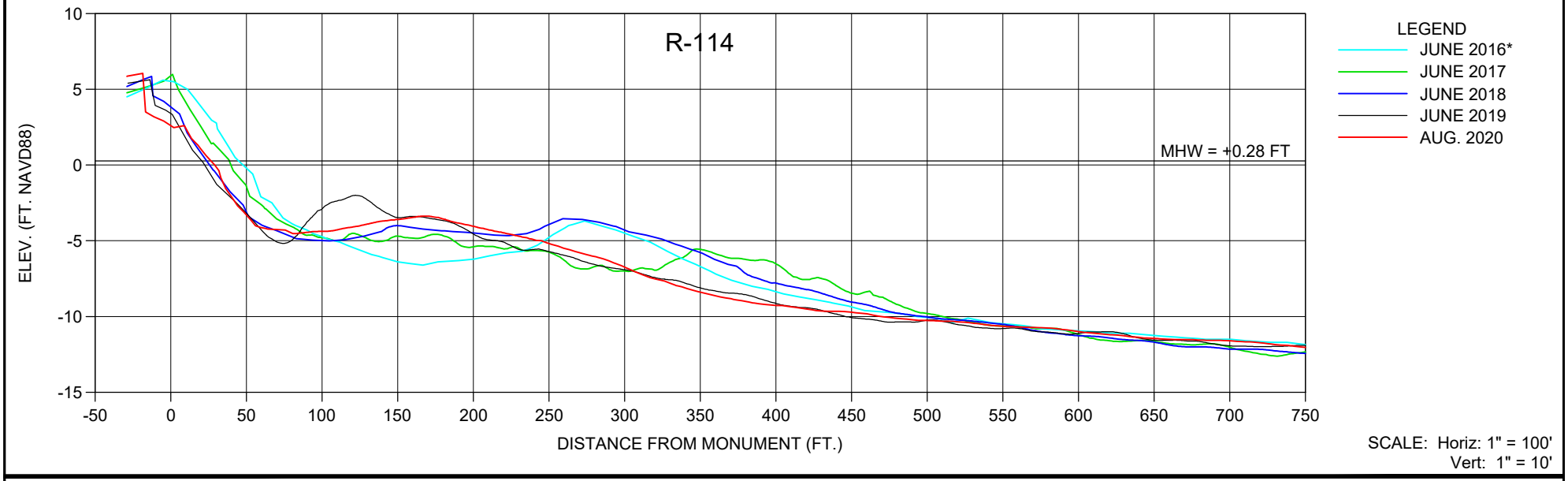
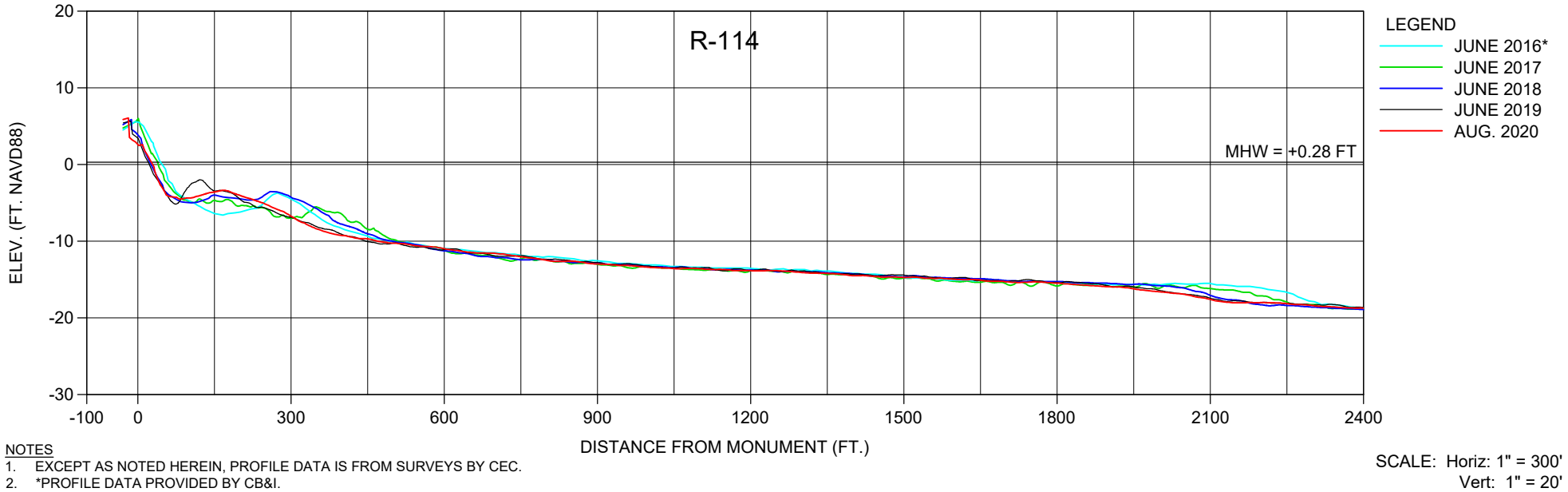
TITLE: R-113.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



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Vert: 1" = 20'

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SHEET 14
FILE NO.: 20030-R-114

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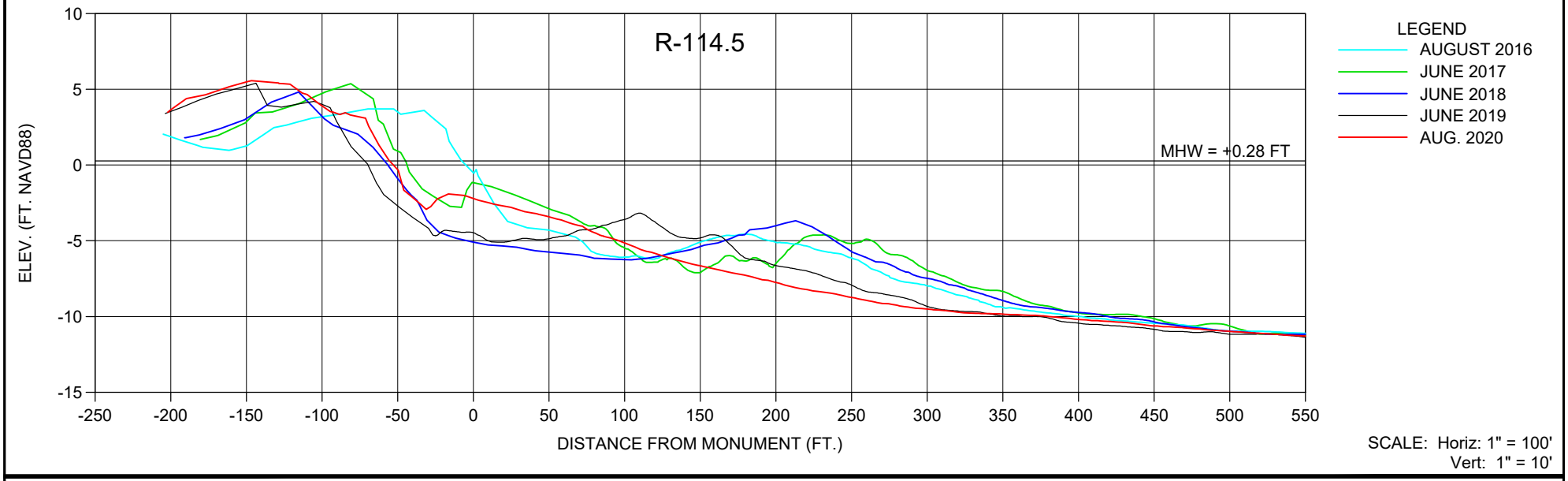
CLIENT: LEE COUNTY

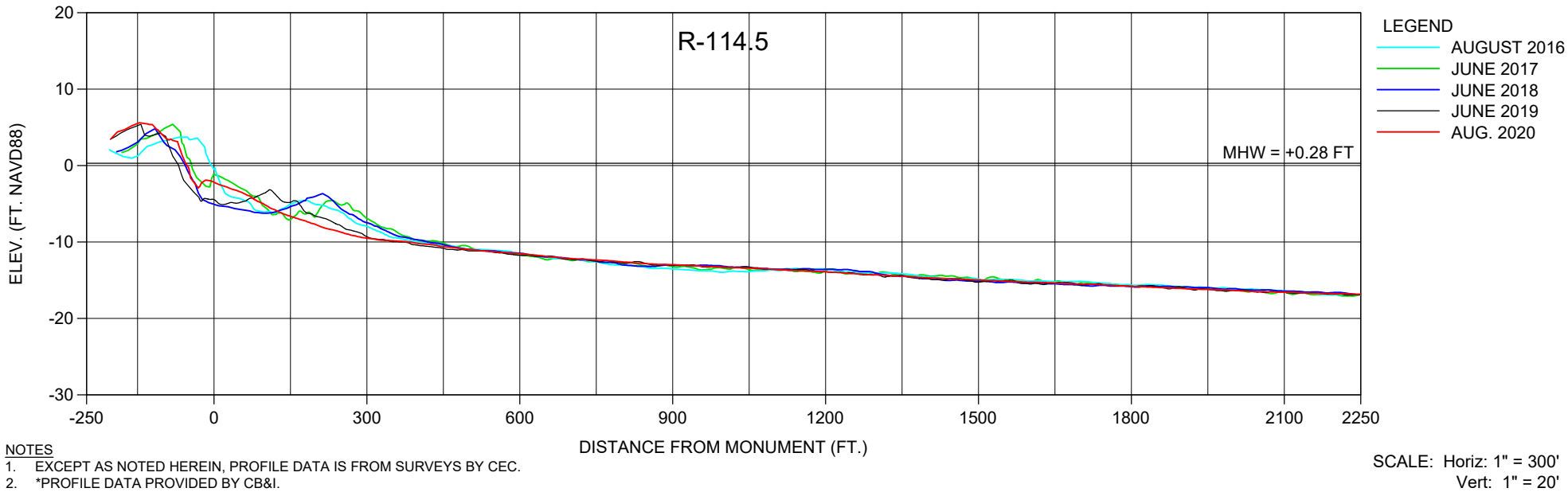
TITLE: R-114 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 15
FILE NO.: 20030-R-114.5

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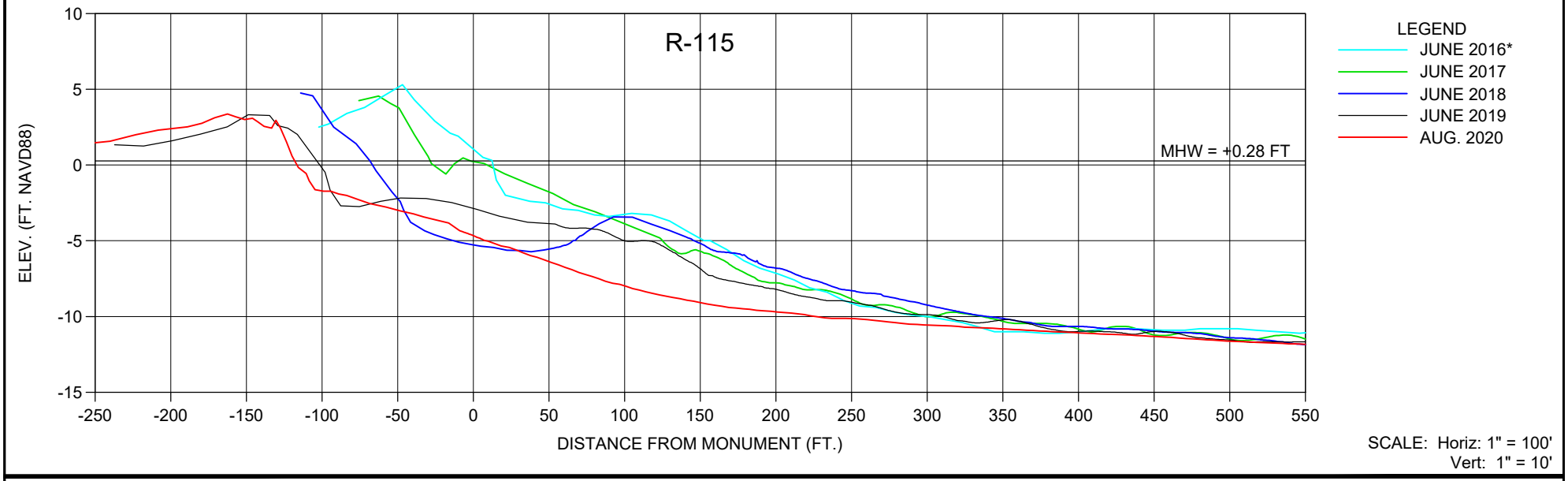
CLIENT: LEE COUNTY

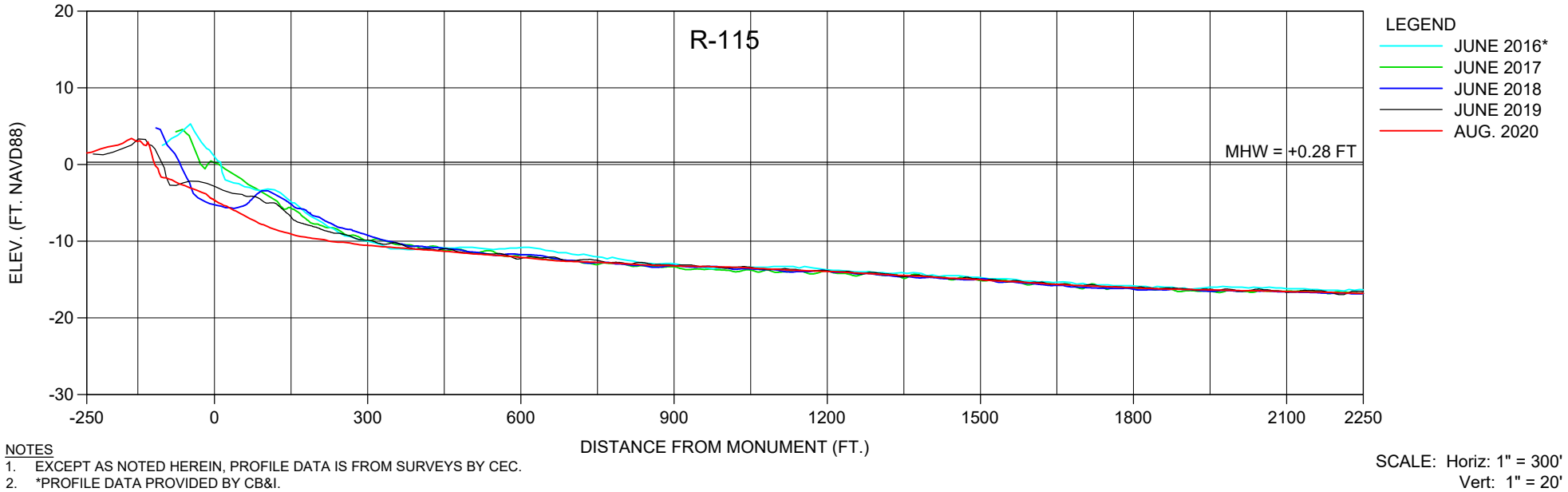
TITLE: R-114.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 16
FILE NO.: 20030-R-115

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SURVEYING: LB 2464
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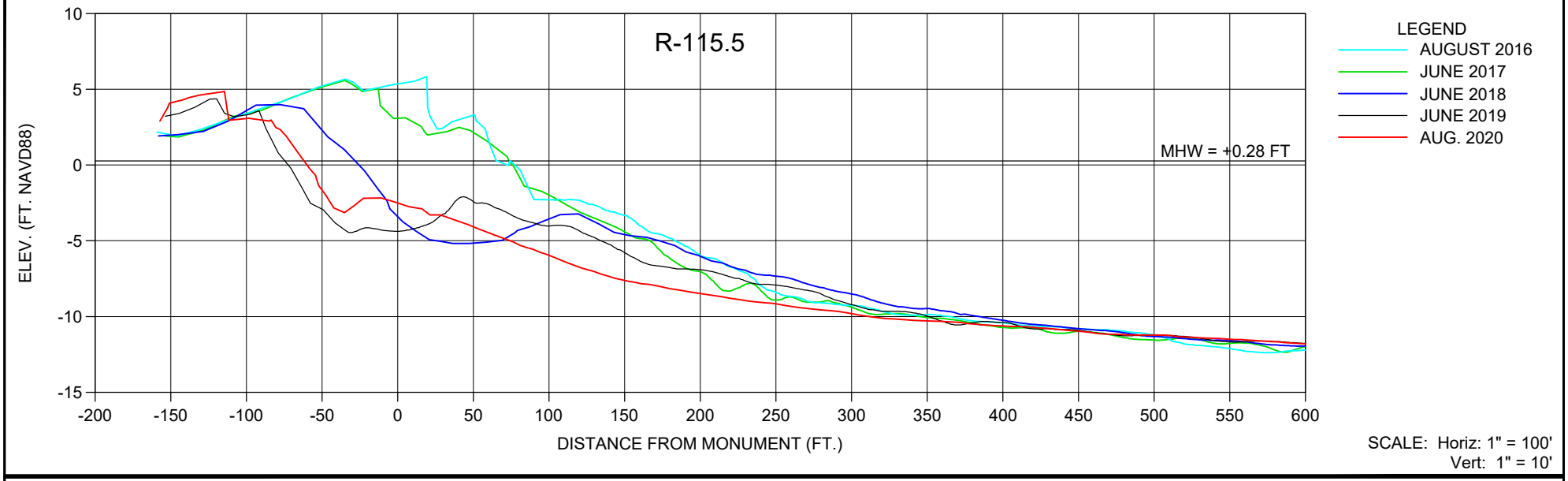
www.coastalengineering.com
E-Mail: info@cecifl.com

CLIENT: LEE COUNTY

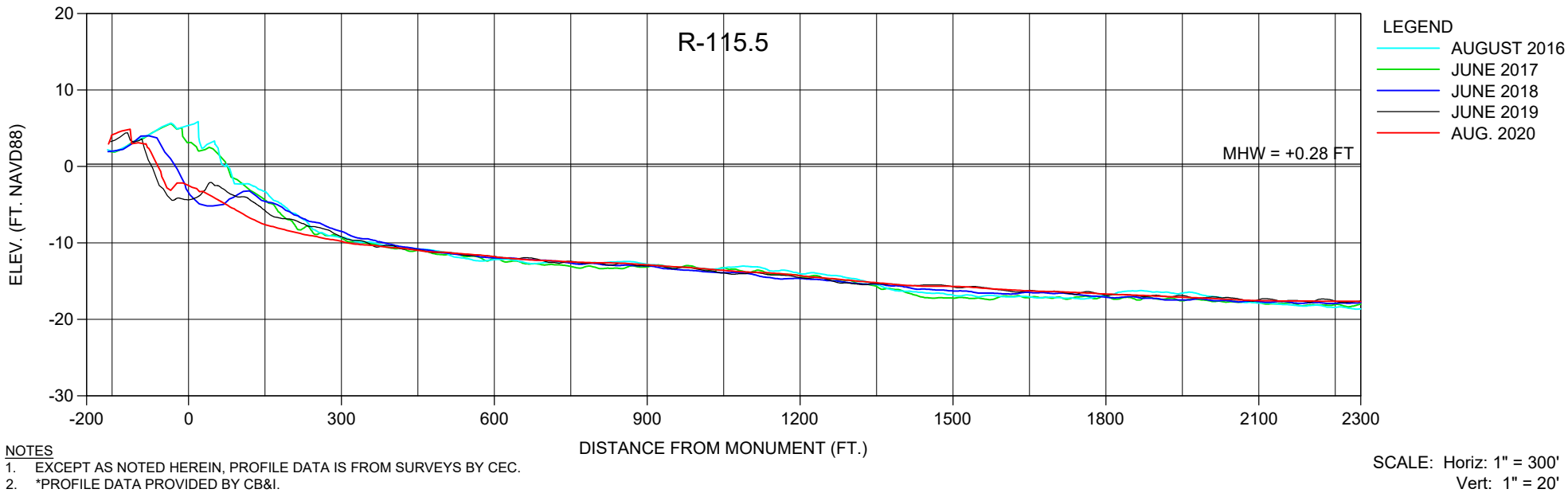
TITLE: R-115 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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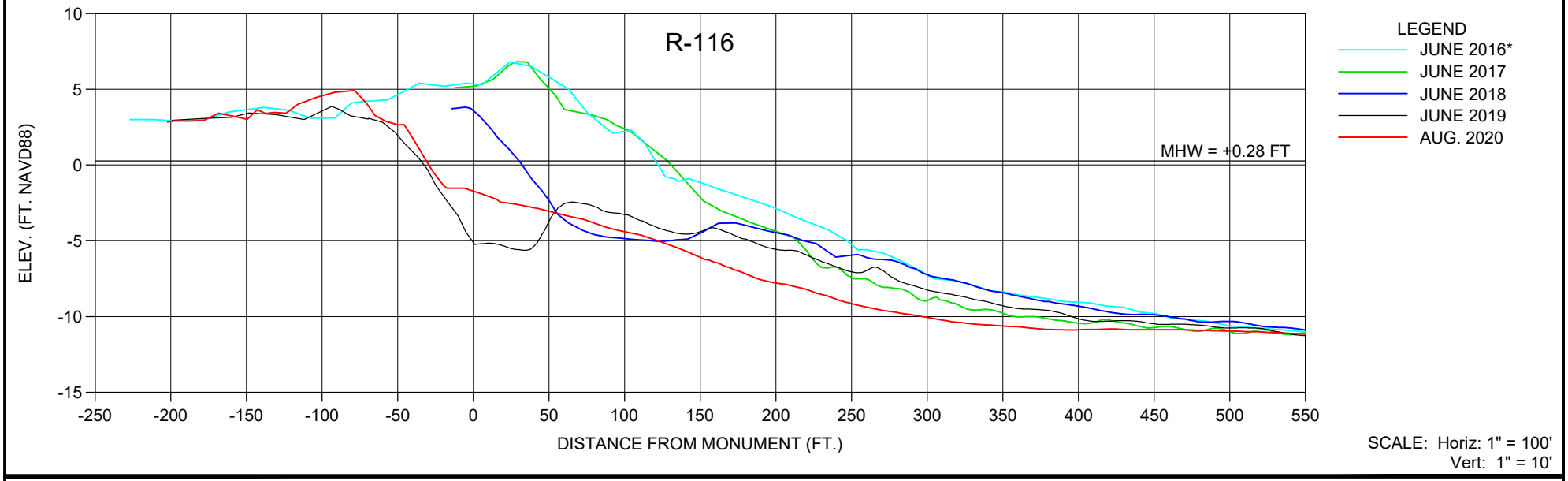
SHEET 17
FILE NO.: 20030-R-115.5

CLIENT: LEE COUNTY

TITLE: R-115.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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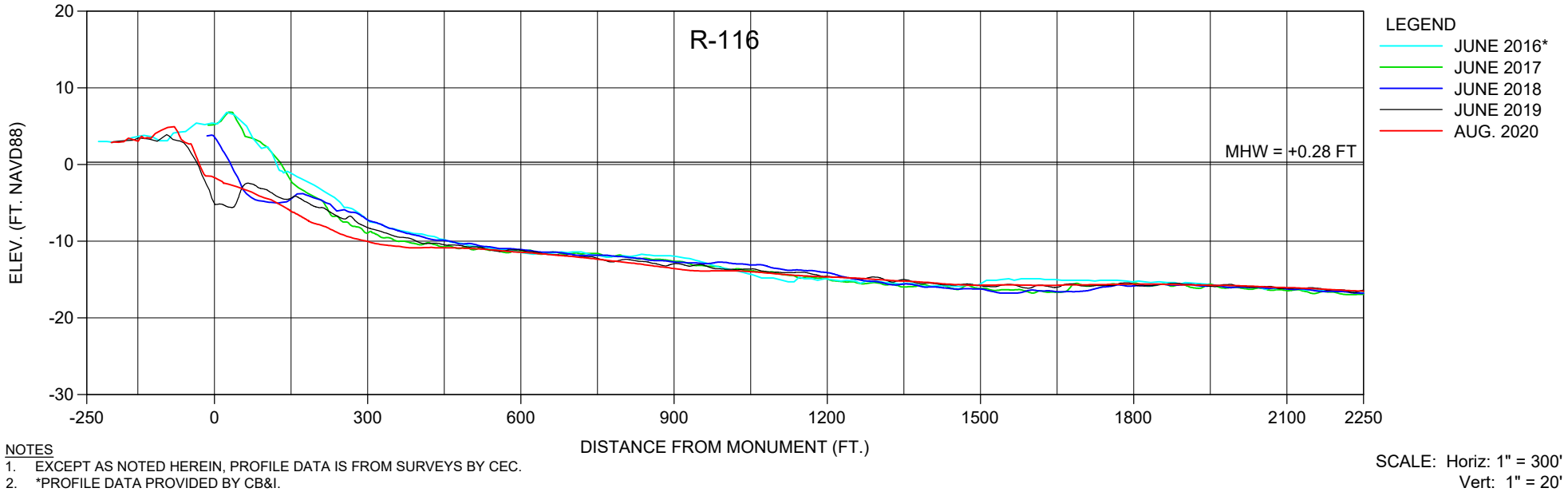

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
1. EXCEPT AS NOTED HEREIN, PROFILE DATA IS FROM SURVEYS BY CEC.
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SHEET 18
FILE NO.: 20030-R-116

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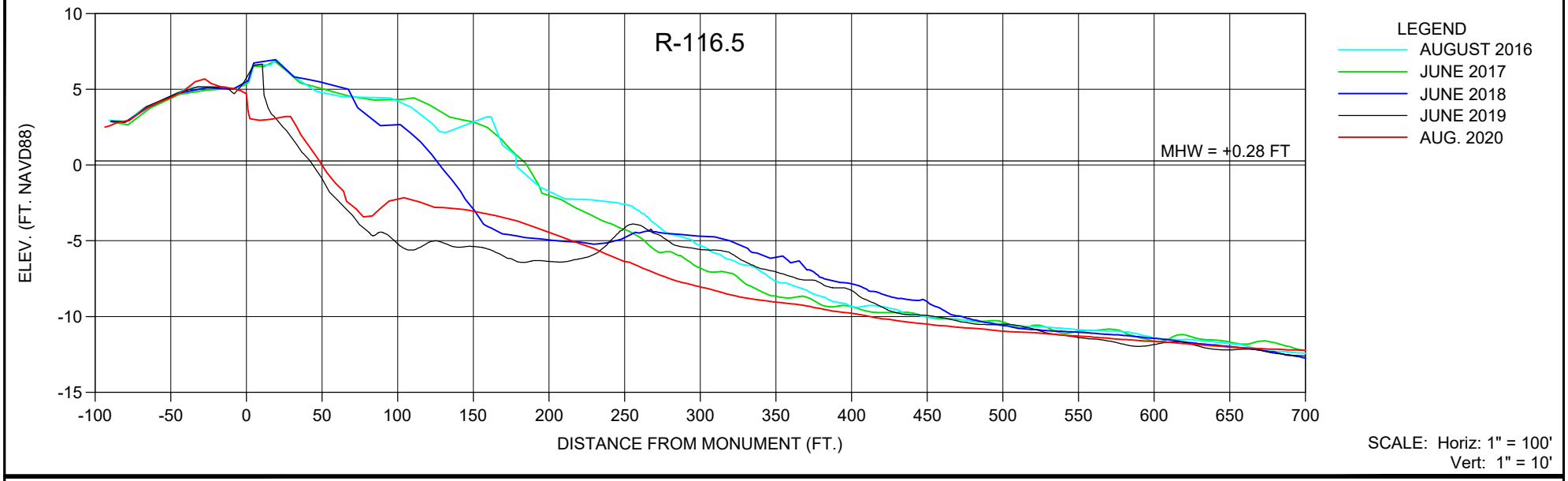
TITLE: R-116 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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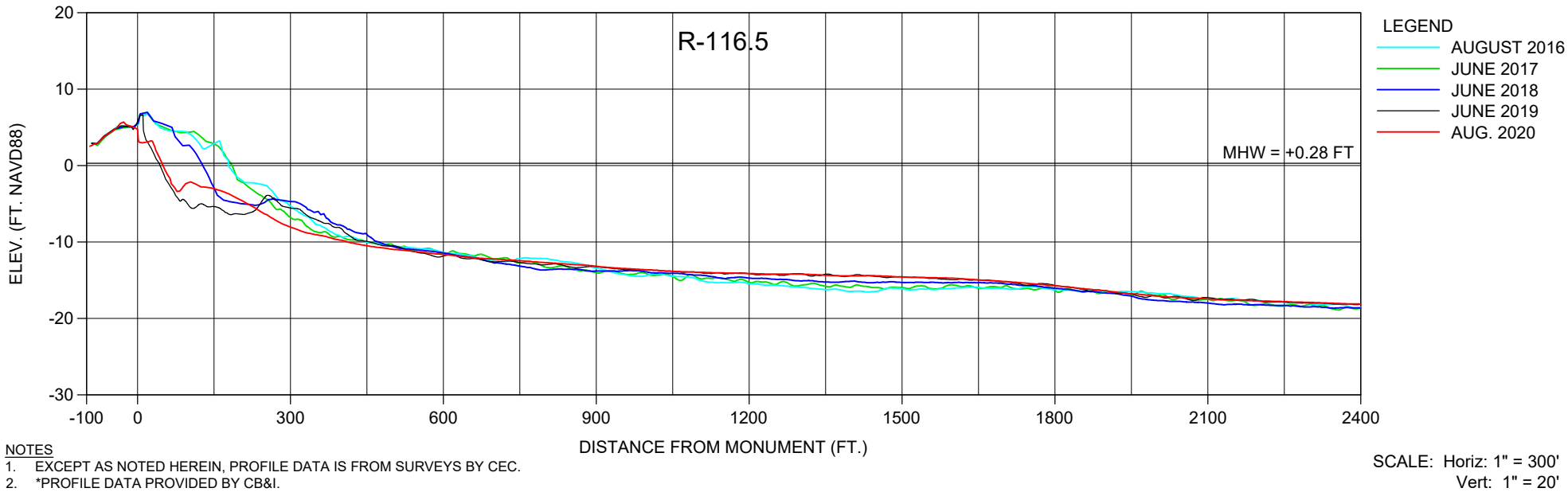
Vert: 1" = 10'



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

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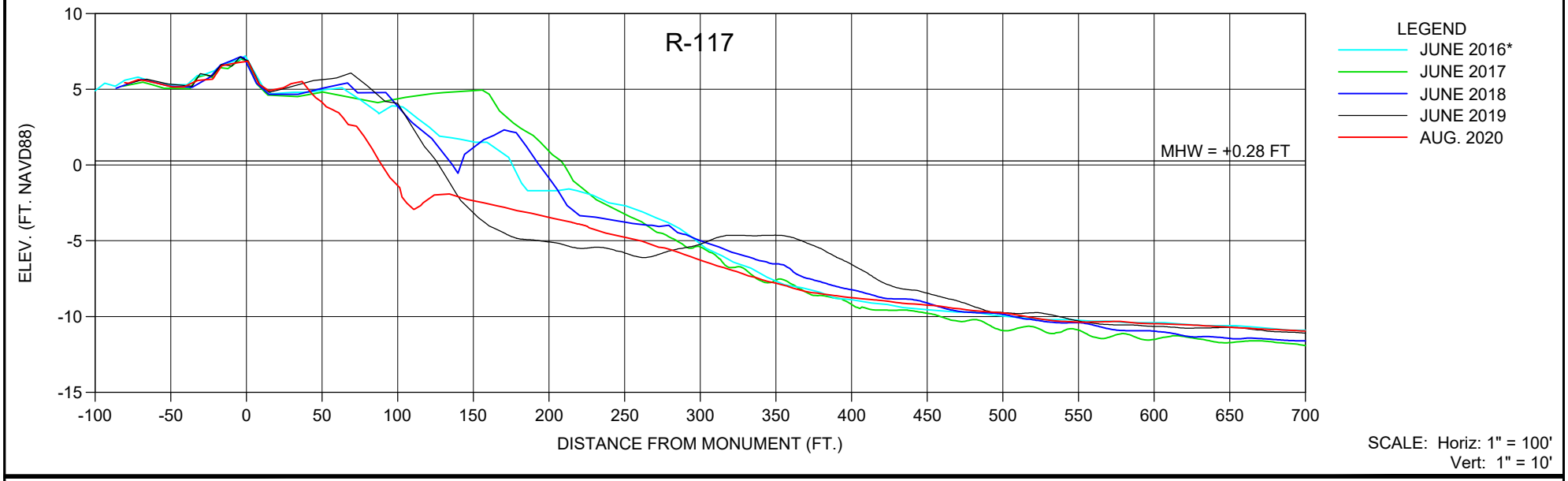
SHEET 19
FILE NO.: 20030-R-116.5

CLIENT: LEE COUNTY

TITLE: R-116.5 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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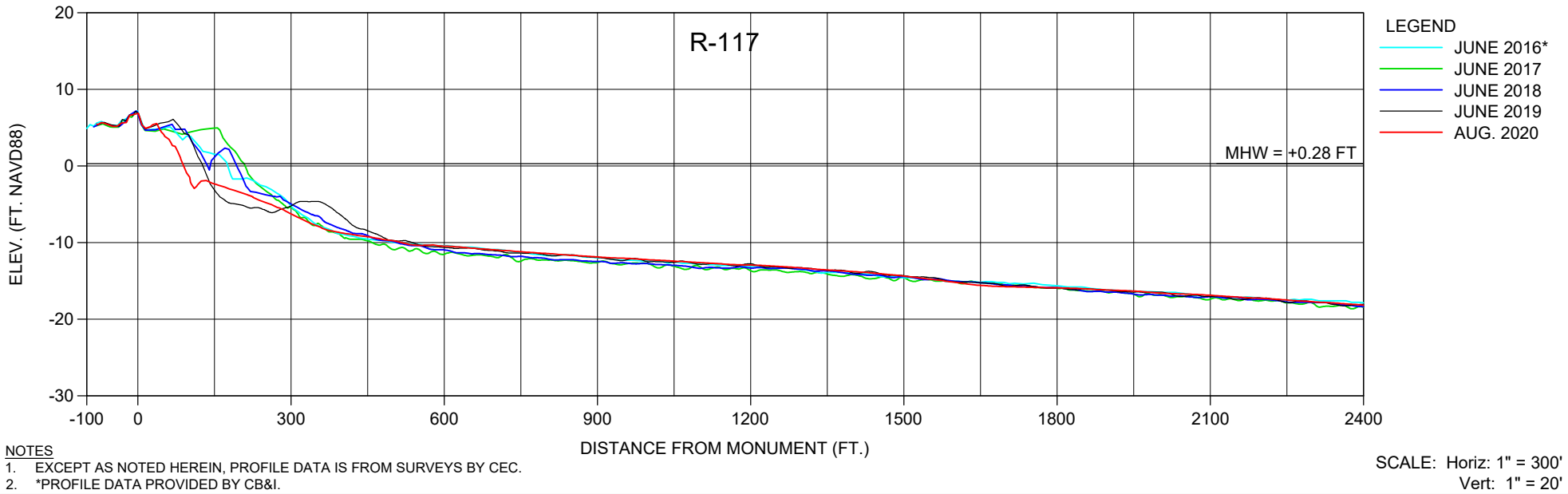
Vert: 1" = 10'



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 20
FILE NO.: 20030-R-117

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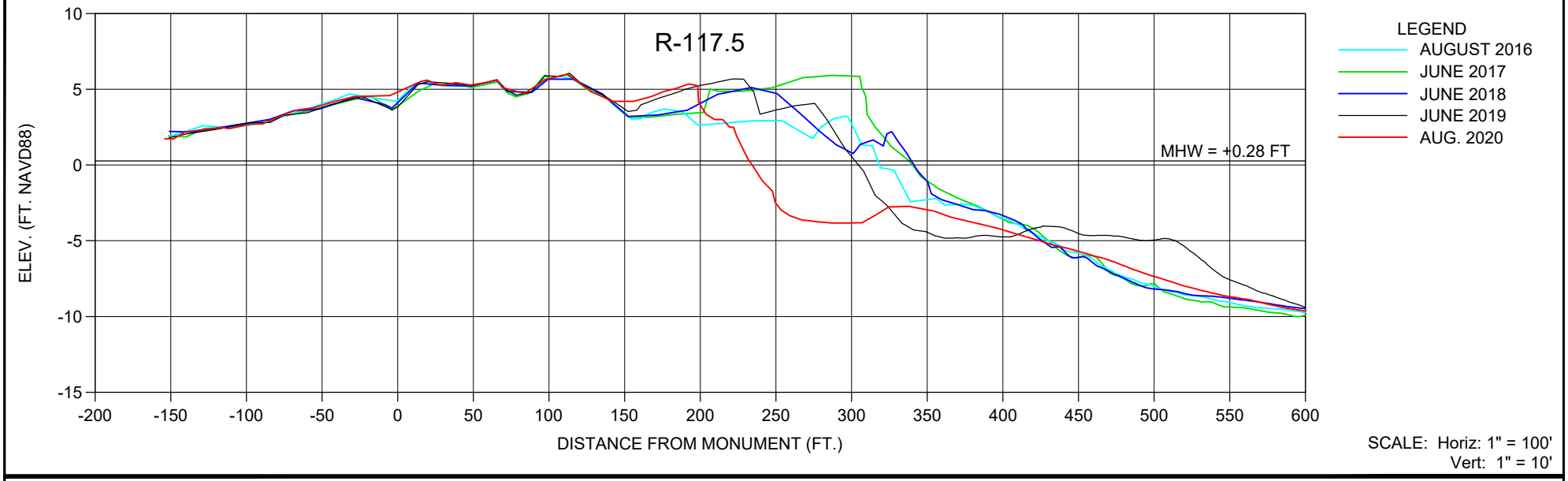
CLIENT: LEE COUNTY

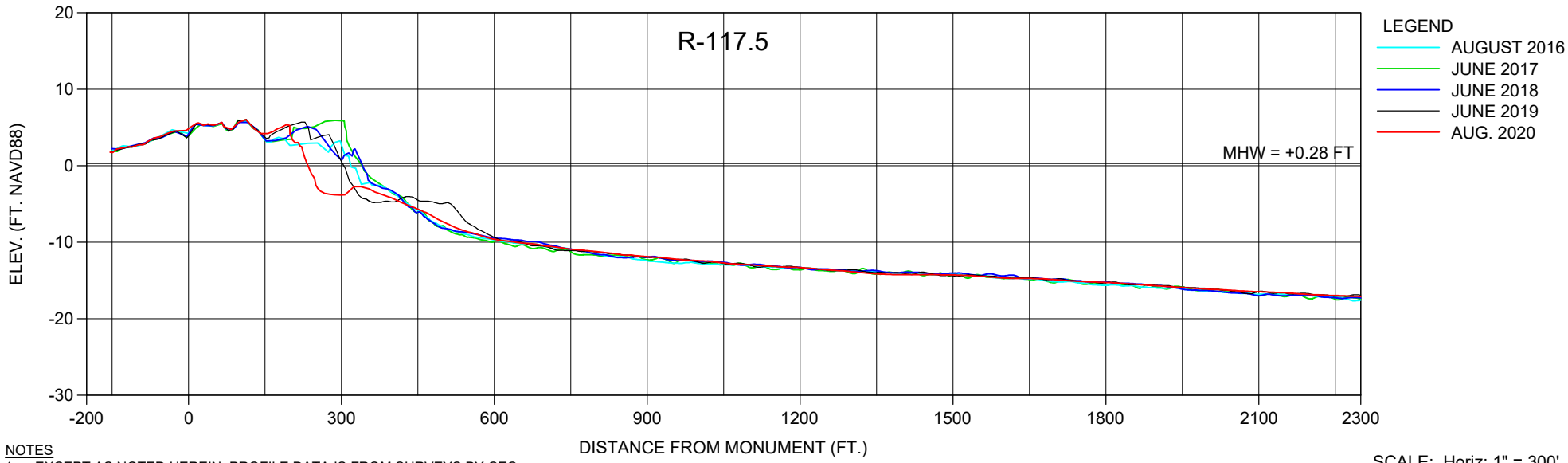
TITLE: R-117 MONITORING SURVEY

DATE:	8/20/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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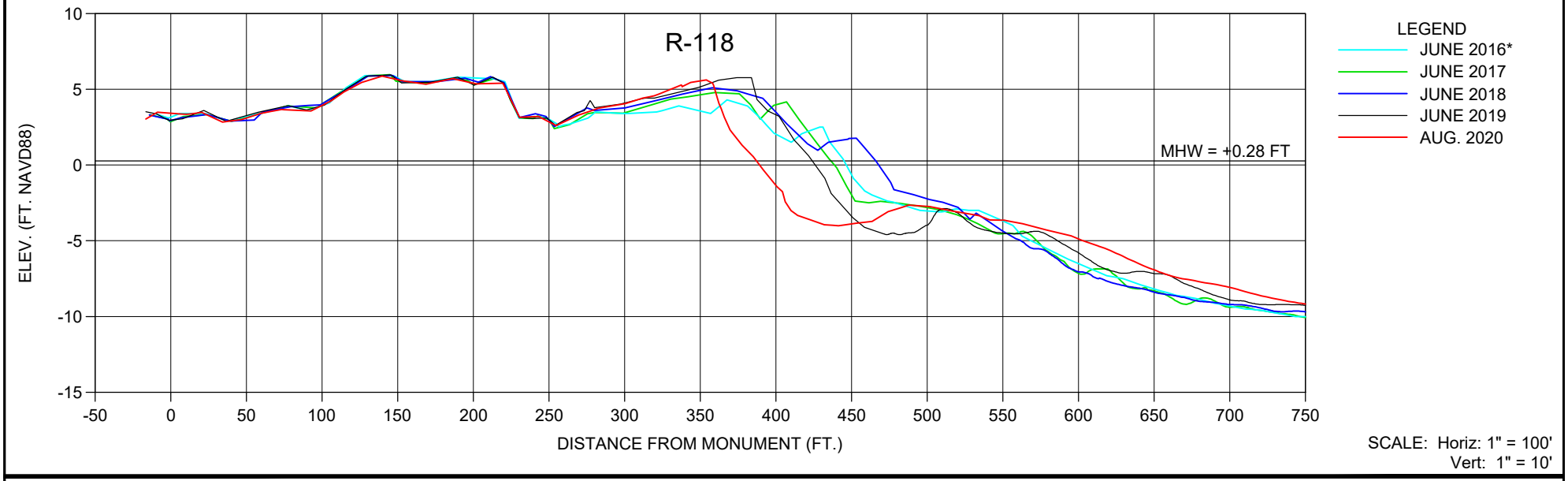
CLIENT: LEE COUNTY

TITLE: R-117.5 MONITORING SURVEY

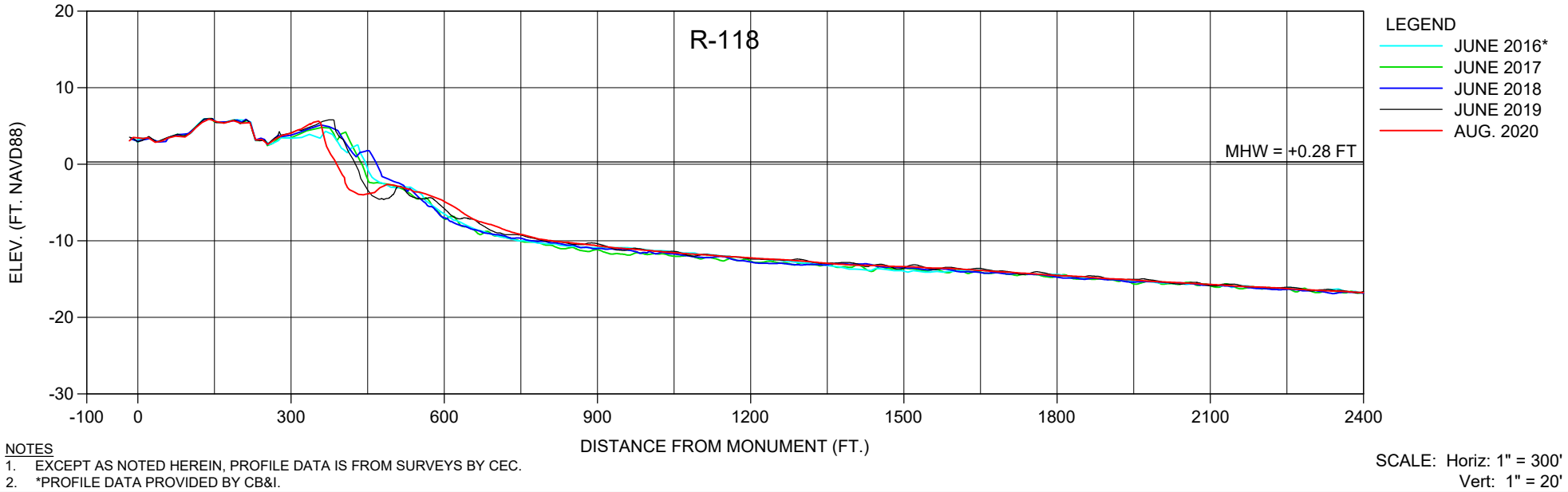
DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION

SHEET 1 2 1
FILE NO.: 20030-R-117.5



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
1. EXCEPT AS NOTED HEREIN, PROFILE DATA IS FROM SURVEYS BY CEC.
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SHEET 22
FILE NO.: 20030-R-118

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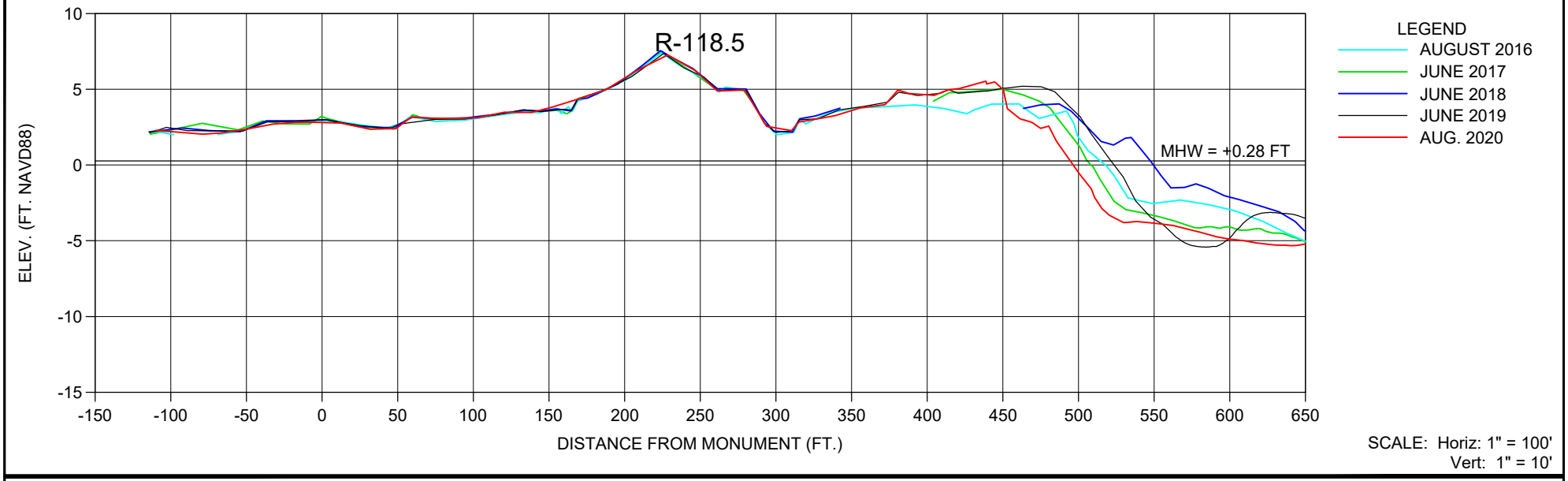
CLIENT: LEE COUNTY

TITLE: R-118 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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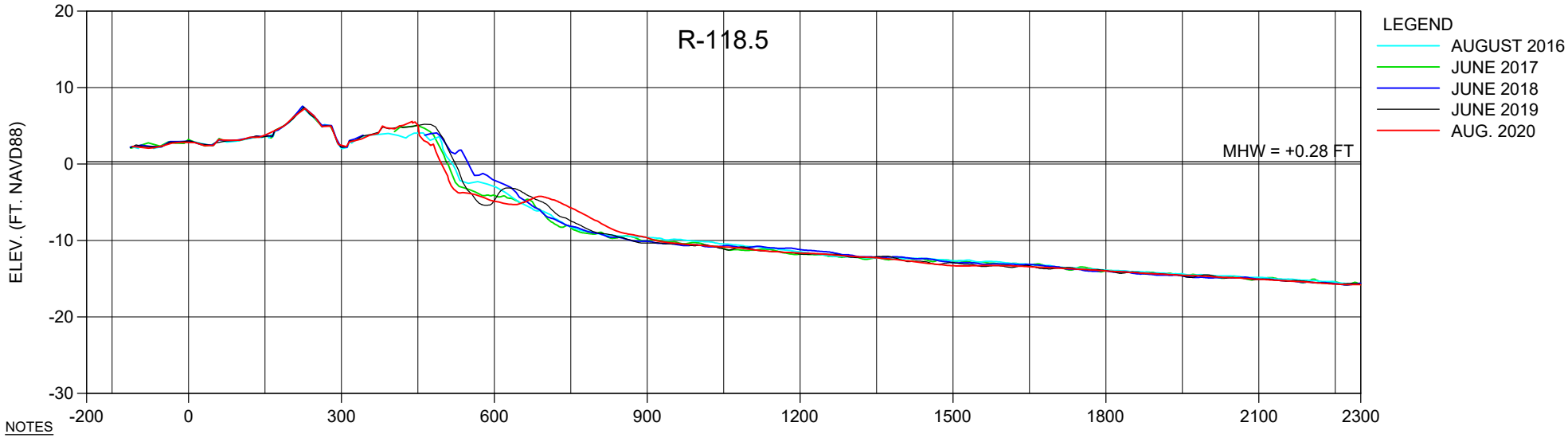

SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
1. EXCEPT AS NOTED HEREIN, PROFILE DATA IS FROM SURVEYS BY CEC.
2. *PROFILE DATA PROVIDED BY CB&I.
3. UPLAND DATA GAPS IN HISTORICAL PROFILES REFECT SHOREBIRD NESTING AREAS, UNLESS OTHERWISE NOTED.

SHEET 23
FILE NO.: 20030-R-118.5

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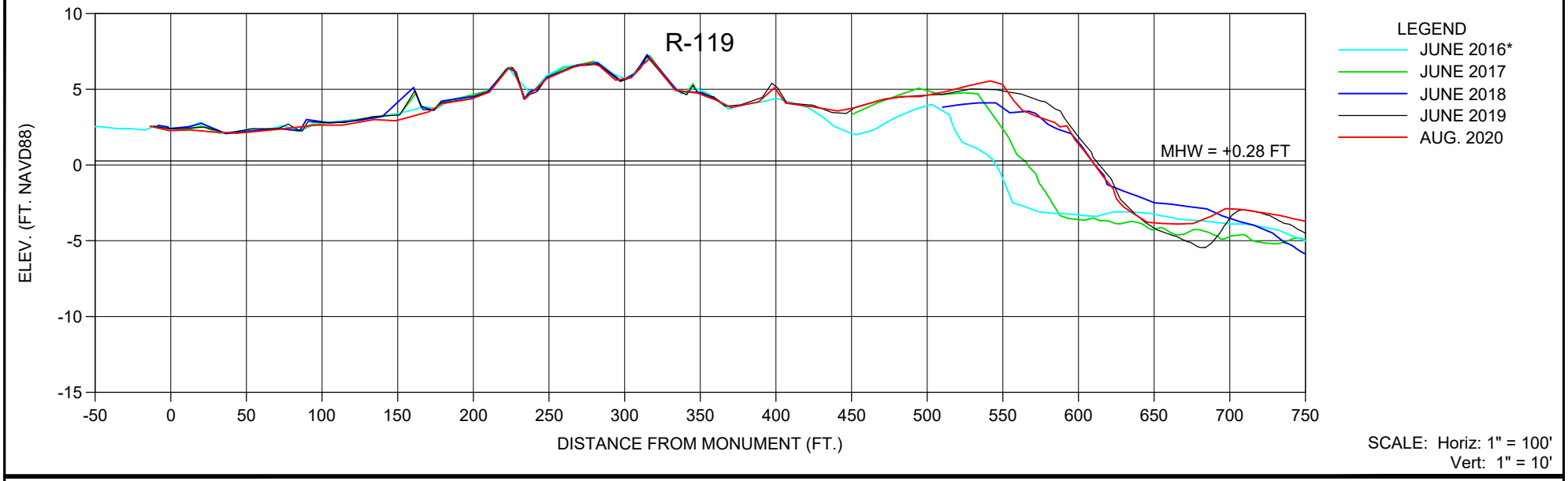
CLIENT: LEE COUNTY

TITLE: R-118.5 MONITORING SURVEY

DATE:	8/20/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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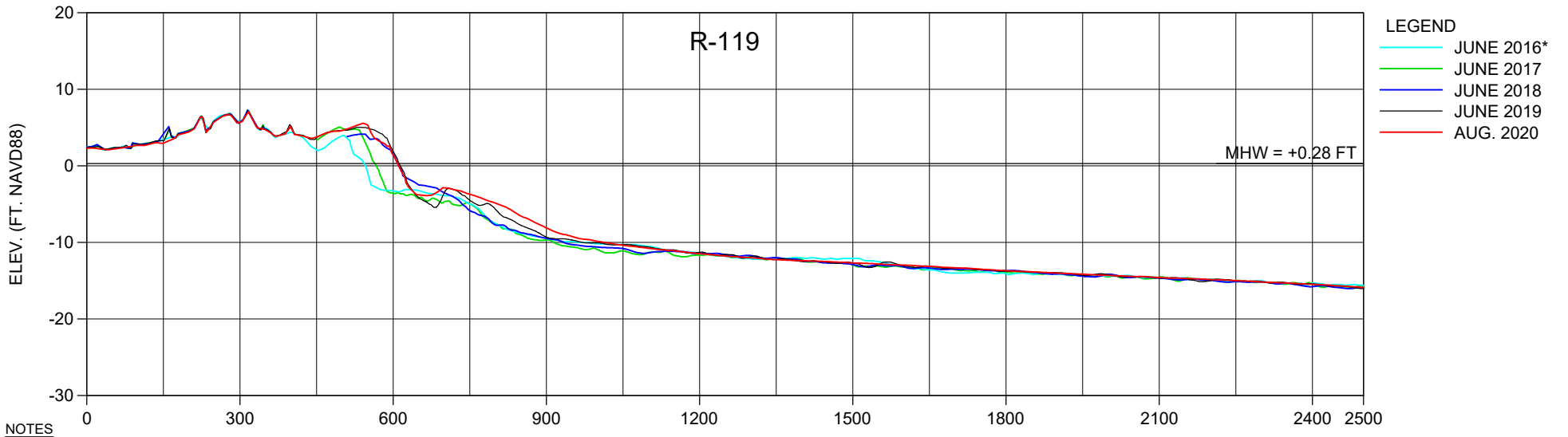
Vert: 1" = 10'



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

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FILE NO.: 20030-R-119 SHEET 24

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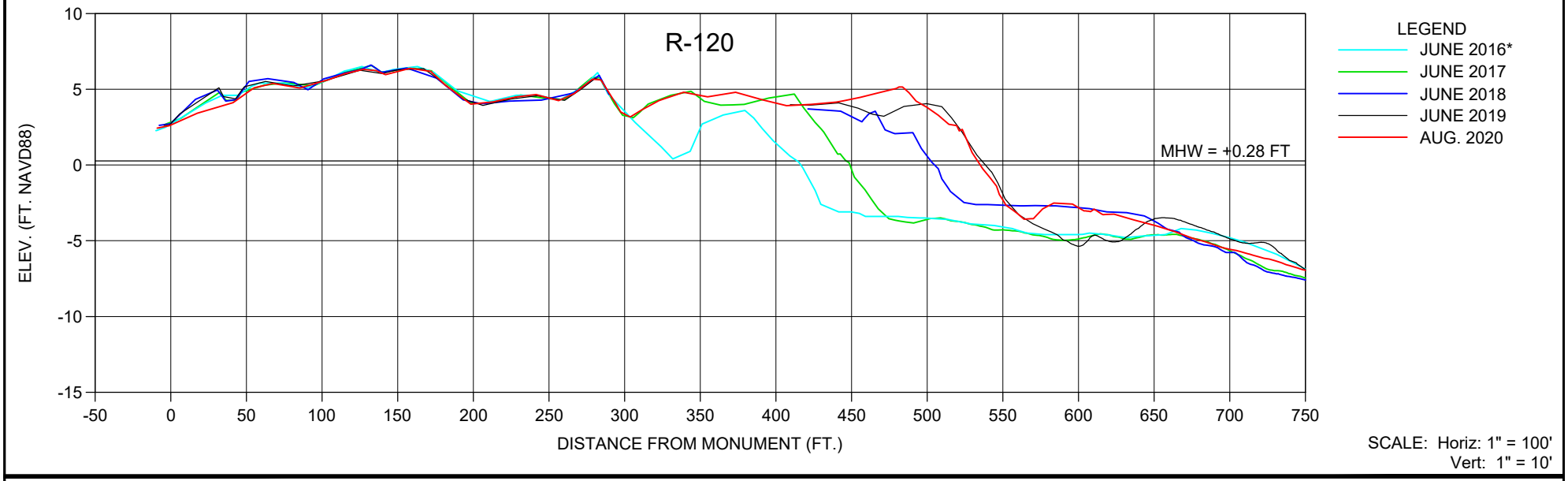
CLIENT: LEE COUNTY

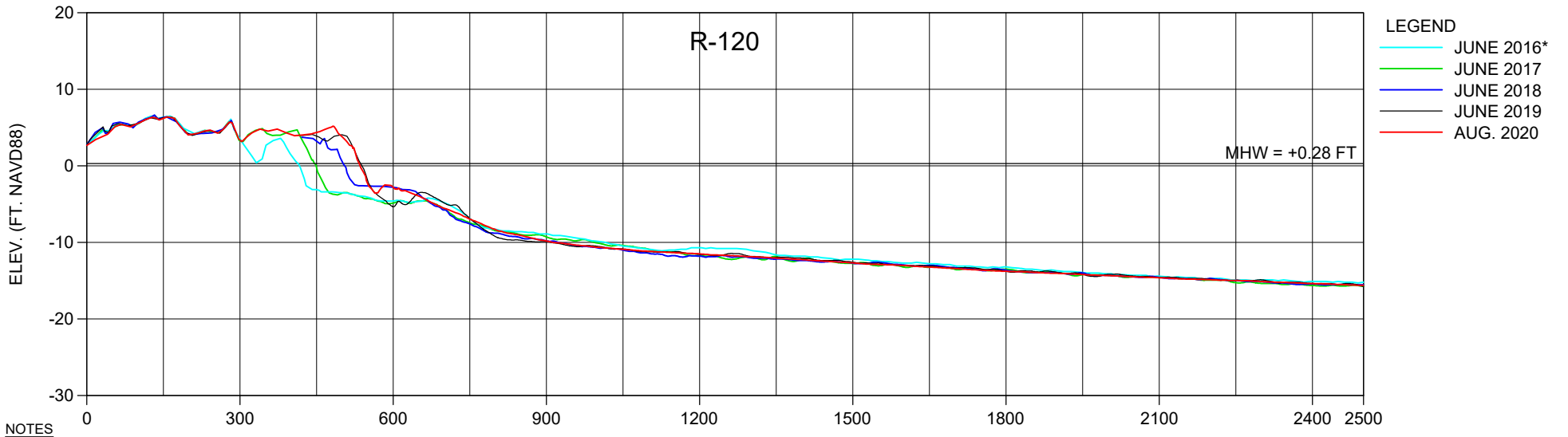
TITLE: R-119 MONITORING SURVEY

DATE:	8/20/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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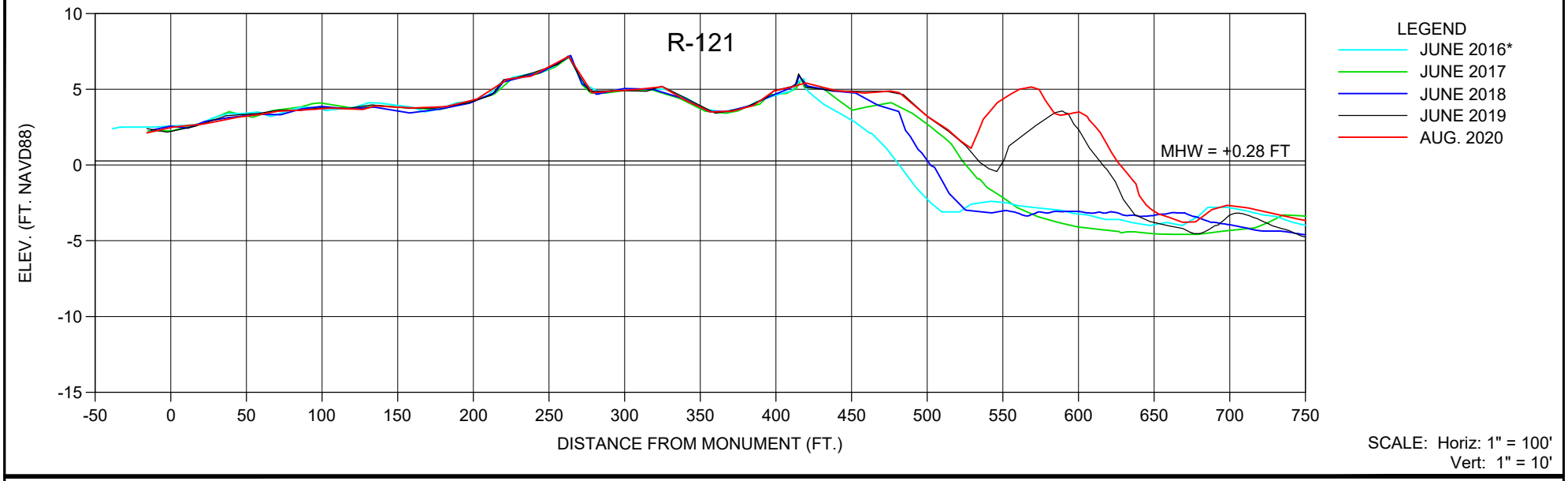
SHEET 25
FILE NO.: 20030-R-120

CLIENT: LEE COUNTY

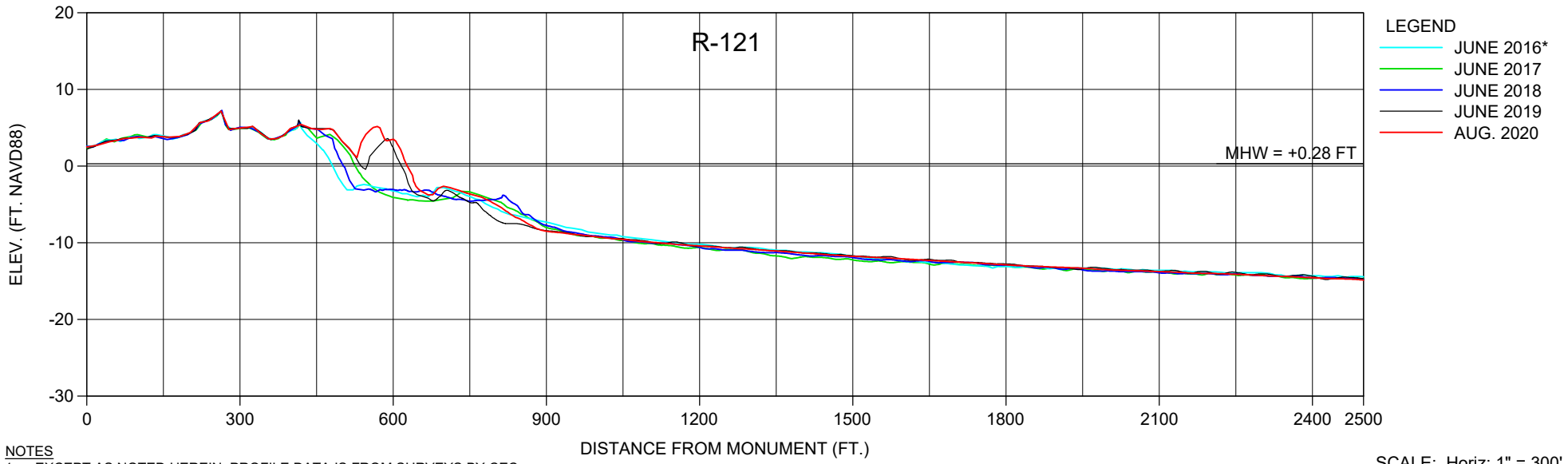
TITLE: R-120 MONITORING SURVEY

DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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FILE NO.: 20030-R-121
SHEET 26

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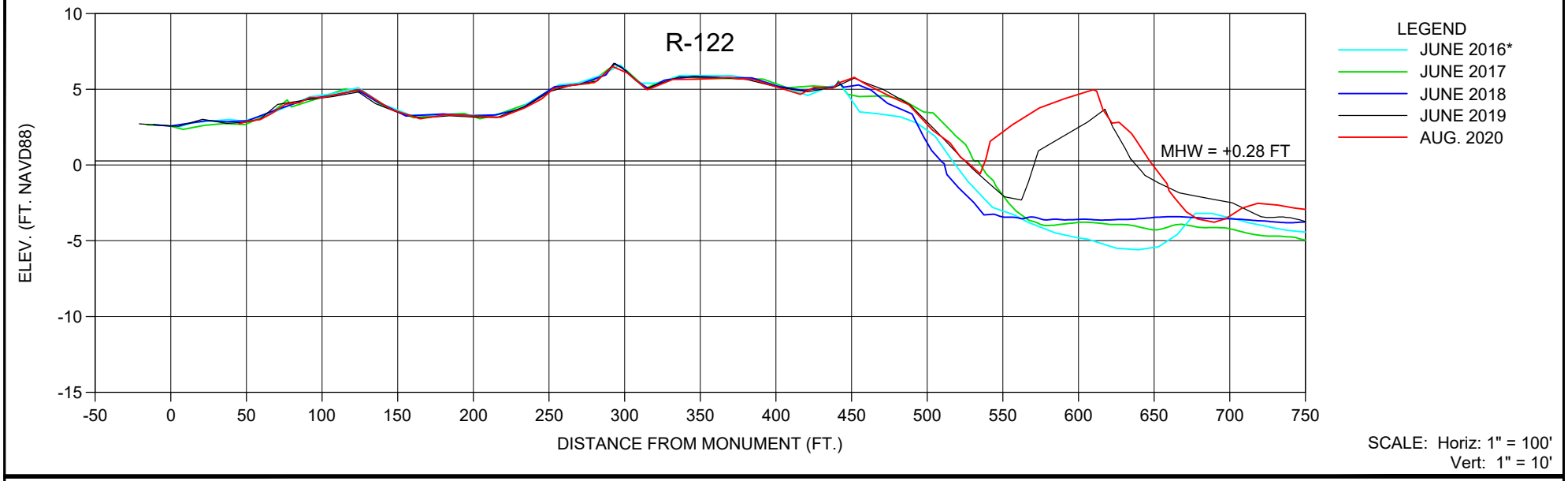
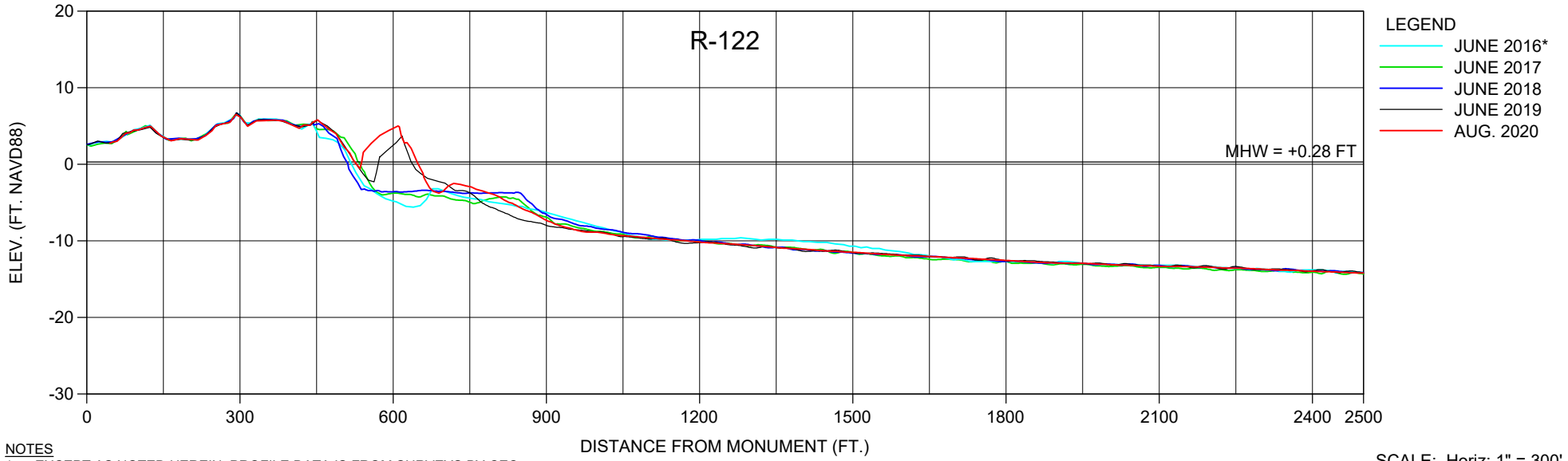
TITLE: R-121 MONITORING SURVEY

DATE:	8/20/2020	SCALE:	AS SHOWN
DRAWN:	SDB	F.B.	
CHECKED:	MTP	PG.	
SEC.	TWP.	RNG.	
ACAD NO.	20030-2020 Mon-RMON.dwg		
REF. NO.	20.030		

NO.	DATE	BY	REVISION DESCRIPTION



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



SCALE: Horiz: 1" = 300'
Vert: 1" = 20'

NOTES
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SHEET 27
FILE NO.: 20030-R-122

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CLIENT: LEE COUNTY

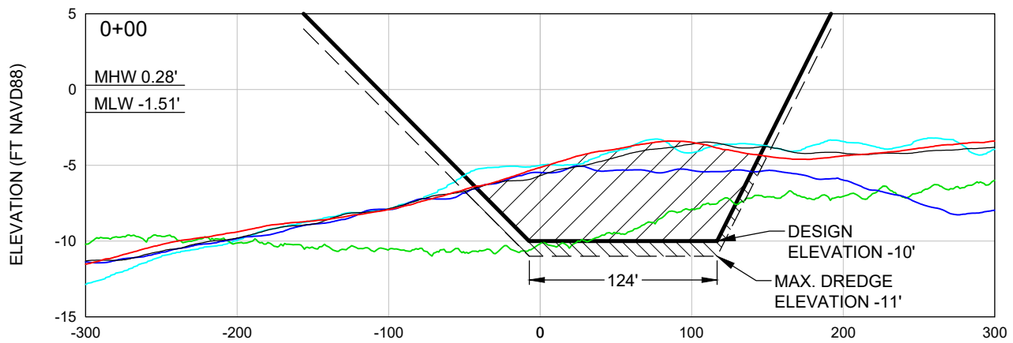
TITLE: R-122 MONITORING SURVEY

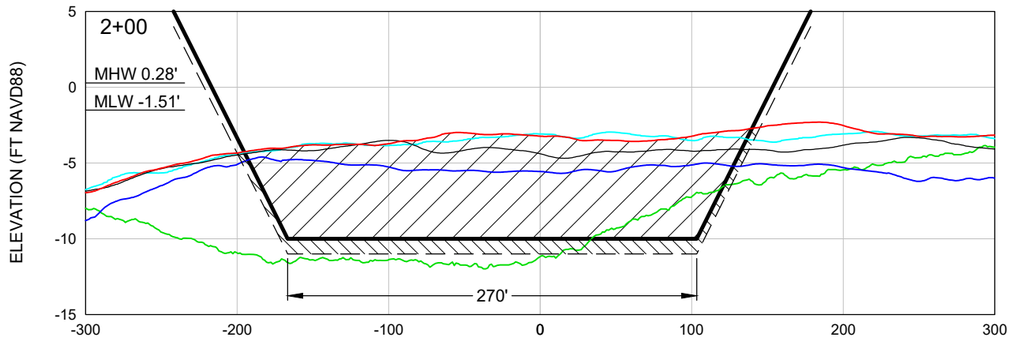
DATE: 8/20/2020	SCALE: AS SHOWN		
DRAWN: SDB	F.B.		
CHECKED: MTP	PG.		
SEC.	TWP.	RNG.	
ACAD NO. 20030-2020 Mon-RMON.dwg			
REF. NO. 20.030			

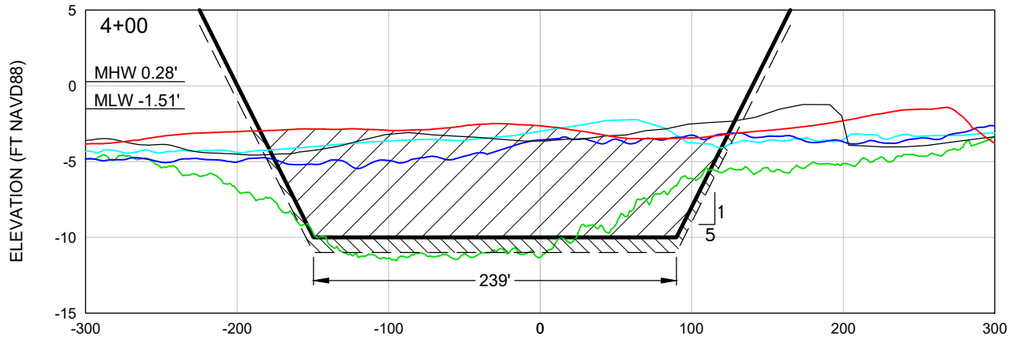
NO.	DATE	BY	REVISION DESCRIPTION

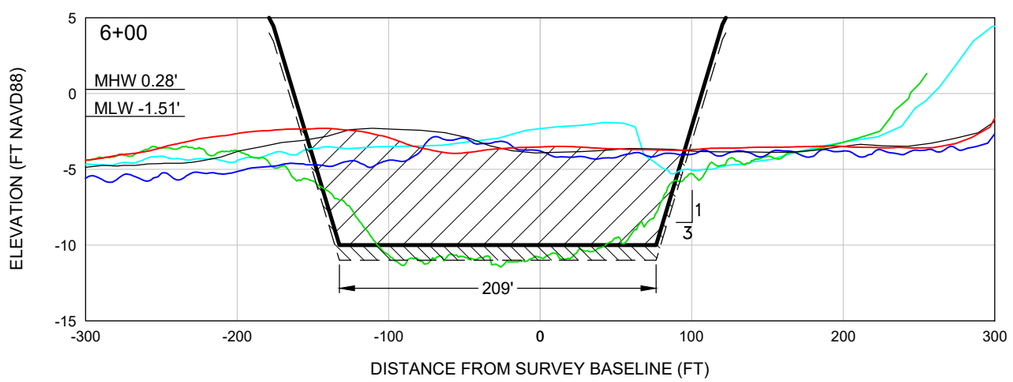
APPENDIX 3

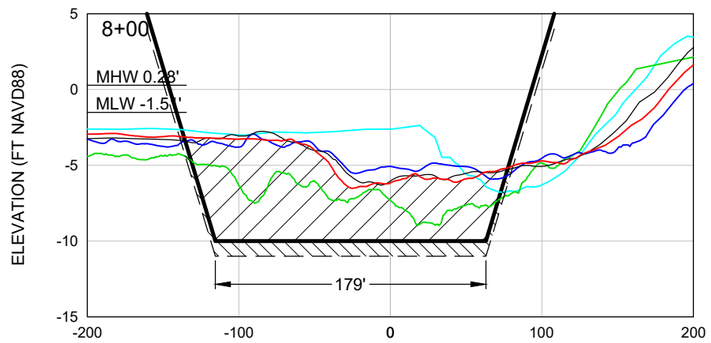
BLIND PASS AND EBB SHOAL CROSS SECTIONS

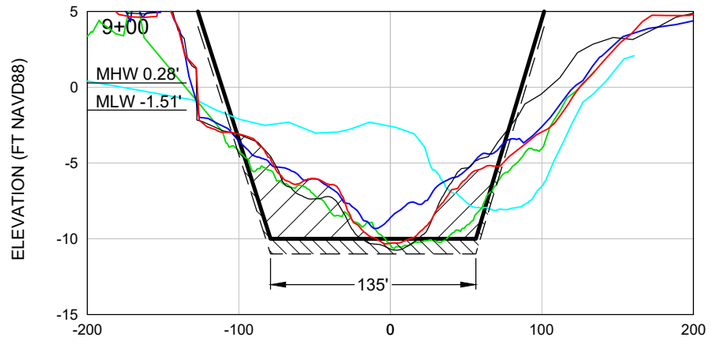


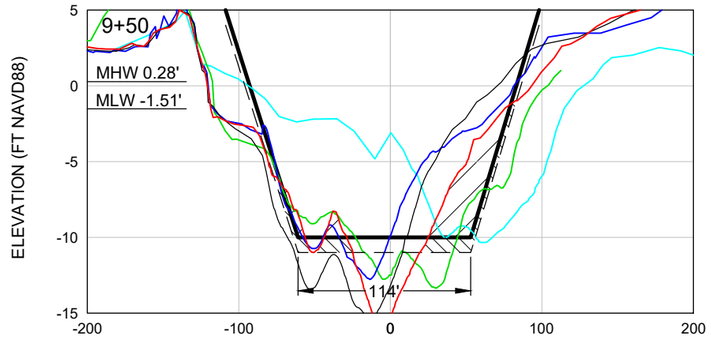


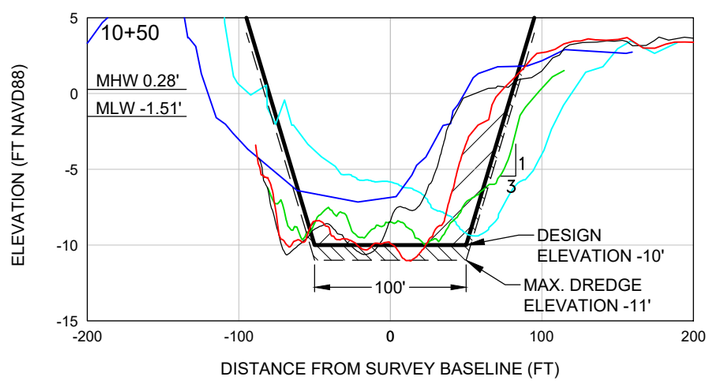












LEGEND:

- = FEB. 2017 SURVEY
- = JUNE 2017 SURVEY
- = JUNE 2018 SURVEY
- = JUNE 2019 SURVEY
- = AUG. 2020 SURVEY
- = DESIGN DREDGE AREA
- = OVERDREDGE AREA

SCALE:

H: 1" = 100'
V: 1" = 10'

NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
P.G.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20,030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: BLIND PASS RESTORATION
CROSS SECTIONS
STA. 0+00 TO 12+00

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SURVEYING: LB 2464
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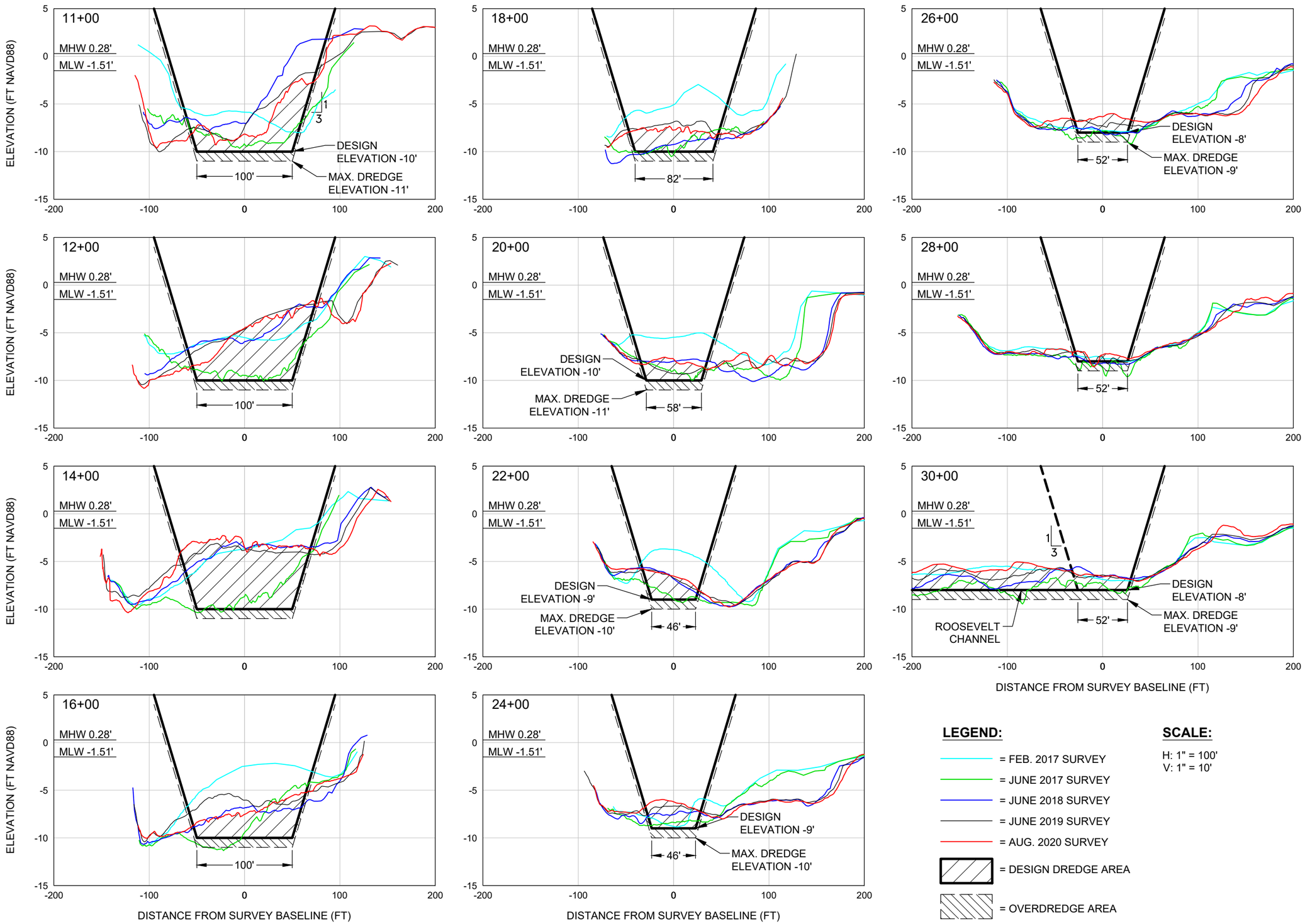
E-Mail: info@cecifl.com

SHEET 1
FILE NO.: 20030-XS-1



LEGEND:

- = FEB. 2017 SURVEY
- = JUNE 2017 SURVEY
- = JUNE 2018 SURVEY
- = JUNE 2019 SURVEY
- = AUG. 2020 SURVEY
- = DESIGN DREDGE AREA
- = OVERDREDGE AREA

SCALE:

H: 1" = 100'
V: 1" = 10'

NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
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ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20,030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: BLIND PASS RESTORATION
CROSS SECTIONS
STA. 14+00 TO 34+00

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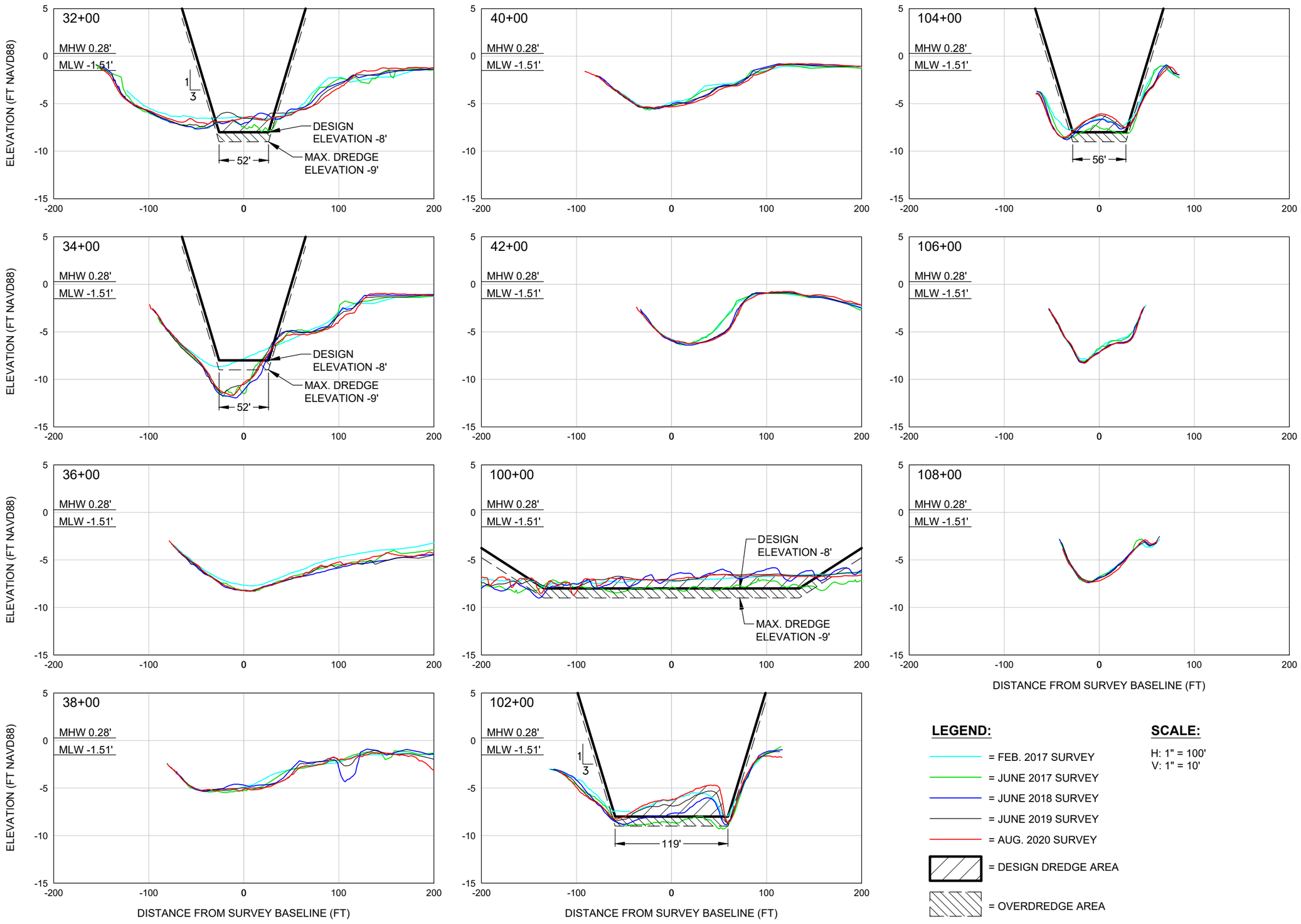
SHEET 2
FILE NO.: 20030-XS-2



LEGEND:

- = FEB. 2017 SURVEY
- = JUNE 2017 SURVEY
- = JUNE 2018 SURVEY
- = JUNE 2019 SURVEY
- = AUG. 2020 SURVEY
- = DESIGN DREDGE AREA
- = OVERDREDGE AREA

SCALE:

H: 1" = 100'
V: 1" = 10'

NO.	DATE	BY	REVISION DESCRIPTION
20,030			

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
PG.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO.

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: BLIND PASS RESTORATION
CROSS SECTIONS STA 36+00 TO 42+00
ROOSEVELT STA 100+00 TO 108+00

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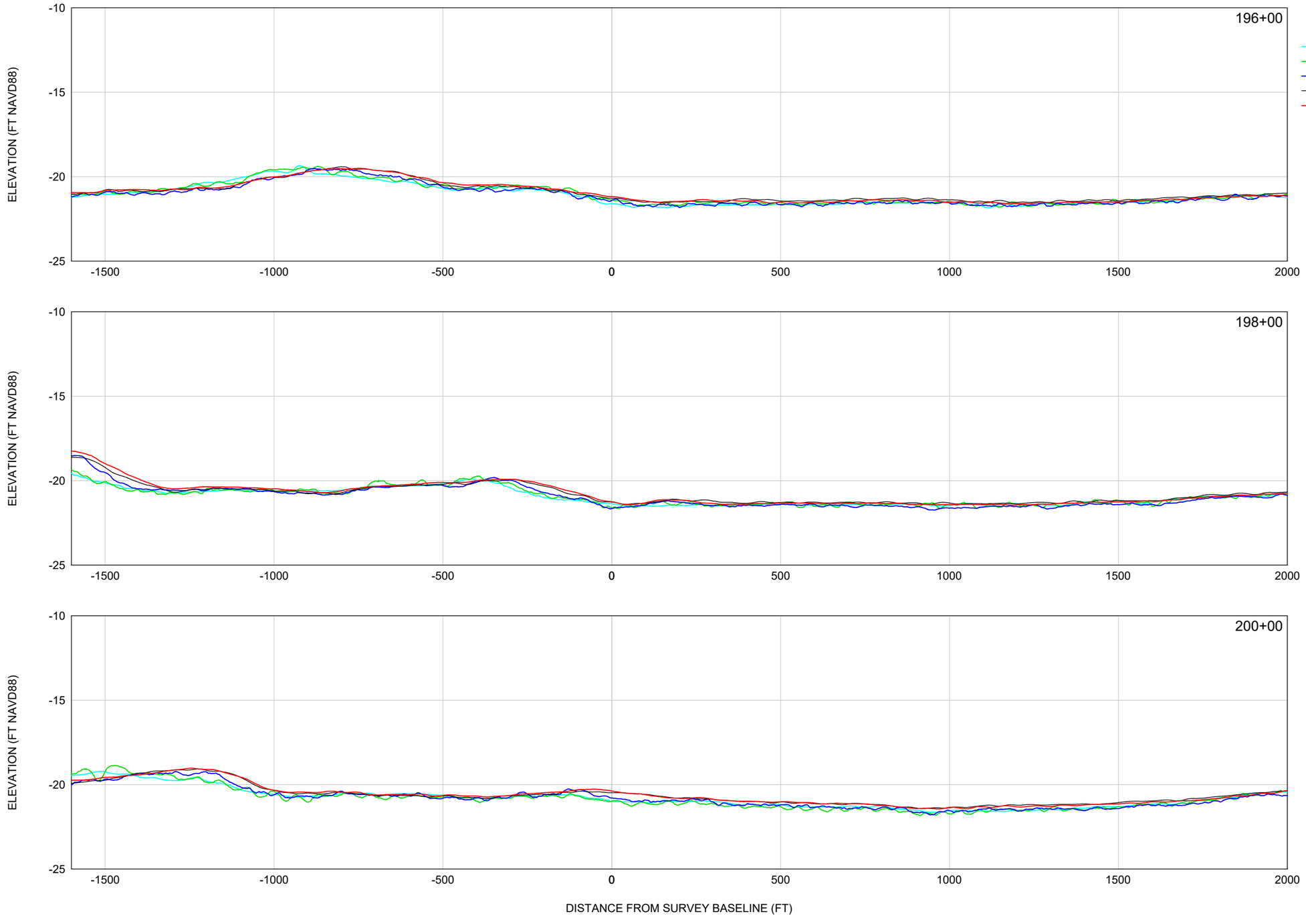
SHEET 3
FILE NO.: 20030-XS-3



NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
PG.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20,030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE:
BLIND PASS RESTORATION
CROSS SECTIONS
EBB SHOAL: STA 196+00 TO 200+00

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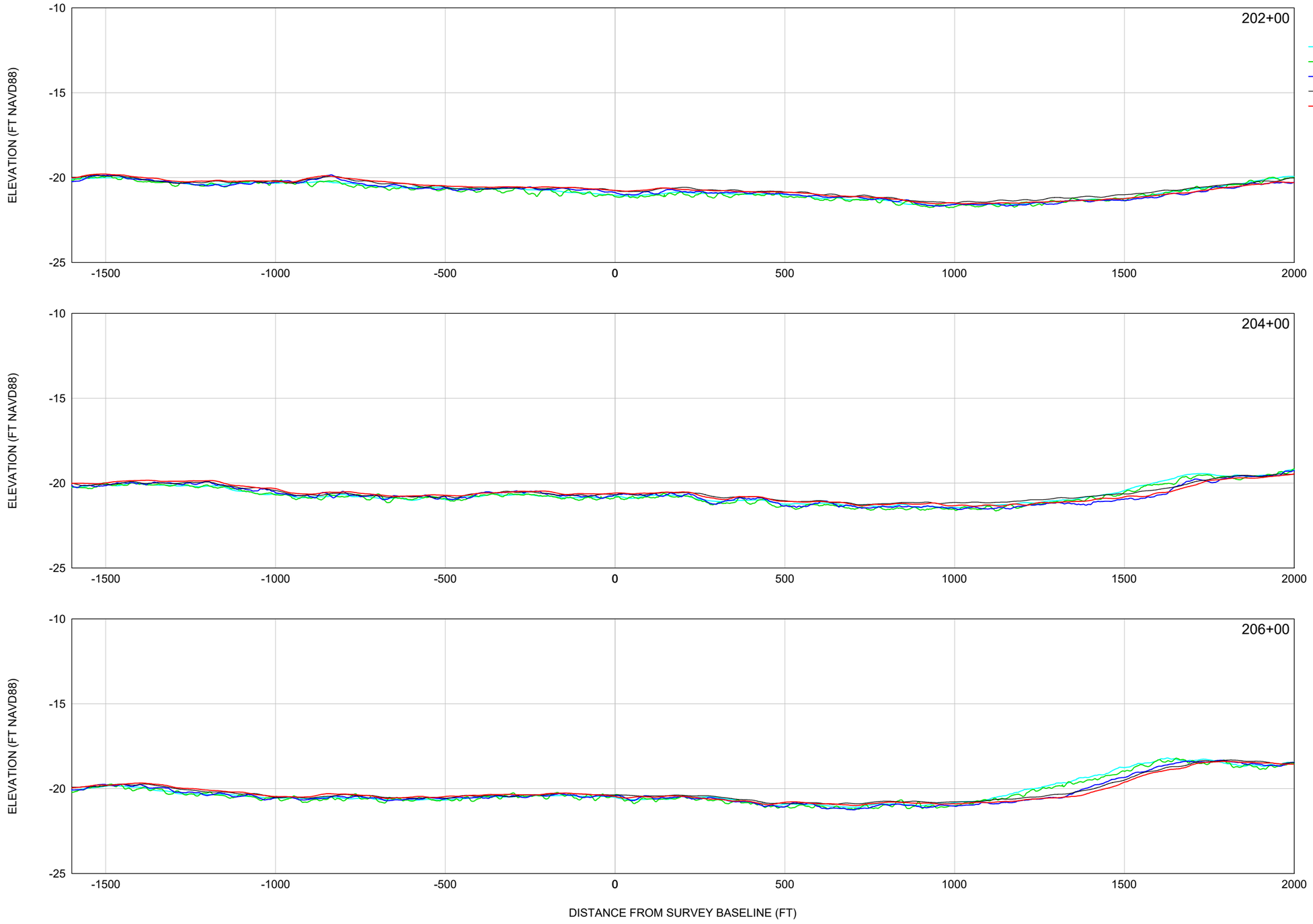
SHEET 4
FILE NO.: 20030-XS-4



NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
PG.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20,030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: BLIND PASS RESTORATION
CROSS SECTIONS
EBB SHOAL: STA 202+00 TO 206+00

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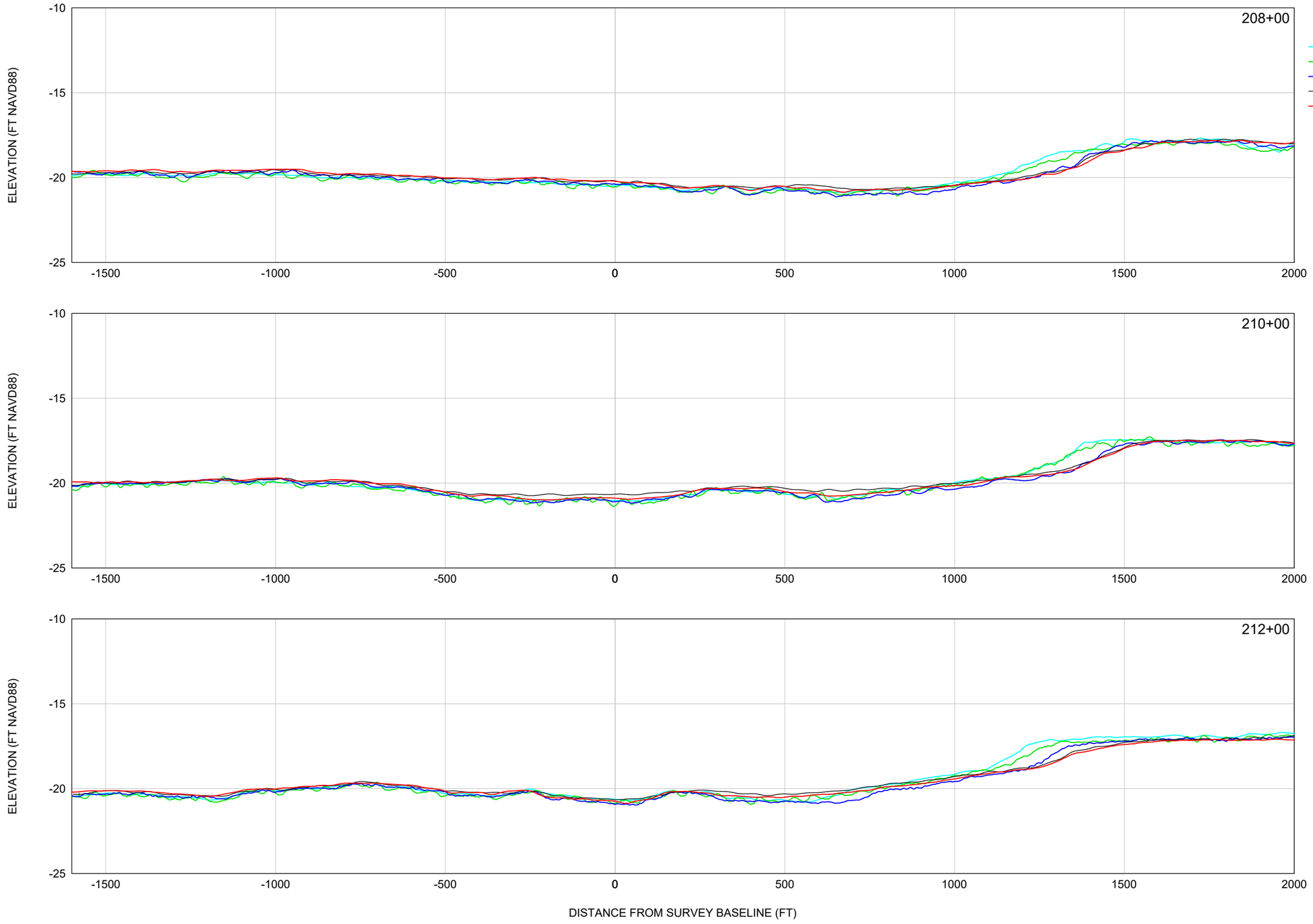
SHEET 5
FILE NO.: 20030-XS-5



NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020 SCALE: AS NOTED
DRAWN: SDB F.B.
CHECKED: MTP PG.
SEC. TWP. RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20.030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: BLIND PASS RESTORATION
CROSS SECTIONS
EBB SHOAL: STA 208+00 TO 212+00

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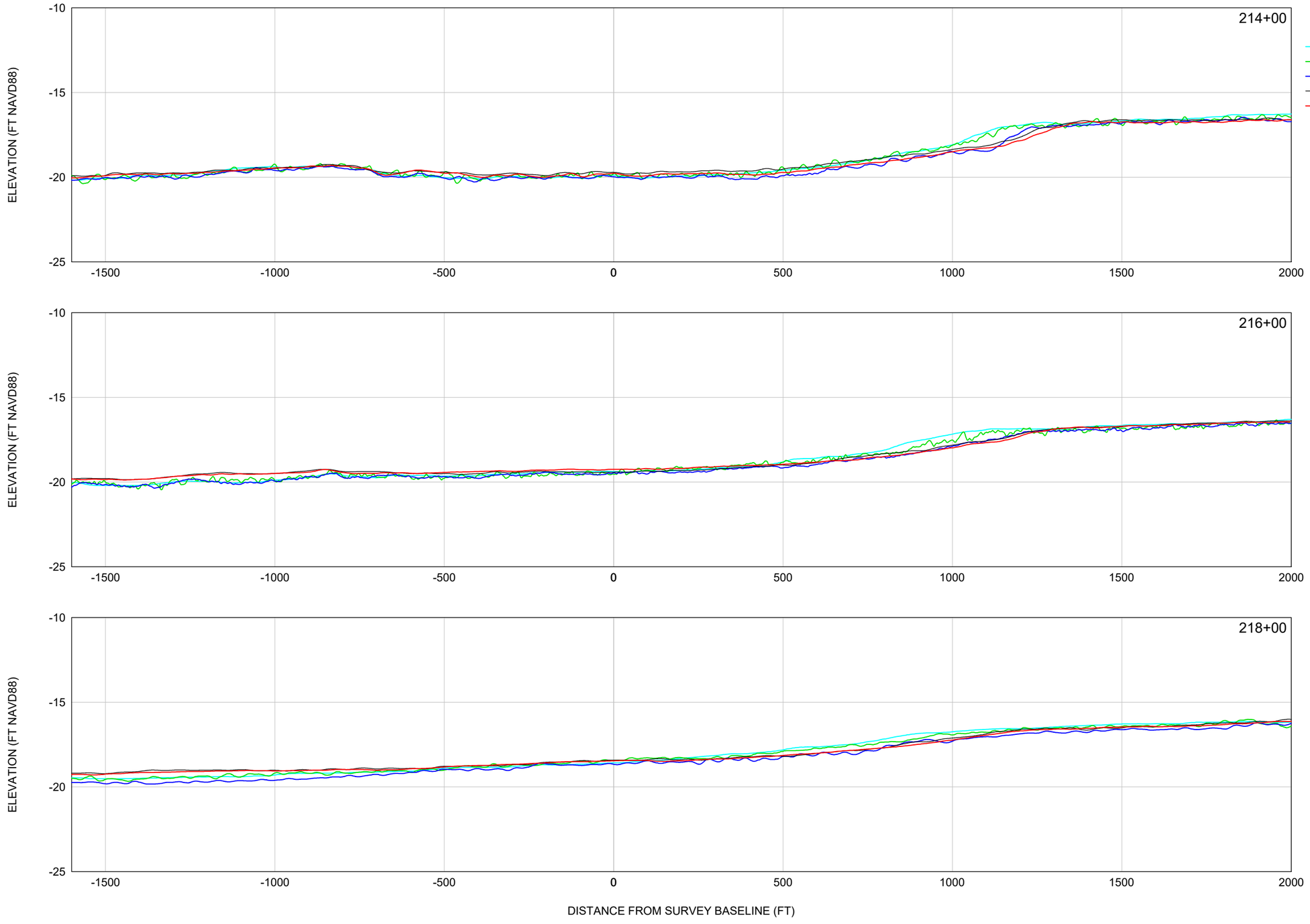
SHEET 6
FILE NO.: 20030-XS-6



NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
PG.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20.030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE:
BLIND PASS RESTORATION
CROSS SECTIONS
EBB SHOAL: STA 214+00 TO 218+00

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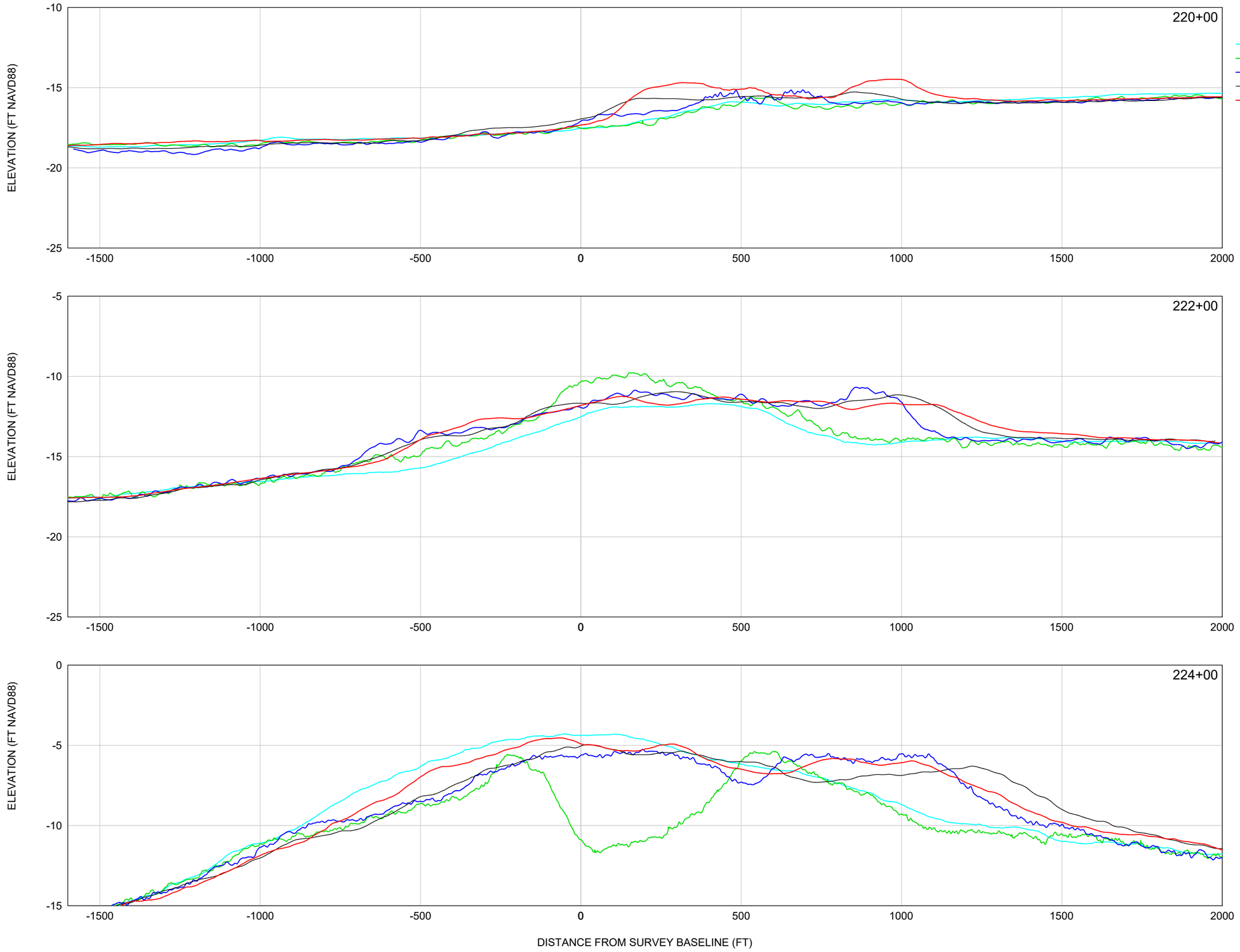
SHEET 7
FILE NO.: 20030-XS-7



NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
PG.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20.030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE:
BLIND PASS RESTORATION
CROSS SECTIONS
EBB SHOAL: STA 220+00 TO 224+00

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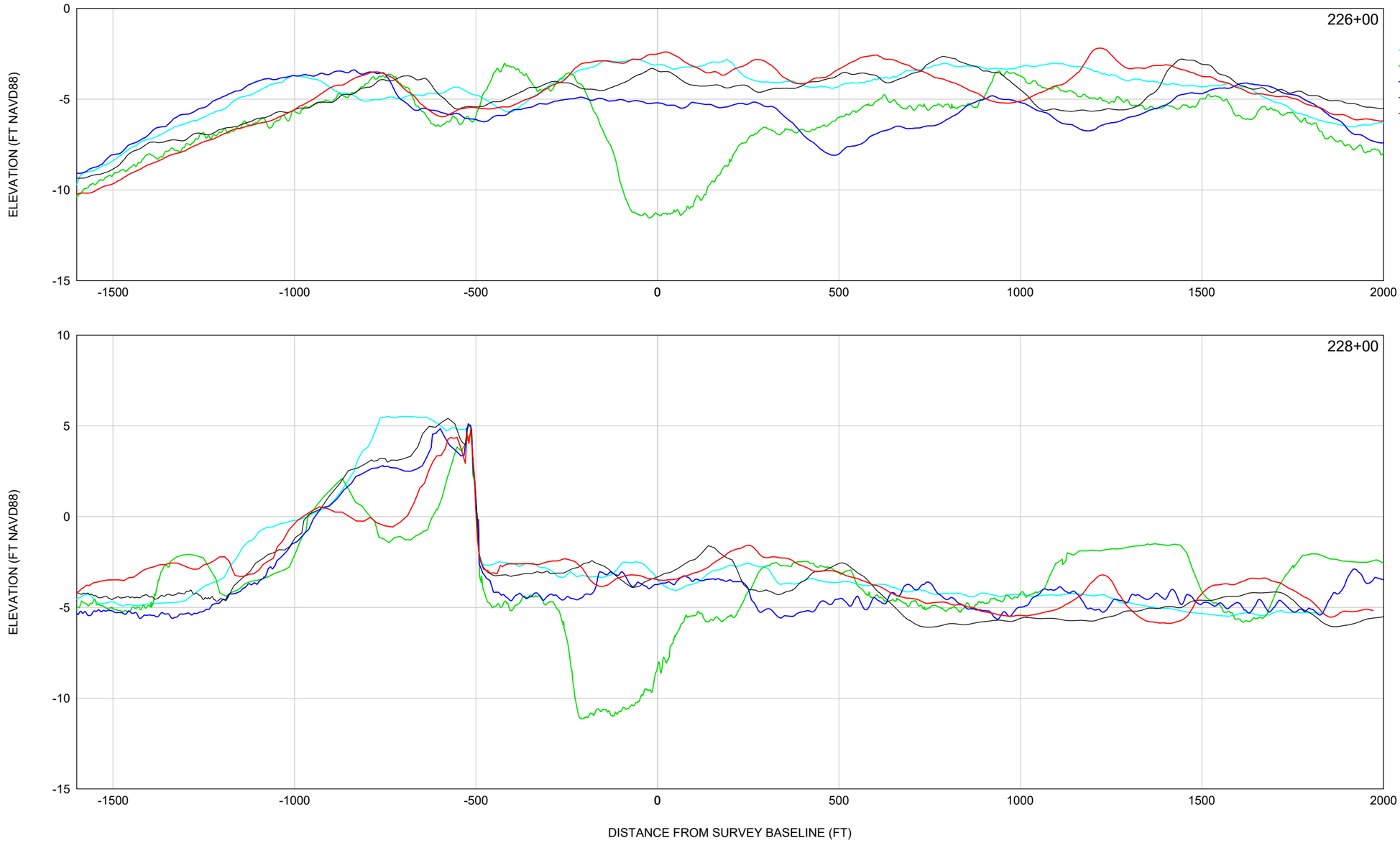
SHEET 8
FILE NO.: 20030-XS-8



NO.	DATE	BY	REVISION DESCRIPTION

DATE: 8/20/2020
SCALE: AS NOTED
DRAWN: SDB
F.B.
CHECKED: MTP
PG.
SEC.
TWP.
RNG.
ACAD NO. 20030-2020 Mon-PASS-XSECT.dwg
REF. NO. 20.030

CLIENT: LEE COUNTY BOARD OF COMMISSIONERS

TITLE: BLIND PASS RESTORATION
CROSS SECTIONS
EBB SHOAL: STA 226+00 TO 228+00

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SHEET 9
FILE NO.: 20030-XS-9