2021

Lake Pontchartrain & Vicinity GRR
Appendix E – Structural Engineering

US Army Corps of Engineers®
New Orleans District

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Non-Federal Sponsor: Coastal Protection and Restoration Authority Board of Louisiana

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APPENDIX E – STRUCTURAL ENGINEERING

1 INTRODUCTION

1.1 OVERVIEW

This appendix presents the analysis of the hard structures in the Lake Pontchartrain and Vicinity (LPV) system.

1.2 SCOPE

The scope of this analysis consists of compiling data to describe the current condition of the LPV hard structures, determining which structures will fail to provide the required level of risk reduction for a relative sea level rise (RSLR) of.1.8 ft for 100-year design elevations, and providing recommended modifications to those structures to bring them up to the required level of risk reduction. The 200-year plan was developed to consider if additional risk reduction would be economically supported but was not fully developed due to the limitations of the authorizing language.

1.2.1 STUDY AREA

For this analysis, the LPV system was divided into 8 segments: St. Charles Parish East Bank, Jefferson Parish Lakefront, Orleans Parish Metro Lakefront, Orleans Parish Lakefront East, South Point to MRGO/GIWW Closure, IHNC and GIWW Basin, St. Bernard Parish, and LPV-MRL.

1.2.1.1 ST. CHARLES PARISH EAST BANK

The St. Charles Parish portion of the LPV system is located north of Airline Highway (U.S. Highway 61). It runs from the Bonnet Carré Spillway East Guide Levee to the Jefferson-St. Charles Parish boundary at the New Orleans Airport East-West runway terminus. Five drainage structures are included. Floodwalls are located at Interstate 310 (I-310), Shell Pipeline Crossing, Good Hope and at the Gulf South Pipeline Crossing. A double track railroad floodgate is located near the eastern end of the segment where the Canadian National Railroad crosses through the protection system. Figure 1-1 shows the St. Charles Parish East Bank segment. Table 1-1 lists the sections and their corresponding descriptions.

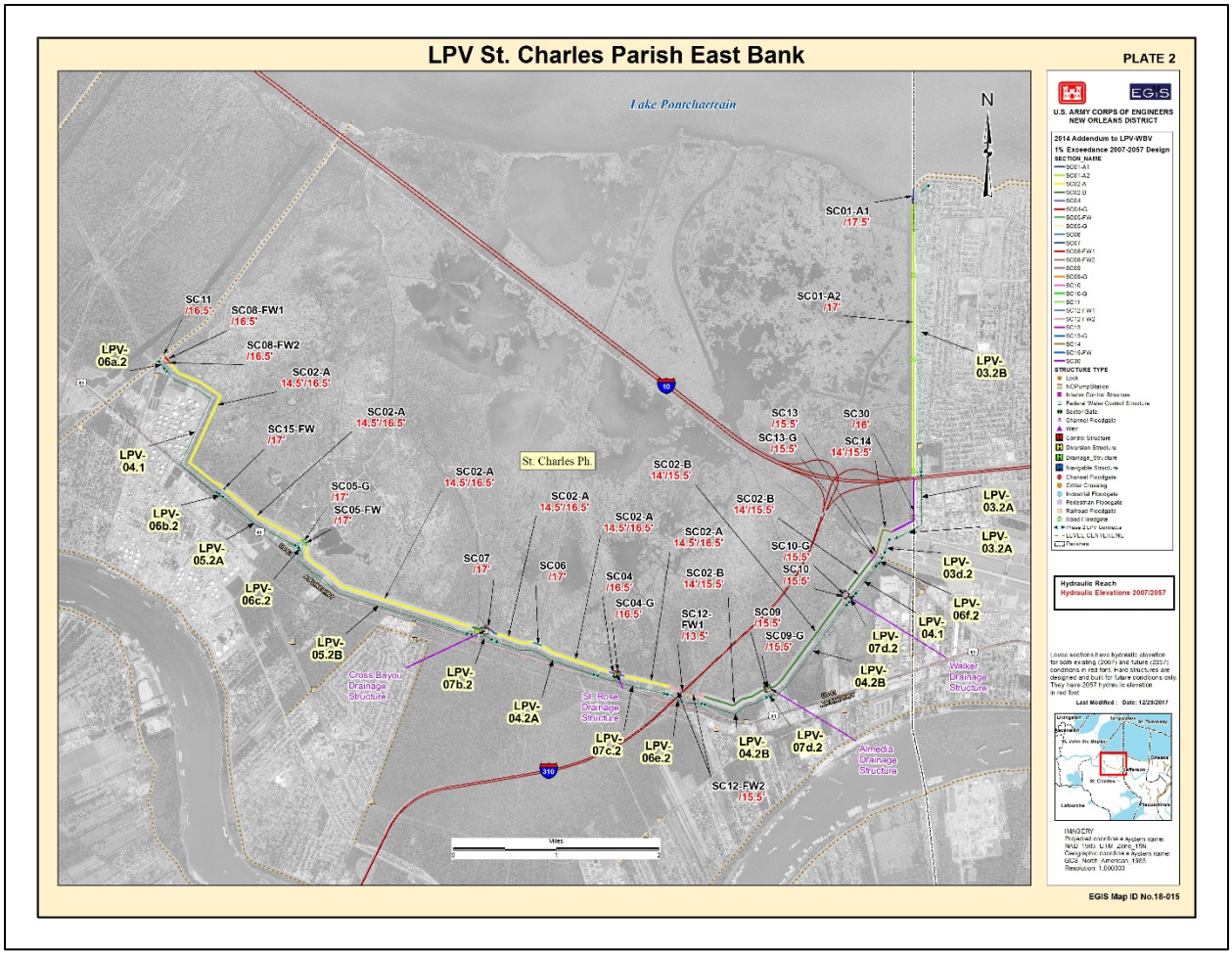

Figure 1-1. St. Charles Parish East Bank

Table 1-1. St. Charles Parish East Bank Hard Structures

Section	Description
SC11	Bonnet Carré Tie-In Floodwall
SC08-FW1	Bayou Trepagnier Complex Fronting Protection
SC08-FW2	Bayou Trepagnier Complex T-Walls
SC15-FW	Shell Pipeline Floodwall
SC05-FW	Good Hope Floodwall
SC05-G	Good Hope Gate
SC05-FW	Good Hope Floodwall
SC07	Cross Bayou Canal T-Wall
SC06	Gulf South Pipeline T-Wall
SC04	St. Rose Canal Drainage Structure
SC04-G	St. Rose Canal Drainage Gate
SC04	St. Rose Canal Drainage Structure
SC12-FW2	I-310 Floodwall
SC12-FW1	I-310 Floodwall Under Ramps
SC12-FW2	I-310 Floodwall
SC09	Almedia Drainage Structure
SC09-G	Almedia Drainage Gate
SC09	Almedia Drainage Structure
SC10	Walker Drainage Structure
SC10-G	Walker Drainage Gate
SC10	Walker Drainage Structure
SC13-FW	ICRR Gate Monolith T-Wall
SC13-G	ICRR Floodgate
SC13-FW	ICRR Gate Monolith T-Wall
SC30	West Return Wall Transition
SC01-A2	St. Charles Return Wall 17.0 ft.
SC01-A1	St. Charles Return Wall 17.5 ft.

1.2.1.2 JEFFERSON PARISH LAKEFRONT

The Jefferson Parish Lakefront portion of the LPV system is located along the bank of Lake Pontchartrain. It runs in an east-west direction from the 17th Street Canal at the Orleans-Jefferson Parish Line to the Jefferson-St. Charles Parish Return Levee. Along this alignment are four pumping stations and several recreation areas at Bonnabel, Williams and Causeway Blvds. Figure 1-2 shows the Jefferson Parish Lakefront segment. Table 1-2 lists the sections and their corresponding descriptions.

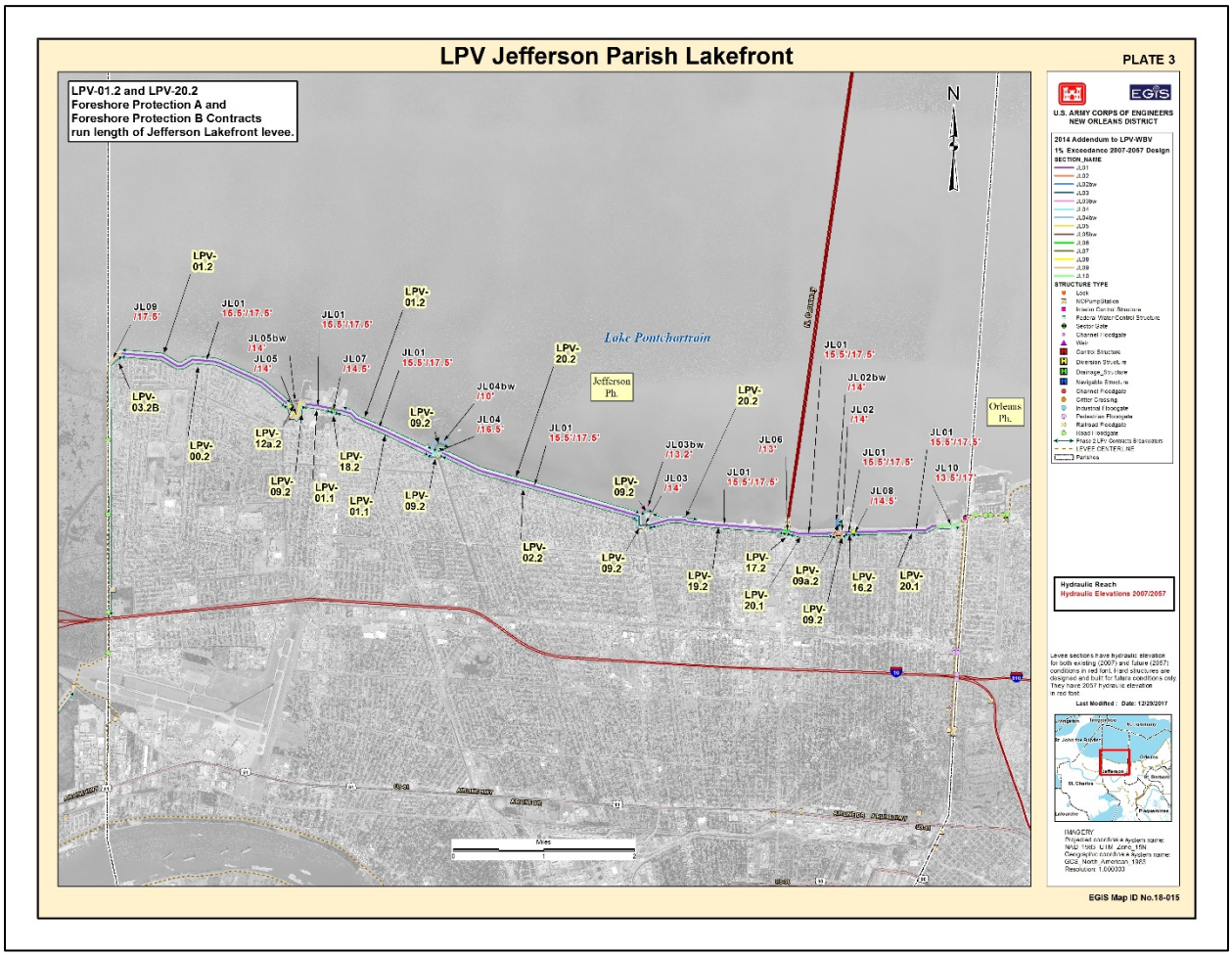

Figure 1-2. Jefferson Parish Lakefront

Table 1-2. Jefferson Parish Lakefront Hard Structures

Section	Description
JL09	Return Wall
JL05	Duncan PS #4 Fronting Protection
JL07	Williams Blvd. Floodgate
JL04	Elmwood PS #3 Fronting Protection
JL03	Suburban PS #2 Fronting Protection
JL06	Causeway Northbound and Southbound T-Wall
JL02	Bonnabel PS #1 Fronting Protection
JL08	Bonnabel Boat Launch Floodgate

1.2.1.3 ORLEANS PARISH METRO LAKEFRONT

The Orleans Parish Metro Lakefront portion of the LPV system covers the Lake Pontchartrain lakefront from the Jefferson Parish line to the Inner Harbor Navigation Canal (IHNC). This segment includes three canal closures, multiple floodgates, and sections of floodwall at the New Orleans Marina, along the Topaz St. levee, at Bayou St. John, along the former location of Pontchartrain Beach, and at the intersection of Lakeshore Dr. and Franklin Ave. Figure 1-3 shows the Orleans Parish Metro Lakefront segment. Table 1-3 lists the sections and their corresponding descriptions.

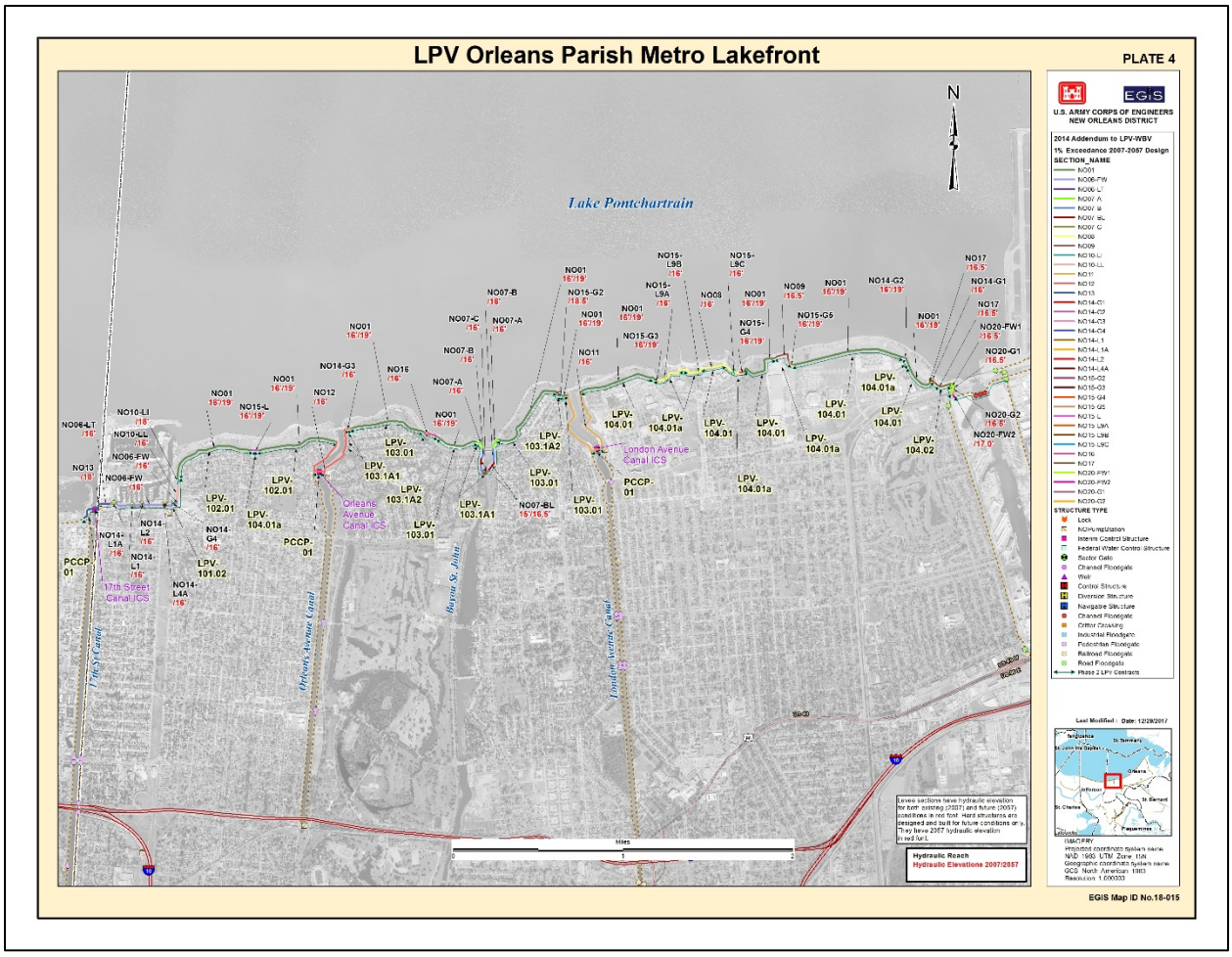

Figure 1-3. Orleans Parish Metro Lakefront

Table 1-3. Orleans Parish Metro Lakefront Hard Structures

Section	Description
NO13	17th St. Outfall Canal Closure
NO13	17th St. Outfall Canal Closure
NO06-LT	NO Marina Levee/Floodwall Combo
NO06-FW	NO Marina Floodwall
NO14-L1A	West Roadway Gate
NO06-FW	NO Marina Floodwall
NO14-L1	West Marina Gate
NO06-FW	NO Marina Floodwall
NO14-L2	East Marina Gate
NO06-FW	NO Marina Floodwall
NO14-L4A	Pontchartrain Blvd Gate
NO06-FW	NO Marina Floodwall
NO14-G4	Floodgate at Lakeshore Dr just N of Lake Marina Ave.
NO06-FW	NO Marina Floodwall
NO10-LL	Topaz St. Levee/Floodwall Combination
NO10-LI	Topaz St. Levee/Floodwall Combination
NO12	Orleans Ave. Outfall Canal Closure
NO14-G3	Floodgate at Marconi
NO16	Lakeshore Drive near Rail St. Floodgate
NO07-A	Bayou St. John Lakefront Floodwall
NO07-B	Bayou St. John Bayou Floodwall
NO07-B	Bayou St. John Bayou Floodwall
NO07-C	Bayou St. John Sector Gate
NO07-B	Bayou St. John Bayou Floodwall
NO07-B	Bayou St. John Bayou Floodwall
NO07-A	Bayou St. John Lakefront Floodwall
NO15-G2	Lakeshore Drive Floodgate W of London Ave. Canal
NO11	London Ave. Outfall Canal Closure
NO08	Pontchartrain Beach Floodwall
NO15-L9A	West Floodgate at Pontchartrain Beach
NO08	Pontchartrain Beach Floodwall
NO15-L9B	Center Floodgate at Pontchartrain Beach
NO08	Pontchartrain Beach Floodwall
NO15-L9C	East Floodgate at Pontchartrain Beach

Section	Description
NO08	Pontchartrain Beach Floodwall
NO09	American Standard Floodwall
NO17	Leroy Johnson Drive
NO14-G1	Floodgate near Seabrook L13
NO17	Leroy Johnson Drive
NO20-FW1	Floodwall Under Leon C. Simon Dr. near Seabrook (W)
NO20-G1	Boat Launch Gate Near Seabrook (West)
NO20-FW1	Floodwall Under Leon C. Simon Dr. near Seabrook (W)
NO20-G2	Norfolk Southern Railroad Gate near Seabrook (West)
NO20-FW1	Floodwall Under Leon C. Simon Dr. near Seabrook (W)
NO20-FW2	I-Wall Tie-in to Seabrook Gate (West)

1.2.1.4 ORLEANS PARISH LAKEFRONT EAST

The Orleans Parish Lakefront East portion of the LPV system covers the New Orleans East lakefront from the IHNC to South Point. This segment includes three pumping stations, one pipeline crossing, and sections of floodwalls at the New Orleans Lakefront Airport, along the Citrus Lakefront Levee, at Lincoln Beach, and a transition section at South Point. Figure 1-4 shows the Orleans Parish Lakefront East segment. Table 1-4 lists the sections and their corresponding descriptions.

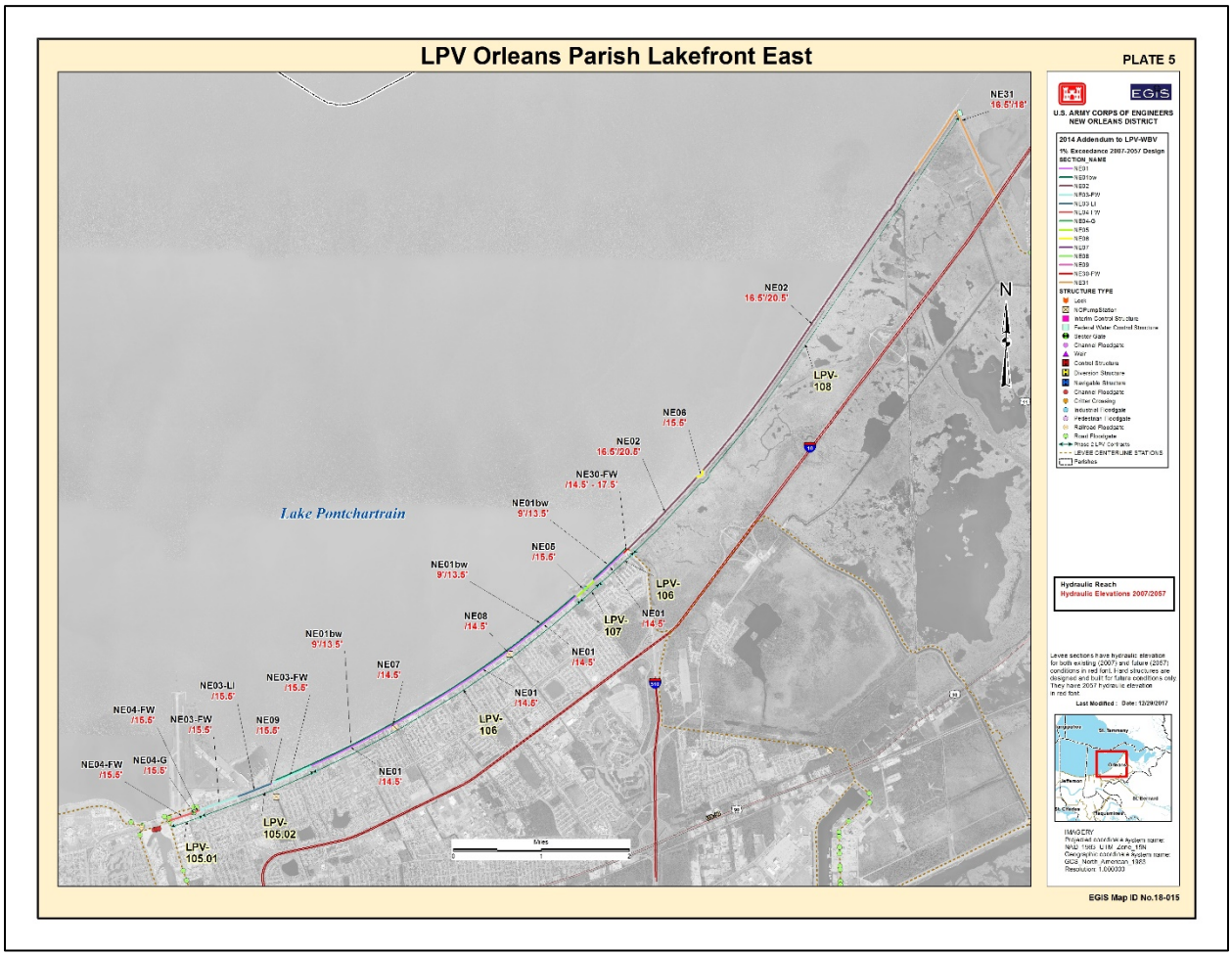

Figure 1-4. Orleans Parish Lakefront East

Table 1-4. Orleans Parish Lakefront East Hard Structures

Section	Description
NE04-FW	New Orleans Lakefront Airport West Floodwall
NE04-G	Downman Road Gate
NE04-FW	New Orleans Lakefront Airport West Floodwall
NE03-FW	New Orleans Lakefront Airport East T-Wall
NE03-LI	New Orleans Lakefront Airport East Lv/FW Combo
NE09	St. Charles Pump Station (OP #16)
NE03-FW	New Orleans Lakefront Airport East T-Wall
NE01	Citrus Lakefront Levee/I-Wall Combination
NE07	Citrus Pump Station (OP #10)
NE01	Citrus Lakefront Levee/I-Wall Combination
NE08	Jahncke Pump Station (OP #14)
NE01	Citrus Lakefront Levee/I-Wall Combination
NE05	Lincoln Beach Floodwall
NE01	Citrus Lakefront Levee/I-Wall Combination
NE30-FW	Transition Reach from NE01-NE02 T-Walls
NE06	Collins Pipeline Crossing Floodwall

1.2.1.5 SOUTH POINT TO MRGO/GIWW CLOSURE

The South Point to MRGO/GIWW Closure portion of the LPV system covers the segment from South Point to the Lake Borgne Surge Barrier. This segment includes one section of floodwall at the end of the New Orleans Back Levee closest to the Lake Borgne Surge Barrier, one pumping station and three floodgates: two at highway crossings and one at a railroad crossing. Figure 1-5 shows the South Point to MRGO/GIWW Closure segment. Table 1-5 lists the sections and their corresponding descriptions.

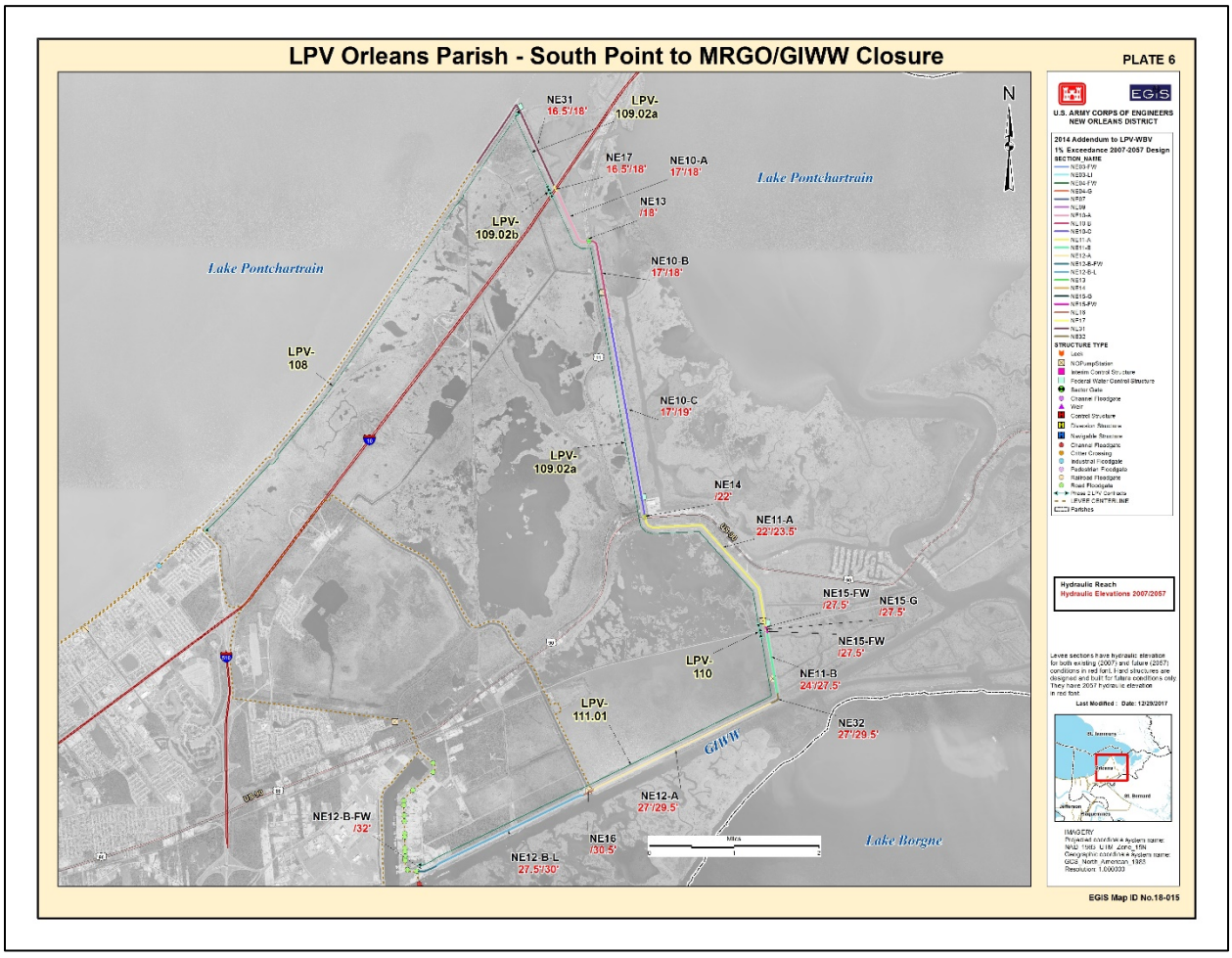

Figure 1-5. South Point to MRGO/GIWW Closure

Table 1-5. South Point to MRGO/GIWW Closure Hard Structures

Section	Description
NE13	Highway 11 Floodgate
NE14	Highway 90 Floodgate
NE15-FW	CSX RR Floodwall
NE15-G	CSX RR Floodgate
NE15-FW	CSX RR Floodwall
NE16	New Orleans East PS 15 T-Walls
NE12-B-FW	Tie-ins between NE12B and IHNC T-Wall

1.2.1.6 IHNC AND GIWW BASIN

The IHNC and GIWW Basin portion of the LPV system consists of the levees and floodwalls encompassing the Inner Harbor Navigation Canal (IHNC), Gulf Intracoastal Waterway (GIWW) and a portion of the Mississippi River Gulf Outlet (MRGO) where it joins the GIWW. This segment includes the Lake Borgne Surge Barrier, IHNC Lock, Bayou Bienvenue Floodgate and Seabrook Closure Complex; six pumping stations; and floodwall sections under the Paris Rd. Bridge, along the IHNC and at the Michoud Canal and Slip. Figure 1-6 shows the IHNC and GIWW Basin segment. Table 1-6 lists the sections and their corresponding descriptions. This analysis only includes perimeter floodwalls; therefore only the Seabrook Closure Complex, GIWW, Lake Borgne Surge Barrier, Bayou Bienvenue Floodgate, and MRGO Closure floodwalls were analyzed.

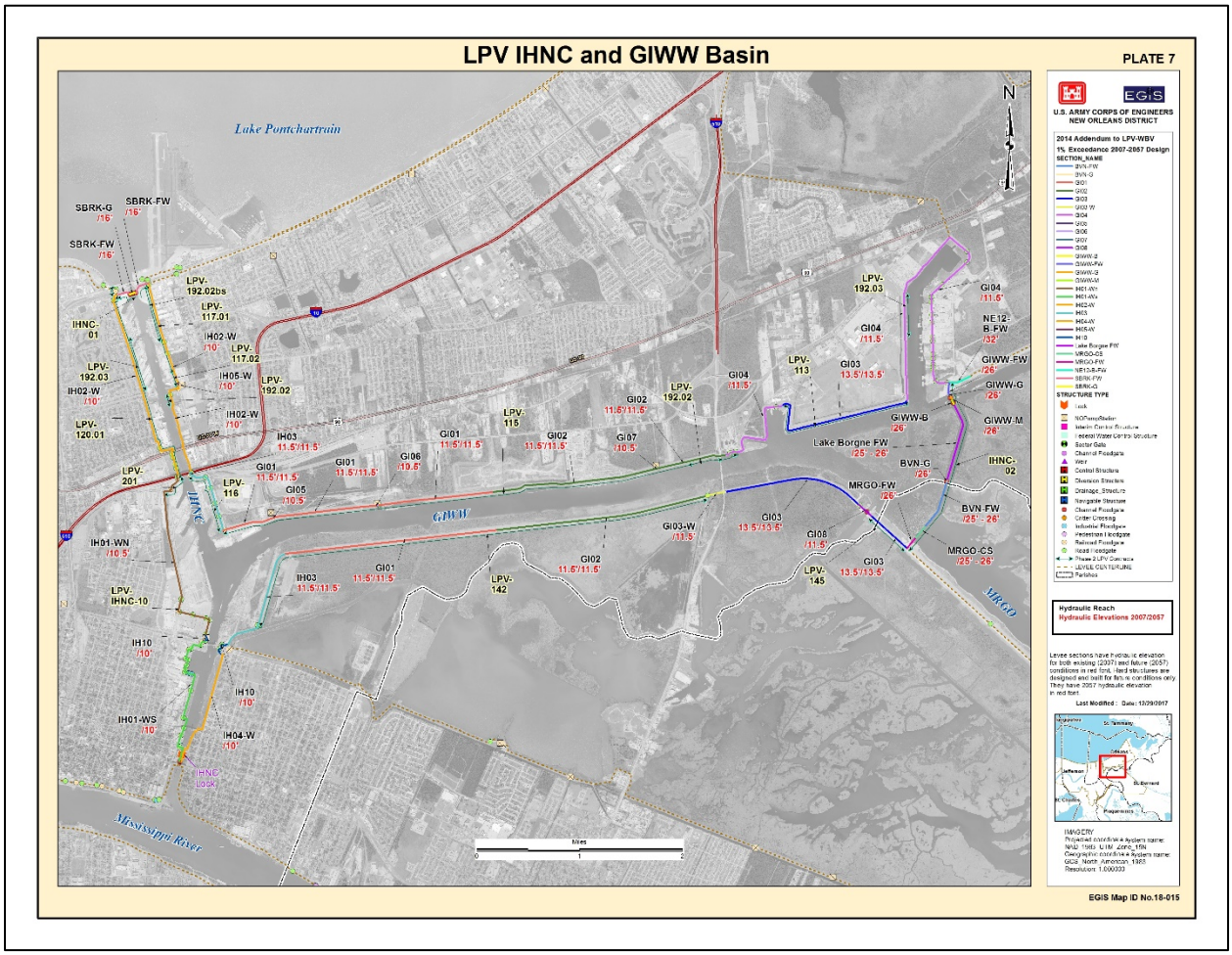

Figure 1-6. IHNC and GIWW Basin

Table 1-6. IHNC and GIWW Basin Hard Structures

Section	Description
SBRK-FW	Seabrook Closure Complex East Tie-in Walls
SBRK-G	Closure Gate at Seabrook
SBRK-FW	Seabrook Closure Complex East Tie-in Walls
GIWW-FW	GIWW Tie-in T-Walls to Levee
GIWW-G	Navigable Floodgate at GIWW
GIWW-M	GIWW Monoliths
GIWW-B	GIWW Concrete Swing Barge
Lake Borgne FW	Lake Borgne Floodwall Crenel/Merlon (N Barrier Wall)
BVN-G	Navigable Floodgate at Bayou Bienvenue
BVN-FW	Bayou Bienvenue Braced Floodwall
MRGO-CS	MRGO Closure Floodwall Crenel
MRGO-FW	Tie-in T-Walls and at MRGO Levee

Based on the maximum water level (100-year, high RSLC) in the IHNC Basin of El. 6.9 (See Table 5, LPV/WBV Hydrology and Hydraulics Report, Dated March 2020), the existing I-walls have been determined to be at low risk of failure due to several factors. First, there is a current Regulated Navigation Area rule in place and enforced by the US Coast Guard (USCG) for this area. Under the Captain of the Port order, any vessel capable of causing a potential hazard during a storm event will be forced to exit the basin prior to the storm event. The USCG also coordinates with USACE Operations Division to inspect and document all potential floating hazards within the IHNC basin prior to and during each hurricane season. An Operation Plan is developed between the organizations with detailed plans on utilizing the IHNC lock and Lake Borne Barrier Gate to evacuate vessels prior to the storm event. Through previous analysis of the IHNC basin performed by Structures Branch, it was determined that a low risk water level inside the IHNC basin was El. 8.0 (NAVD 88 2004.65). For this water elevation, due to the existing ground and berm sections near the I-walls, it was determined that any large vessel or barge would ground out prior to coming in contact with any wall. All the floodwalls in the IHNC basin are reinforced with adequate scour protection (either concrete or grouted riprap), but none of these walls would be overtopped at El. 6.9. For these reasons, it was determined that for the LPV/WBV GRR Study, that these walls be considered low risk of failure for our analysis.

1.2.1.7 ST. BERNARD PARISH

The St. Bernard Parish portion of the LPV system extends from the Lake Borgne Surge Barrier to the Caernarvon Freshwater Diversion Structure. This segment includes one pumping station, the Bayou Dupre Control Structure, the Caernarvon sector gate, three roadway floodgates, and either floodwall or levee and floodwall sections for the rest of the segment. Figure 1-7 shows the St. Bernard Parish segment. Table 1-7 lists the sections and their corresponding descriptions.

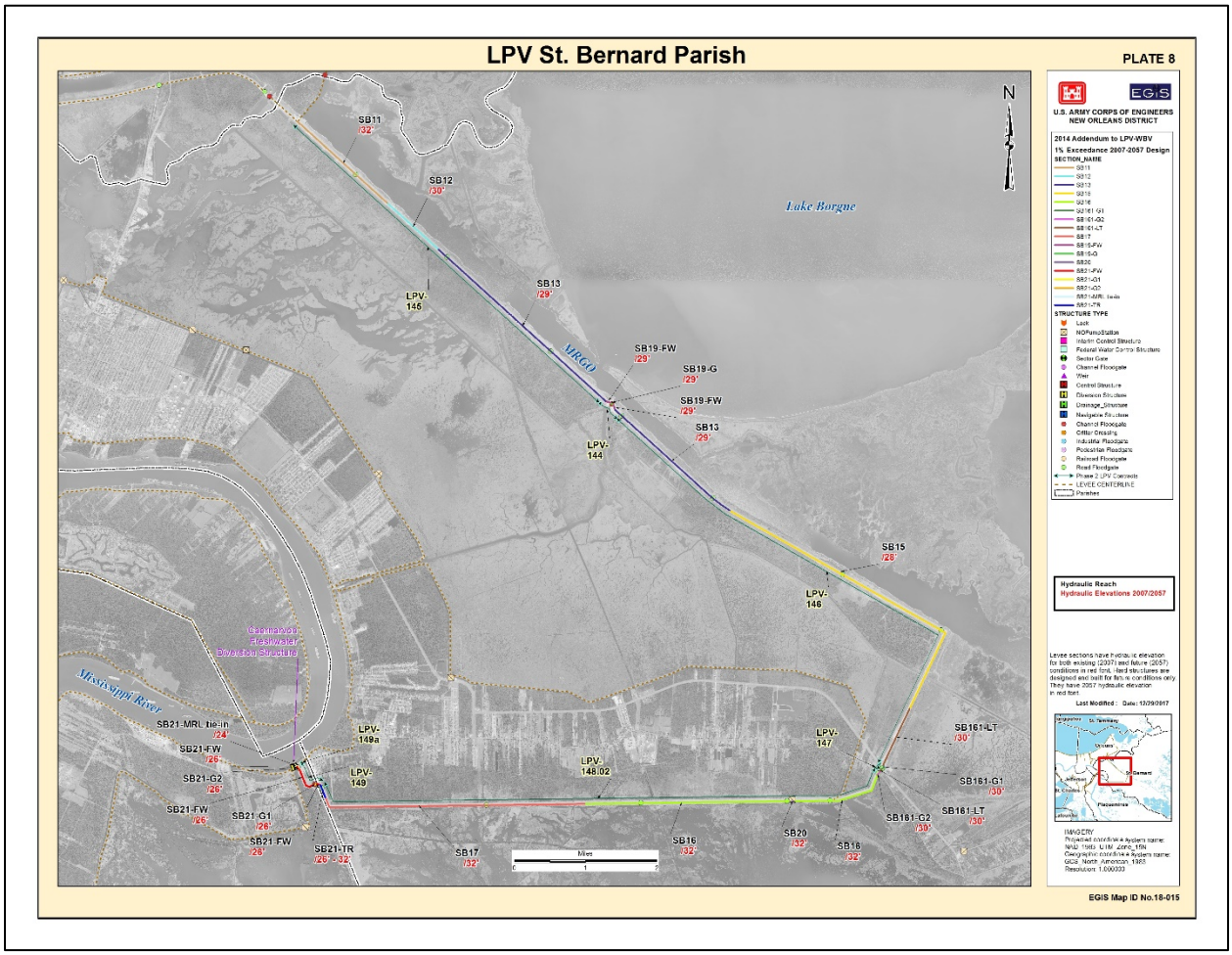

Figure 1-7. St. Bernard Parish

Table 1-7. St. Bernard Parish Hard Structures

Section	Description
SB11	MRGO Levee to IHNC Surge Barrier Tie-in
SB12	MRGO Levee/Floodwall Combo
SB13	MRGO Levee – Bayou Bienvenue to Bayou Dupre
SB19-FW	Bayou Dupre T-Wall Tie-ins
SB19-G	Bayou Dupre Control Structure
SB19-FW	Bayou Dupre T-Wall Tie-ins
SB13	MRGO Levee – Bayou Bienvenue to Bayou Dupre
SB15	MRGO Levee – Bayou Dupre to Hwy 46
SB161-LT	Bayou Road to Hwy 46 Levee/Floodwall Combo
SB161-G1	Caernarvon to Verret Hwy 46 Floodgate
SB161-LT	Bayou Road to Hwy 46 Levee/Floodwall Combo
SB161-G2	Caernarvon to Verret Bayou Rd Floodgate
SB16	Caernarvon to Verret
SB20	St. Mary Pump Station (PS #8)
SB16	Caernarvon to Verret
SB17	Caernarvon to Verret
SB21-TR	Caernarvon Canal Transition Floodwall Reach
SB21-FW	Caernarvon to Mississippi River Floodwall
SB21-G1	Caernarvon Canal Sector Gate
SB21-FW	Caernarvon to Mississippi River Floodwall
SB21-G2	Caernarvon Canal Hwy 39 Gate and RR Gate
SB21-FW	Caernarvon to Mississippi River Floodwall
SB21-MRL tie-in	Tie-in to MRL

The Hurricane and Storm Damage Risk Reduction System (HSDRRS) in St. Bernard Parish consists of six projects (Lake Pontchartrain & Vicinity (LPV)-144, 145, 146, 147, 148.02, and 149) that provide hurricane risk reduction against a storm surge with an annual 1 percent

probability of occurrence (100-year). Three of these projects (LPV-145, 146, and 148.02) include approximately 21.4 miles of pile supported T-walls constructed atop existing levee embankment. A majority of the piles beneath the T-Walls utilized sacrificial steel for corrosion protection.

To date, multiple design concerns with potential impacts to longevity were raised. Multiple numerical modeling and field investigation efforts were performed to address these concerns. Ultimately, the LPV-154 contract was developed to provide field data on the actual performance of the floodwall foundation at specific, predetermined locations. Corrosion monitoring devices were installed to verify the actual corrosion rates. To monitor the effects of consolidation on the H-piles and to validate the moments predicted by the numerical models, electrical resistance strain gages and vibrating wire strain gages were installed on the H-piles at multiple locations. Additional piezometers and magnetic extensometers were installed within the LPV-145, LPV-146, and LPV-148.02 contract reaches to validate the estimated future settlement. These monitoring devices are used to predict if, and when, the moment capacity of the H-piles may be exceeded.

1.2.1.8 LPV-MRL

The LPV-MRL portion of the LPV system consists of the levees and floodwalls along the east bank of the Mississippi River. This segment includes numerous road and railroad floodgates. Figure 1-8 shows the LPV-MRL segment. Table 1-8 lists the sections and their corresponding descriptions.

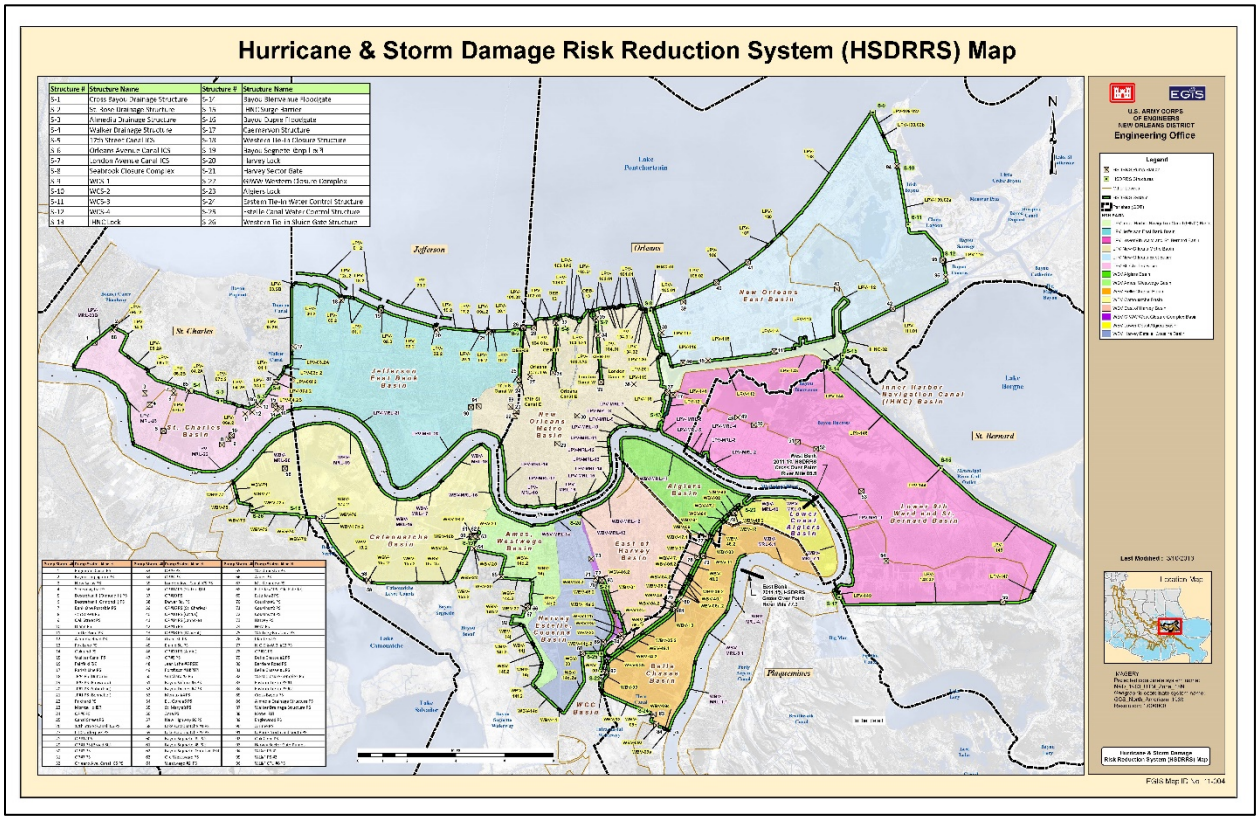

Figure 1-8. LPV-MRL

Table 1-8. LPV-MRL Hard Structures

Section	Description
103E-LF	LPV-MRL-19 Carrollton Bend to Nashville to Napoleon
103E-LF	LPV-MRL-19 Carrollton Bend to Nashville to Napoleon
103E-LF	LPV-MRL-19 Carrollton Bend to Nashville to Napoleon
100E-F	LPV-MRL-18 Nashville to Napoleon FW
99E-F	LPV-MRL-17 Louisiana Wharves Levee/LPV-MRL-16 Capping Sheet Piling Louisiana Wharves
98E-F	LPV-MRL-15 Louisiana to Jackson FW
97E-F	LPV-MRL-14 Jackson to Thalia FW
96E-F	LPV-MRL-14 Jackson to Thalia FW/LPV-MRL-13 Thalia to Poydras FW
95E-F	LPV-MRL-11 Canal to Toulouse FW/LPV-MRL-10 Dumaine fW
94E-F	LPV-MRL-9 Barracks to Montegut FW/LPV-MRL-8 Montegut to Independence FW
93E-F	LPV-MRL-7 Independence to IHNC FW
93E-F	LPV-MRL-6 IHNC Lock to Arabi Levee and FW
92E-LF	LPV-MRL-6 IHNC Lock to Arabi Levee and FW
91E-LF	LPV-MRL-5 Arabi Levee and FW
91E-F	LPV-MRL-5 Arabi Levee and FW
91E-LF	LPV-MRL-4 Amstar Levee and FW
91E-LF	LPV-MRL-3 Chalmette Battlefield Slip
91E-F	LPV-MRL-3 Chalmette Battlefield Slip
91E-LF	LPV-MRL-3 Chalmette Battlefield Slip
91E-LF	LPV-MRL-3 Chalmette Battlefield Slip
91E-F	LPV-MRL-3 Chalmette Battlefield Slip
91E-LF	LPV-MRL-3 Chalmette Battlefield Slip
91E-F	LPV-MRL-3 Chalmette Battlefield Slip
90E-LF	LPV-MRL-2 Chalmette Battlefield Levee and FW
88E-LF	LPV-MRL-1 Caernarvon-Chalmette Battlefield

2 METHODOLOGY

2.1 MODELS USED

Models were not utilized for this analysis. For further information on how the analysis was completed, see paragraphs 3.2, 4.2 and 5.2.

3 EXISTING CONDITIONS

3.1 ASSUMPTIONS

Since the hard structures throughout the LPV system stretch for many miles, the system was divided into sections within segments, as listed in the tables of paragraph 1.2.1, STUDY AREA. For the LPV reach, the system consists of approximately 93.7 miles of levee, 40.4 miles of I-wall, and 16.2 miles of T-wall. The scope of this analysis consists of compiling data to describe the current condition of the LPV hard structures. The top of wall elevations for this analysis are based on EGIS data and the elevations are assumed to be same as provided in the 1% HSDRRS Design Elevation Report. These 2057 100-yr HSDRRS design elevations are close to existing survey elevations, since all floodwalls in the post-Katrina upgrade were constructed to 2057 requirements. For simplicity, the average top of wall elevations for each section were used. While the top of wall elevation may vary some within a section, it is unlikely to vary significantly. The following tables compare the existing average top of wall elevation in each segment to the 2057 design elevation to determine if any floodwalls fail to meet the height for the requirements established in the original HSDRSS design. The original HSDRRS design was determined using on older ADCIRC model with different future conditions assumptions. Therefore, the design elevations in this section cannot be directly compared to the design elevations recommended by this current study. For further information on the 2057 100-year design elevations, see the original 2011 HSDRRS 1% Design Elevation Report.

3.2 ANALYSIS

The average 2057 100-year design elevations were compared to the average top of wall elevations. The average top of wall and 2057 100-year design elevations, as well as the amount each section is deficient, are presented in Table 3-1 through Table 3-8 below. Minor differences between design and survey elevations noted in the table below do not currently impact the system's ability to provide the 1% level of risk reduction.

Table 3-1. St. Charles Parish Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
SC11	18.5 ft	16.5 ft	N/A
SC08-FW1	18.2 ft	16.5 ft	N/A
SC08-FW2	16.6 ft	16.5 ft	N/A
SC15-FW	17.1 ft	17.0 ft	N/A
SC05-FW	17.1 ft	17.0 ft	N/A
SC05-G	17.5 ft	17.0 ft	N/A
SC05-FW	17.1 ft	17.0 ft	N/A
SC07	17.3 ft	17.0 ft	N/A
SC06	17.2 ft	17.0 ft	N/A
SC04	16.6 ft	16.5 ft	N/A
SC04-G	16.4 ft	16.5 ft	0.1 ft
SC04	16.6 ft	16.5 ft	N/A
SC12-FW2	15.8 ft	15.5 ft	N/A
SC12-FW1	14.7 ft	13.5 ft	N/A
SC12-FW2	15.8 ft	15.5 ft	N/A
SC09	15.5 ft	15.5 ft	N/A
SC09-G	15.6 ft	15.5 ft	N/A
SC09	15.5 ft	15.5 ft	N/A
SC10	15.5 ft	15.5 ft	N/A
SC10-G	15.5 ft	15.5 ft	N/A

Section	Top of Wall Elevation	Design Elevation	Deficiency
SC10	15.5 ft	15.5 ft	N/A
SC13-FW	15.5 ft	15.5 ft	N/A
SC13-G	15.8 ft	15.5 ft	N/A
SC13-FW	15.5 ft	15.5 ft	N/A
SC30	15.6 ft	16.0 ft	0.4 ft
SC01-A2	17.0 ft	17.0 ft	N/A
SC01-A1	17.3 ft	17.5 ft	0.2 ft

Table 3-2. Jefferson Parish Lakefront Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
JL09	17.4 ft	17.5 ft	0.1 ft
JL05	18.9 ft	14.0 ft	N/A
JL07	16.9 ft	14.5 ft	N/A
JL04	20.4 ft	16.5 ft	N/A
JL03	17.0 ft	14.0 ft	N/A
JL06	15.3 ft	13.0 ft	N/A
JL02	17.0 ft	14.0 ft	N/A
JL08	17.0 ft	14.5 ft	N/A

Table 3-3. Orleans Parish Metro Lakefront Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
NO13	18.0 ft	18.0 ft	N/A
NO13	18.0 ft	18.0 ft	N/A
NO06-LT	16.1 ft	16.0 ft	N/A
NO06-FW	16.0 ft	16.0 ft	N/A
NO14-L1A	15.9 ft	16.0 ft	0.1 ft
NO06-FW	16.0 ft	16.0 ft	N/A
NO14-L1	16.3 ft	16.0 ft	N/A
NO06-FW	16.0 ft	16.0 ft	N/A
NO14-L2	15.9 ft	16.0 ft	0.1 ft
NO06-FW	15.9 ft	16.0 ft	0.1 ft
NO14-L4A	16.0 ft	16.0 ft	N/A
NO06-FW	15.9 ft	16.0 ft	0.1 ft
NO14-G4	16.0 ft	16.0 ft	N/A
NO06-FW	16.0 ft	16.0 ft	N/A
NO10-LL	15.9 ft	16.0 ft	0.1 ft
NO10-LI	18.0 ft	18.0 ft	N/A
NO12	18.0 ft	16.0 ft	N/A

NO14-G3	16.8 ft	16.0 ft	N/A
NO16	17.9 ft	16.0 ft	N/A
NO07-A	18.6 ft	16.0 ft	N/A
NO07-B	16.1 ft	16.0 ft	N/A
NO07-B	16.1 ft	16.0 ft	N/A
NO07-C	16.1 ft	16.0 ft	N/A
NO07-B	16.1 ft	16.0 ft	N/A
NO07-B	16.1 ft	16.0 ft	N/A
NO07-A	18.6 ft	16.0 ft	N/A
NO15-G2	18.6 ft	18.5 ft	N/A
NO11	18.0 ft	16.0 ft	N/A
NO08	18.2 ft	16.0 ft	N/A
NO15-L9A	17.8 ft	16.0 ft	N/A
NO08	18.1 ft	16.0 ft	N/A
NO15-L9B	19.0 ft	16.0 ft	N/A
NO08	18.2 ft	16.0 ft	N/A
NO15-L9C	17.7 ft	16.0 ft	N/A
NO08	18.2 ft	16.0 ft	N/A
NO09	19.0 ft	16.5 ft	N/A
NO17	16.9 ft	16.5 ft	N/A
NO14-G1	16.5 ft	16.0 ft	N/A
NO17	16.9 ft	16.5 ft	N/A
NO20-FW1	16.4 ft	16.5 ft	0.1 ft
NO20-G1	16.4 ft	16.5 ft	0.1 ft
NO20-FW1	16.5 ft	16.5 ft	N/A
NO20-G2	16.5 ft	16.5 ft	N/A
NO20-FW1	16.5 ft	16.5 ft	N/A
NO20-FW2	18.0 ft	17.0 ft	N/A

Table 3-4. Orleans Parish Lakefront East Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
NE04-FW	15.3 ft	15.5 ft	0.2 ft
NE04-G	15.3 ft	15.5 ft	0.2 ft
NE04-FW	15.4 ft	15.5 ft	0.1 ft
NE03-FW	15.5 ft	15.5 ft	N/A
NE03-LI	15.5 ft	15.5 ft	N/A
NE09	15.4 ft	15.5 ft	0.1 ft
NE03-FW	15.5 ft	15.5 ft	N/A
NE01	14.6 ft	14.5 ft	N/A
NE07	14.6 ft	14.5 ft	N/A
NE01	14.6 ft	14.5 ft	N/A
NE08	14.5 ft	14.5 ft	N/A
NE01	14.6 ft	14.5 ft	N/A
NE05	15.7 ft	15.5 ft	N/A
NE01	14.6 ft	14.5 ft	N/A
NE30-FW	17.2 ft	16.0 ft	N/A
NE06	17.7 ft	15.5 ft	N/A

Table 3-5. South Point to MRGO/GIWW Closure Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
NE13	18.3 ft	18.0 ft	N/A
NE14	22.2 ft	22.0 ft	N/A
NE15-FW	27.7 ft	27.5 ft	N/A
NE15-G	29.0 ft	27.5 ft	N/A
NE15-FW	27.7 ft	27.5 ft	N/A
NE16	30.4 ft	30.5 ft	0.1 ft
NE12-B-FW	31.9 ft	32.0 ft	0.1 ft

Table 3-6. IHNC and GIWW Basin Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
SBRK-FW	15.7 ft	16.0 ft	0.3 ft
SBRK-G	15.8 ft	16.0 ft	0.2 ft
SBRK-FW	15.8 ft	16.0 ft	0.2 ft
GIWW-FW	25.9 ft	26.0 ft	0.1 ft
GIWW-G	26.1 ft	26.0 ft	N/A
GIWW-M	26.0 ft	26.0 ft	N/A
GIWW-B	25.8 ft	26.0 ft	0.2 ft
Lake Borgne FW	25.8 ft	25.5 ft	N/A
BVN-G	25.8 ft	26.0 ft	0.2 ft
BVN-FW	25.8 ft	25.5 ft	N/A
MRGO-CS	25.8 ft	25.5 ft	N/A
MRGO-FW	26.0 ft	26.0 ft	N/A

Table 3-7. St. Bernard Parish Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
SB11	31.9 ft	32.0 ft	0.1 ft
SB12	29.8 ft	30.0 ft	0.2 ft
SB13	29.0 ft	29.0 ft	N/A
SB19-FW	28.8 ft	29.0 ft	0.2 ft
SB19-G	30.9 ft	29.0 ft	N/A
SB19-FW	28.8 ft	29.0 ft	0.2 ft
SB13	29.0 ft	29.0 ft	N/A
SB15	28.0 ft	28.0 ft	N/A
SB161-LT	29.8 ft	30.0 ft	0.2 ft
SB161-G1	29.7 ft	30.0 ft	0.3 ft
SB161-LT	29.8 ft	30.0 ft	0.2 ft
SB161-G2	29.9 ft	30.0 ft	0.1 ft
SB16	32.0 ft	32.0 ft	N/A
SB20	31.9 ft	32.0 ft	0.1 ft
SB16	32.0 ft	32.0 ft	N/A
SB17	32.0 ft	32.0 ft	N/A

SB21-TR	27.7 ft	29.0 ft	1.3 ft
SB21-FW	26.4 ft	26.0 ft	N/A

Section	Top of Wall Elevation	Design Elevation	Deficiency
SB21-G1	25.8 ft	26.0 ft	0.2 ft
SB21-FW	26.4 ft	26.0 ft	N/A
SB21-G2	33.5 ft	26.0 ft	N/A
SB21-FW	26.4 ft	26.0 ft	N/A
SB21-MRL tie-in	22.3 ft	24.0 ft	1.7 ft

Table 3-8. LPV-MRL Hard Structures Information – Existing Conditions

Section	Top of Wall Elevation	Design Elevation	Deficiency
103E-LF	25.3 ft	17.5 ft	N/A
103E-LF	24.1 ft	17.5 ft	N/A
103E-LF	24.1 ft	17.5 ft	N/A
100E-F	23.0 ft	17.5 ft	N/A
99E-F	22.9 ft	17.5 ft	N/A
98E-F	22.7 ft	17.5 ft	N/A
97E-F	22.2 ft	17.5 ft	N/A
96E-F	21.9 ft	17.5 ft	N/A
95E-F	21.4 ft	17.5 ft	N/A
94E-F	20.9 ft	17.5 ft	N/A
93E-F	20.8 ft	17.5 ft	N/A
93E-F	20.8 ft	17.5 ft	N/A
92E-LF	20.6 ft	17.5 ft	N/A
91E-LF	20.6 ft	17.5 ft	N/A
91E-F	21.3 ft	17.5 ft	N/A
91E-LF	20.6 ft	17.5 ft	N/A
91E-LF	20.5 ft	17.5 ft	N/A
91E-F	20.4 ft	17.5 ft	N/A
91E-LF	20.6 ft	17.5 ft	N/A
91E-LF	20.5 ft	17.5 ft	N/A
91E-F	21.3 ft	17.5 ft	N/A
91E-LF	20.0 ft	17.5 ft	N/A
91E-F	19.8 ft	17.5 ft	N/A

90E-LF	19.9 ft	17.5 ft	N/A
88E-LF	22.5 ft	17.5 ft	N/A

3.3 CONCLUSIONS

Currently, the average top of wall elevations for the majority of the sections in the LPV system are at or above the average 2057 100-year design elevations. Of the deficient sections, the majority are only slightly deficient with deficiencies at or below 0.5 ft. There are also two moderately deficient sections with deficiencies of 1.3 ft and 1.7 ft.

4 FUTURE WITHOUT PROJECT/ACTION CONDITIONS – 100-YEAR

4.1 ASSUMPTIONS

Since the hard structures throughout the LPV system stretch for many miles, the system was divided into sections within segments, as listed in the tables of paragraph 1.2.1, STUDY AREA. The scope of this analysis consists of determining which hard structures in the LPV system will fail to provide the required level of risk reduction for the 2073 100-year RSLR scenario of 1.8 ft. The top of wall elevations for this analysis are based on EGIS data and the 2073 100-year design elevations on data provided by the Hydraulics and Hydrology Branch utilizing a more refined ADCIRC model. Therefore, the design elevations in this section cannot be directly compared to the 2057 100-yr HSDRRS design elevations. For simplicity, the average top of wall and 2073 100-year design elevations for each section were used. While the top of wall elevation may vary some within a section, it is unlikely to vary significantly. For further information on the 2073 100-year design elevations, see the Hydraulics and Hydrology appendix.

4.2 ANALYSIS

The average 2073 100-year design elevations were compared to the average top of wall elevations. The average top of wall and 2073 100-year design elevations, as well as the amount each section is deficient, are presented in Table 4-1 through Table 4-8 below. Table 4-8 only includes sections located downriver of the crossover point. The reductions in some future 100-year elevations are because these design elevations are based upon updated design calculations and updated hydraulic information with updated surge hazard analysis and wave periods.

Table 4-1. St. Charles Parish Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
SC11	18.5 ft	15.5 ft	N/A
SC08-FW1	18.2 ft	15.5 ft	N/A
SC08-FW2	16.6 ft	15.5 ft	N/A
SC15-FW	17.1 ft	15.5 ft	N/A
SC05-FW	17.1 ft	18.0 ft	0.9 ft
SC05-G	17.5 ft	18.0 ft	0.5 ft
SC05-FW	17.1 ft	18.0 ft	0.9 ft
SC07	17.3 ft	17.0 ft	N/A
SC06	17.2 ft	17.5 ft	0.3 ft
SC04	16.6 ft	17.0 ft	0.4 ft
SC04-G	16.4 ft	17.0 ft	0.6 ft
SC04	16.6 ft	17.0 ft	0.4 ft
SC12-FW2	15.8 ft	15.5 ft	N/A
SC12-FW1	14.7 ft	15.5 ft	0.8 ft
SC12-FW2	15.8 ft	15.5 ft	N/A
SC09	15.5 ft	15.5 ft	N/A
SC09-G	15.6 ft	15.5 ft	N/A
SC09	15.5 ft	15.5 ft	N/A
SC10	15.5 ft	15.5 ft	N/A
SC10-G	15.5 ft	15.5 ft	N/A
SC10	15.5 ft	15.5 ft	N/A
SC13-FW	15.5 ft	15.5 ft	N/A
SC13-G	15.8 ft	15.5 ft	N/A
SC13-FW	15.5 ft	15.5 ft	N/A
SC30	15.6 ft	15.5 ft	N/A
SC01-A2	17.0 ft	17.0 ft	N/A
SC01-A1	17.3 ft	18.0 ft	0.7 ft

Table 4-2. Jefferson Parish Lakefront Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
JL09	17.4 ft	15.5 ft	N/A
JL05	18.9 ft	15.0 ft	N/A
JL07	16.9 ft	14.5 ft	N/A
JL04	20.4 ft	15.0 ft	N/A
JL03	17.0 ft	15.0 ft	N/A
JL06	15.3 ft	15.0 ft	N/A
JL02	17.0 ft	15.0 ft	N/A
JL08	17.0 ft	15.0 ft	N/A

Table 4-3. Orleans Parish Metro Lakefront Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
NO13	18.0 ft	15.0 ft	N/A
NO13	18.0 ft	15.0 ft	N/A
NO06-LT	16.1 ft	15.0 ft	N/A
NO06-FW	16.0 ft	15.0 ft	N/A
NO14-L1A	15.9 ft	15.0 ft	N/A
NO06-FW	16.0 ft	15.0 ft	N/A
NO14-L1	16.3 ft	15.0 ft	N/A
NO06-FW	16.0 ft	15.0 ft	N/A
NO14-L2	15.9 ft	15.0 ft	N/A
NO06-FW	15.9 ft	15.0 ft	N/A
NO14-L4A	16.0 ft	15.0 ft	N/A
NO06-FW	15.9 ft	15.0 ft	N/A
NO14-G4	16.0 ft	15.0 ft	N/A
NO06-FW	16.0 ft	15.0 ft	N/A
NO10-LL	15.9 ft	15.0 ft	N/A
NO10-LI	18.0 ft	15.0 ft	N/A

NO12	18.0 ft	15.0 ft	N/A
NO14-G3	16.8 ft	15.0 ft	N/A
NO16	17.9 ft	14.5 ft	N/A
NO07-A	18.6 ft	15.0 ft	N/A
NO07-B	16.1 ft	15.0 ft	N/A
NO07-B	16.1 ft	15.0 ft	N/A
NO07-C	16.1 ft	15.0 ft	N/A
NO07-B	16.1 ft	15.0 ft	N/A
NO07-B	16.1 ft	15.0 ft	N/A
NO07-A	18.6 ft	15.0 ft	N/A
NO15-G2	18.6 ft	14.5 ft	N/A
NO11	18.0 ft	15.0 ft	N/A
NO08	18.2 ft	14.5 ft	N/A
NO15-L9A	17.8 ft	14.5 ft	N/A
NO08	18.1 ft	18.0 ft	N/A
NO15-L9B	19.0 ft	17.0 ft	N/A
NO08	18.2 ft	18.0 ft	N/A
NO15-L9C	17.7 ft	17.5 ft	N/A
NO08	18.2 ft	15.0 ft	N/A
NO09	19.0 ft	14.5 ft	N/A
NO17	16.9 ft	15.0 ft	N/A
NO14-G1	16.5 ft	15.0 ft	N/A
NO17	16.9 ft	15.0 ft	N/A
NO20-FW1	16.4 ft	15.0 ft	N/A
NO20-G1	16.4 ft	15.0 ft	N/A
NO20-FW1	16.5 ft	15.0 ft	N/A
NO20-G2	16.5 ft	15.0 ft	N/A
NO20-FW1	16.5 ft	15.0 ft	N/A
NO20-FW2	18.0 ft	15.0 ft	N/A

Table 4-4. Orleans Parish Lakefront East Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
NE04-FW	15.3 ft	13.5 ft	N/A
NE04-G	15.3 ft	13.5 ft	N/A
NE04-FW	15.4 ft	13.5 ft	N/A
NE03-FW	15.5 ft	13.5 ft	N/A
NE03-LI	15.5 ft	13.5 ft	N/A
NE09	15.4 ft	13.5 ft	N/A
NE03-FW	15.5 ft	13.5 ft	N/A
NE01	14.6 ft	13.5 ft	N/A
NE07	14.6 ft	13.5 ft	N/A
NE01	14.6 ft	13.5 ft	N/A
NE08	14.5 ft	13.5 ft	N/A
NE01	14.6 ft	13.5 ft	N/A
NE05	15.7 ft	13.5 ft	N/A
NE01	14.6 ft	13.5 ft	N/A
NE30-FW	17.2 ft	13.5 ft	N/A
NE06	17.7 ft	15.0 ft	N/A

Table 4-5. South Point to MRGO/GIWW Closure Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
NE13	18.3 ft	16.5 ft	N/A
NE14	22.2 ft	18.5 ft	N/A
NE15-FW	27.7 ft	22.0 ft	N/A
NE15-G	29.0 ft	23.5 ft	N/A
NE15-FW	27.7 ft	23.5 ft	N/A
NE16	30.4 ft	28.5 ft	N/A
NE12-B-FW	31.9 ft	27.5 ft	N/A

Table 4-6. IHNC and GIWW Basin Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
SBRK-FW	15.7 ft	15.0 ft	N/A
SBRK-G	15.8 ft	15.0 ft	N/A
SBRK-FW	15.8 ft	15.0 ft	N/A
GIWW-FW	25.9 ft	27.5 ft	1.6 ft
GIWW-G	26.1 ft	28.5 ft	2.4 ft
GIWW-M	26.0 ft	28.5 ft	2.5 ft
GIWW-B	25.8 ft	28.5 ft	2.7 ft
Lake Borgne FW	25.8 ft	28.5 ft	2.7 ft
BVN-G	25.8 ft	29.0 ft	3.2 ft
BVN-FW	25.8 ft	29.5 ft	3.7 ft
MRGO-CS	25.8 ft	30.0 ft	4.2 ft
MRGO-FW	26.0 ft	29.5 ft	3.5 ft

Table 4-7. St. Bernard Parish Hard Structures Information – Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
SB11	31.9 ft	26.5 ft	N/A
SB12	29.8 ft	26.0 ft	N/A
SB13	29.0 ft	25.5 ft	N/A
SB19-FW	28.8 ft	25.5 ft	N/A
SB19-G	30.9 ft	25.5 ft	N/A
SB19-FW	28.8 ft	25.5 ft	N/A
SB13	29.0 ft	25.0 ft	N/A
SB15	28.0 ft	25.0 ft	N/A
SB161-LT	29.8 ft	23.5 ft	N/A
SB161-G1	29.7 ft	23.0 ft	N/A
SB161-LT	29.8 ft	23.0 ft	N/A
SB161-G2	29.9 ft	23.0 ft	N/A

SB16	32.0 ft	24.0 ft	N/A
SB20	31.9 ft	23.5 ft	N/A
SB16	32.0 ft	23.5 ft	N/A
SB17	32.0 ft	24.0 ft	N/A
SB21-TR	27.7 ft	21.5 ft	N/A
SB21-FW	26.4 ft	22.0 ft	N/A
SB21-G1	25.8 ft	21.5 ft	N/A
SB21-FW	26.4 ft	21.5 ft	N/A

Section	Top of Wall Elevation	Design Elevation	Deficiency
SB21-G2	33.5 ft	22.0 ft	N/A
SB21-FW	26.4 ft	21.5ft	N/A
SB21-MRL tie-in	22.3 ft	21.5 ft	N/A

Table 4-8. LPV-MRL Hard Structures Information –Future Conditions (2073 100-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
90E-LF	19.9 ft	20.5 ft	0.6 ft
88E-LF	22.5 ft	19.0 ft	N/A

4.3 CONCLUSIONS

Based on this analysis, the majority of the sections in the LPV system will not be deficient with the 2073 100-year RSLR of 1.8 ft. Of the deficient sections, approximately half are significantly deficient with deficiencies ranging from 2.1 ft to 4.2 ft. The other half are slightly deficient with deficiencies ranging from 0.3 ft to 0.9 ft. There is also one moderately deficient section with a deficiency of 1.6 ft.

5 FUTURE WITHOUT PROJECT/ACTION CONDITIONS – 200-YEAR

5.1 ASSUMPTIONS

Since the hard structures throughout the LPV system stretch for many miles, the system was divided into sections within segments, as listed in the tables of paragraph 1.2.1, STUDY AREA. The scope of this analysis consists of determining which hard structures in the LPV system will fail to provide the required level of risk reduction for the 2073 200-year RSLR scenario of 1.8 ft. The top of wall elevations for this analysis are based on EGIS data and the 2073 200-year design elevations on data provided by the Hydraulics and Hydrology Branch utilizing a more refined ADCIRC model. Therefore, the design elevations in this section cannot be directly compared to the 2057 100-yr HSDRRS design elevations.. For simplicity, the average top of wall and 2073 200-year design elevations for each section were used. While the top of wall elevation may vary some within a section, it is unlikely to vary significantly. For further information on the 2073 200-year design elevations, see the Hydraulics and Hydrology appendix.

5.2 ANALYSIS

The average 2073 200-year design elevations were compared to the average top of wall elevations. The average top of wall and 2073 200-year design elevations, as well as the amount each section is deficient, are presented in Table 5-1 through Table 5-8 below. Table 5-8 only includes sections located downriver of the crossover point. The reductions in some future 200-year elevations are because these design elevations are based upon updated design calculations and updated hydraulic information with updated surge hazard analysis and wave periods.

Table 5-1. St. Charles Parish Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
SC11	18.5 ft	16.5 ft	N/A
SC08-FW1	18.2 ft	16.5 ft	N/A
SC08-FW2	16.6 ft	16.5 ft	N/A
SC15-FW	17.1 ft	17.0 ft	N/A
SC05-FW	17.1 ft	19.5 ft	2.4 ft
SC05-G	17.5 ft	19.5 ft	2.0 ft
SC05-FW	17.1 ft	19.5 ft	2.0 ft
SC07	17.3 ft	19.0 ft	1.7 ft
SC06	17.2 ft	19.5 ft	2.3 ft
SC04	16.6 ft	19.0 ft	2.4 ft
SC04-G	16.4 ft	19.0 ft	2.6 ft
SC04	16.6 ft	19.0 ft	2.4 ft
SC12-FW2	15.8 ft	17.0 ft	1.2 ft
SC12-FW1	14.7 ft	17.0 ft	2.3 ft
SC12-FW2	15.8 ft	17.0 ft	1.2 ft
SC09	15.5 ft	17.0 ft	1.5 ft
SC09-G	15.6 ft	17.0 ft	1.4 ft
SC09	15.5 ft	17.0 ft	1.5 ft
SC10	15.5 ft	17.0 ft	1.5 ft
SC10-G	15.5 ft	17.0 ft	1.5 ft
SC10	15.5 ft	17.0 ft	1.5 ft
SC13-FW	15.5 ft	17.5 ft	2.0 ft
SC13-G	15.8 ft	17.5 ft	1.7 ft
SC13-FW	15.5 ft	17.5 ft	2.0 ft
SC30	15.6 ft	17.5 ft	1.9 ft
SC01-A2	17.0 ft	19.0 ft	2.0 ft
SC01-A1	17.3 ft	19.5 ft	2.2 ft

Table 5-2. Jefferson Parish Lakefront Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
JL09	17.4 ft	17.0 ft	N/A
JL05	18.9 ft	16.5 ft	N/A
JL07	16.9 ft	16.5 ft	N/A
JL04	20.4 ft	16.5 ft	N/A
JL03	17.0 ft	17.0 ft	N/A
JL06	15.3 ft	17.0 ft	1.7 ft
JL02	17.0 ft	17.0 ft	N/A
JL08	17.0 ft	17.0 ft	N/A

Table 5-3. Orleans Parish Metro Lakefront Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
NO13	18.0 ft	17.0 ft	N/A
NO13	18.0 ft	17.0 ft	N/A
NO06-LT	16.1 ft	17.0 ft	0.9 ft
NO06-FW	16.0 ft	17.0 ft	1.0 ft
NO14-L1A	15.9 ft	17.0 ft	1.1 ft
NO06-FW	16.0 ft	17.0 ft	1.0 ft
NO14-L1	16.3 ft	17.0 ft	0.7 ft
NO06-FW	16.0 ft	17.0 ft	1.0 ft
NO14-L2	15.9 ft	17.0 ft	1.1 ft
NO06-FW	15.9 ft	17.0 ft	1.1 ft
NO14-L4A	16.0 ft	17.0 ft	1.0 ft
NO06-FW	15.9 ft	17.0 ft	1.1 ft
NO14-G4	16.0 ft	17.0 ft	1.0 ft
NO06-FW	16.0 ft	17.0 ft	1.0 ft
NO10-LL	15.9 ft	17.0 ft	1.1 ft
NO10-LI	18.0 ft	17.0 ft	N/A

NO12	18.0 ft	17.0 ft	N/A
NO14-G3	16.8 ft	17.0 ft	0.2 ft
NO16	17.9 ft	17.0 ft	N/A
NO07-A	18.6 ft	17.0 ft	N/A
NO07-B	16.1 ft	17.0 ft	0.9 ft
NO07-B	16.1 ft	17.0 ft	0.9 ft
NO07-C	16.1 ft	17.0 ft	0.9 ft
NO07-B	16.1 ft	17.0 ft	0.9 ft
NO07-B	16.1 ft	17.0 ft	0.9 ft
NO07-A	18.6 ft	17.0 ft	N/A
NO15-G2	18.6 ft	17.0 ft	N/A
NO11	18.0 ft	17.0 ft	N/A
NO08	18.2 ft	17.0 ft	N/A
NO15-L9A	17.8 ft	17.0 ft	N/A
NO08	18.1 ft	21.0 ft	2.9 ft
NO15-L9B	19.0 ft	19.5 ft	0.5 ft
NO08	18.2 ft	21.0 ft	2.8 ft
NO15-L9C	17.7 ft	19.5 ft	1.8 ft
NO08	18.2 ft	17.0 ft	N/A
NO09	19.0 ft	17.0 ft	N/A
NO17	16.9 ft	17.0 ft	0.1 ft
NO14-G1	16.5 ft	17.0 ft	0.5 ft
NO17	16.9 ft	17.0 ft	0.1 ft
NO20-FW1	16.4 ft	17.0 ft	0.6 ft
NO20-G1	16.4 ft	17.0 ft	0.6 ft
NO20-FW1	16.5 ft	17.0 ft	0.5 ft
NO20-G2	16.5 ft	17.0 ft	0.5 ft
NO20-FW1	16.5 ft	17.0 ft	0.5 ft
NO20-FW2	18.0 ft	17.0 ft	N/A

Table 5-4. Orleans Parish Lakefront East Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
NE04-FW	15.3 ft	15.0 ft	N/A
NE04-G	15.3 ft	15.0 ft	N/A
NE04-FW	15.4 ft	15.0 ft	N/A
NE03-FW	15.5 ft	15.0 ft	N/A
NE03-LI	15.5 ft	15.0 ft	N/A
NE09	15.4 ft	15.0 ft	N/A
NE03-FW	15.5 ft	15.0 ft	N/A
NE01	14.6 ft	15.0 ft	0.4 ft
NE07	14.6 ft	19.0 ft	4.4 ft
NE01	14.6 ft	15.0 ft	0.4 ft
NE08	14.5 ft	15.0 ft	0.5 ft
NE01	14.6 ft	15.0 ft	0.4 ft
NE05	15.7 ft	15.0 ft	N/A
NE01	14.6 ft	15.0 ft	0.4 ft
NE30-FW	17.2 ft	15.0 ft	N/A
NE06	17.7 ft	17.5 ft	N/A

Table 5-5. South Point to MRGO/GIWW Closure Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
NE13	18.3 ft	19.5 ft	1.2 ft
NE14	22.2 ft	22.0 ft	N/A
NE15-FW	27.7 ft	25.5 ft	N/A
NE15-G	29.0 ft	26.5 ft	N/A
NE15-FW	27.7 ft	26.5 ft	N/A
NE16	30.4 ft	31.5 ft	1.1 ft
NE12-B-FW	31.9 ft	31.0 ft	N/A

Table 5-6. IHNC and GIWW Basin Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
SBRK-FW	15.7 ft	17.0 ft	1.3 ft
SBRK-G	15.8 ft	17.0 ft	1.2 ft
SBRK-FW	15.8 ft	17.0 ft	1.2 ft
GIWW-FW	25.9 ft	31.0 ft	5.1 ft
GIWW-G	26.1 ft	32.0 ft	5.9 ft
GIWW-M	26.0 ft	32.0 ft	6.0 ft
GIWW-B	25.8 ft	32.0 ft	6.2 ft
Lake Borgne FW	25.8 ft	32.0 ft	6.2 ft
BVN-G	25.8 ft	33.0 ft	7.2 ft
BVN-FW	25.8 ft	33.0 ft	7.2 ft
MRGO-CS	25.8 ft	34.0 ft	8.2 ft
MRGO-FW	26.0 ft	33.5 ft	7.5 ft

Table 5-7. St. Bernard Parish Hard Structures Information – Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
SB11	31.9 ft	30.0 ft	N/A
SB12	29.8 ft	30.0 ft	0.2 ft
SB13	29.0 ft	29.5 ft	0.5 ft
SB19-FW	28.8 ft	29.5 ft	0.7 ft
SB19-G	30.9 ft	29.5 ft	N/A
SB19-FW	28.8 ft	29.5 ft	0.7 ft
SB13	29.0 ft	29.5 ft	0.5 ft
SB15	28.0 ft	28.5 ft	0.5 ft
SB161-LT	29.8 ft	26.5 ft	N/A
SB161-G1	29.7 ft	26.0 ft	N/A
SB161-LT	29.8 ft	26.0 ft	N/A
SB161-G2	29.9 ft	26.0 ft	N/A

SB16	32.0 ft	28.0 ft	N/A
SB20	31.9 ft	27.5 ft	N/A
SB16	32.0 ft	27.0 ft	N/A
SB17	32.0 ft	28.0 ft	N/A
SB21-TR	27.7 ft	24.5 ft	N/A
SB21-FW	26.4 ft	25.0 ft	N/A
SB21-G1	25.8 ft	24.5 ft	N/A
SB21-FW	26.4 ft	25.0 ft	N/A
SB21-G2	33.5 ft	25.0 ft	N/A
SB21-FW	26.4 ft	24.5 ft	N/A
SB21-MRL tie-in	22.3 ft	24.5 ft	2.2 ft

Table 5-8. LPV-MRL Hard Structures Information –Future Conditions (2073 200-year)

Section	Top of Wall Elevation	Design Elevation	Deficiency
92E-LF	20.6 ft	23.0 ft	2.4 ft
91E-LF	20.6 ft	20.0 ft	N/A
91E-F	21.3 ft	20.0 ft	N/A
91E-LF	20.6 ft	20.0 ft	N/A
91E-LF	20.5 ft	20.0 ft	N/A
91E-F	20.4 ft	20.0 ft	N/A
91E-LF	20.6 ft	20.0 ft	N/A
91E-LF	20.5 ft	20.0 ft	N/A
91E-F	21.3 ft	20.0 ft	N/A
91E-LF	20.0 ft	20.0 ft	N/A
91E-F	19.8 ft	20.0 ft	0.2 ft
90E-LF	19.9 ft	22.5 ft	2.6 ft
88E-LF	22.5 ft	21.0 ft	N/A

5.3 CONCLUSIONS

Based on this analysis, the majority of the sections in the LPV system will be deficient with the 2073 200-year RSLR of 1.8 ft. Of the deficient sections, approximately one third are significantly deficient with deficiencies ranging from 2 ft to 8.2 ft, one third are moderately deficient with

deficiencies ranging from 1 ft to 1.9 ft, and one third are slightly deficient with deficiencies ranging from 0.1 ft to 0.9 ft.

6 RECOMMENDED MODIFICATIONS

Based on past experience and engineering judgment, it was initially determined that sections less than 2 ft deficient could be modified by extending the wall stem as necessary and sections with a deficiency of 2 ft or more would need to be demolished and replaced as increasing the stem height by such a large amount would likely result in the foundation becoming insufficient. Subsequently, representative sections with deficiencies below 2 ft were analyzed for the modified wall heights and determined to be insufficient. Based on these analyses, it was determined that walls with deficiencies of 0.5 ft or more would need to be demolished. As this resulted in all but an insignificant amount of wall being demolished, the decision was made that all deficient walls should be demolished. For the 2073 100-yr RSLR future condition, approximately 4,941 linear feet (0.9 miles) of floodwall would be demolished and 11,779 linear feet (2.2 miles) of levee would be replaced with floodwall (see Civil Appendix for details). For the 2073 200-yr RSLR future condition, approximately 81,830 linear feet (15.5 miles) of floodwall would be demolished and approximately 105,820 linear feet (20.0 miles) of floodwall would be modified.

Due to the magnitude and scope of this study, the PDT determined to use a representative cross section of floodwall as a basis for the development of the quantities and cost estimate. The quantities shown in Table 6-1, on the next page, are for a linear foot of floodwall based on the representative section. These quantities were then multiplied by the linear feet of wall required in each area to provide a representative cost estimate. Further explanation is provided in the assumptions listed for the cost estimate in the appropriate appendix.

Table 6-1. Typical Section Quantities (per foot of wall)

Number	Number Description	Quantity	Unit
1	**Mob & Demob**	1.00	LS
2	**Excavation**		
	Structural Excavation	6.02	CY
3	**Civil**		
	Embankment (Structural Backfill)	6.48	CY
	Fertilizing & Seeding	0.001	AC
4	**Foundation**		
	18” Diameter Steel Pipe Pile	38.31	LF
	Sheet Pile	23.00	SF
5	**Structure Concrete**		
	Reinforced Slabs	1.94	CY
	Reinforced Walls	1.44	CY
	Stabilization Slab (4”)	0.19	CY
6	**Demolition**		
	Sheet Piling	1.00	LF
	Pipe Pile/H-Pile	0.46	EA
	Footing	1.33	CY
	Stem	0.89	CY

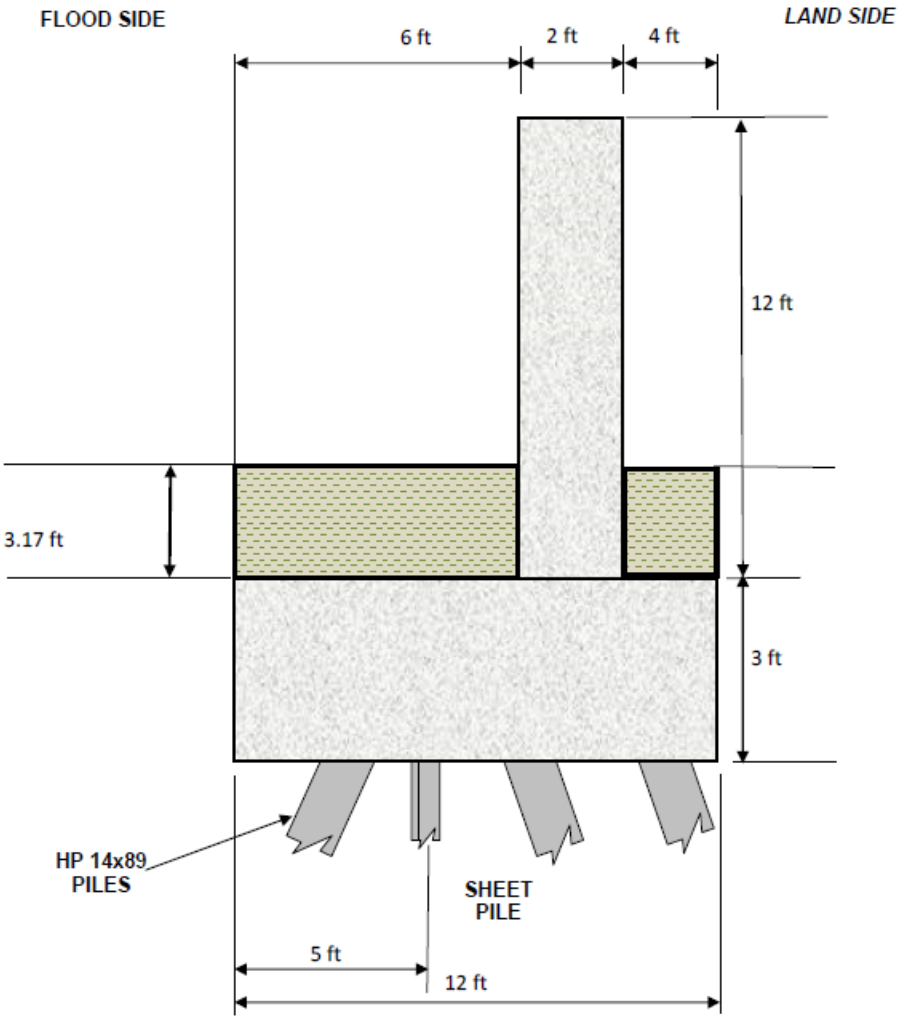

Figure 1-9. Representative Typical Existing T-Wall Cross Section

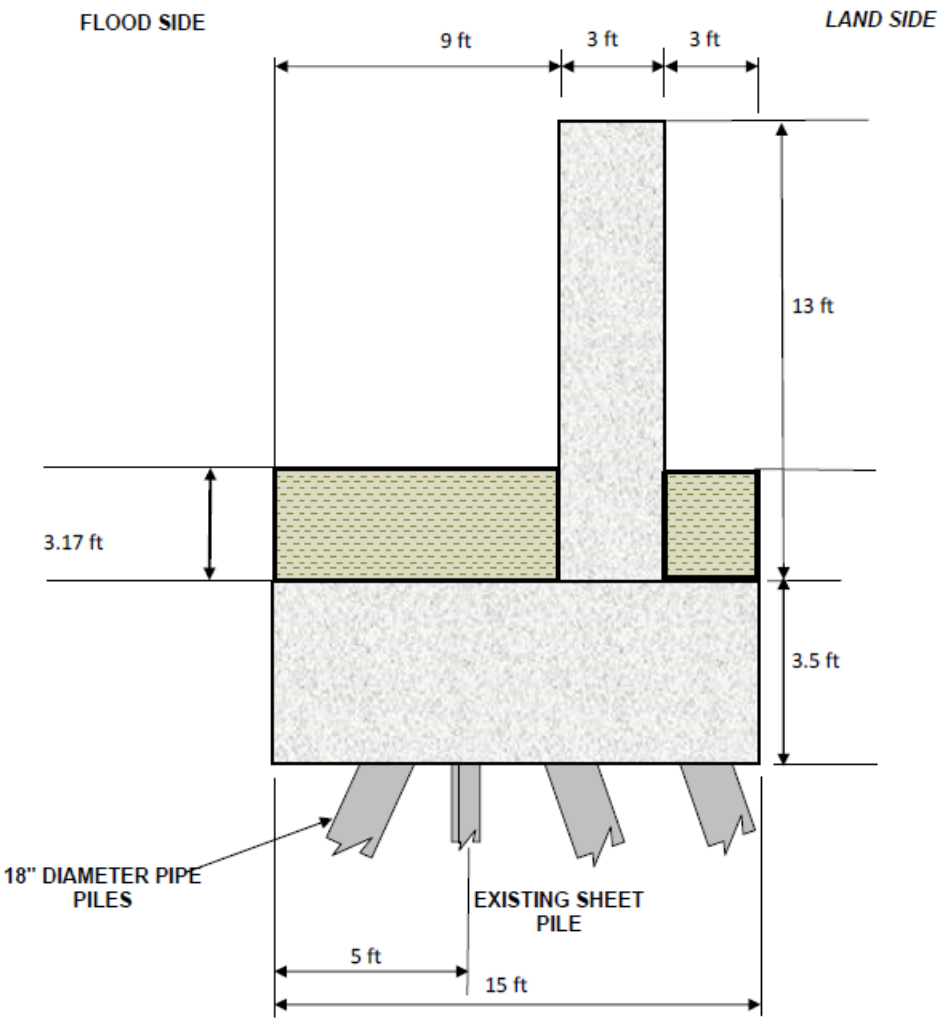

Figure 1-10. Representative Typical Replacement T-Wall Cross Section

7 RISK AND UNCERTAINTY

While the top of wall elevation does vary some, it generally does not vary a significant amount in any given section. Therefore, the level of risk associated with using average elevations for this analysis is low. However, the recommended modifications are based on broad generalizations. Section geometry, soil conditions, and other factors vary from section to section making it very likely that the actual modifications required will differ from those assumed in this analysis.