

Appendix 5

Plaquemines Basin

Background

The Plaquemines (PL) Basin is made up of 11 sub-basins as shown in Figure 1. It is generally composed of the Plaquemines Parish along the east and west banks of the Mississippi River south of Mile 82. Both the west and east bank protection includes the Mississippi River levees as a part of each sub-basin. There are 134 miles of MRL and floodwall, 53 miles of hurricane protection, 12 miles of floodwall, 19 pump stations, a 110-foot small boat lock, and a marine floodgate. The damage consisted of 20 miles of MRL and HPS levee, 9.4 miles of floodwall, and five pump stations.

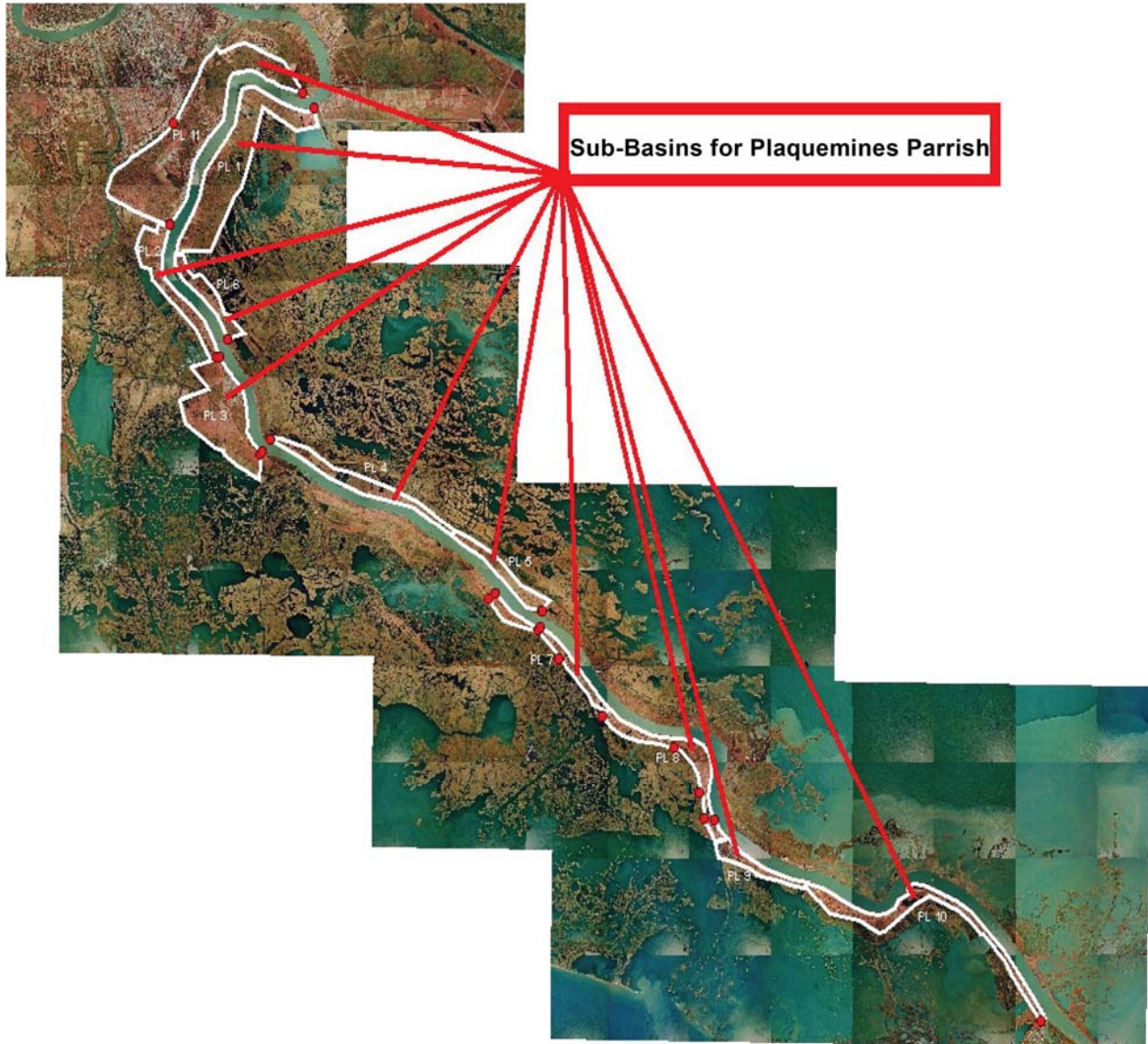


Figure 1. Plaquemines Parrish with levee protection footprint and sub-basins (PL1 – PL11)

PL 11

PL 11 begins along the west back of the MRL, shown in Figure 2, is generally bounded on the east by the Mississippi River, the Intercoastal Waterway on the west, the Plaquemines-Orleans Parrish boundary on the north, and the Hero Canal on the south.

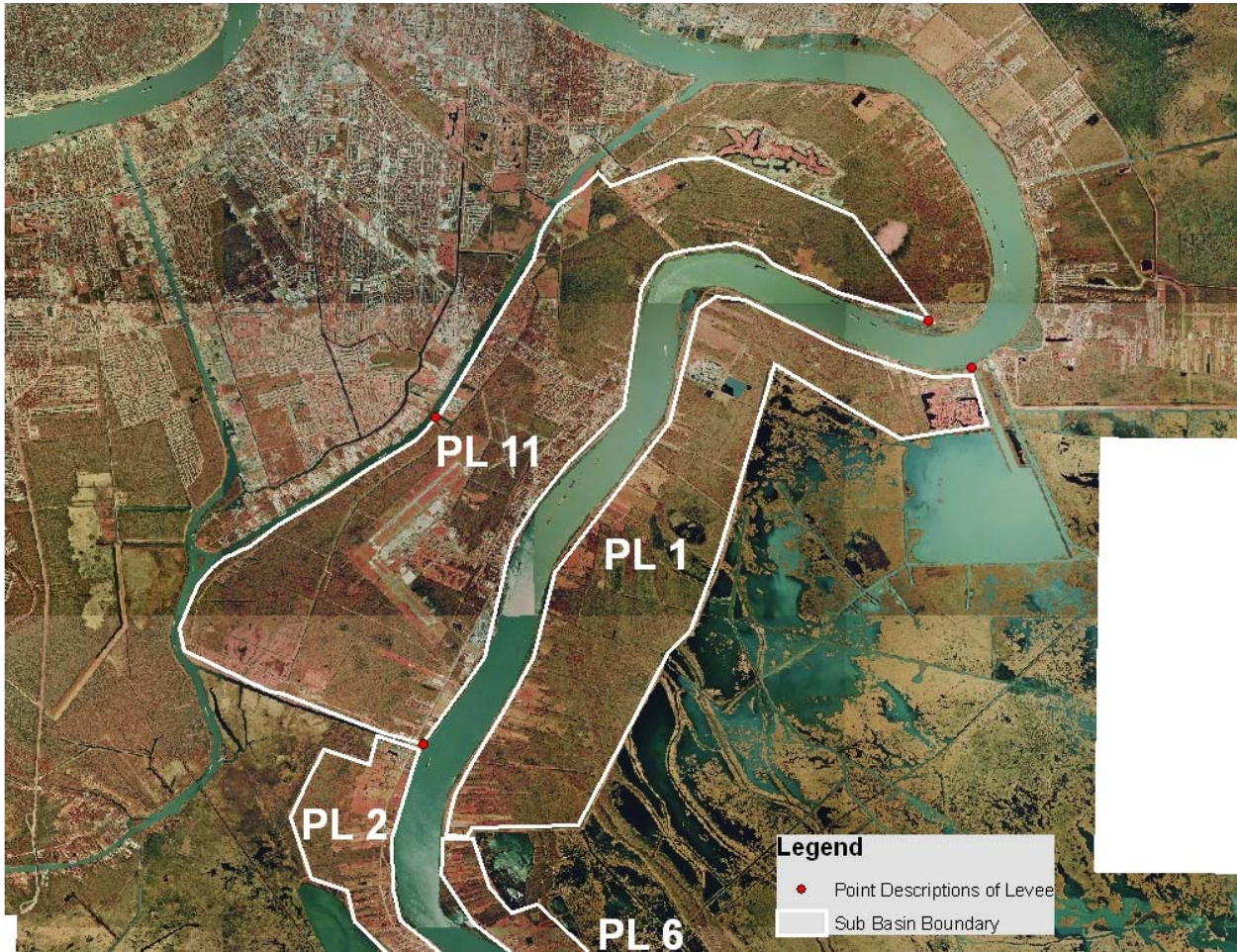


Figure 2. PL 11 and PL 1 Sub-Basins with Reach Beginning and Ending Points (Red Dots)

The federal levee begins at the MRL inside the U.S. Coast Guard station.







Back levee continues inside
U.S. Coast Guard Station

Back levee crossed by roadway
inside U.S. Coast Guard Station.
Roadway is 2 feet lower than
levee. No closure structure



Back levee continues outside U.S. Coast Guard toward GIWW Station



Drainage structure under Back Levee outside U.S. Coast Guard station. Screw gate closure on culvert



Back Levee intersects Hwy 406 looking toward the GIWW and General De Gaulle Bride overpass.
No closure at Hwy



Back Levee passed under General De Gaulle onramp from Hwy 406. Buckling of concrete slab on levee under ramp.

The interior Orleans-Plaquemines Parrish levee ends at the GIWW. The Federal Back levee along the GIWW the proceeds south and passes under the General De Gaulle Highway bridge overpass.



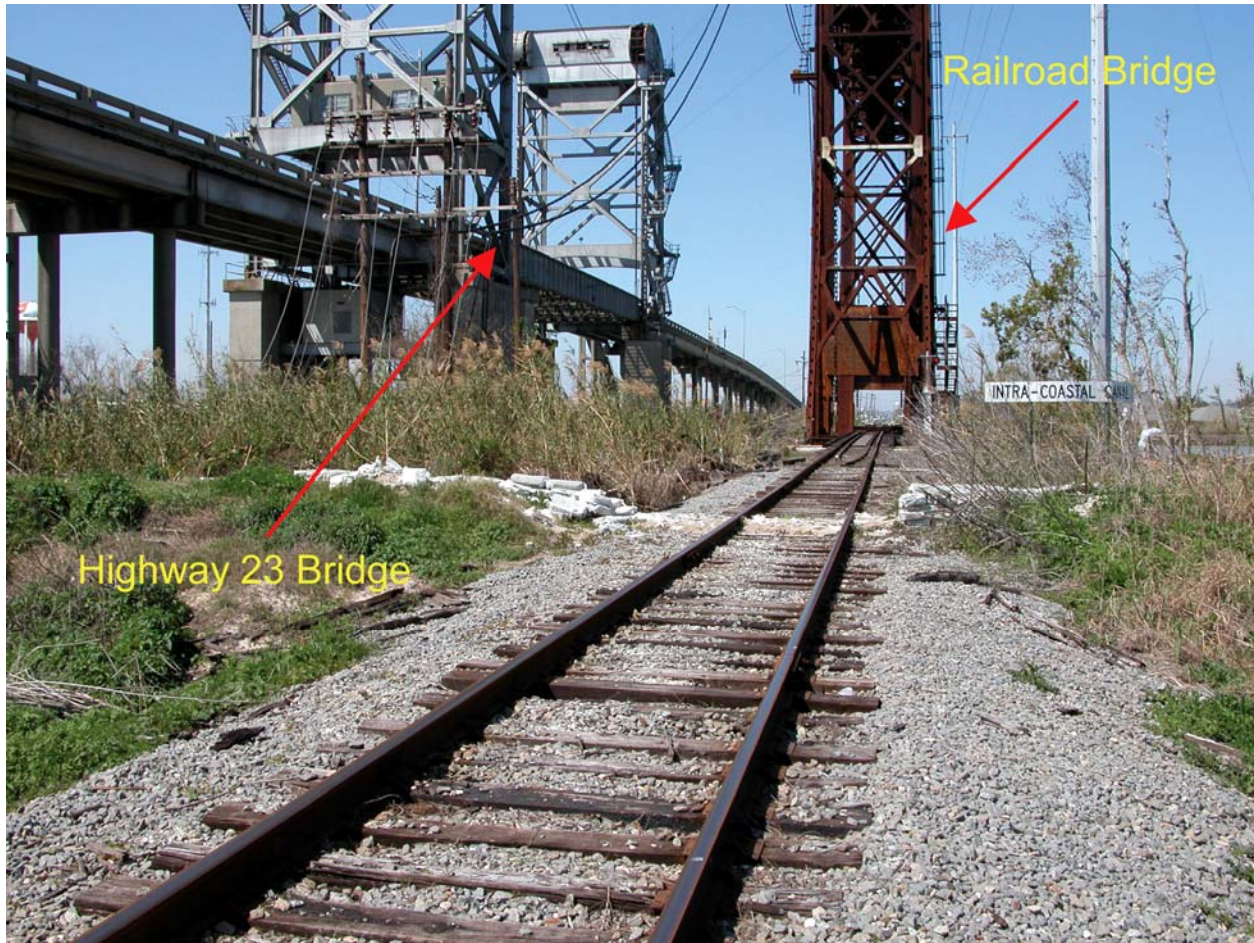


Going south along the GIWW to the Belle Chase Pump Station.

Sub-basin continues south along the GIWW to the Highway 23 and Railroad Bridge Crossing and Tunnel under GIWW.



Highway 23 Bridge over GIWW and Levee





Highway 23 Tunnel under the GIWW



Pipe crossing over the GIWW levee



A point of levee erosion along the GIWW, however most is in good condition



Typical levee section. Numerous gates across levee to contain cattle



Typical levee section along the GIWW



Plaquemines Pump Stations 1 and 2



Plaquemines Pump Stations 1 and 2



PL 11 Back levee intersects Hwy 23 north of Jesuit Bend

The MRL then forms the remaining section of PL 11 as it goes north along the river to the point where it intersects the Plaquemines Parish interior levee inside the U.S. Coast Guard station.



The crown of the levee is generally 10 feet wide, with most paved and some stretches gravel. Numerous pipes cross over the MRL in this area



A number of off-load facilities are located along this portion of the MRL, similar to this grain loading facility



There were a few cases of erosion along the MRL



More typical condition along this section of the MRL, with concrete paved or stone crown and concrete armored floodside

PL 2

PL 2 begins at this point and continues south toward the Alliance Refinery as a non-federal levee. Figure 3 shows the sub-basins PL2, PL3 and PL 6.

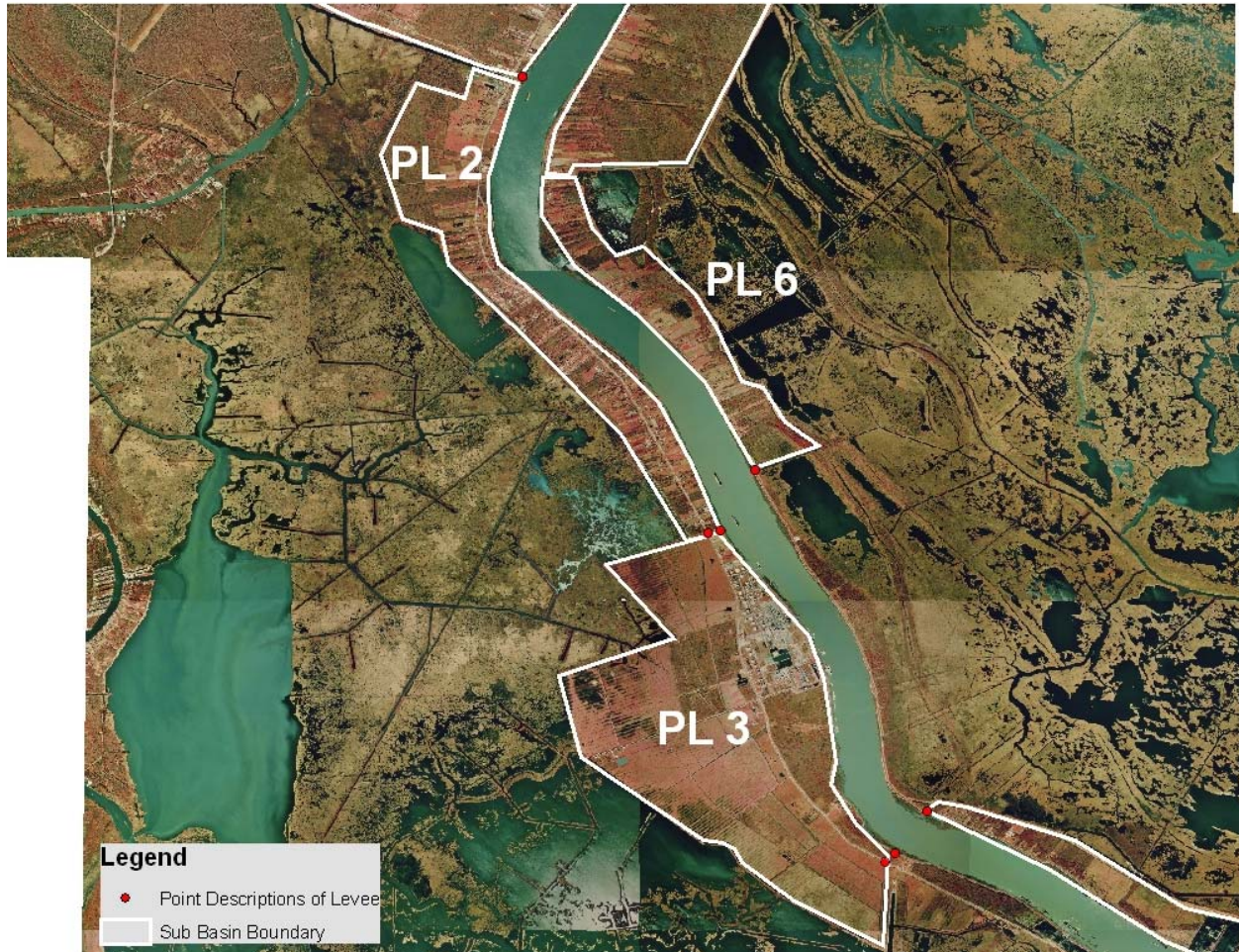


Figure 3. Location of sub-basins PL 2, PL 3, and PL 6



Ollie Pump Station



Ollie Pump Station

The condition of the non-federal levee varies. The crown is generally in better condition if cows are present on the levee.





The PL 2 back levee comes to an end back at Hwy 23 just north of the Alliance Refinery. It then is completed by the MRL as it goes north along the river.

PL 3

PL 3 then begins at this point, just north of the Alliance Refinery, as a non-federal levee and proceeds southward to Myrtle Grove, where it intersects Hwy 23. Levee conditions are generally poorer than the PL 2 back levee, with large overgrowth being common. Many places are impassable by 4 WD vehicles.

The condition of the non-federal levee also varies. The crown is generally poor condition, with much impassable by motorized vehicle.





Continuing southward along the MRL, the sub-basin enclosed by the Citrus Lands Back Levee will not be included. There was an extensive breach in this levee and repairs were difficult. Below is the initial repair.



Citrus Lands Back Levee repairs to breach



Citrus Lands Back Levee repairs to breach

The Back Levee crosses Hwy 23 and connects to the MRL. The sub-basin enclosure then goes north as the MRL.



The Back Levee intersects the MRL after it crosses Hwy 23

As the MRL proceeds north, numerous locations of erosion occurred due to overtopping. Some were repaired and some were not extensive enough to require repair. Debris is located on the levee top and slopes as shown on the following three photos.







Also the MRL has numerous locations where the concrete armor was eroded and was replaced with stone. More cases of erosion are shown on the following three photos.







PL 4, 5, 7, 8, 9, and 10

These sub-basins are on the west bank, south of St. Jude. These sub-basins are in a project named New Orleans to Venice (NOV) Hurricane Protection Project.

NOV

The Mississippi River Levees also serve as the hurricane protection system south of St. Jude and is part of the NOV Hurricane Protection Project. On the East Bank, the project extends 16 miles from Phoenix down to Bohemia. On the West Bank it extends 37 miles from St. Jude to Venice.

Figures 4a and 4b give a comparison the NOV project definitions, and the sub-basin PL 4, 5, 7, 8, 9, and 10 locations.



Figure 4a. New Orleans to Venice, LA, Hurricane Protection Project



Figure 4b. Sub-basins PL 4, 5, 7, 8, 9, and 10

West Bank Back Levees

St. Jude to City Price

The St. Jude to City Price reach includes 3 miles of enlarged back levees from St. Jude to City Price (between approximate river miles 47.1 and 43.9 Above Head of Passes (AHP)). This levee was constructed to elevation 7.0 feet NGVD as a non-federal levee. The non-federal levee was later incorporated into the federal project at 12.5 ft (NGVD). The NOV project area includes approximately 15,600 acres of land including 4,300 acres in Reach A; 3,800 acres in Reach B-1; 2,300 acres in Reach B-2; 4,500 acres in Reach C and 700 acres in the St. Jude to City Price area.

Reach A includes 13 miles of enlarged back levees from City Price to Tropical Bend and two 54-in. flap-gated culverts (between approximate river miles 43.9 and 30.7 AHP). It consists of approximately 12.8 miles of levee system with a net elevation of 12.5-14.5 feet and includes floodwalls at the Hayes Canal and Gainard Woods Pump Stations. The levee enlargement consisted of a marsh side embankment with a wave berm. The base of the levee incorporated geotextile fabric with a sand blanket and a clay cap at least 2 feet thick. The embankment was constructed of uncompacted clay, though a sand core may have been substituted in places. The main levee cross section is 1V on 3H.

Reach B-1 includes 12 miles of enlarged back levees with a net elevation of 15 ft from Tropical Bend to Fort Jackson (between approximate river miles 30.7 and 20.5 AHP) and a marine floodgate at Empire. The main levee cross section is 1V on 4H. The Flood Side (FS) and Protected Side (PS) berms generally vary from 1V on 15-20H and from 1V on 12-20H, respectively. The reach also includes a flood gate at Empire and floodwalls at the Bayou Grand Laird (I- and T-wall) and Sunrise Pump Stations. The Empire Floodgate is in the Empire to Gulf Waterway and consists of a reinforced concrete U-shaped gated bay with a steel gate hinged at the bottom, guide walls and fenders, inverted T-wall reinforce concrete floodwalls extending about 150 feet on each side of the structure, access road and breakwater.

Reach B-2 includes 9 miles of enlarged back levees with a net elevation of 15 ft from Fort Jackson to Venice between approximate river miles 20.5 and 10.4 AHP and includes floodwalls at the Venice Pump Station. The levee consists of a sand core with hydraulic clay fill. The levee construction occurred in three stages or lifts. The main levee cross section is 1V on 4H with the Flood Side (FS) and Protected Side (PS) berms generally varying from 1V on 15-74H FS and from 1V on 29-71H PS.

West Bank River Levee

The West Bank River Levee (WBRL) includes 34 miles of West Bank Mississippi River levees built to a net design elevation of 16 to 17 ft, from City Price to Venice (between Mississippi river miles 44 to 10 AHP) (Note: the lock at Empire is a State of Louisiana facility.)

PL 7

Sub-basin PL 7 begins near City Price at Diamond Pump Station and continues past Hayes Pump Station and on southward near Homeplace as shown in Figure 4b.

PL 8

Sub-basin PL 8 begins at this location and proceeds on to near Empire Lock.

PL 9

Sub-basin PL 9 begins near Empire Lock and proceeds on to near Sunrise Pump Stations.

PL 10

Sub-basin PL 10 begins at Sunrise Pump Stations and proceeds on to near Venice.

East Bank

PL 4 and PL 5

The back levee begins at Phoenix and proceeds southward to Bohemia. The separation between PL 4 and PL 5 occurs near Pointe a La Hache. Reach C of the NOV and the East Bank of the MRL enclose these sub-basins. Reach C consists of approximately 16 miles of enlarged back levees with a net elevation of 17 feet. The back levee has a sand core with clay blanket. It was enlarged with hauled fill and raised from approximately 14-foot elevation to the 17-foot design level. It includes floodwalls (I-type sheet piling) at the pump stations near Bellevue and Pointe a La Hache. Construction of the levee to date has included three of the designed four lifts. It lays between approximate river miles 59.3 and 44.3 AHP and 10 flap-gated culverts.

The NOV was damaged by Hurricane Katrina when it made landfall near Buras-Triumph, which is on Reach B-1. The storm produced storm surge levels that exceed the level of the constructed protection. Numerous breaches occurred along the back levees on both the east and west bank sides of the NOV project. Levees were overtopped and breached, resulting in extensive erosion and scour, along both the back levees and the Mississippi River levees (as enlarged for hurricane protection). In addition there was damage to the floodgate at Empire and to the floodwalls along the MRL and back levees.

PL 1 and PL 6

The final two sub-basins (PL 1 and PL 6) are on the east bank of the river across from PL 11 (Figures 2 and 3). The non-federal back levee begins near the Plaquemines-St. Benard Parrish boundary and continues south, ending south of Belair. The protection level is at elevation 6 feet. These sub-basins are closed by the MRL as it proceeds north along the river to the parrish boundary.

Risk Model Idealization

The Plaquemines Parrish Basin was discretized into 11 sub-basins (PL1 – PL11) as shown in Figure 5. The sub-basins were defined to correspond to the known interior drainage areas. This reach idealization follows from the basin description information presented previously, which was collected from project documents and field inspections. Figures 6 and 7 show the elevations for the Plaquemines Parrish HPS: **Pre-Katrina**-at the time of Katrina and **Current**-as of 1 Jun 2007.

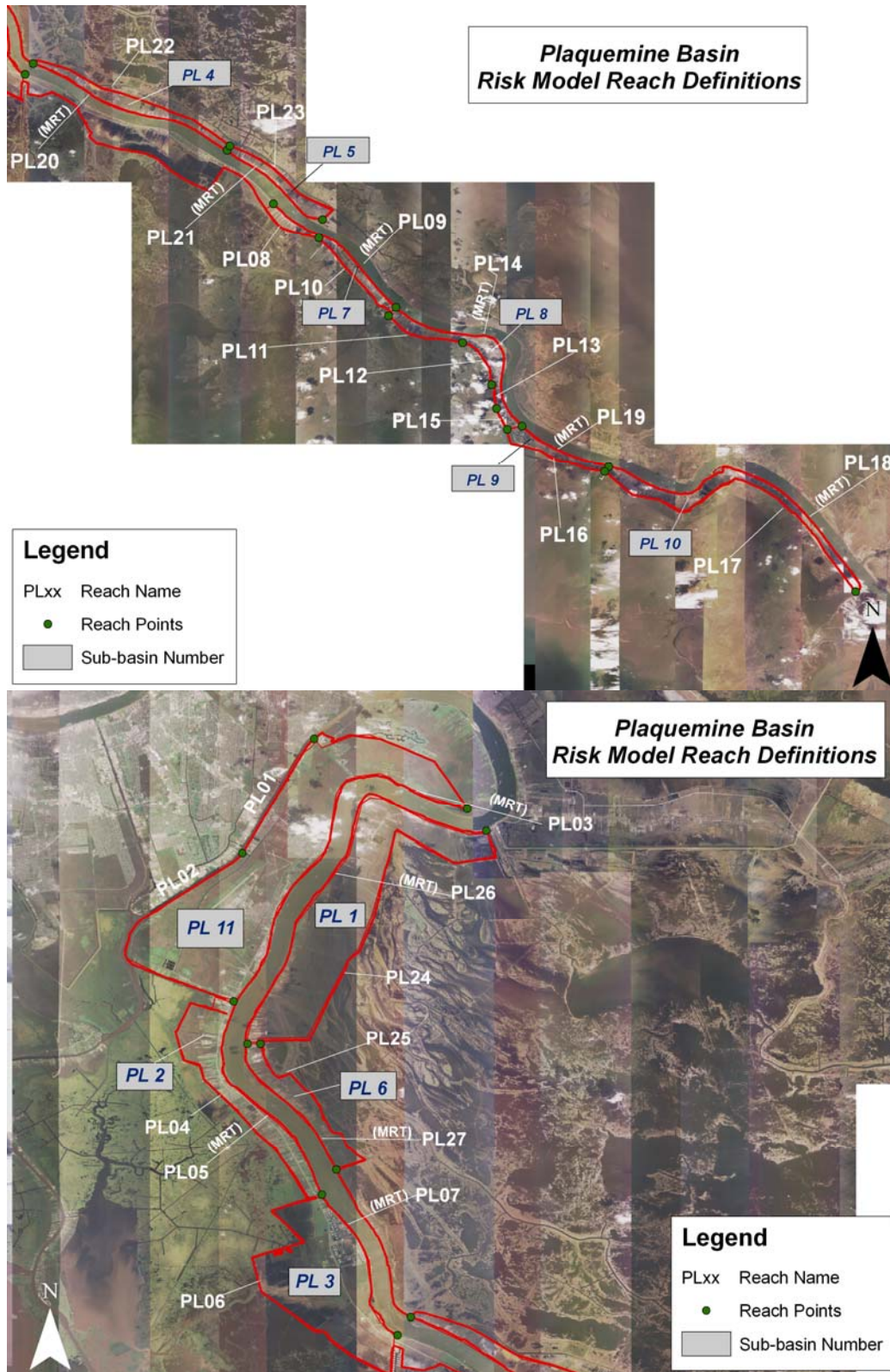


Figure 5. Plaquemines Parrish Basin reaches (PL01-PL28) and sub-basins (PL 1 - PL 11) definition for use in the risk model

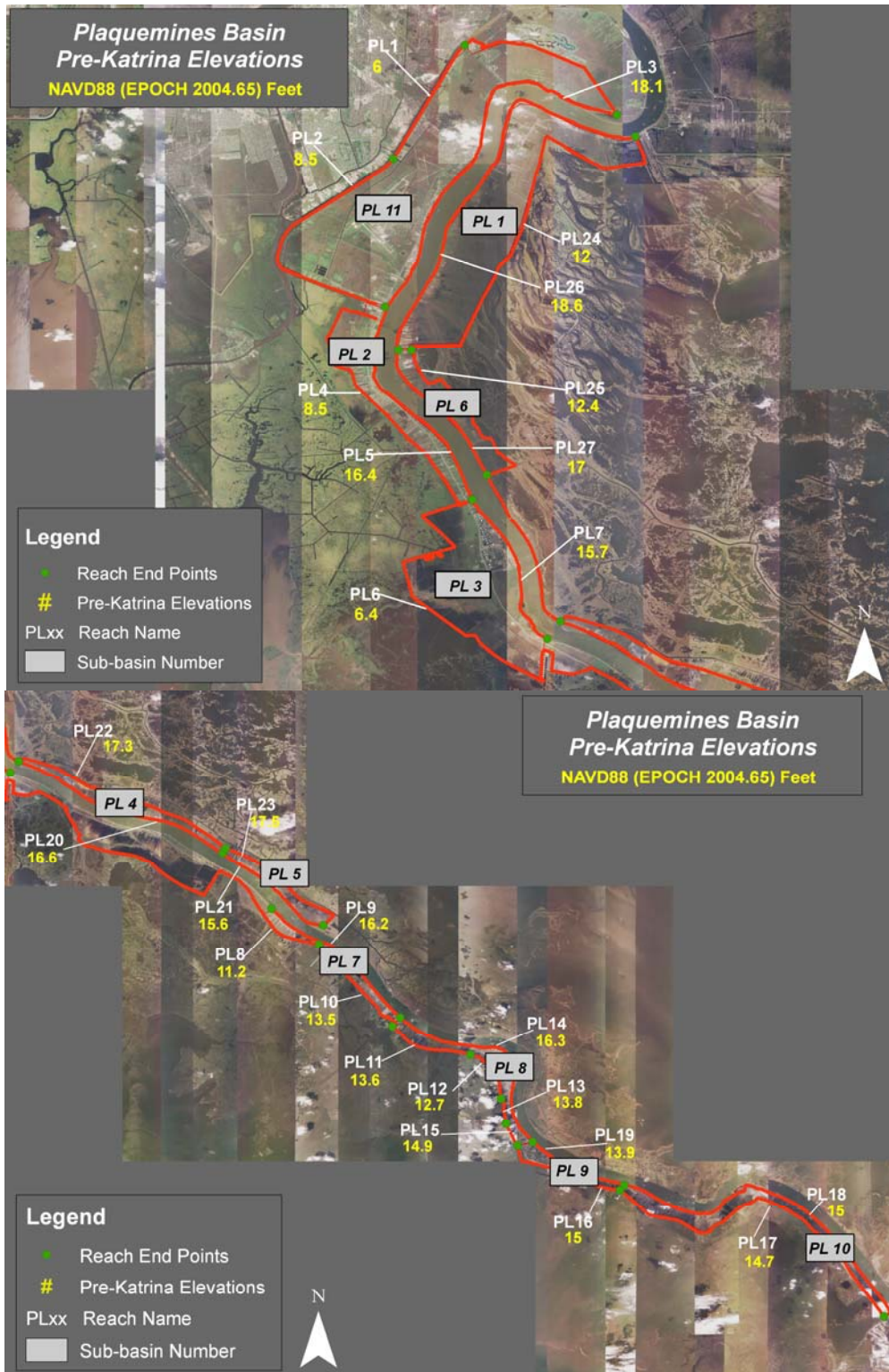


Figure 6. Elevations for the Plaquemines Parrish Basin for the Pre-Katrina HPS (in place when Katrina occurred)

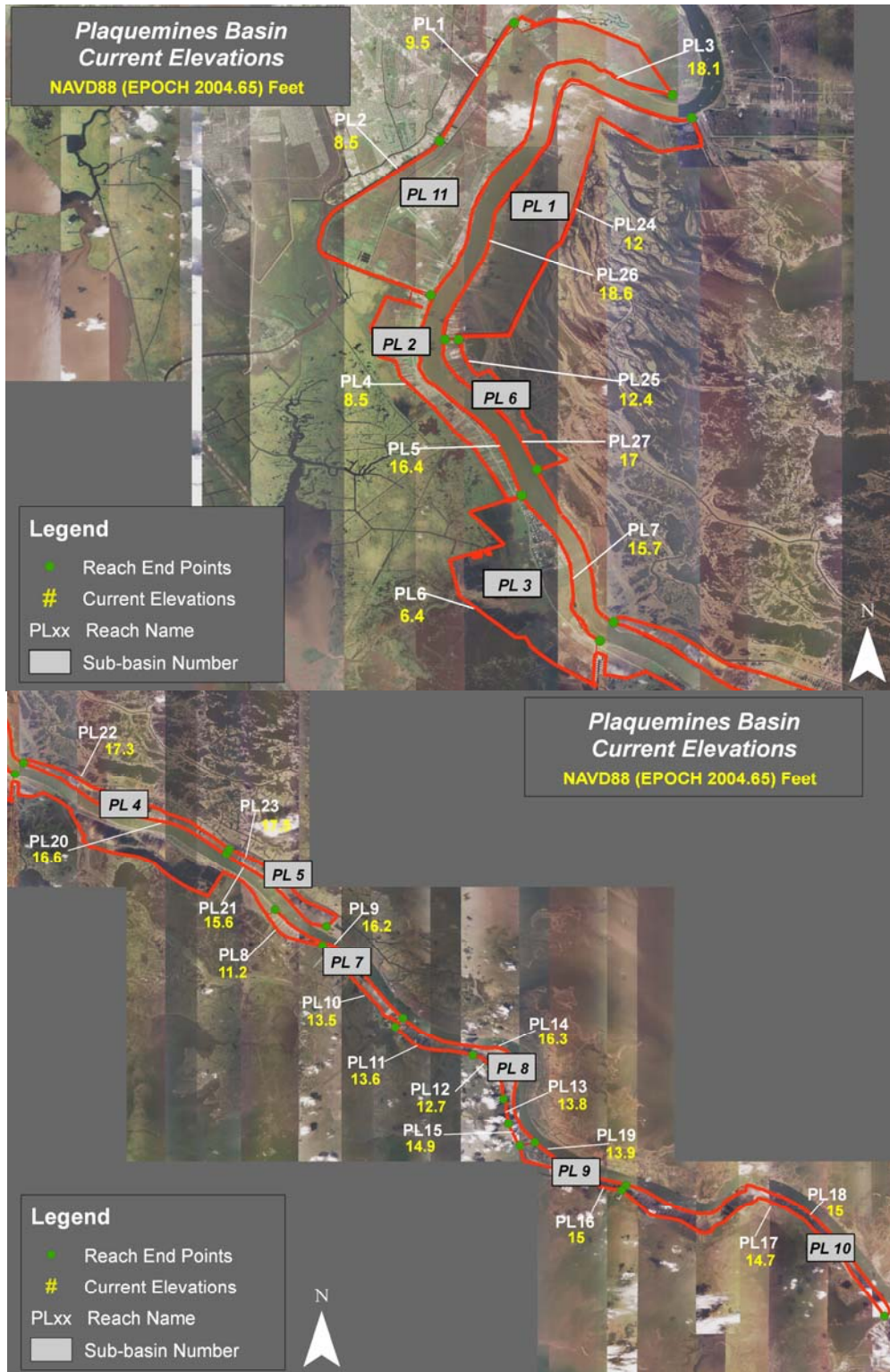


Figure 7. Elevations for the Plaquemines Parrish Basin for the Current HPS (as of 1 June 2007)

Plaquemines Transitions						
Feature Number	Transition Type	Reach	Width (ft)	Elevation (ft) (NAVD88 2004.65)	Sub-Basin	Description of Feature
132	P	PL1	400.0	8	PL12	Pump Station - Belle Chase #2
133	P	PL1	175.0	10	PL12	Pump Station - Belle Chase #1
134	P	PL4	280.0	10	PL2	Pump Station - Upper Ollie
135	P	PL6	100.0	8	PL3	Pump Station - Wilkerson Canal
136	P	PL8	120.0	18	PL8	Pointe A Lache West Pump Station
137	P	PL8	170.0	10	PL7	Diamond Pump Station
138	P	PL10	342.0	16	PL11	Hayes Pumping Station
139	P	PL11	550.0	17	PL8	Gainard Woods Pump Station
140	P	PL16	1010.0	20	PL9	Sunrise Pumping Station
141	G	PL16	635.0	19.5	PL9	Empire Flood Gate
142	P	PL17	627.0	19	PL10	Venice Pumping Station
143	P	PL17	975.0	19	PL10	Grand Liard (Buras) PS
144	P	PL22	100	18	PL4	Bellevue Pumping Station
145	P	PL27	175	20	PL5	Pointe A La Hache East Pumping Station
146	P	PL25	100	10.5	PL6	Belair Pump Station
147	P	PL25	200	14	PL1	Scarsdale Pump Station
148	P	PL24	80	9	PL1	Braitwaithe Pump Station
149	U	PL2	2200	8	PL2	Unprotected area between PL11 and PL2
150	U	PL1	1650	5	PL1	Unprotected area between PLAQ and STB
151	U	PL1	1730	18	PL1	MRT between PLAQ and STB

Plaquemines Reaches					
Reach No.	Length (ft)	Pre-Katrina Elevation (NAVD88 2004.65)	Reach Type (1)	Foundation Material Type (H, C, P) (2)	Subbasin Reference (3)
81	22,000	6.00	L	H	PL11
82	41,525	8.50	L	H	PL11
83	57,470	18.10	L	C	PL11
84	50,610	8.50	L	H	PL2
85	36,605	16.40	L	C	PL2
86	60,615	6.40	L	H	PL3
87	25,865	15.70	L	C	PL3
88	17,170	11.20	L	H	PL7
89	39,195	16.20	L	C	PL7
90	27,100	13.50	L	H	PL7
91	19,120	13.60	L	H	PL8
92	13,774	12.70	L	H	PL8
93	6,635	13.80	L	H	PL8
94	49,470	16.30	L	C	PL8
95	6,160	14.90	L	H	PL8
96	26,710	15.00	L	H	PL9
97	78,500	14.70	L	H	PL10
98	79,100	15.00	L	C	PL10
99	22,740	13.90	L	C	PL9
100	51,200	16.60	L	C	PL4
101	32,235	15.60	L	C	PL5
102	50,475	17.30	L	H	PL4
103	29,050	17.50	L	H	PL5
104	62,810	12.00	L	H	PL1
105	30,940	12.40	L	H	PL6
106	61,710	18.60	L	C	PL1
107	25,225	17.00	L	C	PL6