

F Drainage and Stormwater Management Facilities

Introduction

The purpose of this element is support Plaquemines Parish's efforts for long-term drainage improvement and effective storm-water management goals. Further, this section presents recommendations based on the Community Assessment which are specific to the unique challenge of providing drainage in Plaquemines Parish, as the levees that protect Plaquemines Parish every day from storm surges and coastal flooding also make it more difficult to remove rainwater from populated areas of the Parish.

The Drainage and Stormwater Management Facilities element of the Community Agenda section is organized as follows:

- F.1. Summary of the Drainage and Stormwater Management Facilities Element of the Community Assessment
- F.2. Short Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities
- F.3. Medium Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities
- F.4. Long Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities
- F.5. Action Plan and Top Recommendations for Investment in Drainage and Stormwater Management Facilities

F.1. Summary of the Drainage and Stormwater Management Facilities Element of the Community Assessment

The Community Assessment presented a snapshot of drainage and stormwater management facilities and strategies currently employed in Plaquemines Parish. Plaquemines Parish is located in the extreme southeastern portion of Louisiana and is surrounded on all sides by marshland and the Gulf of Mexico. In addition, the Mississippi River bisects the Parish, dividing it into two distinct sections. To protect the Parish from flooding events caused by the Mississippi River, the River is lined by federally owned and maintained levees on both sides. Because of its low elevation and position in the Gulf of Mexico, the Parish is also extremely vulnerable to storm surge flooding on the east and west caused by hurricanes in the Gulf of Mexico. Due to this threat, the Parish is lined on its east and west banks with levees owned and maintained by the Parish or private entities to protect the Parish's interior areas from storm surge flooding.

This arrangement of levees which protect the Parish from external flooding complicates drainage of the populated areas of the Parish. Because the levees on the Mississippi River and marsh sides are higher than the surrounding topography, all rainwater must be collected and pumped out of the Parish by a system of collector canals and pump stations which pump water

over the back levees and into marsh areas. In general, in Plaquemines Parish, because areas along the Mississippi River are typically higher in elevation than the areas closer to the back levees, stormwater flows downhill to the back levees where most of the drainage pump stations are located.

The strategy of drainage and stormwater management in Plaquemines Parish is common in southeastern Louisiana. As in neighboring Orleans, Jefferson, and St. Bernard Parishes, the collector canals and drainage pumps stations form the defensive system against interior flooding caused by storm events. Because these mechanized drainage pump stations must be externally powered they are susceptible to failure during violent weather events such as hurricanes as these significant weather events cause the greatest chance for mechanical failures or power interruption. Therefore, these severe storms create the greatest instance of interior flooding vulnerability for the populated areas of Plaquemines Parish.

In Plaquemines Parish, drainage and stormwater management is accomplished by a system of drainage canals and twenty – one (21) mechanized drainage pump stations operated by the Plaquemines Parish Government Drainage Department. These twenty one stations, all of which were damaged and repaired following Hurricane Katrina in 2005 serve as the crucial element of the drainage and stormwater management system.

In its current state, the drainage and stormwater system currently operated in Plaquemines Parish does not always meet the needs of residents and businesses in the Parish. Accordingly, several large concepts to guide future investments were developed. These concepts and recommendations related to them are discussed in more detail in the Community Agenda. However, the broad needs of the Parish are hardening of the pump station infrastructure to guard against failure and increasing of canal capacity for additional storage, and greater back levee protection for areas with inadequate back levee infrastructure.

The largest need identified for the Plaquemines the Plaquemines Drainage Department is to undergo a storm-proofing or hardening program throughout the 21 drainage pump stations, much like the programs that are currently being installed throughout Orleans and Jefferson Parishes. These hardening projects, with an estimated cost of \$46.2 million, would increase the probability of the stations remaining in service during significant storm events. The types of projects would include:

- Installation of safe houses to protect the operators during severe storms
- Hardening of the buildings which are currently rated for 120 mph winds, but not the 150 mph winds of a Category 5 hurricane
- Mechanical bar screens to prevent damage to pumps during storm events
- Reinforcement and protection of fuel tanks from storm – related damage.

Another need is to develop a strategy to enhance the conveyance capacity in parish canals and to add new pump stations. Improve canal maintenance through dredging and cleaning, reshaping, sheet piling, and control structure modifications. Some canal systems need to be extended for improved efficiency. A related concept is for the Parish to pursue servitude agreement to bring private drainage ditches into Parish system to ensure proper maintenance

and flood protection. Future investments will need to be coordinated carefully with coastal restoration programs as the two go hand in hand with one another.

Another pressing need identified is the need for increased hurricane protection levees on both the east and west banks of the Parish.

Based upon the results of the Community Assessment, the Master Plan Steering Committee developed a Community Agenda to guide investment in the drainage and stormwater facilities and strategies for the future. This agenda will guide investment by presenting a series of goals and recommendations based upon public input, needs as identified by the Parish Government and pump station operators, and observations of the current system in general.

The Master Plan Steering Committee developed the following recommendations which are presented below. These recommendations were divided into groups based upon their projected completion timeframe. Accordingly, these recommendations are presented in the following groups: Short Term Goals and Recommendations, Medium Term Goals and Recommendations, and Long Term Goals and Recommendations. From these, the top needs were identified and are presented at the end of this Community Agenda as the Top Needs and Recommendations for Drainage and Stormwater Management Facilities and Strategies.

F.2. Short Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities

The Short Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities are presented below:

Action	Action Type	Projected Cost	Responsible Party
Develop a Comprehensive Stormwater and Master Drainage Plan	Study	\$500,000 - \$1,000,000	Plaquemines Parish
Develop a system for pumping the water levels of drainage canals down to provide additional storage before storms and hurricanes	Program	\$250,000 - \$500,000	Plaquemines Parish
Acquire servitudes to the minor drainage ditches for maintenance	Project	<\$250,000	Plaquemines Parish
Identify, evaluate, and repair areas along the back levees damaged by borrow or erosion	Project	\$10 – 25 Million	Plaquemines Parish
Adopt a Stormwater Management Ordinance	Project	\$<500,000	Plaquemines Parish

Short Term Plan and Recommendation 1 – Develop a Comprehensive Stormwater and Master Drainage Plan: Throughout the years, Plaquemines Parish has commissioned a number of studies of various drainage areas. These studies have been widely varied in their scope. Some of these studies have been confined to a neighborhood level while others have been district – wide. In addition, some areas have been studied to determine their performance for the 100 – year storm event and other areas have been studied for their performance only at the 10 – year and 25 – year storm event. There does not appear to have been a significant effort undertaken to study the entire system as a whole.

A comprehensive study of the drainage system as a whole will benefit the Parish greatly. While studies of individual districts and pump stations or other facilities provide an outlook of how a facility may be undersized or improperly operated as on its own, it is important to understand how the entire system operates as a whole and how changes or improvements to one facility effects the performance of another. Furthermore, the posts – hurricane Katrina years have

ushered in a variety of pump station and levee improvements. The effects of these improvements on the overall system should be studied in order to make the most appropriate recommendations for targeted investments in the future.

Accordingly, it is recommended that the Parish pursue the development of a comprehensive master drainage plan to correlate the performance of the existing subsurface and surface drainage facilities, improved pump stations, and levee improvements in recent years. Furthermore, this study should include a detailed evaluation of how much of the Parish is drained by drainage ditches on private property (Recommendation 3).

Estimated Timeline: 1-5 Years

Estimated Cost: \$250,000 - \$1,000,000

Short Term Plan and Recommendation 2 – Develop a system for pumping the water levels of drainage canals down to provide additional storage before storms and hurricanes.

This recommendation involves the development of an official policy for the pumping down of drainage canals to their lowest safe water level prior to storm events to allow for increased storage capacity. While it is important to note that the canals cannot be pumped to completely dry due to hydraulic considerations related to the pump intakes and geotechnical concerns regarding the stability of the drainage canals, pumping the canals down to the safe water level would indeed provide additional capacity for storage during high intensity storm events, moving water out of streets and into canals. *Drainage Study and Report for Eastbank Bellevue and East Pointe a la Hache Drainage District* prepared by Prescott Follett and Associates recommended that in the future, the district's main drainage canal be pumped down to a prescribed level of -3.0 National Geodetic Vertical Datum (NGVD) prior to rain events prior to storms and that the pumps at the Pointe a la Hache and Bellevue Pump Stations be operated at full capacity at all times during a storm. It is recommended be studied and adopted Parish-wide as an official operational policy.

Estimated Timeline: 1-5 Years

Estimated Cost: \$250,000 - \$500,000

Short Term Plan and Recommendation 3 – Acquire servitudes to the minor drainage ditches for maintenance.

Based upon conversations with the Parish, it is apparent that some areas within the Parish are drained by ditches that run through private property. This situation is more prevalent in the rural areas of the Parish. Accordingly, these drainage ditches are not always maintained to properly promote effective drainage. The Parish should pursue servitude agreements to bring these ditches and swales into the Parish system to ensure adequate drainage. Because public funds cannot by law be expended on private property, the Parish has no option but to depend on local property owners to maintain the ditches. As a matter of practice, this type of maintenance includes cutting the grass and keeping the channels clear of obstructions.

It is not known how much of the Parish relies on drainage ditches which traverse private property. As part of Short Term Plan and Recommendation 1, the development of a Comprehensive Master Drainage Plan including a detailed study of how much of the Parish is drained by drainage ditches which run through private property would be the most logical first step to remedying such situations, followed by an aggressive program to bring those ditches under Parish control, and therefore, Parish supervision.

Estimated Timeline: 1-5 Years

Estimated Cost: \$10 – 25 Million

Short Term Plan and Recommendation 4 – Identify, evaluate, and repair areas along the back levees damaged by borrow or erosion.

The back levees are a very important component of the overall drainage system as they allow for the drainage system to function by keeping external floodwaters out of the Parish. As detailed in the Community Assessment, this system is a high priority concern for the Parish. In some areas along the back levees, borrow and erosion have damaged the levees, potentially compromising their performance. Accordingly, it is recommended that the Parish initiate a program designed to identify and remediate those damaged areas prior to future storm events.

Estimated Timeline: 1-5 Years

Estimated Cost: \$<500,000

Short Term Plan and Recommendation 5 –Adopt or Update Stormwater Management Ordinance

This would provide Plaquemines Parish with the latest means for providing drainage to its citizens. A comprehensive drainage ordinance, carrying the force of law, would allow the Parish to take necessary actions to ensure that the drainage system is properly maintained and operated. Furthermore, this would ensure that future development is constructed and designed as to not have a detrimental effect on the stormwater management and drainage system.

Estimated Timeline: 1-5 Years

Estimated Cost: \$<250,000

F.2. Medium Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities

The Medium Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities are presented below:

Action	Action Type	Projected Cost	Responsible Party
Harden or Storm – Proof Drainage Pump Stations	Project	\$>50 Million	Plaquemines Parish
Improve Drainage on the Northern Bank of the Intracoastal Canal	Project	\$5-10 Million	Plaquemines Parish
Construct New Drainage Canal Behind Good News Avenue	Project	\$1-5 Million	Plaquemines Parish
Repair Culverts Along Cazalard Road	Project	\$1-5 Million	Plaquemines Parish
Study Canal Improvements and Pump Station Improvements for the Grand Liard, Diamond, Hayes, and Sunrise Drainage Districts	Project	\$1-5 Million	Plaquemines Parish

Medium Term Plan and Recommendation 1 – Harden or Storm – Proof Drainage Pump Stations

The largest need identified for the Plaquemines the Plaquemines Drainage Department is to pursue a storm-proofing or hardening program throughout the 21 drainage pump stations, much like the programs that are currently being installed throughout Orleans and Jefferson Parishes. These hardening projects, with an estimated cost of \$50 million, would increase the probability of the stations remaining in service during significant storm events. The types of projects would include:

- Installation of safe houses to protect the operators during severe storms
- Hardening of the buildings which are currently rated for 120 mph winds, but not the 150 mph winds of a Category 5 hurricane
- Mechanical bar screens to prevent damage to pumps during storm events
- Reinforcement and protection of fuel tanks from storm – related damage.

Because the Parish depends on these mechanized drainage pump stations for drainage of its interior populated areas, a severe storm which could impede the operation of a drainage pump station creates the greatest vulnerability for the Parish. Accordingly, it is recommended that the Parish pursue a hardening program to mitigate against potential drainage pump station failures in the future.

Estimated Timeline: 5-10 Years

Estimated Cost: \$50 – 75 Million

Medium Term Plan and Recommendation 2 – Improve Drainage on the Northern Bank of the Intracoastal Canal

As indicated in *Hydraulic Study West of Intracoastal Waterway along Engineer’s Road and Fort St. Leon Subdivision* by PEEC, 2008, the areas along between the Algiers Outfall Canal and the Intracoastal Waterway have experienced repeated flooding throughout the years. This includes the areas of St. Leon Subdivision, the Cazalard Road area, the area surrounding North Concord Road, and the WPA Canal Drainage Area.

Based upon the study, the following recommendations were made to improve drainage in the area:

- Provide an additional 48” outfall from Warren Street and Burmaster Street to the Algiers Outfall Canal
- Reconstruct the 66” outfall on New Canal Street to lower pipe 2.5’.
- Construct an open canal from Planter Canal Road at Shirley Street North to the Planters Canal following an apparent abandoned roadway
- Construct a 40 CFS pump station along Cazalard Road Canal (Construction underway)
- Remove and Replace existing drainage pipes at North Concord and Engineers Road

- Reshape and grade the existing ditch along North Concord Road to increase capacity
- Reshape existing drainage ditches along WPA Road and the WPA canal to improve capacity

Estimated Timeline: 5-10 Years

Estimated Cost: \$5-10 Million

Medium Term Plan and Recommendation 3 – Construct New Drainage Canal Behind Good News Avenue

Hydrologic Study and Report of Districts 2, 3, and 4 for Plaquemines Parish Government prepared by PEEC, 2007 recommended the construction of a new 8' deep trapezoidal ditch or a dual 96" diameter culvert ditch approximately 200' south of Goodnews Avenue to connect to the Barriere Canal. This item was identified as a priority by the Master Plan Steering Committee and would improve drainage in a repetitive loss area in Belle Chasse.

Estimated Timeline: 5-10 Years

Estimated Cost: \$1-5 Million

Medium Term Plan and Recommendation 4 – Repair Culverts along Cazalard Road

Hydrologic Study and Report of Districts 2, 3, and 4 for Plaquemines Parish Government prepared by PEEC, 2007 recommended the replacement of the culverts alongside Cazalard Road, which are undersized and have been noted by the Parish to be in poor repair. It is recommended that the Parish pursue replacement of the culverts and reshaping of the ditches to improve conveyance as recommended by the study.

Estimated Timeline: 5-10 Years

Estimated Cost: \$1-5 Million

Medium Term Plan and Recommendation 5 – Study Canal and Pump Station Improvements for the Grand Liard, Diamond, Hayes, Gainard Woods, and Sunrise Drainage Districts

Hydrologic Analysis to Determine Appropriate Canal Sizes to Handle 10 and 25 Year Rainfall Events on the West Bank of Plaquemines Parish, Louisiana prepared by Prescott Follett & Associates, Inc. in 1997 concluded that the Grand Liard, Diamond, Hayes, Gainard Woods and Sunrise Drainage districts would require a variety of improvements to the canals and/or pump stations to prevent flooding during 10 and 25 year storm events. The study did not provide anticipated costs of such improvements. As the USACE has improved the pump stations for all of these drainage districts, it is recommended that the Parish undertake a study to determine

what improvements would still be necessary to prevent flooding during storms up to the 100 – year event and what those improvements would cost.

Estimated Timeline: 5-10 Years

Estimated Cost: \$1-5 Million

F.4. Long Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities

The Long Term Plans and Recommendations for Investment in Drainage and Stormwater Management Facilities are presented below:

Action	Action Type	Projected Cost	Responsible Party
Assess and Inventory Existing Back Levees	Study	\$1-5 Million	Plaquemines Parish
Construct Improvements to Bring Private Levees up to Federal Standards	Project	Over \$25 Million	Plaquemines Parish
Federalize Private and Parish – Owned Back Levees	Project	Over \$25 Million	Plaquemines Parish
Construct Pump to the River Project in Belle Chasse Basin	Project	\$10-25 Million	Plaquemines Parish

Long Term Plan and Recommendation 1 – Assess and Inventory Existing Back Levees

The back levees form an important part of the drainage system by protecting the Parish’s interior areas from tidal flooding. Currently, the Parish is protected by a collection of various privately owned and Parish – owned levees. Federal levees are confined to the Mississippi River and the segment of the Greater New Orleans HSDRRS which wraps around Belle Chasse. The Parish has indicated that they wish to improve this system by possibly federalizing it. The first step in any such project would be to develop an inventory of these assets and identify their ownership and deficiencies. This would also allow for the development of an exact cost and strategy for improvements required to bring the levees up to federal standards.

Estimated Timeline: >10 Years

Estimated Cost: \$1-5 Million

Long Term Plan and Recommendation 2 – Construct Improvements to Bring Private Levees up to Federal Standards

The back levees form an important part of the drainage system by protecting the Parish's interior areas from tidal flooding. As part of the overall goal to federalize these levees, these levees will need to be improved to federal standards before being accepted by the Federal Government. The first step would be the assessment in Long Term Plan and Recommendation 1 above.

Estimated Timeline: >10 Years

Estimated Cost: \$>25 Million

Long Term Plan and Recommendation 3 – Federalize the Private and Parish Owned Back Levees

Federalization of the Private and Parish Owned Back levees has been identified by the Master Plan Steering Committee as a priority concept for the Parish's long term survivability. Without improvements to the back levees, the Parish will continue to suffer repetitive losses from flooding and discouraged economic investment in areas without federalized levees.

The federalization of the back levees will be a challenging undertaking. First, the Parish will have to assess and inventory all back levees. Levees that are privately owned will have to be transferred to Parish control and improved to federal standards. Finally, the Parish will have to petition the Federal Government and USACE to include the levees in their systems which could ultimately depend on the availability of the Federal Government's Resources.

Estimated Timeline: 5-10 Years

Estimated Cost: \$1-5 Million

Long Term Plan and Recommendation 4 – Construct a Pump to the River Project in the Belle Chasse River Basin

Hydrologic Study and Report of Districts 2, 3, and 4 for Plaquemines Parish Government prepared by PEEC, 2007 recommended the construction of a drainage pump station at Avenue G which would discharge to the Mississippi River. This would divert existing drainage from the area of Oak Street, 3rd Street, and Avenue F.

The purpose of this improvement would be two – fold. First, it would relieve some pressure on the Belle Chasse Pump Stations. In addition, as the area is one of the farthest from the Belle Chasse Drainage Pump Stations it would benefit from a dedicated pump station in its geographic vicinity. This project would be similar to projects proposed and under construction in Jefferson Parish.

Estimated Timeline: 5-10 Years

Estimated Cost: \$1-5 Million