Mississippi Valley Division,
Regional Planning and Environment Division South

St. Tammany Parish, Louisiana Feasibility Study

Appendix D – Annex 4 - Preliminary Life Safety Risk Assessment

June 2021

1.0 Introduction

A life safety risk assessment was conducted as part of the flood reduction feasibility study for St Tammany Parish and included as an Annex to the Engineering Appendix. The life safety assessment evaluated the 9 primary alternatives using the available information. The life safety assessment is qualitative and prepared prior to completion of the engineering appendix and without consequence modeling.

2.0 Background

The project is a composite of proposed alternatives included to benefit multiple locations to provide flood risk reduction for both coastal and riverine flooding. The nine initial project alternatives included elements of levees, floodwalls, pumping stations, and channel improvements. The alternatives evaluated are included on the Life Safety Measure/Plan Evaluation Matrix located at the end of this appendix. The design project flood frequency is a 1% annual exceedance probability (or 100-year flood risk reduction). The project includes incorporation some existing systems as well as new work. The alternatives are briefly described in the following sections. See the main body of the report for a project map of all the alternatives and the Engineering Appendix for full descriptions.

2.1 Alternative 1
No Action Alternative.

2.2 Alternative 2
Alternative 2 has parish wide coverage in areas of flood damages (FRM and CSRM) to structures. It includes flood proofing, structure raising, buyouts and relocations.

2.3 Alternative 4
Alternative 4 includes multiple potential alignments of levee to reduce coastal flooding. Alternative 4a consists of approximately 9 miles (47,700 ft) of levee in the City of Lacombe, Louisiana, to reduce coastal flooding. Alternative 4b is comprised of approximately 13.7 miles (72,000 ft) of levee, which combines the Lacombe Levee from Alternative 4a.1 and the West Slidell Levee from Alternative 5, to reduce coastal flooding in Lacombe, Slidell, and the area between the two cities.

2.4 Alternative 5
This alternative is a combination of approximately 6.5 miles (34,000 ft) of levees and 0.08 miles (450 ft) of floodwall located on the west side of the City of Slidell, Louisiana.

2.5 Alternative 6
There are three existing ring levees in the City of Slidell: the King’s Point System which consists of two ring levees on the northeast side, the Lakeshore Estates Levee on the southeast side, and the Oak Harbor Levee in the vicinity of Eden Isle. There is also an authorized Southeast Louisiana (SELA) Schneider Canal Study currently under-way.

The South Slidell is a combination of levees and pump stations, which are proposed to reduce risk of storm surge flooding. There are three alignments for this alternative. Alternative 6a consists of the South Slidell levee alignment. Alternative 6b consists of a combination of South Slidell levee and Eden Isle floodwall. Alternative 6c is a combination of portions of levee from alternative 5 (except for west portion of alignment) and alternative 6a (except for northwest portion of alignment). The two alignments are tied together with a railroad gate across the railroad tracks.

2.6 Alternative 7

Alternative 7 includes the Pearl River levee which is approximately 4.8 miles (25,000 ft), diversion channel and channel improvements to address riverine flooding. The features in this alternative are all separate and combinable and could all be implemented if justified.

2.7 Alternative 8

The Upper Tchefuncte/Covington- Channel alternative includes channel modifications that reduce rainfall and riverine flooding in the upper reaches of the Tchefuncte and Bogue Falaya Rivers. The alternative does not include structural flood control features such as levees or floodwalls.

2.8 Alternative 9

Alternative 9a replaces the existing lakefront seawall to elevation 7.3 ft NAVD88 and adds a passive drainage option on Bayou Ravine Aux Coquilles and Little Castine Bayou. Alternative 9b replaces the existing seawall to elevation 7.3 ft NAVD88 and adds pump stations at the lakefront at Girod Street and Ravine Aux Coquilles. Alternative 9c replaces the existing seawall to elevation 18 ft NAVD88 and adds pump stations at the lakefront at Girod Street and Ravine Aux Coquilles.

3.0 Consequences

Limited modeling has been done to inform the potential benefits and consequences of the flood reduction alternatives. HEC-LifeSIM modeling was not available at the time of this screening level life safety risk assessment. At the time of this assessment, the Project Delivery Team has not made the determination to complete HEC-LifeSIM during Planning or Preconstruction Engineering and Design (PED) Phase. Currently, the Planning PDT does not include a HEC-LifeSIM modeler. Hydraulic modeling input is required to generate consequences. The determination of when to complete this effort is currently pending.

4.0 Loading

4.1 Seismic

No significant seismic concerns are expected. The seismic chapter will be produced in the Preconstruction Engineering and Design Phase (PED).

4.2 Hydrology and Hydraulics

HEC-RAS (2D) and ADCIRC modeling is complete. Additional iterations will be made with flood gates in place for multiple bayou crossings and design of the pump stations. Additional RAS modeling needed may impact gate dimensions and operating procedures.

4.3 Sea Level Change

Sea Level Rise. Sea level rise and subsidence considerations must be investigated for both design and the future condition risk assessment.

5.0 Tentatively Selected Plan (TSP)

5.1 South and West Slidell Combined Levee

The TSP alignment includes levee and floodwall sections in west and south Slidell, referred to as Alternative 6c (combination of portions of Alternatives 5 and 6a). Figure 1 depicts the levee system components for the Tentatively Selected Plan (TSP).

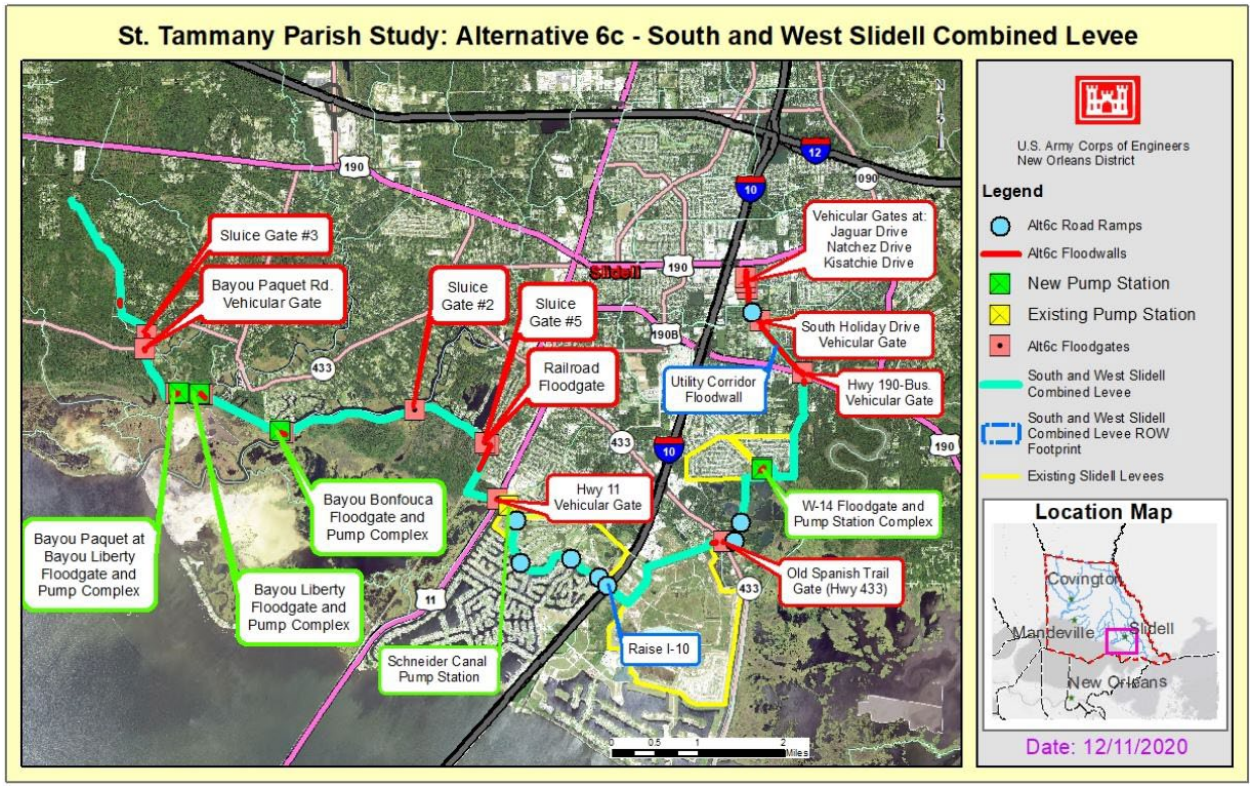

Figure 1. Project Plan for TSP

The preliminary assumptions are that the levee has a 10 ft wide levee crown and side slopes of 1V:3H. Berm sections will be determined in the next phase of the study. The

elevation of the new West Slidell levee will vary between 13 ft and 14.5 ft the new South Slidell levee will vary between 13 ft and 15 ft. The typical T-wall section will consist of a 3 ft thick by 8.5 ft wide slab with a 1.5 ft thick stem. Preliminary assumptions are two rows of 1H:3V battered H-piles, 60 ft deep, spaced on 5 ft centers, and 30 ft-deep steel PZ sheet pile. The design of the new T-wall including the foundation is subject to change once detailed geotechnical investigations are conducted. The preliminary design elevation of the floodwall segments will vary from 13.5 ft to 17 ft.

The full TSP alignment was not considered during this assessment, but a Semi-Quantitative Risk Assessment will be conducted on the TSP during a later stage of the study.

5.2 Project Features outside Realm of Risk Assessment

Other features included in the TSP but not considered for the Life Safety Risk Assessment include channel improvement for multiple channels and nonstructural raising of residential structures. Channel improvement includes both channel enlargement and clearing and snagging.

- Mile Branch Channel Improvements
- Bayou Patassat Clearing and Snagging
- Nonstructural home elevations

6.0 Engineering Concerns

6.1 Geotechnical Exploration

Limited existing data exists along the proposed levee alignment for the TSP. For this stage of the feasibility study no additional exploration or testing was conducted to further inform the design efforts. Significant potential foundation and constructability concerns, including proximity to waterways and highly compressible foundations exist along the alignment.

6.2 Design Data Available

Coordination with local entities for St. Tammany has not yielded complete design surveys, design reports, as-built drawings, or monitoring reports for prior locally designed or constructed flood risk reduction features. Historic records should include levees and structures (fronting protection). This data will influence the data exploration needed and better inform existing system performance in the risk assessment.

6.3 Geotechnical and Geological Concerns

Coastal geomorphology and possible historic channel crossings within levee alignment create concerns for both foundation settlement and seepage. Portions of the levee alignment are near environmentally sensitive areas, which historically has resulted in alignment and design changes. In addition, portions of the proposed levee alignments are alongside Bayou Bonfouca. At the time of this assessment, the depth and dimensions of the bayou were unknown to life safety risk team. The engineering

unknowns create uncertainty with the performance of the planned alignment, proposed levee section without berm and floodwall designs, and existing features.

7.0 Semi-Quantitative Risk Assessment (SQRA)

7.1 A life safety risk assessment was initiated in the very beginning of the study phase of this project. The Planning PDT provided very limited information at this early stage. Due to complexity of the project with multiple benefit areas, the early concept was to use life safety risk as a criterion for determining the TSP. Due to the very short period between the TSP milestone and report submission, the life safety risk assessment team did not have a report to review at time of preparation for this annex. The next phase will include an Engineering Appendix as a reference. Reaches of the project have not been physically seen by the life safety risk assessment team due to the remote location and short schedule for submission date of this Appendix. No risk assessment team members have seen any of the sites.

7.2 The SQRA is currently targeted for completion early during PED, should the project be authorized and appropriated.

7.3 Potential Failure Mode Analysis (PFMA) is an early step of the SQRA. The PFMA will be accomplished with the PDT design team and the life safety risk assessment team. The life safety risk assessment team members chosen at this time have experience with design of the project features. Shared experience with existing design PDT can assist with proposed exploration plan and subsequently ensure all current guidelines are met.

7.4 Risk Drivers identified during the SQRA process will assist in development and refinement of design criteria. Overtopping rates will consider the 1% annual exceedance probability limit of 0.1 cfs/ft overtopping. Discussion during elicitation on risk drivers may inform construction sequencing. Sea level rise and subsidence along with storm frequencies beyond the current project scope will be included in the risk assessment. Ongoing land loss rates will be checked to assess future conditions. The project life is defined as 50 years.

7.5 When completed, the SQRA will meet current Risk Management Center (RMC) criteria and greatly assist the subsequent need for National Flood Insurance Protection (NFIP) analysis.

8.0 Life Safety Risk Assessment

8.1 Assessment Results

The matrix below summarizes the results of the life safety analysis on the Alternatives based on the information provided to the life safety risk assessment team at the time of analysis.

Alternatives	Metric					
	Expected Annual LL[1]	Flood Velocity LLR	Warning Time LLR[2]	Evacuation LLR	Vulnerable Population > 2ft[3]	Incremental Risk[3]
No Action	Low	Medium	Low	Low	-	Low
Non-Structural	Low	Medium	Low	Low	-	Low
Alternative 4a	Low	Low	Low	Low	-	Medium
Alternative 4a.1	Low	Low	Low	Low	-	Medium
Alternative 4b	Low	Low	Low	Low	-	Medium
Alternative 5	Low	Low	Low	Low	-	Medium
Alternative 6	Medium	Medium	Low	Low		High
Alternative 7	Low	Low	Low	Low		Medium
Alternative 8	Low	Low	Low	Low		Low
Alternative 9	Medium	Medium	Low	Low		High

Notes: LL – Life Loss, LLR – Life Loss Risk

1. Expected annual life loss is assumed to be low to medium for all scenarios based on population density
2. Warning time based on the tropical storm forecasting occurs days in advance of an event
3. Inundation maps generated through HEC-LifeSIM were unavailable at time of assessment, Incremental Risk is based on evaluation of proposed flood control features and populations of protected areas

The life safety assessment was completed on the alternatives, concentrating on levee and floodwalls, with channel improvement projects not contributing significantly to the evaluation. Alternatives 4 and 5 were considered substantially similar and received the same ratings. Alternatives 6 and 9 contained floodwalls near populated areas and were evaluated with similar risks. The high incremental risk for Alternatives 6 and 9 were due to the potential for incremental life loss due to the density of the population adjacent to the flood control structures. The team considered the incremental risk of the floodwalls and levees in the highly populated Slidell area higher than the proposed levee alignments of Alternatives 4 and 5 with lower population density. The Alternative 7 life safety evaluation primarily considered the Pearl River Levee.

8.2 Uncertainties

The life safety risk assessment was conducted using the information provided by the PDT. At the time of the assessment the engineering appendix was not available. Significant uncertainties and unknowns are incorporated into this assessment. The engineering unknowns, particularly the lack of geotechnical data resulting in major assumption in the foundation design, result in uncertainty with the potential long-term performance of the levees and floodwalls as currently presented. In addition, no life consequence data was available to the team for the assessment. Assumptions were made about the performance and the potential consequences. Additional geotechnical,

hydrological, and structural design along with consequence modeling would provide necessary information to reduce the uncertainty to tolerable levels.