Appendix D – Noise and Vibration Report

STEVENSON CONSULTING, INC.

TRAFFIC NOISE AND VIBRATION ASSESSMENT

PORT OF PASCAGOULA RESTORE PROJECT
NORTH RAIL CONNECTOR
Moss Point, Mississippi

Prepared for

FEDERAL RAILROAD ADMINISTRATION and
JACKSON COUNTY PORT AUTHORITY
P.O. BOX 70
PASCAGOULA, MISSISSIPPI
39568-0070

Stevenson Consultants Project No. 41-208

June 15, 2021

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Federal Railroad Administration and
Jackson County Port Authority
P.O. Box 70
Pascagoula, Mississippi 39568

Reference: Port of Pascagoula Restore Project North Rail Connector - Moss Point, Mississippi
Traffic Noise and Vibration Assessment
Stevenson Consulting Project No.: 41-208

Dear Sir or Madam:

Stevenson Consulting, Inc. is pleased to submit this traffic Noise and Vibration Assessment Report for the above referenced project. These services were provided in accordance with Stevenson Consulting Proposal No. PE41-1160-04202021, dated April 20, 2021 and your subsequent approval to proceed.

The following report describes the project characteristics provided to us by Compton Engineering, Inc. The traffic noise and vibration screening and general assessment was conducted based on the U.S. Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual dated September 2018.

Stevenson Consulting appreciates the opportunity to provide traffic noise and vibration assessment services for you and will remain available for further consultation during the design and construction of this project.

Should you have any questions concerning this report or require additional consultation services then contact our office at (228) 447-3427.

Sincerely,
STEVENSON CONSULTING, INC.

Tom Labuda, PE, PG.
Principal Engineer

Larry Nobles, PE

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1.0 INTRODUCTION

The Federal Railroad Administration (FRA) is providing a grant to fund a project that will be undertaken by the Jackson County Port Authority. The Jackson County Port Authority (JCPA) proposes to construct a rail line to connect an existing rail owned by Mississippi Export Railroad (MSE) that crosses over the Escatawpa River in Moss Point, Mississippi to an existing JCPA-owned rail line that crosses through the Moss Point Industrial and Technology Complex (MPITC) and provides access to the Port of Pascagoula, Bayou Casotte Harbor (the Proposed Project).

The purpose of the following analysis is to conclude whether noise or vibration levels at the properties (i.e., receivers) near the proposed improvements may exceed applicable thresholds due to the project alternatives, according to U.S. Federal Transit Administration (FTA) guidelines. This study provides results of the traffic noise and vibration screening and general steps.

2.0 PROJECT DESCRIPTION

The proposed project is located in Section 19, Township 7 South, and Range 5 West of Jackson County, MS. The approximate center point of the proposed modified rail is at 30.415546 degrees latitude and -88.514452 degrees longitude. The new rail extends from mile post 2.89 (30.251207/-88.310005) on the north and extends to mile post 2.05 (30.413308/-88.508269) on the east where it joins the existing rail.

The Proposed Project, referred to as the North Rail Connector, would be approximately 3,659 liner feet with 2,852 feet of elevated rail and 807 feet of rail constructed on fill or existing uplands. There would be approximately 2,649 cubic yards of fill at the pile abutments for the elevated rail and in an area of estuarine wetlands. Approximately 0.90 acres of wetlands will be filled associated with the project. An existing grade crossing on Orange Grove Road would be relocated approximately 500 feet to the west to allow for the curve needed to accommodate the expected train lengths and speed. The existing MSE rail at the west end would need to be adjusted to allow insertion of a turn out to join with the new elevated rail line. For construction, a staging area would be established within the MPITC, in an area that was recently used for the same purpose. The staging area would be approximately one acre in size and not located within a wetland. A Project Location Map is shown on Figure 1 included in Appendix A.

The purpose of the Proposed Project is to provide additional railroad capacity and connectivity between existing infrastructure to support the growing needs of the Port of Pascagoula, Bayou Casotte Harbor. Currently, freight trains that travel from the north on the MSE line must pass through downtown Moss Point and Pascagoula to the Pascagoula Interchange to join CSX rail. This operation regularly blocks vehicular traffic and creates delays at four major roadway intersections. Also, the curve alignment from the existing MSE line entering the Moss Point Industrial and Technology Complex (MPITC) is too tight for the expected length of train to travel through that area safely. The Proposed Project is needed to remove operational conflicts between railroads, reduce congestion, and accommodate the proposed restoration of passenger rail service.

3.0 NOISE AND VIBRATION SCREENING

The noise and vibration impact criteria used for the North Rail Connector Project are based on information contained in the FTA guidance manual (2018). The criteria used to assess the noise and vibration impact from train operations are described in this section. The FTA methodology begins with a noise screening procedure to determine whether any noise-sensitive land uses are located within a critical distance of noise impact potential. The projected rail traffic consists of two trains a day, with up to 50 cars traveling at 20 mph during daytime.

3.1 Transit Noise Screening

The Noise Screening Procedure is a simplified method of identifying study area receivers or locations where a project may have the potential for noise impacts from transit projects. This procedure accounts for impact criteria (Transit), the type of project, and noise-sensitive land uses.

Tables 4-7 and 4-8 included in FTA manual provide guidelines to identify project type and the screening distance from the transit sources. Based on our project understanding, we selected the screening distance for the Commuter Rail Road with Horns and Bells for unobstructed conditions from the Table 4-7. Following the FTA manual, the screening distance used for this assessment was 1,600 feet measured from the guideway center.

Based on the manual, the east potion of the project is within the Land Use Category 2 – Residential. The western part of the project crossing through the marsh is within the special class identified as Undeveloped Land.

Table 4-3 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Land Use Type	Noise Metric, dBA	Description of Land Use Category
1	High Sensitivity	Outdoor $L_{eq(1hr)}$*	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	Residential	Outdoor L_{dn}	This category is applicable all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	Institutional	Outdoor $L_{eq(1hr)}$*	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also included in this category.

* $L_{eq(1hr)}$ for the loudest hour of project-related activity during hours of noise sensitivity.

Based on the location of the new rail alignment and FTA manual, multiple residential structures (noise receptors) were identified within the screening zone. Noise-sensitive land uses along the corridor were identified using aerial photography overlay within 1,600 feet of the alignment, included in Attachment A. The screening results triggered the general noise assessment presented in Section 4.

3.2 Transit Vibration Screening

Ground-borne vibration from heavy rail is common when there is less than 50 ft between track and building foundations. The proposed new rail alignment is farther than 50 ft from the closest building foundation. The Vibration Screening Procedure mimic the noise screening methodology and is a simplified method of identifying study area receivers or locations where a project may have the potential for vibration impacts from transit projects. This procedure includes four steps:

1. Classify project vehicles
2. Determine project type
3. Determine screening distance
4. Identify vibration-sensitive land uses

The transit project in terms of type of vehicles falls into the Steel-wheel/Steel-rail Vehicles category. Based on FTA manual table 6-7 the project is Type I.

Table 6-7 Project Types for Vibration Screening Procedure

Project Type Number	Project Type	Description
I	Conventional Commuter Railroad	Both locomotives and passenger vehicles create vibration. For commuter trains, the highest vibration levels are typically created by the locomotives. Electric commuter rail vehicles create levels of ground-borne vibration that are comparable to electric rapid transit vehicles.
2	RRT	Ground-borne vibration impact from rapid transit trains is one of the major environmental issues for new systems. Ground-borne vibration is usually a major concern for subway operations. It is less common for at-grade and elevated rapid transit lines to create intrusive ground-borne vibration and noise since air-borne noise typically dominates.
3	LRT and Streetcars	The ground-borne vibration characteristics of light rail systems are very similar to those of rapid transit systems. Because the speeds of light rail systems are usually lower, typical vibration levels are usually lower. Steel-wheel/steel-rail AGT is included in either this category or the ICT category depending on the level of service and train speeds.
4	Intermediate Capacity Transit	Because of the low operating speeds of most ICT systems, vibration problems are not common. However, steel-wheel ICT systems that operate close to* vibration-sensitive buildings have the potential of causing intrusive vibration. With a stiff suspension system, an ICT system could create intrusive vibration.
5	Bus and Rubber-Tire Transit Projects	This category encompasses most projects that do not include steel-wheel trains of some type. Examples include diesel buses, electric trolley buses, and rubber-tired people movers. Most projects that do not include steel-wheel trains do not cause vibration impacts.**

*See the screening distances for category I land uses in Table 6-8.
** Most complaints about vibration caused by buses and trucks are related to rattling of windows or items hung on the walls. These vibrations are usually the result of airborne noise and not ground-borne vibration. In the case where ground-borne vibration is the source of the complaint, the vibration can usually be attributed to irregularities in the road.

This in combination with the Land Use Category 2 (Residential) from Table 6-1 and parameters from Table 6-8 defines the screening distance at 200 ft.

Table 6-1 Land Use Categories for General Vibration Assessment Impact Criteria

Land Use Category	Land Use Type	Description of Land Use Category
-	Special Buildings	This category includes special-use facilities that are very sensitive to vibration and noise that are not included in the categories below and require special consideration. However, if the building will rarely be occupied when the source of the vibration (e.g., the train) is operating, there is no need to evaluate for impact. Examples of these facilities include concert halls, TV and recording studios, and theaters.
1	High Sensitivity	This category includes buildings where vibration levels, including those below the threshold of human annoyance, would interfere with operations within the building. Examples include buildings where vibration-sensitive research and manufacturing* is conducted, hospitals with vibration-sensitive equipment, and universities conducting physical research operations. The building's degree of sensitivity to vibration is dependent on the specific equipment that will be affected by the vibration. Equipment moderately sensitive to vibration, such as high resolution lithographic equipment, optical microscopes, and electron microscopes with vibration isolation systems are included in this category.** For equipment that is more sensitive, a Detailed Vibration Analysis must be conducted.
2	Residential	This category includes all residential land use and buildings where people normally sleep, such as hotels and hospitals. Transit-generated ground-borne vibration and noise from subways or surface running trains are considered to have a similar effect on receivers.***
3	Institutional	This category includes institutions and offices that have vibration-sensitive equipment and have the potential for activity interference such as schools, churches, doctors' offices. Commercial or industrial locations including office buildings are not included in this category unless there is vibration-sensitive activity or equipment within the building. As with noise, the use of the building determines the vibration sensitivity.

* Manufacturing of computer chips is an example of a vibration-sensitive process.

** Standard optical microscopes can be impacted at vibration levels below the threshold of human annoyance.

*** Even in noisy urban areas, the bedrooms will often be in quiet buildings with effective noise insulation. However, ground-borne vibration and noise are experienced indoors, and building occupants have practically no means to reduce their exposure. Therefore, occupants in noisy urban areas are just as likely to be exposed to ground-borne vibration and noise as those in quiet suburban areas.

Table 6-8 Screening Distances for Vibration Assessments

Type of Project	Critical Distance for Land Use Categories* Distance from ROW or Property Line, ft		
	Land Use Cat. 1	Land Use Cat. 2	Land Use Cat. 3
Conventional Commuter Railroad	600	200	120
RRT	600	200	120
LRT and Streetcars	450	150	100
ICT	200	100	50
Bus Projects (if not previously screened out)	100	50	--

*For the Vibration Screening Procedure, evaluate special buildings as follows: Category 1 - concert halls and TV studios, Category 2 - theaters and auditoriums

Based on the location of the new rail alignment and FTA manual, seven residential structures were identified within the vibration 200 ft screening zone. The cluster of residential structures identified as sensitive receptors are located along Elder Street, Tanner Street, and Lilly Circle in Moss Point, Mississippi. Therefore, a general vibration assessment was conducted for this study.

4.0 NOISE AND VIBRATION GENERAL ASSESSMENT

4.1 Transit Noise General Assessment

A general noise assessment analysis using FTA methodology was conducted to evaluate potential noise effects from the proposed North Rail Connector project. The noise general assessment utilized in the FTA methodology evaluates project-generated L_{dn} noise levels for land use Category 2. Consistent with the FTA methodology, the general assessment consisted of the following steps:

1. Identify Noise Sensitive Receivers within the 1,600 feet
2. Determine Project Noise Source Reference Level
3. Estimate Project Noise Exposure by Distance
4. Combine Noise Exposure from All Sources
5. Measure Existing Noise Exposure (from FTA manual tabularized data)
6. Inventory Impacts
7. Determine Noise Mitigation Needs.

For this general noise assessment, we have used the Noise Impact Assessment Spreadsheet provided by the Federal Transit Administration on their website and referenced in the FTA manual. The input for the spreadsheet cells is as following:

Receiver Parameters

Land Use Category	2 Residential
Existing Noise (Generic Value from Manual Table 4-17)	used range between 70 dB and 40 dB based on distance from the rail road

Noise Source (3)
Only Daytime trips are planned.

Source Type	Fixed Guideway
Specific Source (1)	Diesel Electric Locomotive
Avg. Number of Rail Cars/Train	2
Speed (mph)	20
Avg. Number of Events/hr	0.133
Distance	Parametric study from 50 ft to 1600 ft
Number of Intervening Rows of Buildings	0

Source Type	Fixed Guideway
Specific Source (2)	Rail Car

Avg. Number of Rail Cars/Train	50
Speed (mph)	20
Avg. Number of Events/hr	0.133
Distance	Parametric study from 50 ft to 1600 ft
Number of Intervening Rows of Buildings	0

Source Type	Fixed Guideway
Specific Source (3)	Locomotive Horn
Speed (mph)	20
Avg. Number of Events/hr	0.133
Distance	Parametric study from 50 ft to 1600 ft
Number of Intervening Rows of Buildings	0

Summary of noise impact calculations relative to the distance from the source is presented below.

Distance from Rail Rod (feet)	Existing L_{dn} (dB)	Total Noise Exposure (dB)	Noise Increase (dB)	Impact Level	No. of Impacted Receptors
50	70	71	1	None	0
100	65	66	1	None	0
121 -129	60	62	2	Moderate	2
130	60	62	2	None	0
240	55	57	2	None	0
500	50	53	3	None	0
800	45	48	3	None	0
1000 and over	40	46	6	None	0

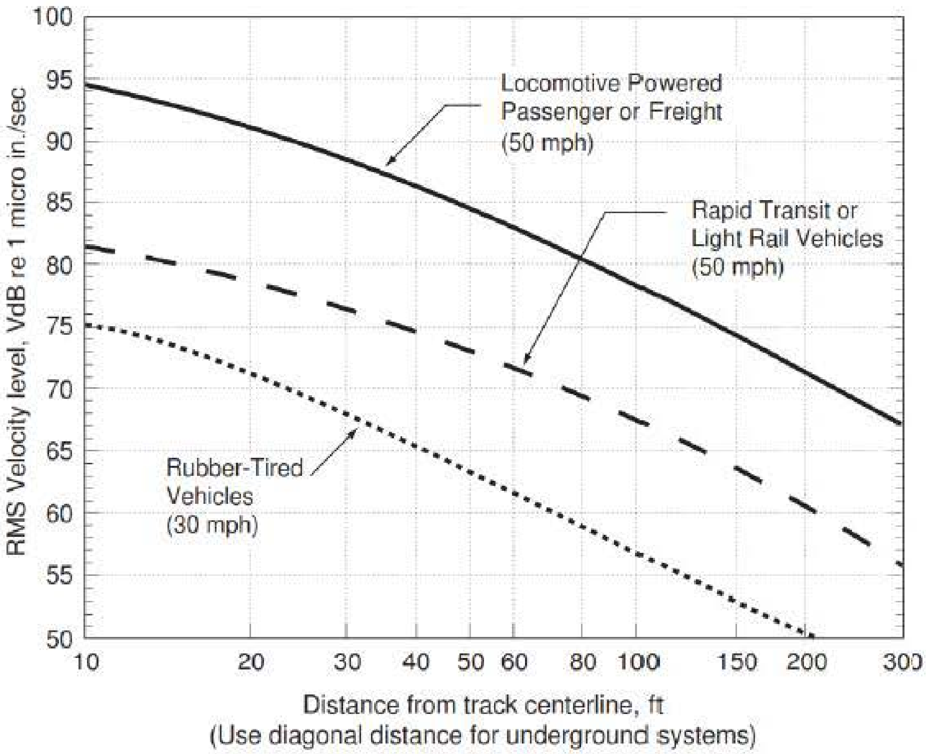
The closest residential structure identified on provided plans is located 100 feet away from the center of ROW. Based on the general noise assessment the increase in cumulative noise levels is withing the 'No Impact' category for majority of identified receptors. Two residential structures located at 6100 and 6106 Elder Street in Moss Point, Mississippi are within the 'Moderate Impact' category with 2 dB noise increase above the generic existing noise level. However, both structures straddle over the 'No Impact' and 'Moderate Impact' level zones. The installation of a noise barrier along the ROW line would reduce the noise impact for both receivers and place them entirely within the 'No Impact' level zone. However, the mitigation measures by installing noise barrier may not be feasible from the cost perspective. Therefore, the North Rail Connector project will not require further detail assessment.

4.2 Transit Vibration General Assessment

The vibration analysis for the project was performed using the procedures described in the FTA guidance manual. To examine potential effects during operation, the FTA guidance document (similar to the approach for assessing noise) lays out a three-step approach for the analysis of vibration and ground-borne noise: a screening procedure, a general assessment, and a detailed analysis. Seven receptors were identified by the screening procedure prompting general assessment.

Vibration levels at receivers are determined by estimating the overall vibration velocity level and A-weighted ground-borne noise levels as a function of distance from the track and applying adjustments to account for factors such as track support systems, vehicle speed, type of building, and track and wheel conditions.

The ground surface vibration level base for each identified receptor was assessed from the base curve provided by FTA manual.



For at-grade heavy rail, FTA recommends using the Rapid Transit or Light Rail Vehicles curve. Then, adjustments are applied to develop project-specific vibration projections at each receiver. The following table presents summary of assumptions and calculated adjustments following FTA guideline.

Source Factor	Adjustment
Speed	-8 dB
Vehicle Parameters	+10 dB
Special Trackwork (100 to 200 ft)	+5 dB
Geologic conditions	+10 dB
Wood-Frame Houses	-5 dB
Total Adjustments	+12 dB

Inventory of vibration impacted receptors is presented in the following table:

Receiver Address in Moss Point, Mississippi	Distance from center of ROW (feet)	RMS Velocity Level from Base Curve (VdB)	Adjustment (VdB)	Calculated Vibration Level (VdB)
6000 Elder Street	100	67.5	+12	79.5
6006 Elder Street	120	67	+12	79.0
4935 Tanner Street	182	62	+12	74.0
Lilly Circle 4 homes with no identified address	178 - 200	63 to 61	+12	75 to 73

The accepted indoor ground-borne vibration levels are provided in the FTA manual Table 6-3. For infrequent events for category 2 land use, that level is specified at 80 VdB. Therefore, according to the General Vibration Assessment there is no potential negative impact and Detailed Vibration Analysis are not required.

5.0 LIMITATIONS

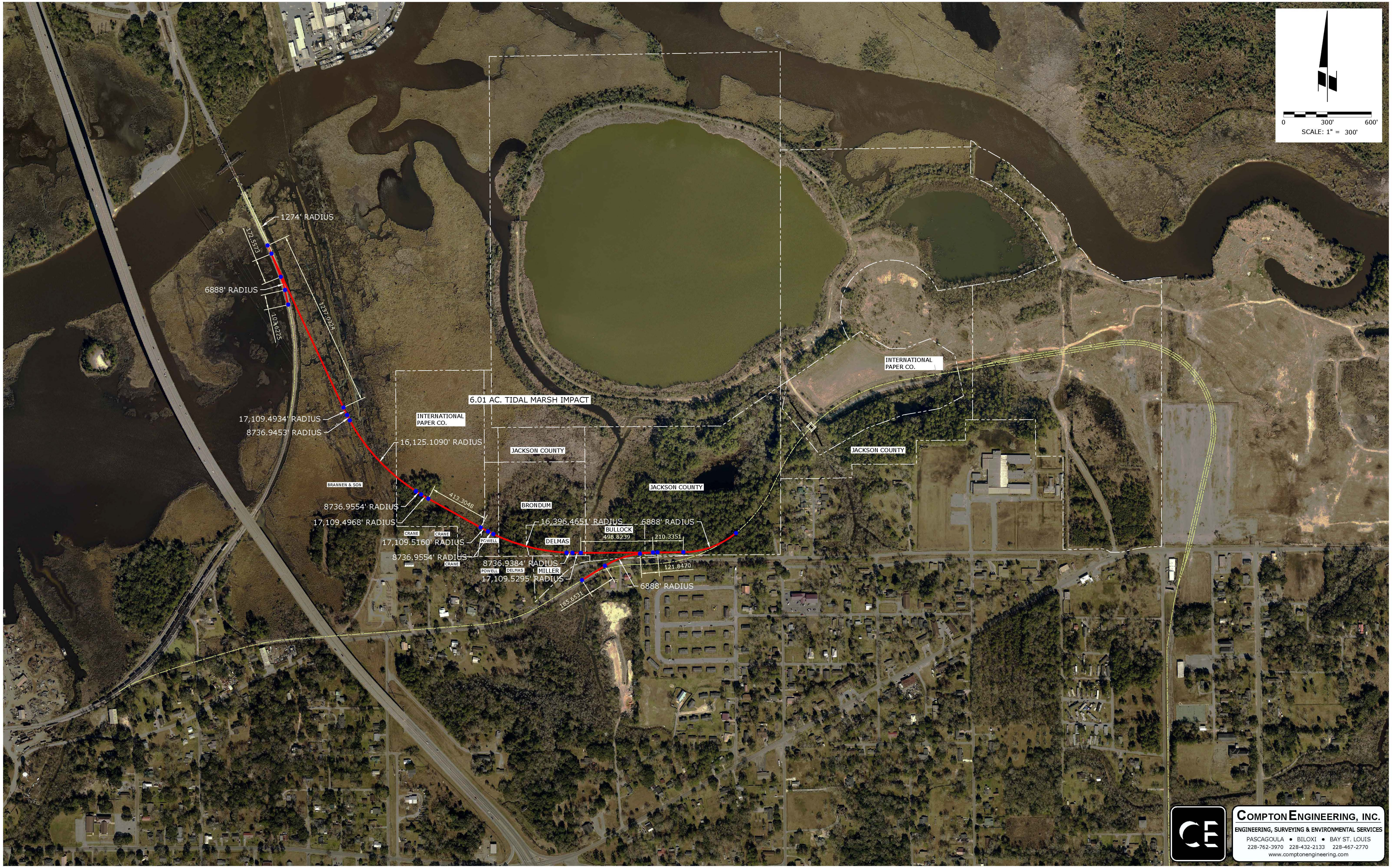
Information contained in this report are based upon project data provided to us by Compton Engineering, Inc. This report has been prepared in accordance with FTA guidance included in manual (2018). No other warranty, expressed or implied, is made as to the professional advice included in this report.

This report has been prepared to assist the design professionals in the design of this project. It is intended for use with the specific project as described herein. Any substantial changes in design should be brought to our attention so that Stevenson Consulting may determine any effect on the assessment results rendered herein.

STEVENSON CONSULTING, INC.

Appendix A:

Project Location Plan



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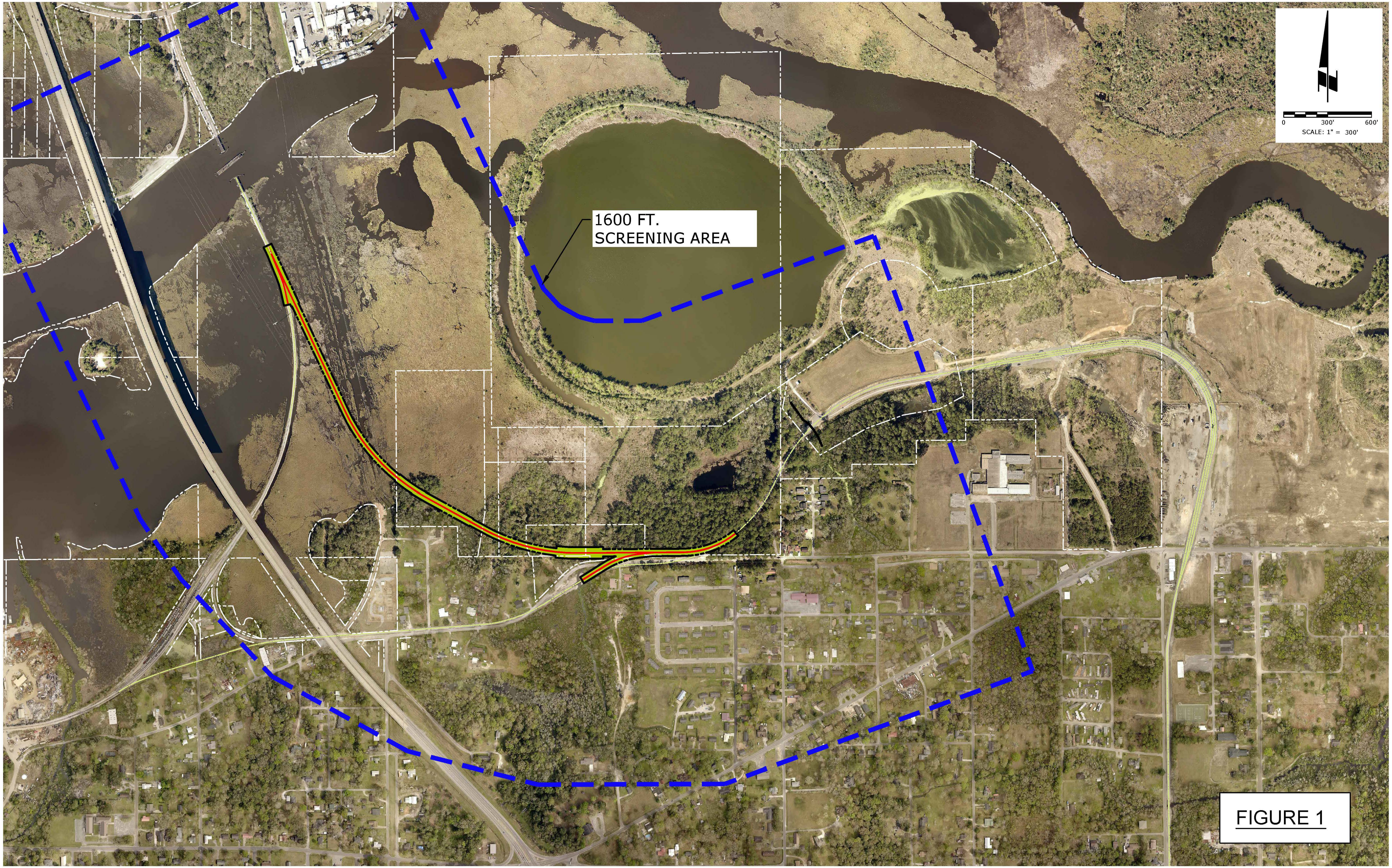

FIGURE 1

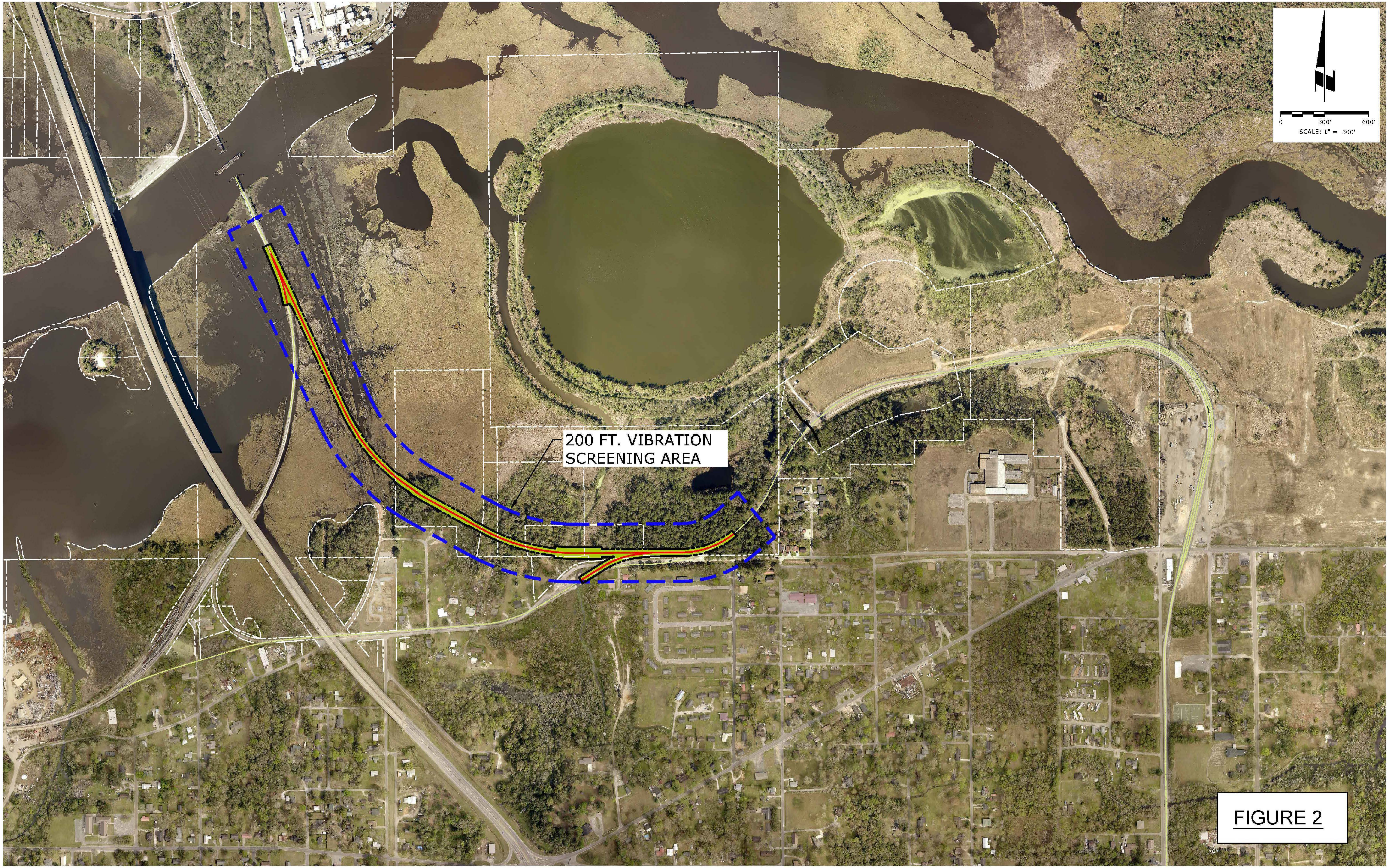

FIGURE 2

NORTH RAIL PROJECT - MOSS POINT

Vibration Calculation During Construction Per FTA Manual 2018

PPV_{ref}^{*} (in/sec)	D (feet)	**PPV_{equip} (in/sec)**	
1.518	437	**0.02**	Use 0.05 ips since most seismographs record up to 0.05 ips in continous mode

$$PPV_{equip} = PPV_{ref} \times \left(\frac{25}{D}\right)^{1.5}$$ **Eq. 7-2**

where:

PPV_{equip} = the peak particle velocity of the equipment adjusted for distance, in/sec

PPV_{ref} = the source reference vibration level at 25 ft, in/sec

D = distance from the equipment to the receiver, ft

PPV_{ref}^{*} From Table 7-4 - Pile Driving

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 08/24/2021
Case Description: North Rail Moss Point

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Closest Structure 437 ft	Residential	50.0	50.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Impact Pile Driver	Yes	20		101.3	437.0	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Impact Pile Driver	82.4	75.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Total	82.4	75.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A