

SUBJECT
Port NOLA LIT VIA

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DEPARTMENT
Mobility

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TO
Chelsea Crawford

OUR REF
Port NOLA LIT VIA

PROJECT NUMBER
30154409

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Introduction

This memo documents the existing and potential future environmental vibration conditions for the proposed Port of New Orleans (Port NOLA) Louisiana International Terminal (LIT) project in Violet, Louisiana. The memo describes the project, contains information on the current environmental vibration levels, discusses existing land uses and roads surrounding the Port NOLA site, and summarizes how the additional future truck and rail traffic in the area could affect the transportation-induced vibration levels at the closest occupied buildings. This assessment has been completed based on the current design and available information. If significant changes are made to the current design then this assessment should be revisited and changes evaluated to confirm the results of this assessment.

In addition to potential future vibration, construction vibration levels from the most impactful equipment (pile drivers and ground compaction equipment) were also investigated.

Purpose of the Study

The purpose of this study is to evaluate the potential for vibration from the future on-site rail lines and trucking routes at the nearest homes (i.e. operational vibration), as well as the approximate vibration zones of influence due to the construction activities. For clarity, the vibration assessment has been separated into operational vibration and construction vibration throughout this memo. In the event there is potential for perceptible vibration, or vibration that could lead to building damage, mitigation recommendations will be made to be incorporated into the design of the terminal.

Project Background and Description

The proposed Port NOLA LIT project will be in the vicinity of Violet, Louisiana, and will consist of a three-berth modern container terminal, with 2 million TEU (twenty-foot equivalent unit) container annual capacity at full buildout. The Terminal will be located on an approximately 500-acre site, with waterfront to accommodate up to 3,600 linear feet of berth space. This length of wharf would be adequate to berth two of the largest basis of design ships concurrent with barges. The Terminal has a "Phase 1" capacity of approximately 1.0-1.2 million TEU's. Subsequent phases will be completed based on market demand. This assessment was prepared based on a full design.

The terminal facilities will incorporate modern terminal design elements related to safety as well as operational and environmental efficiencies. Wharf facilities will be designed to accommodate container on barge vessels and provisions for up to 400-meter class (23,000 TEU) container vessels. The conceptual layout for the proposed PORT NOLA LIT is shown in Figure 1.

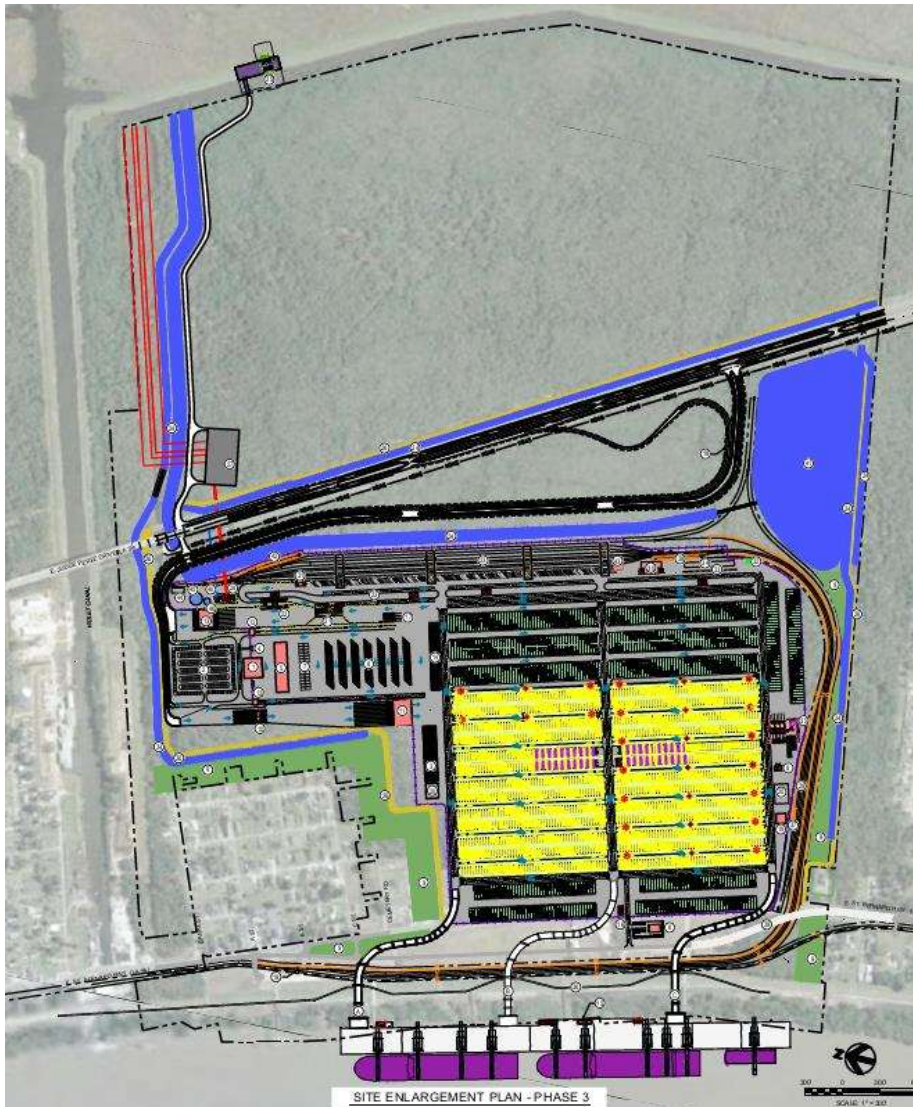


Figure 1. Proposed Conceptual Layout

Vibration Criteria

The Federal Transit Administration (FTA) has published a manual, titled “Transit Noise and Vibration Impact Assessment Manual” (FTA Manual), for conventional rail noise and ground-borne vibration impact assessments. The assessment procedures outlined in the FTA manual are relied upon by the Federal Railway Administration (FRA). This manual outlines vibration criteria based on land and building uses during both construction activities and typical operational activities. These are summarized below in Table 1 and Table 2 for building damage during construction activities, and perception during operational activities.

Table 1: Building Vibration Damage Criteria (For Construction Assessment)

Building/Structural Category	PPV (in/sec)	Approximate Lv (VdB re 1 micro- inch/sec)
I. Reinforced-concrete, steel or timber (no plaster)	0.5	102
II. Engineered concrete and masonry (no plaster)	0.3	98
III. Non-engineered timber and masonry buildings	0.2	94
IV. Buildings extremely susceptible to vibration damage	0.12	90

Although vibrations are not expected to reach levels enough to damage buildings, Category III buildings are a conservative assumption for this area, which represents a mix of newer, older constructions and mobile homes.

Table 2: Indoor Ground-Borne Vibration Impact Criteria for General Vibration Assessments (For Operational Assessment)

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)					
	Frequent Events		Occasional Events		Infrequent Events	
	PPV (in/sec)	VdB	PPV (in/sec)	VdB	PPV (in/sec)	VdB
Category 1: Buildings where vibration would interfere with interior operations.	0.007	65	0.007	65	0.007	65
Category 2: Residences and buildings where people normally sleep.	0.016	72	0.022	75	0.04	80
Category 3: Institutional land uses with primarily daytime use.	0.022	75	0.032	78	0.057	83

As terminals tend to operate continuously throughout the day, the potential for frequent events should be considered. Based on the types of vibration receptors in the vicinity, i.e. residences, the use of 72 VdB criteria is appropriate for this assessment to determine the potential for vibration perception and annoyance during the terminal's typical operations.

Existing Vibration Levels

Prior to assessing the potential future vibration impacts, a monitoring campaign was undertaken to quantify the existing vibration levels within the site. Levels were monitored for a period of 12 hours at four (4) different locations at the W. Smith Junior Elementary School (School), as shown in Figure 2.



Figure 2: Existing Vibration Monitoring Locations

Measurements are representative of the vibrations generated by both road and rail traffic along the E St Bernard Highway and the adjacent rail line. The vibration monitors were located at distances representative of the setback distances residences in the area would experience. For example, monitors VM-01 and VM-02 were located at the same distance from the highway as the existing residences fronting the same roadway, while monitors VM-03 and VM-04 are representative of what second-row and third-row residences would be exposed to. Vibration data was collected on July 24, 2024, as peak particle velocity in in/sec. The table below summarizes the peak traffic-related vibration levels.

Table 3: Peak Traffic-related Vibration Levels (PPV, in/sec)

Monitor	Vibration Level (in/sec)	Vibration Level (VdB)
VM-01	0.038	80
VM-02	0.035	79

VM-03	<0.02*	<74*
VM-04	<0.02*	<74*

* Rail traffic-related vibrations were below the threshold of the instrument and are considered insignificant

Although the times of rail passbys were not noted during the measurement campaign, the peak traffic-related vibration levels noted in Table 3 are typical of freight passbys. It can be assumed that these are the worst-case rail passby vibration levels first-row residences would be exposed to.

In addition to steady traffic flow, there were a few instances of localized activities that resulted in briefly elevated vibration levels. These were related to cement and dump truck activities. The peak vibration levels during these localized events are outlined in Table 4.

Table 4: Measured Peak Vibration Levels

Monitor	Vibration Level (in/sec)	Vibration Level (VdB)
VM-01	0.063	84
VM-02	1.008	108
VM-03	0.02	74
VM-04	<0.02*	<74*

* Vibration levels due to localized trucking activities were below the threshold of the instrument and are considered insignificant

With the exception of one dump truck-related peak level of 1.008 in/sec, both traffic and trucking-related vibration levels are below the building vibration damage criteria. We believe that the spike in vibration levels from the dump truck activities was a localized event as it was not registered at nearby instruments. Therefore, this level should not be assumed to be frequent and representative of the area.

Additional baseline vibration measurements were conducted at locations shown in Figure 3. These measurements were completed to determine the typical vibration levels other residences in the area are regularly exposed to.



Figure 3: Additional Vibration Monitoring Locations

The maximum vibration levels at each monitoring location are shown in Table 5.

Table 5. Measured Peak Vibration Levels

Monitor	Maximum Vibration Level (in/sec)	Vibration Level (VdB)
VM1	0.001	48
VM2	0.001	48
VM3	0.003	58

Overall, the existing vibration levels in the area surrounding the Terminal are low. If future vibration levels exceed these levels residents may notice the change in vibration level. Additionally, if vibration monitoring is conducted for the construction of the Terminal, it can be assumed that any measured vibration levels that are higher than these background levels are due to the construction work.

The school is expected to remain in place and in use during the first two phases of construction and operation of the Terminal. It will be relocated as part of Phase 3 of the Terminal construction. Although the assessment is based on the full design, information on how the school may be affected, prior to relocation, is presented in the subsequent sections.

Vibration Impact Methodology

In addition to assessing vibration from rail, the FTA manual also includes assessment procedures for vibrations resulting from trucks. The following sections outline the methodologies used and provide a summary of the results at a high-level.

Rail Vibration

Chapter 6.4 of the FTA Manual provides a general assessment approach for ground-borne vibration as a function of distance from sources, along with adjustments to account for factors such as rail speed. Equation 6-1 from the FTA Manual applies to locomotive-powered passenger and freight trains.

$$L_v = 92.28 + 14.81 \log D - 14.17 \log D^2 + 1.62 \log D^3$$

Where:

L_v = velocity level, VdB

D = distance, ft

This equation is based on data for 50 mph rail. Adjustments for different rail speeds can be made using Equation 6-4 in the FTA Manual.

$$Adj_{speed}(dB) = 20 \log \left(\frac{speed}{speed_{ref}} \right)$$

Where:

$speed$ = new corridor speed

$speed_{ref}$ = reference speed of 50 mph

By combining these two equations, an approximate ground-borne vibration level can be determined for the homes nearest the future rail tracks. Additional factors can be incorporated into the assessment, such as vehicle design (suspension and wheels), track design, track treatments (floating slab, ballast mats, high-resilience fasteners, etc.), to refine the results. However, these details are not yet known.

Construction and Trucking Vibration

Chapter 7 of the FTA Manual deals with construction noise and vibration impacts. For the purposes of this assessment, equations 7-2 and 7-3 from the FTA Manual will be used to estimate the potential for building damage and annoyance due to construction activities and trucks.

Equation 7-2 from the FTA Manual deals with building damage and is provided below:

$$PPV_{equip} = PPV_{ref} \cdot \left(\frac{25}{D}\right)^{1.5}$$

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

Equation 7-3 from the FTA Manual deals with annoyance and is provided below:

$$L_{v,distance} = L_{vref} - 30 \log\left(\frac{D}{25}\right)$$

Where:

$L_{v,distance}$ = the rms velocity level adjusted for distance, VdB

L_{vref} = the source reference vibration level at 25 ft, VdB

D = distance from the equipment to the receiver, ft

A combination of FTA-published and calculated PPV_{ref} and L_{vref} values were used to estimate the vibration levels. Table 6 provides the reference levels.

Table 5: Construction Equipment Vibration Reference Levels

Equipment	PPV _{ref} at 25 ft (in/sec)	Approximate L _{vref} at 25 ft (VdB)
Pile Driver (Impact, Ape D160, upper range)	2.966	117
Pile Driver (Impact, Ape D100, upper range)	2.353	115
Pile Driver (Vibratory, Ape D200, upper range)	0.458	101
Compaction (Vibratory Roller)	0.210	94

Earth Movement (Large Bulldozer)	0.089	87
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Note that the reference vibration levels for the impact and vibratory drivers were based on the maximum power and frequency of the equipment expected to be used on site. It has not been verified with the manufacturer if this combination of conservative assumptions is realistic or sustainable over long periods of time. Therefore, this is considered to be a very conservative assumption resulting in a conservative zone of influence.

Vibration Results

Operational Vibration

This operational vibration assessment was completed for the residences close to the new rail tracks and trucking routes based on the FTA Manual methodologies with the following assumptions:

- On-site rail speed = 15 mph
- Distance to closest on-site rail track = 270 ft
- Distance to closest on-site truck route = 650 ft

During Phase 2 of operation, the School will be approximately 350 ft away from the nearest truck route. Similar calculation methodology was applied to estimate the effects on the school due to trucking activities. Rail is further way and not considered to have a significant effect.

As vibration typically decays over distance, if the closest homes are shown to experience negligible levels of vibration due to the proposed rail and truck routes on site, homes set back further are expected to experience similar or lower levels of vibrations. The closest homes to the operational activities, are off E St Bernard Highway near Bryant Road and Caserta Drive. The receptors affected by operational activities are expected to be different from the receptors most affected by construction activities. The predicted vibration levels are summarized below in Table 7.

Table 7: Operational Vibration Results

Vibration Source	Vibration Level at Nearest Home		Annoyance Criteria		Pass or Exceedance?
	in/sec	VdB	in/sec	VdB	
Rail (to residence)	0.003	58	0.016	72	Pass
Trucks (to residence)	0.001	44	0.016	72	Pass
Trucks (to School)	0.002	52	0.016	72	Pass

As demonstrated, the predicted vibration levels are expected to be below the criteria. Vibration from the new rail lines and trucking activities are not expected to be perceptible.

Construction Vibration

Table 8 summarizes the construction vibration zone of influence for a Category III-type building. The zone of influence indicates the distance at which vibration levels due to the equipment are expected to be below the applicable building damage criteria. For Category III-type buildings, this is 0.2 in/sec.

Table 6: Construction Vibration Zone of Influence for Building Damage

Equipment	Zone of Influence (feet)
Pile Driver (Impact, Ape D160, upper range)	215
Pile Driver (Impact, Ape D100, upper range)	185
Pile Driver (Vibratory, Ape D200, upper range)	62
Compaction (Vibratory Roller)	36
Earth Movement (Large Bulldozer)	20

Figures 4 and 5 (after the memo text) provide a visual illustration of the building damage zone of influence. There are residences within the building damage vibration zone of influence along E. Saint Bernard Highway near Bryant Road and Caserta Drive and near C Street. It is expected that the area to the south (i.e. homes along E. Saint Bernard and Bryant Road and Caserta Drive) will only be impacted by work completed in support of the Highway bridge, while the homes near C Street will only be impacted by ramp construction. Piling outside of these small areas is not expected to affect structures. To minimize the effects, use of the vibratory driver is recommended within these areas. If an impact driver is required to complete the work, it is recommended that vibration monitoring be conducted at all structures within the zones of influence. If vibration monitoring at all structures within the zone of influence is not practical, Figures 6a and 6b note the closest structures where monitoring should at a minimum be undertaken.

Monitoring may be conducted at all locations simultaneously or at the location closest to the construction work and then moved as the construction work moves. For the other work being completed on the site and for the E. Judge Perez overpass as well as the pump station there are no residences within the building damage vibration zone of influence.

Compaction and earth movement are not expected to have an effect as their zones of influence are significantly smaller and not expected to extend only slightly outside of the project boundaries.

The School is expected to be outside of the zones of influence during Phase 2 construction, which is expected to be the one closest to the School. Therefore, vibration monitoring is not expected to be required during all Phase 2 construction activities. However, attended, hand-held monitoring when construction is at the closest will validate the assumptions and is recommended to be carried out. Attended monitoring should be completed for a minimum of a day when any of the above equipment is used in close proximity to the School.

Table 9 provides the zone of influence for annoyance.

Table 7: Construction Vibration Zone of Influence for Human Annoyance

Equipment	Zone of Influence (feet)
Pile Driver (Impact, Ape D160, upper range)	820
Pile Driver (Impact, Ape D100, upper range)	700
Pile Driver (Vibratory, Ape D200, upper range)	235
Compaction (Vibratory Roller)	135
Earth Movement (Large Bulldozer)	80

Figures 7 and 8 (after the memo text) provide a visual illustration of the annoyance zone of influence. A number of residential properties are located within the zone of influence when impact drivers are used. Under the most conservative conditions, the occupants of these properties may perceive some of the vibrations when piling occurs close to the property line as the predicted levels are not only just above the threshold of perception but also above the existing background levels. As noted, the assumptions made herein are conservative and are based on the absolute maximum operational limits of the pile drivers. It is not expected that the equipment can operate at its peak operating conditions for extended periods of time, therefore, the vibration effects are likely to be short-lived. Furthermore, acoustical reductions from the noise and vibration attenuating characteristics of the homes is not taken into consideration. Depending on the characteristics of the homes, the actual vibration levels could be much lower in the interior of the homes.

Use of the vibratory driver is recommended for piles near the perimeter of the project boundary to minimize the effects on residents. If an impact driver is required to complete the work, vibration monitoring in the homes closest to the work area is recommended to ensure vibration levels do not exceed the building damage criteria.

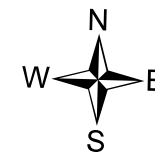
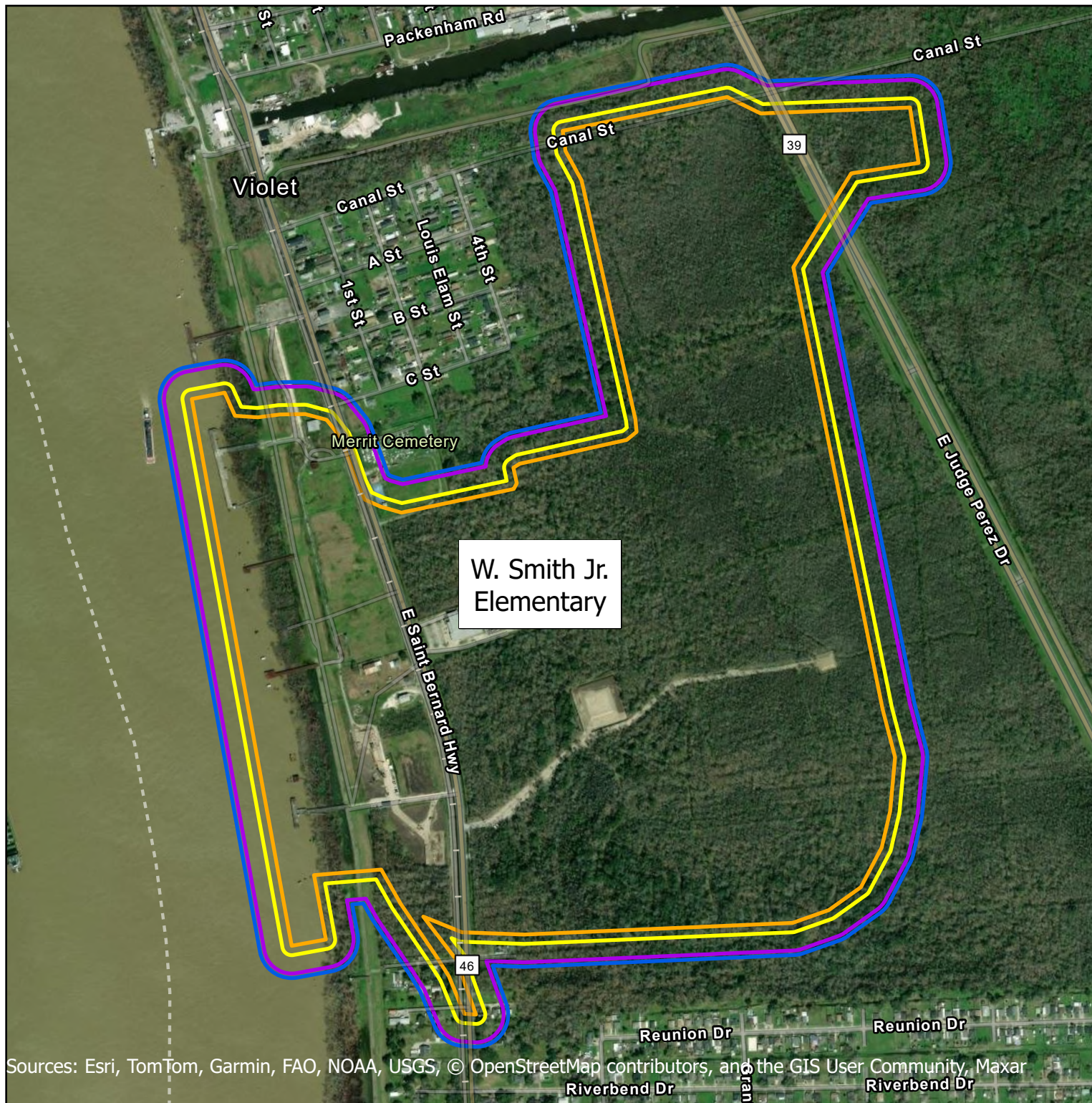
Based on the zones of influence, students occupying the southern and eastern portions of the School are likely to perceive some of the vibrations during pile driving activities.

Conclusions and Recommendations

A high-level quantitative assessment for the entire project boundary demonstrates that vibration levels from the new rail lines and truck activities on-site are not expected to be significant enough to damage buildings or be perceptible. This assessment is based on information known at this stage of the project. If any significant changes are made to the design this assessment should be revisited to ensure the results don't change. It is recommended that rail lines be designed in such a way to minimize potential vibrations.

Vibration from the piling activities for the highway bridge may exceed the building damage criteria when work is being completed near Caserta Drive. During this work it is recommended that vibration monitoring be conducted at the closest residences shown in Figure 6a and 6b to ensure vibration levels remain below the building damage level. Short-term attended vibration monitoring is recommended during Phase 2 construction activities when construction is closest to the School. Vibration due to construction is not expected to exceed building damage criteria at residences for the other areas of work. When piling activities are occurring along the perimeter of the

site, the closest residents may perceive limited vibrations. Temporary vibration monitoring during key piling activities could be undertaken at the closest homes that are within the vibration zones of influence to verify the actual vibration levels. If vibration levels are perceptible, consider piling at reduced power or use of smaller equipment which results in smaller zones of influence. In addition, a notification process should be implemented to provide a warning to affected residents in advance of piling activities.



Legend

- Extent of Potential Pile Work
- Vibration Damage Zone of Influence - Vibratory Ape 200
- Vibration Damage Zone of Influence - Impact Ape D100
- Vibration Damage Zone of Influence - Impact Ape D160
- Point Notes selection

Vibration Damage Zone of Influence

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Figure: 4

Scale: 1:11,000

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Legend

-  Extent of Pile Work for the Highway Overpass and Pump Station
-  Vibration Damage Zone of Influence

Vibration Damage Zone of Influence

Port NOLA LIT VIA

Project Number: 30154409

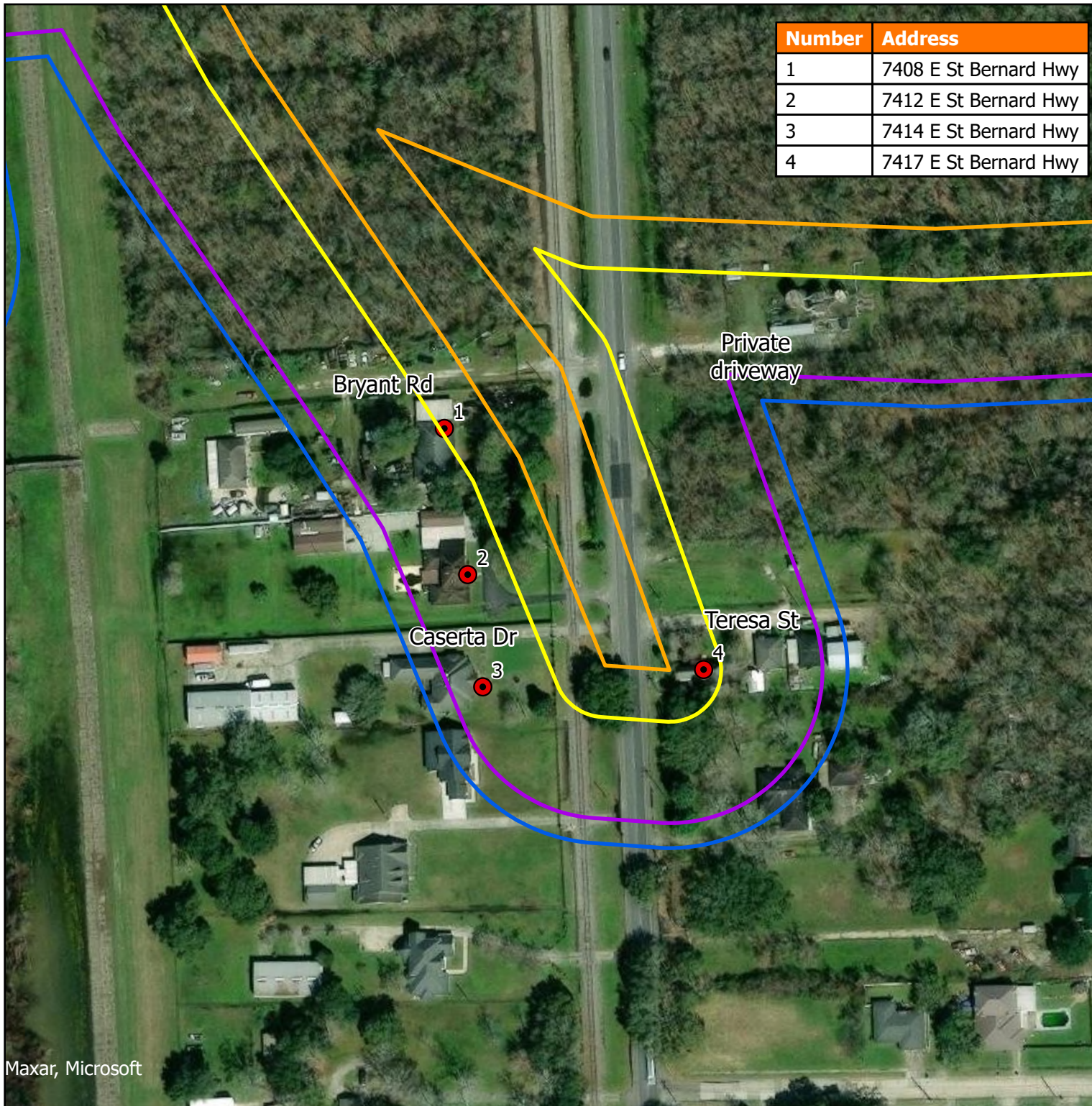


Figure: 5

Scale: 1:13,000

Drawn By: J Kelton.

Date Exported:
2024-10-22



Number	Address
1	7408 E St Bernard Hwy
2	7412 E St Bernard Hwy
3	7414 E St Bernard Hwy
4	7417 E St Bernard Hwy



Legend

-  Extent of Potential Pile Work
-  Vibration Damage Zone of Influence - Vibratory Ape 200
-  Vibration Damage Zone of Influence - Impact Ape D100
-  Vibration Damage Zone of Influence - Impact Ape D160
-  Vibration Monitoring Locations

Vibration Monitoring Locations

Port NOLA LIT VIA

Project Number: 30154409

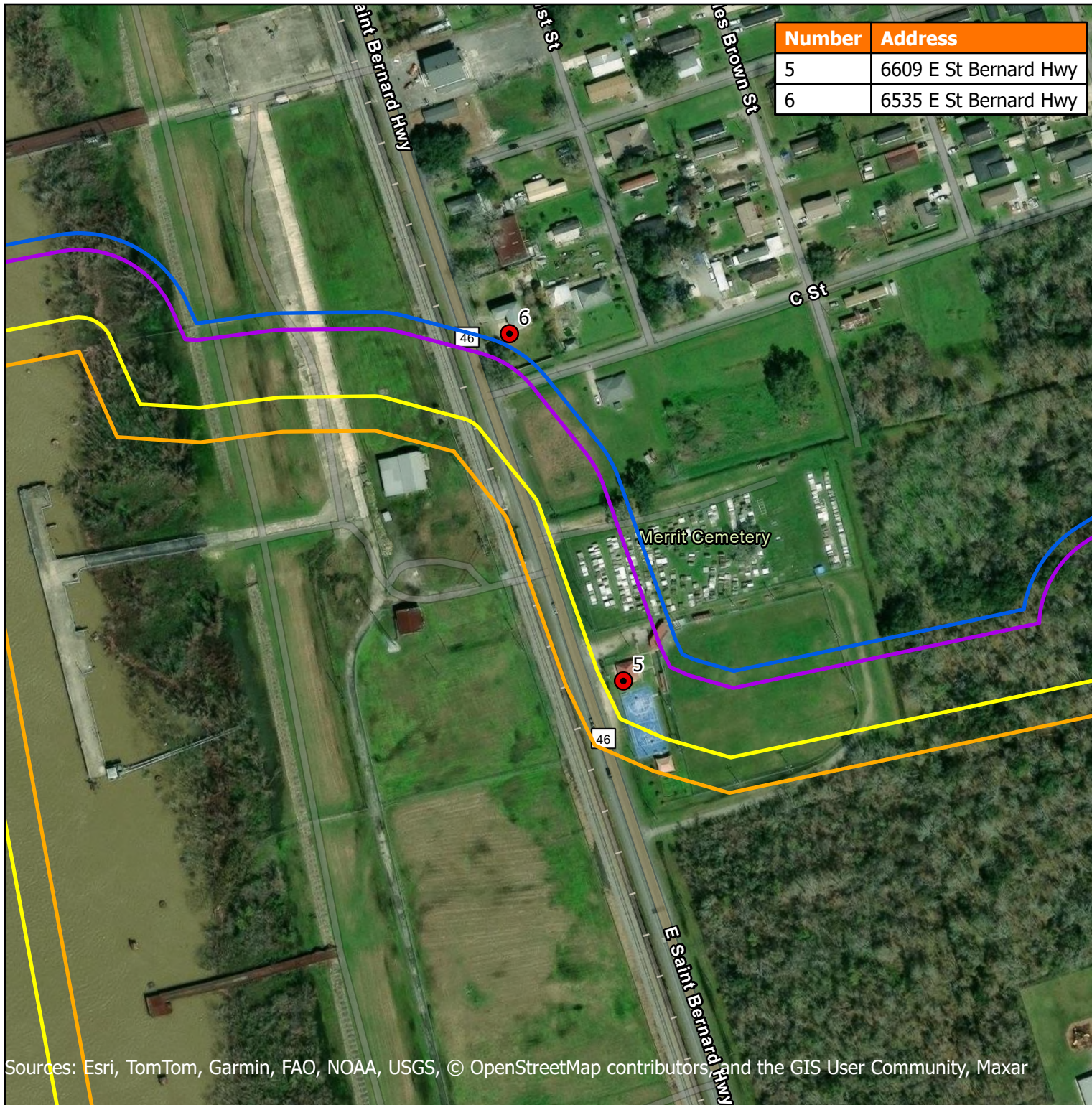


Figure 6a

Scale: 1:2,000

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Number	Address
5	6609 E St Bernard Hwy
6	6535 E St Bernard Hwy



Legend

- Extent of Potential Pile Work
- Vibration Damage Zone of Influence - Vibratory Ape 200
- Vibration Damage Zone of Influence - Impact Ape D100
- Vibration Damage Zone of Influence - Impact Ape D160
- Vibration Monitoring Locations

Vibration Monitoring Locations

Port NOLA LIT VIA

Project Number: 30154409



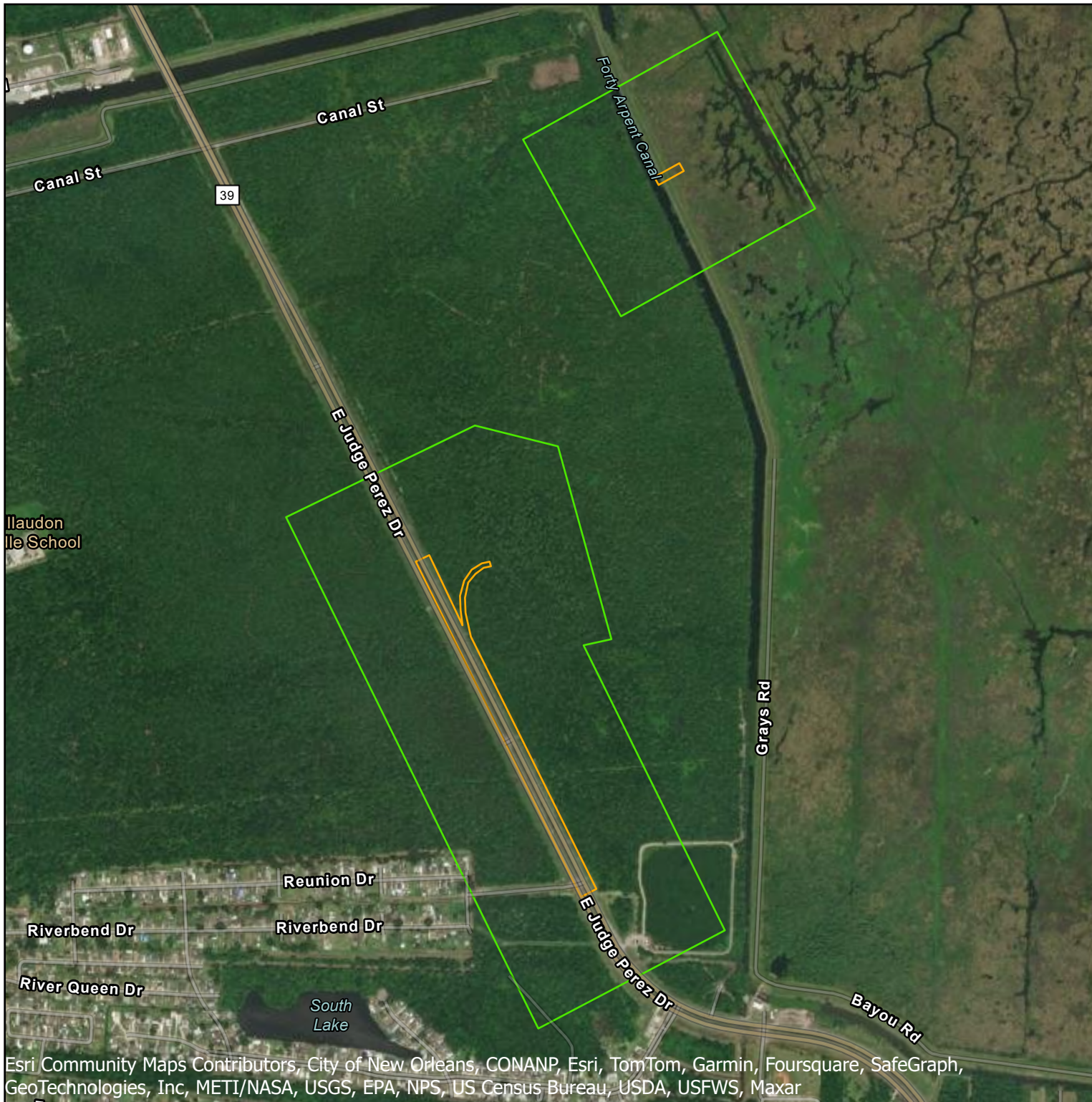
Figure 6b

Scale: 1:3,000

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Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Maxar



Legend

-  Extent of Pile Work for the Highway Overpass and Pump Station
-  Vibration Annoyance Zone of Influence

Vibration Annoyance Zone of Influence

Port NOLA LIT VIA

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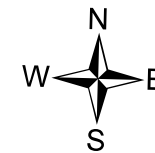
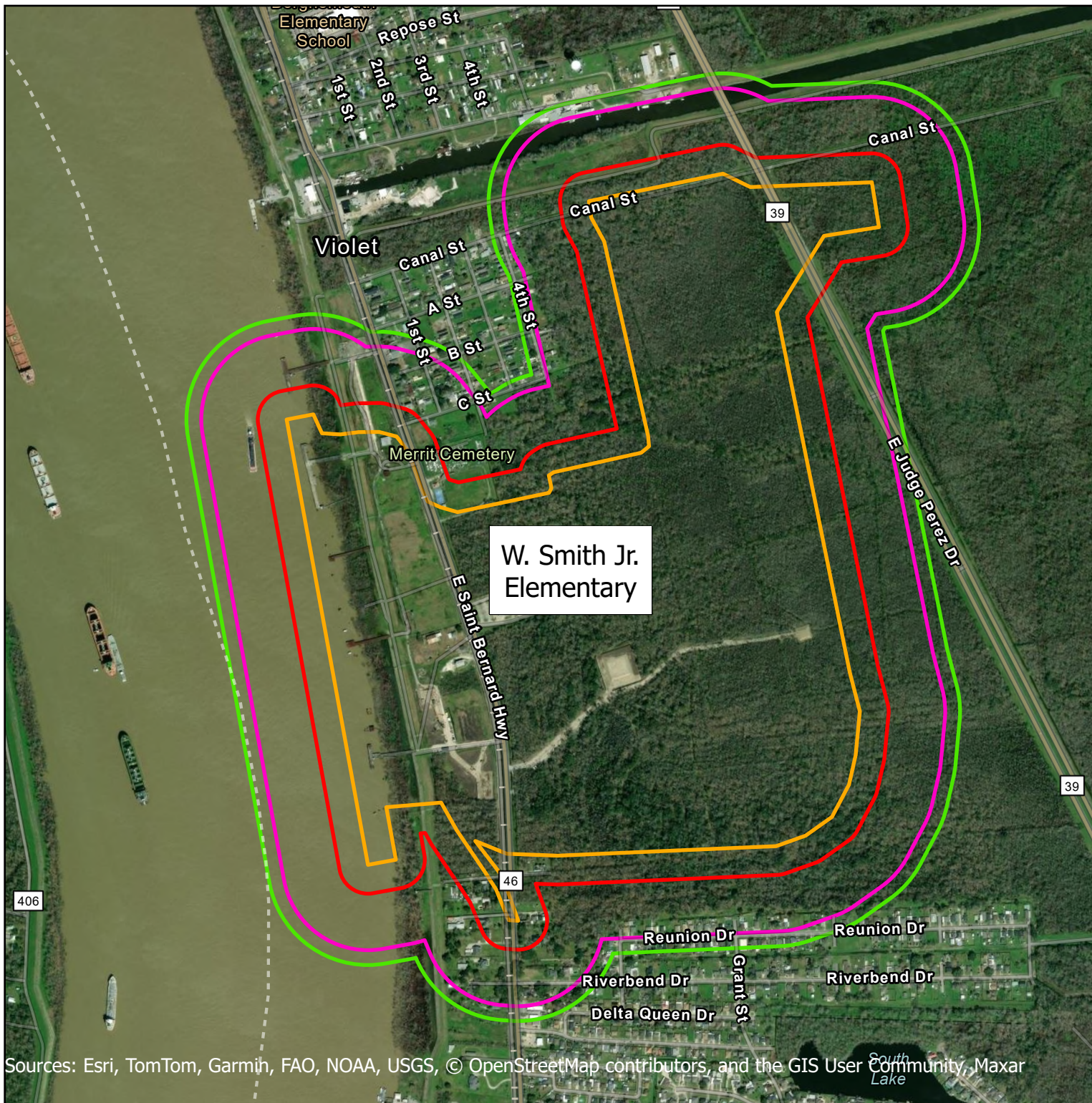


Figure: 7

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2024-10-22



Legend

- Extent of Potential Pile Work
- Vibration Annoyance Zone of Influence - Impact Ape D160
- Vibration Annoyance Zone of Influence - Impact Ape D100
- Vibration Annoyance Zone of Influence - Vibratory Ape 200

Vibration Annoyance Zone of Influence

Port NOLA LIT VIA

Project Number: 30154409



Figure: 8

Scale: 1:13,500

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2025-10-14