# TRAFFIC NOISE REPORT

US 70 Kinston Bypass

Lenoir, Jones, and Craven Counties

WBS Element No. 34460
TIP Project No. R-2553

Prepared for:

North Carolina Department of Transportation
Environmental Analysis Unit

Submitted By:

AECOM

May 2018

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## Executive Summary

This report summarizes the traffic noise analysis findings for North Carolina Department of Transportation (NCDOT) State Transportation Improvement Program (STIP) Project R-2553. Project R-2553 involves constructing a multi-lane highway on new location in Lenoir, Jones, and Craven Counties, North Carolina. As it is currently defined, the Kinston Bypass would consist of a four-lane, median divided freeway from US 70 near LaGrange in Lenoir County to US 70 near Dover, on the Jones and Craven County line (see Figures 1A and 1B). A Draft Environmental Impact Statement is being prepared for this project and is scheduled to be completed in 2018. Federal funding will not be used. Federal Highway Administration (FHWA) approval will not be required.

Currently, there are 12 design year 2040 build alternatives under evaluation. One of the build alternatives is an Upgrade Existing US 70 Alternative, while the other eleven 11 alternatives are partially along existing US 70 and partially on new location to the south of existing US 70. The overall network of alternatives is comprised of various segments, which connect to each other. Each alternative is comprised of a unique set of these segments, and the majority of the segments are used in multiple alternatives. While each alternative contains a unique set of segments from the beginning of the project to the end of the project, none of them travel along a completely unique route.

Traffic noise impacts and temporary construction noise impacts can be a consequence of transportation projects, especially for noise-sensitive land uses in close proximity to high-volume and/or high-speed existing steady-state traffic noise sources. This Traffic Noise Analysis employed computer models created with the FHWA Traffic Noise Model® version 2.5 to predict future noise levels and define impacted receptors along the proposed project. Under proposed conditions, 2040 Build Alternative 1 UE resulted in 42 impacted receptors, Alternative 1 UE SB resulted in 63 impacted receptors, Alternative 11 resulted in 48 impacted receptors, Alternative 12 resulted in 54 impacted receptors, Alternative 31 resulted in 62 impacted receptors, Alternative 32 resulted in 67 impacted receptors, Alternative 35 resulted in 38 impacted receptors, Alternative 36 resulted in 34 impacted receptors, Alternative 51 resulted in 40 impacted receptors, Alternative 52 resulted in 46 impacted receptors, Alternative 63 resulted in 58 impacted receptors, and Alternative 65 resulted in 54 impacted receptors. These numbers may change based on the relocation assistance reports and right-of-way estimate reports.

Barrier 70-10 (Alternatives 31, 32, 63, and 65) is preliminarily recommended along eastbound US 70 between Barwick Station Road and Albert Suggs Road. Barrier JN-01 (Alternatives 11, 12, 31, 32, 63, and 65) is preliminarily recommended along westbound US 70 between NC 11 and US 258. Barrier 70-25 (Alternative 1 UE) is preliminarily recommended along westbound US 70 between US 70 Business and NC 11/NC 55.

Eight barriers were found non-feasible and/or unreasonable due to noise level reduction goals, constructability concerns, effects of non-traffic noise sources, and cost effectiveness. Barrier 70-05 (all alternatives) would have been located along eastbound US 70 between Jim Sutton Road and Barwick Station Road, but did not meet cost-reasonableness requirements. Barrier JB-01/JB-02 (Alternatives 51 and 52) would have been located along westbound US 70 between NC 55 and NC 11, but did not meet cost-reasonableness requirements. Barrier KH-03 (Alternatives 31 and 32) would have been located along westbound US 70 between

Kennedy Home Road and C.F. Harvey Parkway, but did not meet cost-reasonableness requirements. Barrier 11-05 (Alternatives 11, 12, 31, 32, 63, and 65) would have been located along the ramp from NC 11/NC 55 to eastbound US 70. A 24-foot high noise barrier at this location was unable to benefit any of the receptors. Barrier GO-03 (Alternative 1 UE SB) would have been located along westbound US 70 between NC 11/NC 55 and US 258, but did not meet cost-reasonableness requirements. Barrier 58-01 (Alternative 1 UE SB) would have been located along eastbound US 70 between US 258 and NC 58. A 24-foot high noise barrier at this location was unable to benefit any of the receptors. Barrier 70-21 (Alternative 1 UE) would have been located along a service road between US 258 and US 70 Business in front of Westview Cemetery, but a noise reduction of five dB(A) could not be achieved for at least two impacted receptors, thus making the barrier non-feasible. Barrier 70-28 (Alternative 1 UE) would have been located along westbound US 70 between NC 11/NC 55 and US 258, but did not meet cost-reasonableness requirements. Barrier 70-41 (Alternative 1 UE and 1 UE SB) would have been located along eastbound US 70 between Whaley Road and King Heights Boulevard, but did not meet cost-reasonableness requirements.

Consideration for noise abatement measures was given to all impacted receptors. Following the criteria for feasibility and reasonableness as prescribed in the 2016 NCDOT Traffic Noise Policy, noise abatement for this project would be likely at one location for Alternative 1 UE, one location for Alternatives 11 and 12, two locations for Alternatives 31 and 32, and two locations for Alternatives 63 and 65. 'Likely' does not mean a firm commitment. Additional detailed study of potential mitigation measures will be necessary subsequent to selection of the final design of this project.

Furthermore, temporary construction noise impacts may occur due to the close proximity of the noise-sensitive receptors to project construction activities. It is the recommendation of this traffic noise analysis that all reasonable efforts should be made to minimize exposure of noise-sensitive areas to construction noise impacts.

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## 1.0 PROJECT LOCATION & DESCRIPTION

This report summarizes the traffic noise analysis findings for North Carolina Department of Transportation (NCDOT) State Transportation Improvement Program (STIP) Project R-2553. Project R-2553 involves constructing a multi-lane freeway on new location in Lenoir, Jones, and Craven Counties, North Carolina. As it is currently defined, the Kinston Bypass would consist of a four-lane, median divided freeway from US 70 near LaGrange in Lenoir County to US 70 near Dover, on the Jones and Craven County line (see Figures 1A and 1B).

Currently, there are 12 future year build alternatives under evaluation, with a design year of 2040. One of the build alternatives is an Upgrade Existing US 70 Alternative, while the other 11 alternatives are partially along existing US 70 and partially on new location to the south of existing US 70. The overall network of alternatives is comprised of various segments, which connect to each other. Each alternative is comprised of a unique set of these segments, and the majority of the segments are used in multiple alternatives. While each alternative contains a unique set of segments from the beginning of the project to the end of the project, none of them travel along a completely unique route. For all alternatives, a 70 mph design speed will be used for upgrades made on new location, while a 60 mph design speed will be maintained for any upgrades being made on the existing location. These preliminary design alternatives are described in more detail below. Several design changes have been made to interchange configurations since the previous traffic noise analysis was submitted in 2014. These design changes can be seen in the bulleted list after each alternative is described.

**Alternative 1 UE (Upgrade Existing US 70)**

This alternative assumes that US 70 will maintain the current alignment, except it will be upgraded to freeway standards. This means that all at-grade intersections will be removed and access to US 70 would occur through new interchanges. Further, any existing at-grade railroad crossings would be removed or converted to a grade separation.

Design changes since the previous Traffic Noise Report include:

- US 70 at Albert Sugg Road and Barwick Station Road was changed from a diamond interchange to a partial cloverleaf interchange, and
- US 70 at Wyse Fork Road was changed from a diamond interchange to a Parclo B interchange.

**Alternative 1 UE SB (Upgrade Existing US 70 including a Shallow Southern Bypass)**

In this alternative, US 70 will maintain the existing alignment until just east of the C.F. Harvey Parkway interchange at US 70. The alignment will then break off to the south on new location and run parallel to existing US 70 for approximately 6.5 miles. East of NC 58, the new alignment will merge back with the existing US 70 alignment until the end of the planned

freeway design. Like Alternative 1 UE, major street crossings would receive access to US 70 through interchanges.

Design changes since the previous Traffic Noise Report include:

- US 70 at Albert Sugg Road and Barwick Station Road was changed from a diamond interchange to a partial cloverleaf interchange,
- A system interchange was added to connect existing US 70 to the proposed new mainline alignment of US 70,
- US 70 at Wyse Fork Road was changed from a diamond interchange to a Parclo B interchange, and
- US 70 at NC 11/55, US 70 at US 258, and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges.

**Alternative 11**

In this alternative, US 70 will maintain its existing alignment until the C.F. Harvey Parkway interchange at US 70. A southern leg will then be added to the interchange to the south, and the Kinston Bypass will follow this southern leg on new location. Near the existing NC 11 and NC 55 intersection, the alignment will maintain an eastern route to the south of Kinston. This alignment rejoins current US 70 at Dover.

Design changes since the previous Traffic Noise Report include:

- US 70 at Albert Sugg Road and Barwick Station Road was changed from a diamond interchange to a partial cloverleaf interchange,
- US 70 at NC 11/55 was changed from a diamond interchange to a Parclo B interchange,
- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges, and
- US 70 at Wyse Fork Road was changed from a diamond interchange to a partial cloverleaf interchange.

**Alternative 12**

In this alternative, US 70 will maintain its existing alignment until the C.F. Harvey Parkway interchange at US 70. A southern leg will then be added to the interchange to the south, and the Kinston Bypass will follow this southern leg on new location. Near the existing NC 11 and NC 55 intersection, the alignment will maintain an eastern route to the south of Kinston. This alignment is identical to Alternative 11 except that it rejoins current US 70 several miles to the west of Dover, just across the Jones County line. This alternative is the northernmost alignment of the southern bypass alternatives.

Design changes since the previous Traffic Noise Report include:

- US 70 at Albert Sugg Road and Barwick Station Road was changed from a diamond interchange to a partial cloverleaf interchange,

- US 70 at NC 11/55 was changed from a diamond interchange to a Parclo B interchange, and
- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges.

**Alternative 31**

In this alternative, US 70 will maintain its existing alignment until just west of the C.F. Harvey Parkway interchange at US 70. The alignment breaks off on new location to the south and east, and will maintain an eastern route to the south of Kinston, following a similar path as Alternative 11. A southern leg will also be added to the C.F. Harvey Parkway interchange at US 70, which will be an extension of C.F. Harvey Parkway to the Kinston Bypass. Like Alternative 11, this alignment rejoins current US 70 east of Kinston at Dover.

Design changes since the previous Traffic Noise Report include:

- US 70 at NC 11/55 was changed from a diamond interchange to a Parclo B interchange,
- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges, and
- US 70 at Wyse Fork Road was changed from a diamond interchange to a partial cloverleaf interchange.

**Alternative 32**

In this alternative, US 70 will maintain its existing alignment until just west of the C.F. Harvey Parkway interchange at US 70. The alignment breaks off on new location to the south and east, and will maintain an eastern route to the south of Kinston, following a similar path as Alternative 12. Similar to Alternative 31, a southern leg will also be added to the C.F. Harvey Parkway interchange at US 70, which will be an extension of C.F. Harvey Parkway to the Kinston Bypass. Like Alternative 12, this alignment rejoins current US 70 several miles to the west of Dover, just across the Jones County line.

Design changes since the previous Traffic Noise Report include:

- US 70 at NC 11/55 was changed from a diamond interchange to a Parclo B interchange, and
- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges.

**Alternative 35**

In this alternative, US 70 breaks off on new location from its current alignment several miles west of the C.F. Harvey Parkway interchange at US 70. The alignment heads to the south and then to the east, coming close to the Duplin County line. From there, this alternative then heads to the north and east, reconnecting with existing US 70 just across the Jones County line.

Design changes since the previous Traffic Noise Report include:

- US 70 at NC 55, US 70 at NC 11, US 70 at US 258, and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges.

**Alternative 36**

In this alternative, US 70 breaks off on new location from its current alignment several miles west of the C.F. Harvey Parkway interchange at US 70. The alignment heads to the south and then to the east, coming close to the Duplin County line similar to Alternative 35. This alternative then heads to the north and east, and reconnects with existing US 70 at Dover. This alignment is the southernmost alternative of the various southern bypass alternatives.

Design changes since the previous Traffic Noise Report include:

- US 70 at NC 55, US 70 at NC 11, US 70 at US 258, and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges, and
- US 70 at Wyse Fork Road was changed from a diamond interchange to a partial cloverleaf interchange.

**Alternative 51**

In this alternative, US 70 breaks off on new location from its current alignment several miles west of the C.F. Harvey Parkway interchange at US 70. The alignment heads to the south and east, and then directly east, where it takes the same route as Alternative 11 until it reconnects with existing US 70 at Dover.

Design changes since the previous Traffic Noise Report include:

- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges,
- US 70 at NC 55 and US 70 at NC 11 were changed from diamond interchanges to partial cloverleaf interchanges, and
- US 70 at Wyse Fork Road was changed from a diamond interchange to a partial cloverleaf interchange.

**Alternative 52**

In this alternative, similar to Alternative 51, US 70 breaks off on new location from its current alignment several miles west of the C.F. Harvey Parkway interchange at US 70. The alignment heads to the south and east, and then directly east, where it takes the same route as Alternative 12 eastward until it reconnects with existing US 70 several miles west of Dover, just across the Jones County line.

Design changes since the previous Traffic Noise Report include:

- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges, and

- US 70 at NC 55 and US 70 at NC 11 were changed from diamond interchanges to partial cloverleaf interchanges.

**Alternative 63**

In this alternative, US 70 will maintain its existing alignment until just west of the C.F. Harvey Parkway interchange at US 70. The alignment breaks off on new location to the south and east towards the existing NC 11 and NC 55 intersection, and will maintain an eastern route to the south of Kinston, following a similar path as Alternative 11. A southern leg will also be added to the C.F. Harvey Parkway interchange at US 70 which will be an extension of C.F. Harvey Parkway to the Kinston Bypass. The difference between this alternative and Alternative 31 is that this alignment will require a slightly longer southern extension of C.F. Harvey Parkway. The alignment then follows the same route as Alternative 11, rejoining current US 70 east of Kinston at Dover.

Design changes since the previous Traffic Noise Report include:

- US 70 at NC 11/55 was changed from a diamond interchange to a Parclo B interchange, and
- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges.

**Alternative 65**

In this alternative, similar to Alternative 63, US 70 will maintain its existing alignment until just west of the C.F. Harvey Parkway interchange at US 70. The alignment breaks off on new location to the south and east towards the existing NC 11 and NC 55 intersection, and will maintain an eastern route to the south of Kinston, following a similar path as Alternative 12. A southern leg will also be added to the C.F. Harvey Parkway interchange at US 70 which will be an extension of C.F. Harvey Parkway to the Kinston Bypass. The difference between this alternative and Alternative 32 is that this alignment will require a slightly longer southern extension of C.F. Harvey Parkway. The alignment then follows the same route as Alternative 12, rejoining current US 70 several miles west of Dover, just across the Jones County line.

Design changes since the previous Traffic Noise Report include:

- US 70 at NC 11/55 was changed from a diamond interchange to a Parclo B interchange,
- US 70 at US 258 and US 70 at NC 58 were changed from diamond interchanges to partial cloverleaf interchanges, and
- US 70 at Wyse Fork Road was changed from a diamond interchange to a partial cloverleaf interchange.

As this project covers a very large area, the land uses associated with the project area cover a wide range, including residential, commercial, farmland, schools, and government buildings. Since most of the proposed alternatives are on new location and most of the project area is rural, a large portion of the studied corridors travel through sparsely inhabited farmland. Most

of the inhabited sections of these corridors lie adjacent to roadways that will intersect with the proposed alignments, or along proposed alignments that use existing highway corridors.

Detailed figures that illustrate existing and proposed conditions within the project study area, proposed alternatives, noise study areas, modeled noise receptor locations, predicted impacts, and mitigation considerations may be found at the end of this report.

A Traffic Noise Analysis Report for this project was prepared for NCDOT in 2014, following the 2011 Traffic Noise Abatement Policy. This Traffic Noise Report has been updated to comply with the 2016 Traffic Noise Policy and has used an updated traffic forecast and updated designs.

## 2.0 PROCEDURE

This Traffic Noise Analysis represents the preliminary analysis of the probable traffic noise impacts of the US 70 Kinston Bypass Project (TIP R-2553).

In accordance with the 2016 NCDOT Traffic Noise Manual, this Traffic Noise Analysis utilized validated computer models created with the Federal Highway Administration Traffic Noise Model® version 2.5 (FHWA TNM v2.5) to predict future noise levels and define impacted receptors along the proposed project. This analysis is in compliance with the traffic noise requirements of Title 23 CFR Part 772 and the NCDOT Traffic Noise Policy.

## 3.0 CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It is emitted from many natural and man-made sources. Highway traffic noise is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by a ratio of its sound pressure to a reference sound pressure, which is usually twenty micro-Pascals (20μPa). Since the range of sound pressure ratios varies greatly, over many orders of magnitude, a base-10 logarithmic scale is used to express sound levels in dimensionless units of decibels (dB). The commonly accepted limits of detectable human hearing sound magnitudes is between the threshold of hearing at 0 decibels and the threshold of pain at 140 decibels.

Sound frequencies are reported in units of Hertz (Hz), which correspond to the number of vibrations per second of a given tone. A cumulative 'sound level' is equivalent to ten times the base-10 logarithm of the ratio of the sum of the sound pressures of all frequencies to the reference sound pressure. To simplify the mathematical process of determining sound levels, sound frequencies are grouped into ranges, or 'bands.' Sound levels are then calculated by adding the cumulative sound pressure levels within each band – which are typically defined as one 'octave' or '1/3 octave' of the sound frequency spectrum.

The commonly accepted limitation of human hearing to detect sound frequencies is between 20 Hz and 20,000 Hz, and human hearing is most sensitive to the frequencies between 1,000 Hz – 6,000 Hz. Although people are generally not as sensitive to lower-frequency sounds as they are to higher frequencies, most people lose the ability to hear high-frequency sounds as

they age. To accommodate varying receptor sensitivities, frequency sound levels are commonly adjusted, or 'filtered', before being logarithmically added and reported as a single 'sound level' magnitude of that filtering scale. The 'A-weighted' decibel filtering scale applies numerical adjustments to sound frequencies to emphasize the frequencies at which human hearing is sensitive, and to minimize the frequencies to which human hearing is not as sensitive.

Common indoor and outdoor noise levels are presented in Table 1.

The degree of disturbance or annoyance from exposure to unwanted sound – noise – depends upon three factors:

1. The amount, nature, and duration of the intruding noise
2. The relationship between the intruding noise and the existing (ambient) sound environment; and
3. The situation in which the disturbing noise is heard

In considering the first of these factors, it is important to note that individuals have varying sensitivity to noise. Loud noises bother some people more than other people. The time patterns and durations of noise(s) also affect perception as to whether or not it is offensive. For example, noises that occur during nighttime (sleeping) hours are typically considered to be more offensive than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted noise in terms of its relationship to noise from other sources (background noise). A car horn blowing at night when background noise levels are low would generally be more objectionable than one blowing in the afternoon when background noise levels are typically higher. The response to noise stimulus is analogous to the response to turning on an interior light. During the daytime an illuminated bulb simply adds to the ambient light, but when eyes are conditioned to the dark of night, a suddenly illuminated bulb can be temporarily blinding.

| Table 1: Common Indoor and Outdoor Noise Levels | | |
|---|---|---|
| **Common Outdoor Noise Levels** | **Noise Level (dB(A))** | **Common Indoor Noise Levels** |
| | **110** | **Rock Band** |
| **Jet Flyover at 1,000 feet** | **100** | **Inside Subway Train (NY)** |
| **Gas Lawn Mower at 3 feet** | | |
| **Diesel Truck at 50 feet** | **90** | **Food Blender at 3 feet** |
| **Noisy Urban Daytime** | **80** | **Garbage Disposal at 3 feet** |
| **Gas Lawn Mower at 100 feet** | **70** | **Vacuum Cleaner at 10 feet** |
| **Commercial Area** | | **Normal Speech at 3 feet** |
| | **60** | |
| | | **Large Business Office** |
| **Quiet Urban Daytime** | **50** | **Dishwasher Next Room** |
| **Quiet Urban Nighttime** | **40** | **Small Theater, Large Conference Room (Background)** |
| **Quiet Suburban Nighttime** | | **Library** |
| | **30** | |
| **Quiet Rural Nighttime** | | **Bedroom at Night, Concert Hall (Background)** |
| | **20** | |
| | | **Broadcast and Recording Studio** |
| | **10** | |
| | **0** | **Threshold of Hearing** |

Adapted from Guide on Evaluation and Attenuation of Traffic Noise, American Association of State Highway and Transportation Officials (AASHTO). 1974 (revised 1993).

The third factor – situational noise – is related to the interference of noise with activities of individuals. In a 60 dB(A) environment such as is commonly found in a large business office, normal conversation would be possible, while sleep might be difficult. Loud noises may easily interrupt activities that require a quiet setting for greater mental concentration or rest; however, the same loud noises may not interrupt activities requiring less mental focus or tranquility.

Over time, individuals tend to accept the noises that intrude into their lives on a regular basis. However, exposure to prolonged and/or extremely loud noise(s) can prevent use of exterior and interior spaces, and has been theorized to pose health risks. Appropriately, regulations exist for noise control or mitigation from many particularly offensive sources, including airplanes, factories, railroads, and highways. For all "Type I" federal, state, or federal-aid highway projects in the State of North Carolina, traffic and construction noise impact analysis

and mitigation assessment is dictated by the applicable North Carolina Department of Transportation Traffic Noise Abatement Policy.

## 4.0 NOISE ABATEMENT CRITERIA

### 4.1 Title 23 Code of Federal Regulations, Part 772 (23 CFR 772)

The Federal Highway Administration (FHWA) has developed Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. The purpose of 23 CFR, Part 772 is, "To provide procedures for noise studies and noise abatement measures to help protect the public's health, welfare and livability, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways approved pursuant to title 23 U.S.C."

The abatement criteria and procedures are set forth in Title 23 CFR Part 772, which also states, "In abating traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs".

A summary of the NAC for various land uses is presented in Table 2: Noise Abatement Criteria. The $L_{eq}$, or equivalent sound level, is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as a time-varying sound level during the same period. With regard to traffic noise, fluctuating sound levels of traffic noise are represented in terms of $L_{eq}$, the steady, or 'equivalent', noise level with the same energy.

### 4.2 North Carolina Department of Transportation Traffic Noise Policy

The North Carolina Department of Transportation Traffic Noise Policy (effective October 2016) establishes official policy on highway noise. This policy describes the NCDOT process that is used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the NCDOT approach to implementation. This policy is included as Appendix F of this report.

### 4.3 Noise Abatement Criteria

The two categories of traffic noise impacts are defined as 1) those that "approach" or exceed the FHWA Noise Abatement Criteria (NAC), as shown in Table 2, and 2) those that represent a "substantial increase" over existing noise levels as defined by NCDOT. An impact that represents a "substantial increase" is based on a comparison of the existing noise level [$L_{eq(h)}$] with the predicted increase with respect to a change to noise levels in the design year of 10 dB(A) or more.

**Table 2: Noise Abatement Criteria**

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))

| Activity Category | Activity Criteria[1] $L_{eq(h)}$[2] | Evaluation Location | Activity Description |
|---|---|---|---|
| A | 57 | Exterior | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B [3] | 67 | Exterior | Residential |
| C [3] | 67 | Exterior | Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings |
| D | 52 | Interior | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios |
| E [3] | 72 | Exterior | Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F |
| F | -- | -- | Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing |
| G | -- | -- | Undeveloped lands that are not permitted |

[1] The $L_{eq(h)}$ Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2] The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq(h)}$ being the hourly value of $L_{eq}$.

[3] Includes undeveloped lands permitted for this activity category.

## 5.0 AMBIENT NOISE LEVELS

Ambient noise is that noise which is all around us caused by natural and manmade events. It includes the wind, rain, thunder, birds chirping, insects, household appliances, commercial operations, lawn mowers, airplanes, automobiles, etc. It is all noise that is present in a particular area.

Existing traffic noise exposure varies in the vicinity of the proposed US 70 Kinston Bypass project. Dominant roadway noise sources in the project vicinity include US 70, NC 55, NC 11, US 258, and NC 58.

Short term noise monitoring data (20-minutes) was collected at 24 locations and long term noise monitoring data (24-hours) was collected at four locations. The ambient noise monitoring locations are shown in Figure 3. The noise monitoring results, concurrent traffic counts, estimated vehicle speeds, and weather information for the monitoring sites are included in Appendix A.

For this traffic noise analysis, loudest-hour existing noise levels were assessed as the TNM-predicted noise levels based on existing loudest-hour traffic estimates or the ambient noise levels obtained at representative locations in the field.[1]

To validate the accuracy of the model, FHWA TNM v2.5 was used to compare measured traffic noise levels to modeled noise levels at field measurement locations. For each monitoring location, traffic volumes counted during the ambient noise monitoring (20-minutes) periods were normalized to 1-hour volumes. These normalized volumes were assigned to the corresponding project area roadways to simulate the noise source strength at the roadways during the actual measurement period. Modeled and measured sound levels were then compared to determine the accuracy of the model. The validated results for FHWA TNM v2.5 models are included in Appendix A.

## 6.0 PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

Traffic noise emission is composed of several variables, including the number, types, and travel speeds of the vehicles, as well as the geometry of the roadway(s) on which the vehicles travel. Additionally, variables such as weather and intervening topography affect the transmission of traffic noise from the vehicle(s) to noise sensitive receptors.

In accordance with industry standards and accepted best-practices, detailed computer models were created using the FHWA TNM v2.5. The computer models were validated to within acceptable tolerances of field-monitored traffic noise data, and were used to predict traffic noise levels for receptor locations in the vicinity of the US 70 Kinston Bypass Project. Traffic noise consists of three primary parts: tire/pavement noise, engine noise, and exhaust noise. Of these sources, tire/pavement noise is typically the most offensive at unimpeded travel speeds. Sporadic traffic noises such as horns, squealing brakes, screeching tires, etc. are considered aberrant and are not included within the predictive model algorithm. Traffic noise is not constant; it varies in time depending upon the number, speed, type, and frequency of vehicles that pass by a given receptor. Furthermore, since traffic noise emissions are different for various types of vehicles, the TNM algorithm distinguishes between the source emissions from the following vehicle types: automobiles, medium trucks, heavy trucks, buses, and motorcycles, as shown in Table 3. The computer traffic noise prediction model uses the

[1] Per 23 CFR 772.5, existing noise levels are defined as "the worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area." If the TNM-predicted existing loudest-hour *traffic* noise levels are lower than the hourly-equivalent noise levels obtained in the field, then existing noise levels are assessed as the latter.

number and type of vehicles on the planned roadway, vehicle speeds, the physical characteristics of the road (curves, hills, depressions, elevations, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier segment top elevations.

Preliminary project plans of the currently considered design alternatives were used in this traffic noise analysis. Per FHWA guidance, the predictions documented in this report are based upon the potential project Design Year 2040 build-condition traffic conditions (including horizontal alignment alternatives) resulting in the loudest predicted hourly-equivalent traffic noise levels for each receptor. Refer to Appendix B for a comprehensive list of traffic noise level receptors, and existing and predicted Design Year 2040 hourly equivalent traffic noise levels.

**Table 3: Traffic Noise Model (TNM) Vehicle Classification Types**

| TNM Vehicle Type | Description |
|---|---|
| Autos | All vehicles with two axles and four tires, including passenger cars and light trucks, weighing 9,900 pounds or less |
| Medium Trucks | All vehicles having two axles and six tires, weighing between 9,900 and 26,400 pounds |
| Heavy Trucks | All vehicles having three or more axles, weighing more than 26,400 pounds |
| Buses | All vehicles designed to carry more than nine passengers |
| Motorcycles | All vehicles with two or three tires and an open-air driver / passenger compartment |

Sources: FHWA Measurement of Highway-Related Noise, § 5.1.3 Vehicle Types.
FHWA Traffic Monitoring Guide, § 4.1 Classification Schemes

## 7.0 TRAFFIC NOISE IMPACTS AND NOISE CONTOURS

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dB(A) of the noise abatement criteria [NAC] values listed in Table 2 on page 10), or [b] substantially exceed the existing noise levels by 10 dB(A) or more. FHWA and NCDOT require that feasible and reasonable measures be considered to abate traffic noise at all predicted traffic noise impacts. Measures considered include highway alignment selection, traffic systems management, buffer zones, noise walls, and earth berms.

The number and types of predicted traffic noise impacts in each condition are shown in Table 4, with impacts designated as either approaching or exceeding the FHWA NAC, by a substantial increase in Design Year 2040 build-condition traffic noise levels over existing ambient noise levels, or by meeting both criteria. 2040 Build Alternative 1 UE resulted in 42 impacted receptors, Alternative 1 UE SB resulted in 63 impacted receptors, Alternative 11

resulted in 48 impacted receptors, Alternative 12 resulted in 54 impacted receptors, Alternative 31 resulted in 62 impacted receptors, Alternative 32 resulted in 67 impacted receptors, Alternative 35 resulted in 38 impacted receptors, Alternative 36 resulted in 34 impacted receptors, Alternative 51 resulted in 40 impacted receptors, Alternative 52 resulted in 46 impacted receptors, Alternative 63 resulted in 58 impacted receptors, and Alternative 65 resulted in 54 impacted receptors.

**Table 4: Traffic Noise Impact Summary[1]**

| ALT. DESC. | APPROXIMATE # OF IMPACTED RECEPTORS APPROACHING OR EXCEEDING FHWA NAC[2] | | | | | | | SUBST'L NOISE LEVEL INCR.[3] | IMPACTS DUE TO BOTH CRITERIA[4] | TOTAL IMPACTS[5] PER 23 CFR 772 |
|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | | | |
| Alternative 1 UE | 0 | 33 | 5 | 0 | 0 | - | - | 7 | 2 | 42 |
| Alternative 1 UE SB | 0 | 52 | 4 | 0 | 0 | - | - | 15 | 8 | 63 |
| Alternative 11 | 0 | 34 | 0 | 0 | 0 | - | - | 22 | 8 | 48 |
| Alternative 12 | 0 | 37 | 0 | 0 | 0 | - | - | 26 | 9 | 54 |
| Alternative 31 | 0 | 40 | 1 | 0 | 0 | - | - | 34 | 13 | 62 |
| Alternative 32 | 0 | 43 | 1 | 0 | 0 | - | - | 37 | 14 | 67 |
| Alternative 35 | 0 | 22 | 1 | 0 | 0 | - | - | 25 | 10 | 38 |
| Alternative 36 | 0 | 20 | 1 | 0 | 0 | - | - | 23 | 10 | 34 |
| Alternative 51 | 0 | 24 | 0 | 0 | 0 | - | - | 21 | 5 | 40 |
| Alternative 52 | 0 | 27 | 0 | 0 | 0 | - | - | 25 | 6 | 46 |
| Alternative 63 | 0 | 41 | 0 | 0 | 0 | - | - | 28 | 11 | 58 |
| Alternative 65 | 0 | 38 | 0 | 0 | 0 | - | - | 26 | 10 | 54 |

1. This table presents the number of build-condition traffic noise impacts as predicted for the build-condition alternatives and no-build alternative presently under consideration. Refer to Appendix B for a detailed analysis of traffic noise impacts at each noise sensitive receptor location.
2. Predicted traffic noise level impact due to approaching or exceeding NAC (refer to Table 2, page 10).
3. Predicted "substantial increase" traffic noise level impact.
4. Predicted traffic noise level impact due to exceeding NAC *and* "substantial increase" in build-condition noise levels.
5. The total number of predicted impacts is not duplicated if receptors are predicted to be impacted by more than one criterion.

Predicted build-condition traffic noise level contours are not a definitive means by which to assess traffic noise level impacts; however, they can aid in future land use planning efforts in undeveloped areas. Correlating to the traffic noise impact threshold for FHWA NAC "E" land uses, the 71 dB(A) noise level contour and the 66 dB(A) contour are shown for several locations in Table 5. These noise contour locations can be seen in Figure 4.

**Table 5: Noise Contours**

| ALTERNATIVE | LOCATION | CONTOUR NUMBER | 71 dB(A) (FT FROM EOT[1]) | 66 dB(A) (FT FROM EOT[1]) |
|---|---|---|---|---|
| 1 UE | Harold Sutton Rd. to Kennedy Home Rd. | 1 | 150 | 280 |
| 1 UE | NC 11 S. to S. Queen St. | 2 | 70 | 200 |
| 1 UE SB | Harold Sutton Rd. to Kennedy Home Rd. | 3 | 150 | 280 |
| 1 UE SB | US 258 to Trenton Hwy. | 4 | Within ROW | 170 |
| 11 | Sanderson Way to Neuse River | 5 | Within ROW | 190 |
| 11 | Neuse River to NC 55 | 6 | Within ROW | 200 |
| 11 | Woodington Rd. to NC 58 | 7 | Within ROW | 130 |
| 11 | Cobb Rd. to Blonnie Brown Rd. | 8 | 80 | 190 |
| 11 | Wyse Fork Rd. to Burkett Rd. | 9 | 80 | 180 |
| 12 | Harold Sutton Rd. to Kennedy Home Rd. | 10 | 150 | 290 |
| 12 | Banks School Rd. to C.F. Harvey Pkwy. | 11 | 150 | 270 |
| 12 | Sanderson Way to Neuse River | 12 | Within ROW | 230 |
| 12 | Neuse River to NC 55 | 13 | Within ROW | 200 |
| 12 | Woodington Rd. to NC 58 | 14 | Within ROW | 130 |
| 31 | Harold Sutton Rd. to Kennedy Home Rd. | 15 | Within ROW | 180 |
| 31 | Neuse River to NC 55 | 16 | Within ROW | 190 |
| 31 | Woodington Rd. to NC 58 | 17 | Within ROW | 140 |
| 31 | Cobb Rd. to Blonnie Brown Rd. | 18 | 80 | 190 |
| 31 | Wyse Fork Rd. to Burkett Rd. | 19 | 80 | 190 |
| 32 | Harold Sutton Rd. to Kennedy Home Rd. | 20 | Within ROW | 180 |
| 32 | Neuse River to NC 55 | 21 | Within ROW | 190 |
| 32 | Woodington Rd. to NC 58 | 22 | Within ROW | 140 |
| 35 | Louie Pollock Rd. to Kennedy Home Rd. | 23 | 60 | 160 |
| 35 | S. Croom Bland Rd. to NC 11 S. | 24 | 70 | 170 |
| 35 | NC 11 S. to Black Harper Rd. | 25 | Within ROW | Within ROW |
| 35 | Alexander Rouse Rd. to Parker Fork Rd. | 26 | Within ROW | 140 |
| 35 | Bill Smith Rd. to Wyse Fork Rd. | 27 | Within ROW | Within ROW |
| 36 | Louie Pollock Rd. to Kennedy Home Rd. | 28 | 60 | 160 |
| 36 | S. Croom Bland Rd. to NC 11 S. | 29 | 70 | 170 |
| 36 | NC 11 S. to Black Harper Rd. | 30 | Within ROW | 70 |
| 36 | Alexander Rouse Rd. to Parker Fork Rd. | 31 | Within ROW | 140 |
| 36 | Cobb Rd. to Blonnie Brown Rd. | 32 | Within ROW | 150 |
| 36 | Wyse Fork Rd. to Burkett Rd. | 33 | Within ROW | 150 |
| 51 | Louie Pollock Rd. to Kennedy Home Rd. | 34 | 120 | 220 |
| 51 | NC 55 to Jesse T. Bryan Rd. | 35 | 110 | 220 |
| 51 | Joe Nunn Rd. to US 258 | 36 | Within ROW | 130 |
| 51 | Woodington Rd. to NC 58 | 37 | Within ROW | 120 |
| 51 | Wyse Fork Rd. to Burkett Rd. | 38 | 80 | 190 |
| 52 | Louie Pollock Rd. to Kennedy Home Rd. | 39 | 120 | 220 |
| 52 | NC 55 to Jesse T. Bryan Rd. | 40 | 110 | 220 |
| 52 | Joe Nunn Rd. to US 258 | 41 | Within ROW | 130 |
| 52 | Woodington Rd. to NC 58 | 42 | Within ROW | 120 |
| 63 | Kennedy Home Rd. to Neuse River | 43 | 110 | 220 |
| 63 | Neuse River to NC 55 | 44 | Within ROW | 200 |
| 63 | Woodington Rd. to NC 58 | 45 | Within ROW | 140 |
| 65 | Kennedy Home Rd. to Neuse River | 46 | 110 | 220 |
| 65 | Neuse River to NC 55 | 47 | Within ROW | 200 |
| 65 | Woodington Rd. to NC 58 | 48 | Within ROW | 140 |
| 65 | Cobb Rd. to Blonnie Brown Rd. | 49 | 80 | 190 |
| 65 | Wyse Fork Rd. to Burkett Rd. | 50 | 80 | 190 |

1. Feet from the edge of the traveled way.

Per 23 CFR 772.9(c) and NCDOT Policy, noise contour lines shall not be used for determining highway traffic noise impacts. However, the 71 dB(A) and 66 dB(A) noise level

contour information should assist local authorities in exercising land use control over the remaining undeveloped lands, so as to avoid development of incompatible activities adjacent to the roadways within local jurisdiction. It should be noted that, due to variations in terrain, vehicle mix and traffic volumes, traffic noise levels may vary throughout the study area. For future planning purposes, it is preliminarily recommended that detailed traffic noise studies be performed for specific project locations to determine more finite results.

## 8.0 POTENTIAL TRAFFIC NOISE ABATEMENT MEASURES

FHWA and NCDOT require that feasible and reasonable noise abatement measures be considered and evaluated for the benefit of all predicted build-condition traffic noise impacts. Feasibility and reasonableness are distinct and separate considerations. Feasibility is the consideration as to whether noise abatement measures *can* be implemented. Reasonableness is the consideration as to whether noise abatement measures *should* be implemented. Per NCDOT Policy, the following traffic noise abatement measures may be considered: highway alignment selection, traffic systems management, buffer zones, noise barriers (earth berms and noise walls), and noise insulation of Activity Category D land use facilities.

### 8.1 Highway Alignment Selection

Highway alignment selection for traffic noise abatement measures involves modifying the horizontal and vertical geometry of the proposed facility to minimize traffic noise to noise-sensitive receptors. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of locating the roadway at a sufficient distance from noise sensitive receptors. Appreciable reductions in traffic noise transmissions to sensitive receptors can be made by adjusting the vertical highway alignment and/or section geometry. For example, lowering a roadway below existing grade creates a cut section which could act similarly as an earth berm, depending upon the relative location(s) of noise-sensitive receptor(s). For this project, altering the horizontal or vertical alignment of the proposed roadway would create more human and environmental impacts than the current designs, and could increase the cost of the project. Further, this project includes complex grade separations which have been carefully designed to meet all roadway design criteria. Because of this, shifting the alignment of the roadway was determined non-feasible.

### 8.2 Traffic System Management Measures

Traffic management measures such as prohibition of truck traffic, lowering speed limits, limiting of traffic volumes, and/or limiting time of operation were considered as possible traffic noise impact abatement measures. The purpose of the proposed project is to improve regional mobility, connectivity, and capacity for US 70 between La Grange and Dover. The aforementioned traffic management measures would diminish the functional capacity of the freeway and are not considered practicable.

### 8.3 Buffer Zones

Buffer zones are typically not practical and/or cost effective for noise mitigation due to the substantial amount of right-of-way required, and would not be a feasible noise mitigation measure for this project. Furthermore, if the acquisition of a suitable buffer zone had been feasible, the associated costs would likely exceed the NCDOT Policy reasonable abatement cost threshold per benefited receptor.

### 8.4 Noise Barriers

Passive noise abatement measures are effective because they absorb sound energy, extend the source-to-receptor sound transmission path, or both. Sound absorption is a function of abatement medium (e.g. earth berms absorb more sound energy than noise walls of the same height because earth berms are more massive). The source-to-receptor path is extended by placement of an obstacle, such as a wall, that sufficiently blocks the transmission of sound waves that travel from the source to the receptor.

Highway sound barriers are primarily constructed as earth berms or solid-mass walls adjacent to limited-access freeways that are in close proximity to noise-sensitive land use(s). To be effective, a sound barrier must be long enough and tall enough to shield the impacted receptor(s). Generally, the noise wall length must be eight times the distance from the barrier to the receptor. For example, if a receptor is 200 feet from the roadway, an effective barrier would be approximately 1,600 feet long – with the receptor in the horizontal center. On roadway facilities with direct access for driveways, sound barriers are typically not feasible because the openings render the barrier ineffective in impeding the transmission of traffic noise. Due to the requisite lengths for effectiveness, sound barriers are typically not economical for isolated or most low-density areas. However, sound barriers may be economical for the benefit of as few as two predicted traffic noise impact if the barrier can benefit enough total receptors – impacted and non-impacted combined – to meet applicable reasonableness criteria.

Consideration for noise abatement measures was given to all impacted receptors in the 2040 build conditions. Following the criteria for feasibility and reasonableness as prescribed in the 2016 NCDOT Traffic Noise Policy, noise abatement for this project was found to be preliminarily feasible and reasonable for three locations, each location applicable to one to six different alternatives. The following section describes the feasibility and reasonableness of potential noise mitigation. Theses analyses are preliminary in nature and meant solely to describe noise study areas where potential noise barriers may be successfully employed in accordance with NCDOT reasonableness and feasibility criteria. While these recommendations do affirm proposed mitigation locations, they do not offer definitive or final barrier design descriptions. An eventual Design Noise Report for this project will determine these specifics. It is expected the length and height of each barrier may vary to optimize both cost and effectiveness within acceptable limits. These potential noise barriers can be seen on Figure 3.

### 8.4.1 Feasible and Reasonable Noise Barriers (Preliminary)

Barrier 70-10 (Alternative 31, 32, 63, and 65)

Barrier 70-10 is located along eastbound US 70 between Barwick Station Road and Albert Suggs Road. This barrier is approximately 750 feet long, 10 feet high, and has a total area of 7,500 square feet. This barrier is predicted to benefit six receptors, including six predicted impacts. The 1,250 square feet per benefit is less than the maximum allowable 2,000 square feet per benefit.

Barrier JN-01 (Alternative 11, 12, 31, 32, 63, and 65)

Barrier JN-01 is located along westbound US 70 between NC 11 and US 258. This barrier is approximately 1,650 feet long, 16 feet high, and has a total area of 26,400 square feet. This barrier is predicted to benefit 17 receptors, including 14 predicted impacts. The 1,553 square feet per benefit is less than the maximum allowable 2,500 square feet per benefit.

Barrier 70-25 (Alternative 1 UE)

Barrier 70-25 is located along westbound US 70 between US 70 Business and NC 11/NC 55. This barrier is approximately 650 feet long, 8 feet high, and has a total area of 5,200 square feet. This barrier will serve five total receptors, and is predicted to benefit four receptors, including four predicted impacts. The 1,300 square feet per benefit is less than the maximum allowable 1,500 square feet per benefit.

### 8.4.2 Non-Feasible and/or Unreasonable Noise Barriers (Preliminary)

Eight barriers were found non-feasible and/or unreasonable due to noise level reduction goals, constructability concerns, effects of non-traffic noise sources, and cost effectiveness.

Barrier 70-05 (Alternative 1 UE)

Barrier 70-05 would have been located along eastbound US 70 between Jim Sutton Road and Barwick Station Road. This barrier would have been approximately 2,350 feet long, 8 feet high, and have a total area of 18,800 square feet. All five of the impacted receptors would be benefited by this barrier. The 3,760 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-05 was determined unreasonable.

Barrier 70-05 (Alternative 1 UE SB)

Barrier 70-05 would have been located along eastbound US 70 between Jim Sutton Road and Barwick Station Road. This barrier would have been approximately 2,200 feet long, 8 feet high, and have a total area of 17,600 square feet. All five of the impacted receptors would be benefited by this barrier. The 3,520 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-05 was determined unreasonable.

Barrier 70-05 (Alternative 11 and 12)

Barrier 70-05 would have been located along eastbound US 70 between Jim Sutton Road and Barwick Station Road. This barrier would have been approximately 2,400 feet long, 8 feet high, and have a total area of 19,200 square feet. All five of the impacted receptors would be benefited by this barrier. The 3,840 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-05 was determined unreasonable.

Barrier 70-05 (Alternative 31, 32, 35, 36, 51, 52, 63, and 65)

Barrier 70-05 would have been located along eastbound US 70 between Jim Sutton Road and Barwick Station Road. This barrier would have been approximately 1,800 feet long, 10 feet high, and have a total area of 18,000 square feet. All five of the impacted receptors would be benefited by this barrier. The 3,600 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-05 was determined unreasonable.

Barrier JB-01/JB-02 (Alternative 51)

Barrier JB-01/JB-02 would have been located along westbound US 70 between NC 55 and NC 11. This barrier would have been approximately 1,600 feet long, 12 feet high, and have a total area of 19,200 square feet. All five of the impacted receptors would be benefited by this barrier. The 3,840 square feet per benefit is greater than the maximum allowable 2,500 square feet per benefit. Thus, Barrier JB-01/JB-02 was determined unreasonable.

Barrier JB-01/JB-02 (Alternative 52)

Barrier JB-01/JB-02 would have been located along westbound US 70 between NC 55 and NC 11. This barrier would have been approximately 1,650 feet long, 12 feet high, and have a total area of 19,800 square feet. All five of the impacted receptors would be benefited by this barrier. The 3,960 square feet per benefit is greater than the maximum allowable 2,500 square feet per benefit. Thus, Barrier JB-01/JB-02 was determined unreasonable.

Barrier KH-03 (Alternative 31 and 32)

Barrier KH-03 would have been located along westbound US 70 between Kennedy Home Road and C.F. Harvey Parkway. This barrier would have been approximately 2,400 feet long, 12 feet high, and have a total area of 28,800 square feet. This barrier was predicted to benefit ten receptors, including eight predicted impacts. The 2,869 square feet per benefit is greater than the maximum allowable 2,500 square feet per benefit. Thus, Barrier KH-03 was determined unreasonable.

Barrier 11-05 (Alternative 11, 12, 31, 32, 63, and 65)

Barrier 11-05 would have been located along the ramp from NC 11/NC 55 to eastbound US 70. Traffic noise impacts were predicted for seven of the modeled receptors. A 24-foot high noise barrier at this location was unable to benefit any of the receptors. These receptors were located along NC 11, where non-project traffic noise sources may be the dominant noise source. Thus, Barrier 11-05 was determined non-feasible.

Barrier GO-03 (Alternative 1 UE SB)

Barrier GO-03 would have been located along westbound US 70 between NC 11/NC 55 and US 258. This barrier would have been approximately 1,350 feet long, 22 feet high, and have a total area of 29,700 square feet. All seven of the impacted receptors would be benefited by this barrier. The 4,243 square feet per benefit is greater than the maximum allowable 2,500 square feet per benefit. Thus, Barrier GO-03 was determined unreasonable.

Barrier 58-01 (Alternative 1 UE SB)

Barrier 58-01 would have been located along eastbound US 70 between US 258 and NC 58. Traffic noise impacts were predicted for four of the modeled receptors. A 24-foot high noise barrier at this location was unable to benefit any of the receptors. These receptors were located along NC 58, where non-project traffic noise sources may be the dominant noise source. Thus, Barrier 58-01 was determined non-feasible.

Barrier 70-21 (Alternative 1 UE)

Barrier 70-21 would have been located along a service road between US 258 and US 70 Business in front of Westview Cemetery, but a noise reduction of five dB(A) could not be achieved for at least two impacted receptors. Thus, Barrier 70-21 was determined non-feasible.

Barrier 70-28 (Alternative 1 UE)

Barrier 70-28 would have been located along westbound US 70 between NC 11/NC 55 and US 258. This barrier would have been approximately 650 feet long, 10 feet high, and have a total area of 6,500 square feet. Both of the impacted receptors would be benefited by this barrier. The 2,057 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-28 was determined unreasonable.

Barrier 70-41 (Alternative 1 UE)

Barrier 70-41 would have been located along eastbound US 70 between Whaley Road and King Heights Boulevard. This barrier would have been approximately 1,100 feet long, 12 feet high, and have a total area of 13,200 square feet. All five of the impacted receptors would be benefited by this barrier. The 2,640 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-41 was determined unreasonable.

Barrier 70-41 (Alternative 1 UE SB)

Barrier 70-41 would have been located along eastbound US 70 between Whaley Road and King Heights Boulevard. This barrier would have been approximately 750 feet long, 12 feet high, and have a total area of 9,000 square feet. All four of the impacted receptors would be benefited by this barrier. The 2,250 square feet per benefit is greater than the maximum allowable 2,000 square feet per benefit. Thus, Barrier 70-41 was determined unreasonable.

### 8.4.3 Summary

A noise barrier evaluation was conducted for this project utilizing the Traffic Noise Model (TNM 2.5) software developed by the FHWA. The following table summarizes the results of the evaluation.

**Table 6: Noise Barrier Evaluation Results**

| Alternative | Barrier | Feasible | Reasonable | Likely |
|---|---|---|---|---|
| 1 UE | NW 70-05 | Yes | No | No |
| 1 UE SB | NW 70-05 | Yes | No | No |
| 11 | NW 70-05 | Yes | No | No |
| 12 | NW 70-05 | Yes | No | No |
| 31 | NW 70-05 | Yes | No | No |
| 32 | NW 70-05 | Yes | No | No |
| 35 | NW 70-05 | Yes | No | No |
| 36 | NW 70-05 | Yes | No | No |
| 51 | NW 70-05 | Yes | No | No |
| 52 | NW 70-05 | Yes | No | No |
| 63 | NW 70-05 | Yes | No | No |
| 65 | NW 70-05 | Yes | No | No |
| 31 | NW 70-10 | Yes | Yes | Yes |
| 32 | NW 70-10 | Yes | Yes | Yes |
| 63 | NW 70-10 | Yes | Yes | Yes |
| 65 | NW 70-10 | Yes | Yes | Yes |
| 51 | NW JB-01/JB-02 | Yes | No | No |
| 52 | NW JB-01/JB-02 | Yes | No | No |
| 11 | NW JN-01 | Yes | Yes | Yes |
| 12 | NW JN-01 | Yes | Yes | Yes |
| 31 | NW JN-01 | Yes | Yes | Yes |
| 32 | NW JN-01 | Yes | Yes | Yes |
| 63 | NW JN-01 | Yes | Yes | Yes |
| 65 | NW JN-01 | Yes | Yes | Yes |
| 31 | NW KH-03 | Yes | No | No |
| 32 | NW KH-03 | Yes | No | No |
| 11 | NW 11-05 | No | No | No |
| 12 | NW 11-05 | No | No | No |
| 31 | NW 11-05 | No | No | No |
| 32 | NW 11-05 | No | No | No |
| 63 | NW 11-05 | No | No | No |
| 65 | NW 11-05 | No | No | No |
| 1 UE SB | NW GO-03 | Yes | No | No |
| 1 UE SB | NW 58-01 | No | No | No |
| 1 UE | NW 70-21 | No | No | No |
| 1 UE | NW 70-25 | Yes | Yes | Yes |
| 1 UE | NW 70-28 | Yes | No | No |
| 1 UE | NW 70-41 | Yes | No | No |
| 1 UE SB | NW 70-41 | Yes | No | No |

### 8.5 Noise Insulation

Since no traffic noise impacts for the US 70 Kinston Bypass Project are predicted to occur for interior noise-sensitive areas (NAC "D"), interior noise insulation was not considered as a potential traffic noise impact mitigation measure as part of the analysis for this Traffic Noise Analysis.

## 9.0 CONSTRUCTION NOISE

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, bridge/grade separation construction, and paving. Temporary and localized construction noise impacts will likely occur as a result of these activities (refer to Table 7). During daytime hours, the predicted effects of these impacts will be temporary speech interference for passers-by and those individuals living or working near the project. During evening and nighttime hours, steady-state construction noise emissions such as from paving operations will be audible, and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise emissions such as from backup alarms, lift gate closures ("slamming" of dump truck gates), etc., will be perceived as distinctly louder than the steady-state acoustic environment, and will likely cause impacts to the general peace and usage of noise-sensitive areas.

Extremely loud construction noise activities such as usage of pile-drivers and impact-hammers (jack hammer, hoe-ram) will provide sporadic and temporary construction noise impacts in the near vicinity of those activities (refer to Table 7). Construction activities that will produce extremely loud noises should be scheduled during times of the day when such noises will create as minimal disturbance as possible.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications to the extent possible. These measures include, but are not limited to, work-hour limits, equipment exhaust muffler requirements, haul-road locations, elimination of "tail gate banging", ambient-sensitive backup alarms, construction noise complaint mechanisms, and consistent and transparent community communication.

While discrete construction noise level prediction is difficult for a particular receptor or group of receptors, it can be assessed in a general capacity with respect to distance from known or likely project activities. For this project, earth removal, grading, hauling, bridge/grade separation construction, and paving is anticipated to occur in the vicinity of noise-sensitive receptors. Although construction noise impact mitigation should not place an undue burden upon the financial cost of the project or the project construction schedule, pursuant to the requirements of 23 CFR 772.19, it is the recommendation of this traffic noise analysis that:

- Earth removal, grading, hauling, bridge/grade separation construction, and paving activities in the vicinity of residences should be limited to weekday daytime hours.
- If meeting the project schedule requires that earth removal, grading, hauling and / or paving must occur during evening, nighttime and / or weekend hours in the vicinity of residences, the Contractor shall notify NCDOT as soon as possible. In such instance(s), all reasonable attempts shall be made to notify and to make appropriate

arrangements for the mitigation of the predicted construction noise impacts upon the affected property owners and / or residents.

- If construction noise activities must occur during context-sensitive hours in the vicinity of noise-sensitive areas, discrete construction noise abatement measures including, but not limited to, portable noise barriers and / or other equipment-quieting devices shall be considered.

For additional information on construction noise, please refer to the FHWA Construction Noise Handbook (FHWA-HEP-06-015) and the Roadway Construction Noise Model (RCNM), available online at: https://www.fhwa.dot.gov/environment/noise/construction_noise/index.cfm.

**Table 7: Construction Equipment Typical Noise Level Emissions[1]**

| Equipment | Noise Level Emissions (dB(A)) at 50 Feet From Equipment[2] |
|---|---|
| | 70 80 90 100 |
| Pile Driver[3] | |
| Jack Hammer | |
| Tractor | |
| Road Grader | |
| Backhoe | |
| Truck | |
| Paver | |
| Pneumatic Wrench | |
| Crane | |
| Concrete Mixer | |
| Compressor | |
| Front-End Loader | |
| Generator | |
| Saws | |
| Roller (Compactor) | |

1. Adapted from *Noise Construction Equipment and Operations, Building Equipment, and Home Appliances*. U.S. Environmental Protection Agency. Washington D.C. 1971.
2. Cited noise level ranges are typical for the respective equipment. For "point sources" such as the construction equipment listed above, noise levels generally dissipate at a rate of -6 dB(A) for every doubling of distance. For example, if the noise level from a pile driver at a distance of 50 feet = 100 decibels (dB(A)), then at 400 feet, it might be 82 decibels (dB(A)) or less.
3. Due to project safety and potential construction noise concerns, pile driving activities are typically limited to daytime hours.

## 10.0 NOISE-COMPATIBLE LAND USE

One of the most effective means to prevent future traffic noise impacts is noise-sensitive land-use development. The compatibility of highways and neighboring local areas is essential for continued growth, and can be achieved if local governments and developers require and practice noise-sensitive land-use planning. Although regulation of land use is not within the purview of FHWA or NCDOT, some widely accepted techniques for noise-sensitive land use planning in the vicinity of existing and proposed highway facilities include:

- Locating retail, industrial, manufacturing, and other noise-compatible land-uses adjacent to highways
- Incorporating effective traffic noise mitigating features, such as earth berms and solid-mass noise walls, as part of residential developments
- Utilization of noise-sensitive architectural design and site planning, such as the orientation of quiet spaces away from roadways
- Required use of sound insulating building materials and construction methods

As indicated in the October 2016 NCDOT Traffic Noise Policy, local jurisdictions with zoning control should use the information contained in this report to develop policies and/or ordinances to limit the growth of noise-sensitive land uses located adjacent to roadways. Furthermore, NCDOT encourages the dissemination of this information to all people who may be affected by, or who might influence others affected by, traffic noise.

## 11.0 CONCLUSION

This report summarizes the traffic noise analysis findings for NCDOT STIP Project R-2553. Project R-2553 involves constructing a multi-lane highway on new location in Lenoir, Jones, and Craven Counties, North Carolina.

Traffic noise and temporary construction noise can be a consequence of transportation projects, especially in areas in close proximity to high-volume and high-speed existing steady-state traffic noise sources. This Traffic Noise Analysis used computer models created with FHWA TNM v2.5, validated to field-collected traffic noise monitoring data, to predict future noise levels and define impacted receptors along the proposed new highway project.

2040 Build Alternative 1 UE resulted in 42 impacted receptors, Alternative 1 UE SB resulted in 63 impacted receptors, Alternative 11 resulted in 48 impacted receptors, Alternative 12 resulted in 54 impacted receptors, Alternative 31 resulted in 62 impacted receptors, Alternative 32 resulted in 67 impacted receptors, Alternative 35 resulted in 38 impacted receptors, Alternative 36 resulted in 34 impacted receptors, Alternative 51 resulted in 40 impacted receptors, Alternative 52 resulted in 46 impacted receptors, Alternative 63 resulted in 58 impacted receptors, and Alternative 65 resulted in 54 impacted receptors.

Furthermore, temporary construction noise impacts – some of them potentially substantial – may occur due to the close proximity of numerous noise-sensitive receptors to project construction activities. It is the recommendation of this traffic noise analysis that all

reasonable efforts should be made to minimize exposure of noise-sensitive areas to construction noise impacts.

Consideration for noise abatement measures was given to all impacted receptors. Following the criteria for feasibility and reasonableness as prescribed in the 2016 NCDOT Traffic Noise Policy, noise abatement for this project was found to be preliminarily feasible and reasonable. Noise abatement measures would likely be installed at one location for Alternative 1 UE, one location for Alternatives 11 and 12, two locations for Alternatives 31 and 32, and two locations for Alternatives 63 and 65. 'Likely' does not mean a firm commitment. Additional detailed study of potential mitigation measures at all aforementioned barrier locations will be necessary subsequent to selection of the final design of this project. The final decision on the installation of abatement measures shall be made upon completion of the project design, the public involvement process, and concurrence with the NCDOT Policy. As this project is state-funded, FHWA acceptance will not be required. This analysis completes the traffic noise requirements of the Title 23 Code of Federal Regulations Part 772 and NCDOT Traffic Noise Policy.

## 12.0 REFERENCES

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North Carolina Department of Transportation. *Traffic Noise Manual*. October 2016.

U.S. Environmental Protection Agency. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. Washington, D.C. 1971.

# Figures

**Figures**

Figure 1A: Vicinity Map

This figure shows the project study area, existing roadways, railroads, streams, rivers, waterbodies, and county lines.

Figure 1B: Detailed Study Alternatives

This figure shows the centerlines for the detailed study alternatives being considered.

Figure 2: Map Key

This figure is a map key for Figure 3. There are 45 map areas illustrated in this figure. Some map areas will be used by two alternatives, while others represent several alternatives. Each map area (1-45) corresponds to the map sheets shown in Figure 3.

Figure 3: Noise Impacts

These figures show the proposed alternatives, noise measurement locations, noise study areas, modeled noise receptor locations, predicted impacts, and preliminarily feasible and reasonable noise barriers. Each alternative is broken into multiple sheets. These sheet numbers correspond to the numbers shown in the map key, Figure 2. The alternatives and the sheets that are used for these alternatives are shown below:

| Alternative | Sheets |
|---|---|
| 1 UE | 1-4, 7-19 |
| 1 UE SB | 1-4, 6-7, 12-22 |
| 11 | 1-6, 18-19, 24-29, 44-45 |
| 12 | 1-6, 15-19, 24-30 |
| 31 | 1-6, 18-19, 23, 25-29, 44-45 |
| 32 | 1-6, 15-19, 23, 25-30 |
| 35 | 1-3, 15-19, 29-30, 36-44 |
| 36 | 1-3, 18-19, 29, 36-45 |
| 51 | 1-3, 18-19, 26-29, 31-35, 44-45 |
| 52 | 1-3, 15-19, 26-35 |
| 63 | 1-6, 15-19, 23, 25-30 |
| 65 | 1-6, 18-19, 23, 25-29, 44-45 |

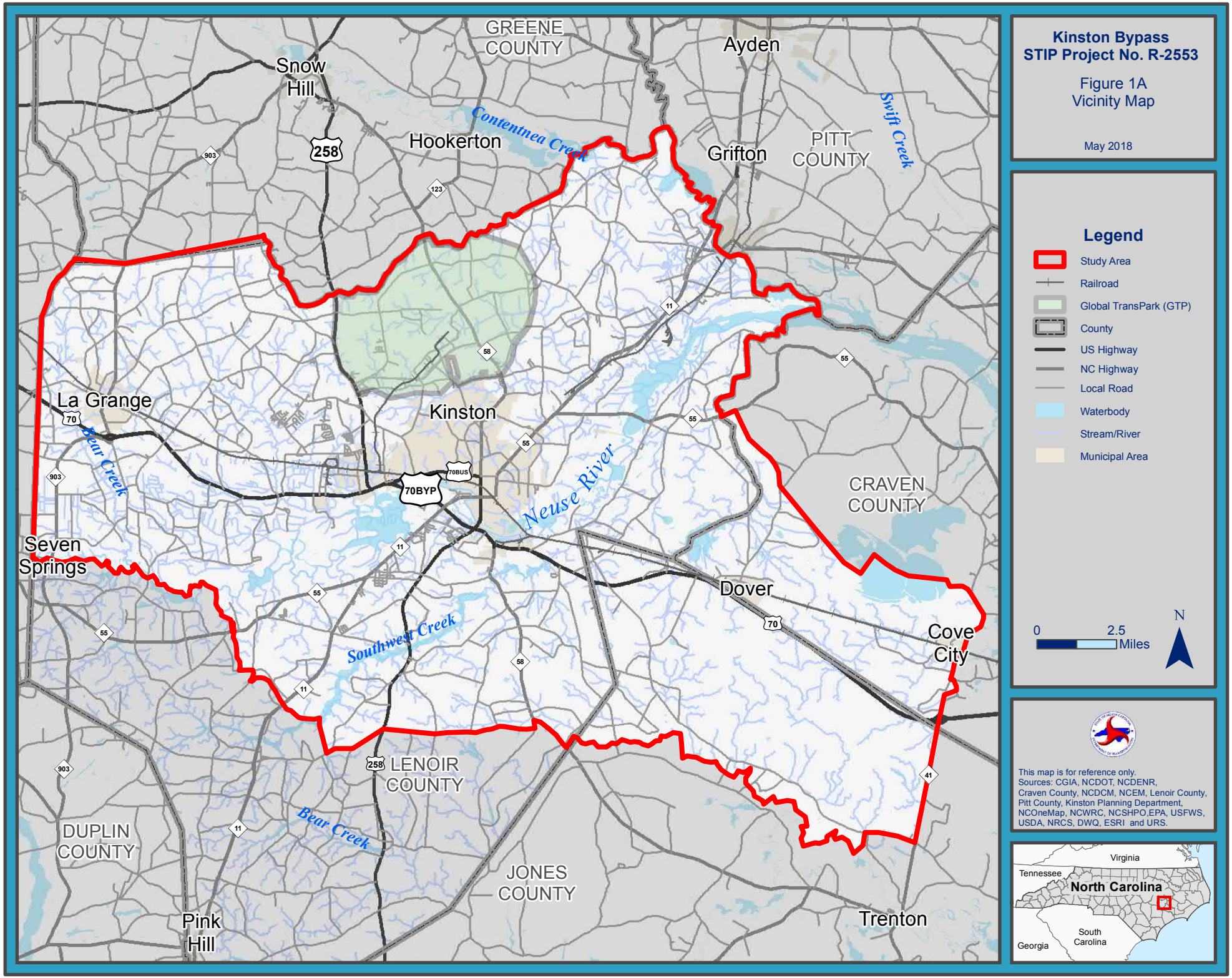


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Figure 1A
Vicinity Map

May 2018

## Legend

- Study Area
- Railroad
- Global TransPark (GTP)
- County
- US Highway
- NC Highway
- Local Road
- Waterbody
- Stream/River
- Municipal Area

0 2.5 Miles

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and URS.

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**STIP Project No. R-2553**

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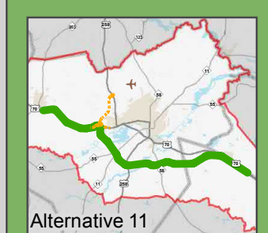
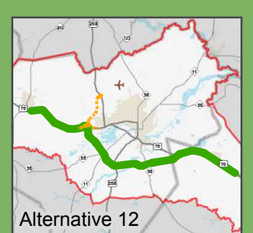
# FIGURE 1B: DETAILED STUDY ALTERNATIVES

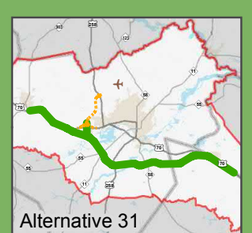
## Upgrade Existing US 70 Alternative

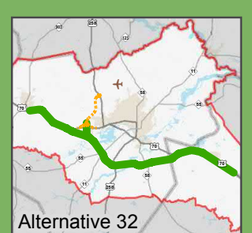

## Upgrade Existing US 70 Shallow Bypass Alternative

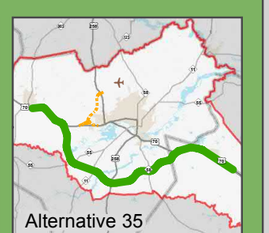

## Southern Bypass Alternatives



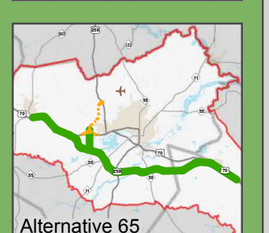



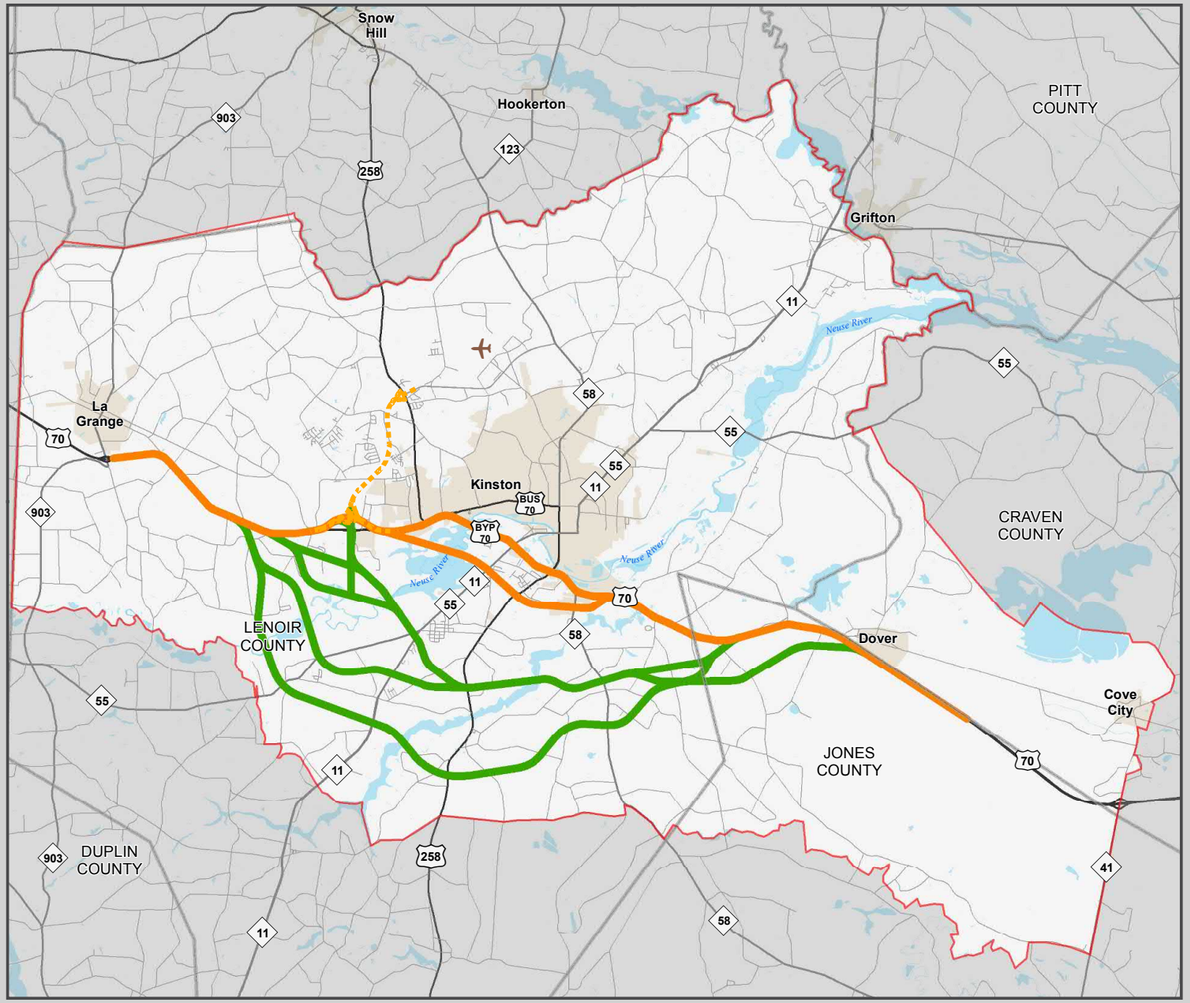








## Legend

N

Not To Scale

- Kinston Jetport
- Upgrade Existing Detailed Study Alternative
- Southern Detailed Study Alternatives
- Study Area
- County
- Waterbody
- Municipal Area
- US Highway
- NC Highway
- Project R-2719A


This map is for reference only. Sources:
CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Jones County,
Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.

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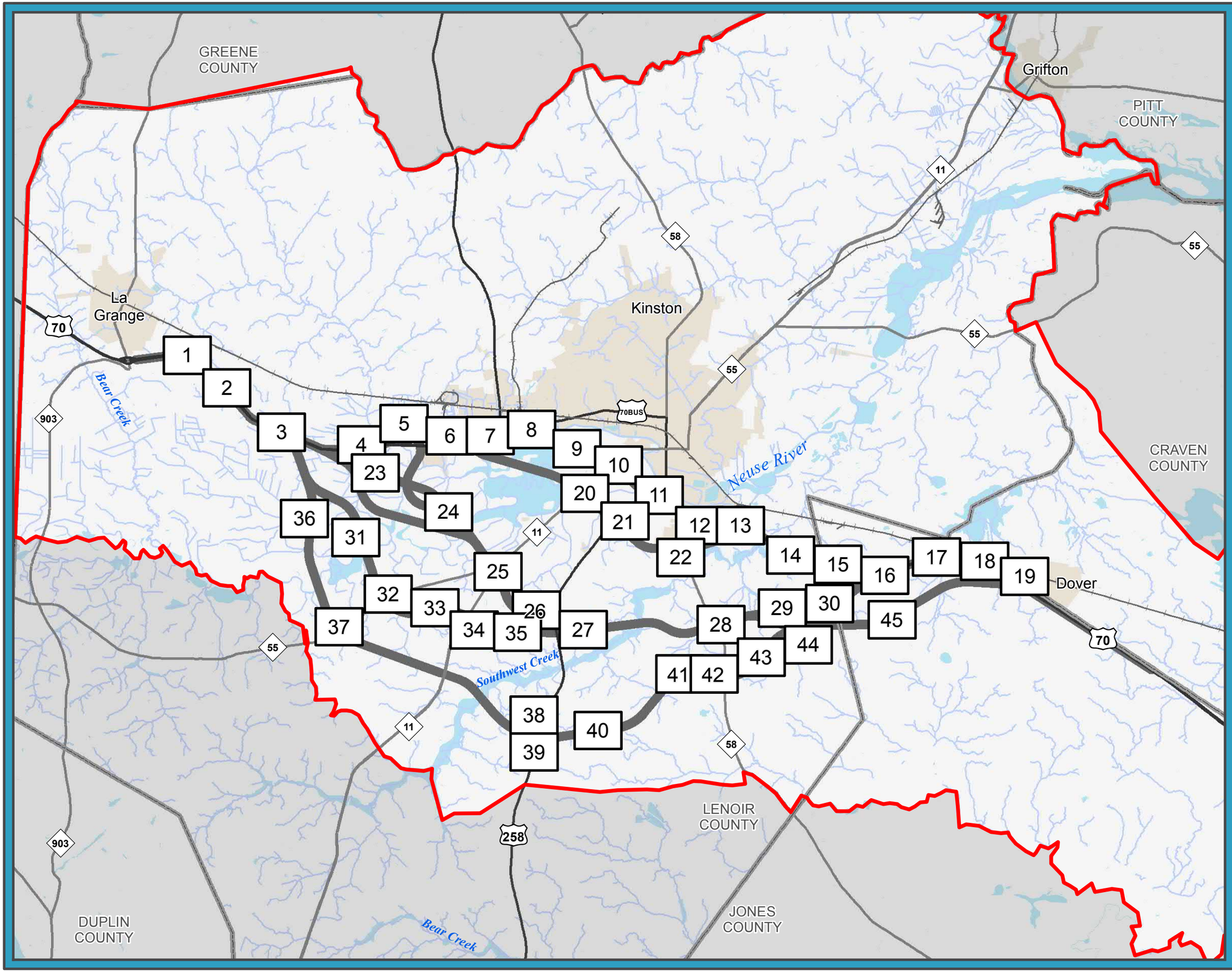
Figure 2
Map Key

May 2018




## Legend

- Noise Receiver and DSA Maps
- Study Area
- US Highway
- NC Highway
- Railroad
- Stream/River
- Detailed Study Alternatives
- Waterbody
- Municipal Area
- County

0 2 Miles

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.

# Kinston Bypass
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Figure 3
Noise Receivers and
Detailed Study Alternatives

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**Alt 1 UE: Sheet 1 of 45**

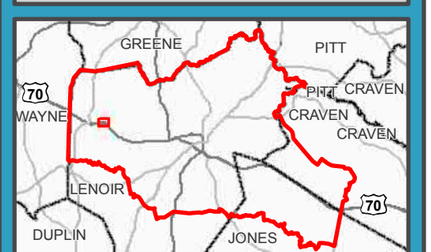
## Legend

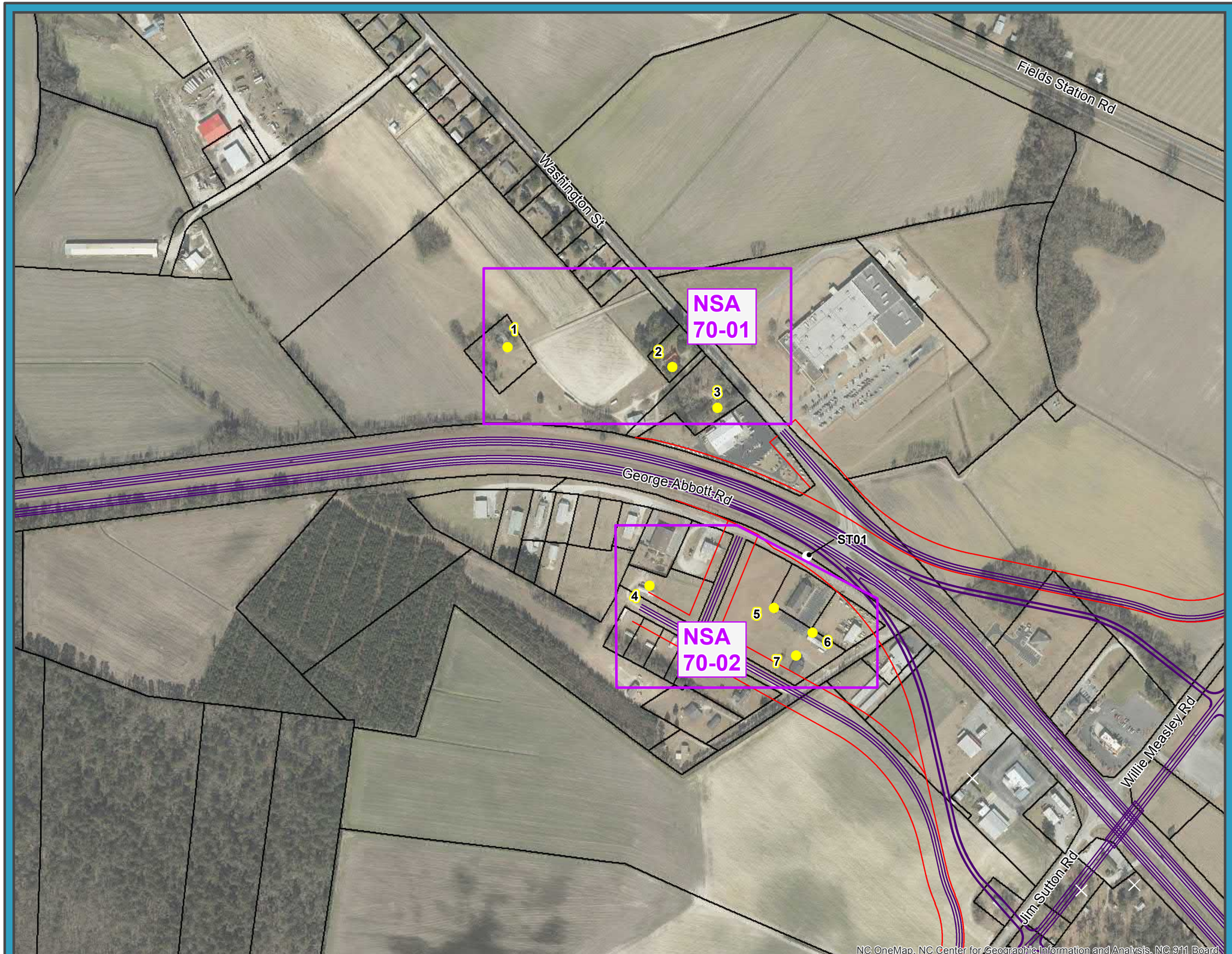
- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 1 UE: Sheet 2 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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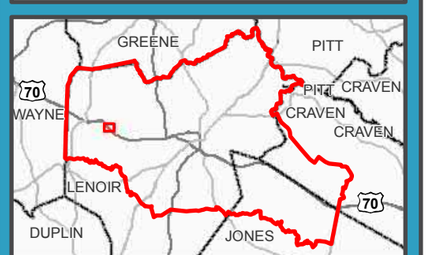
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE: Sheet 3 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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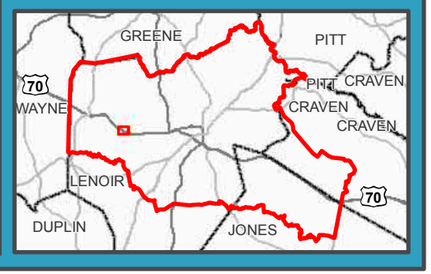


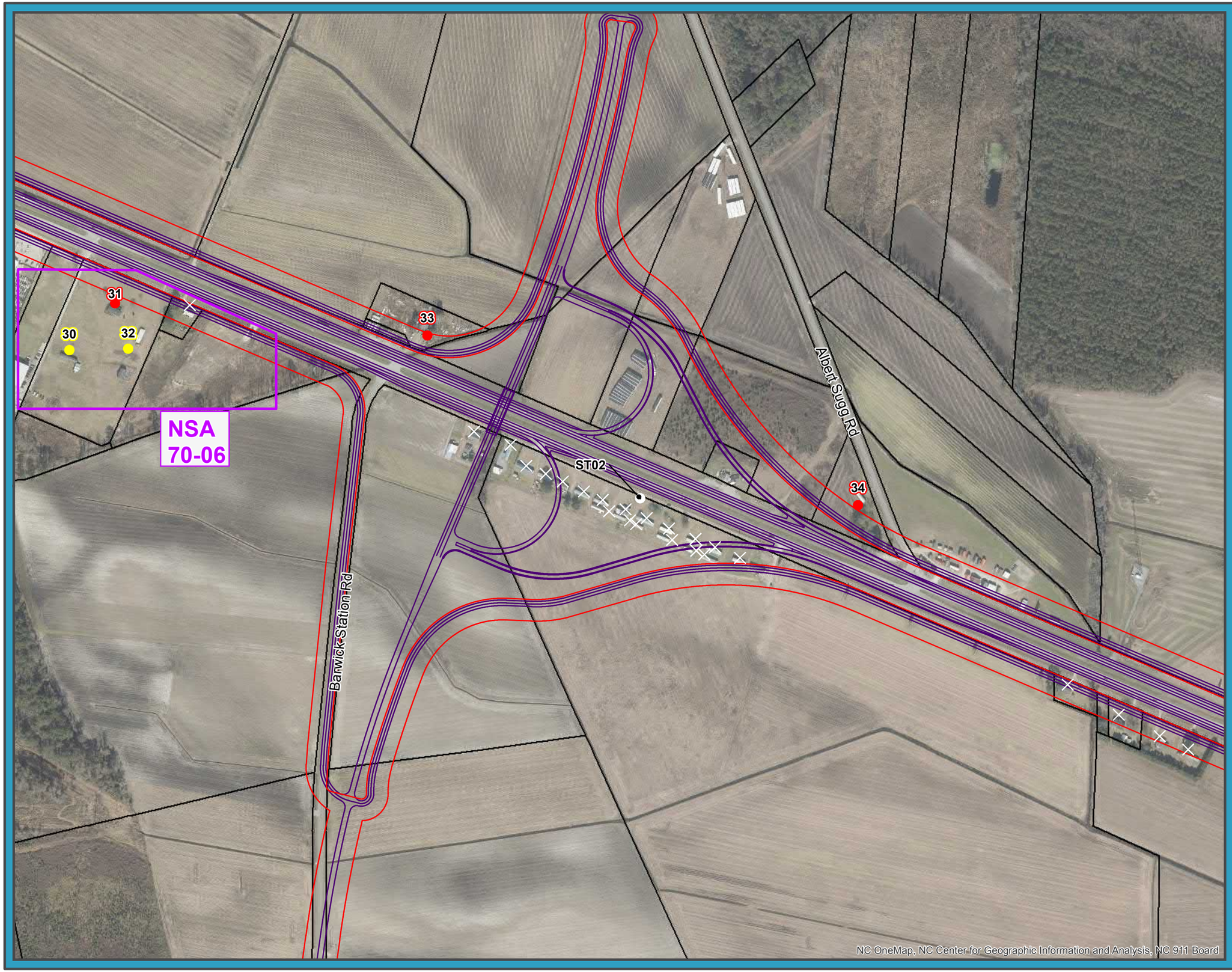

# Kinston Bypass
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Figure 3
Noise Receivers and
Detailed Study Alternatives

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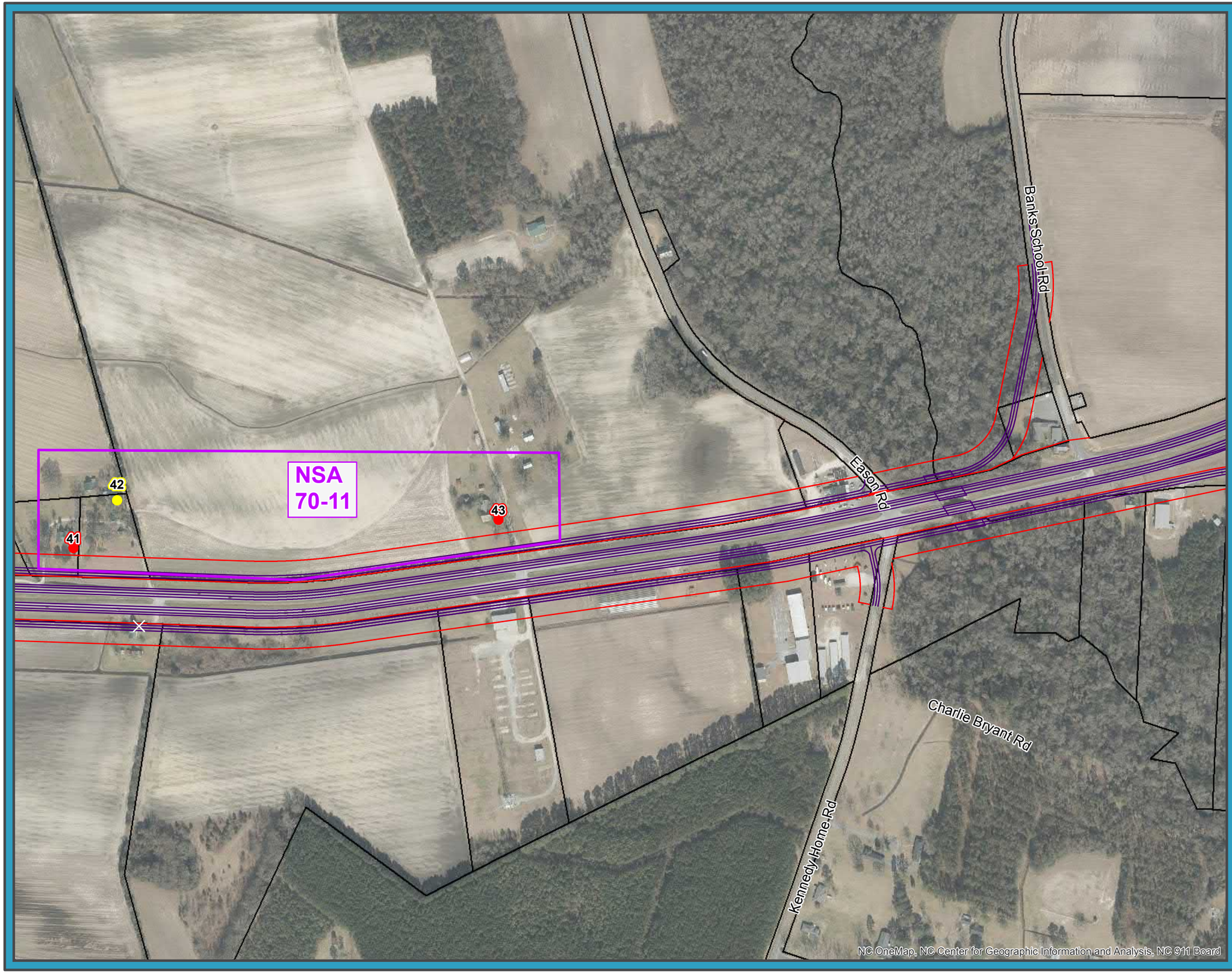


## Alt 1 UE: Sheet 4 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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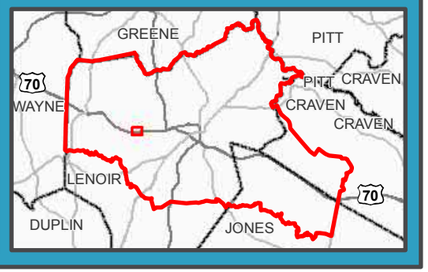

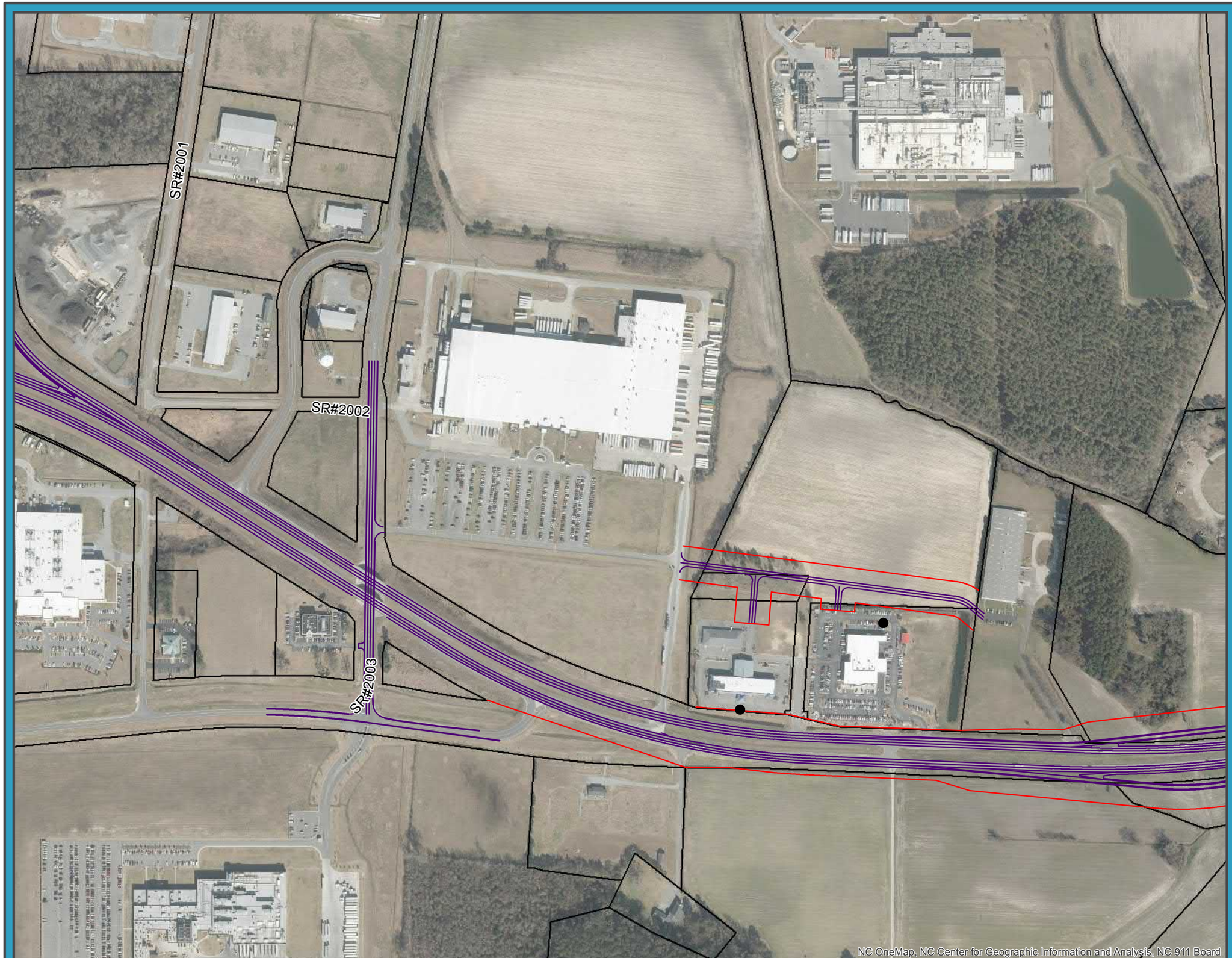


# Kinston Bypass
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Figure 3
Noise Receivers and
Detailed Study Alternatives

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## Alt 1 UE: Sheet 6 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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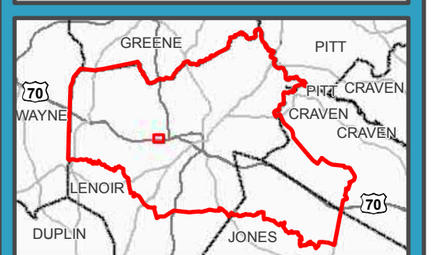
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

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## Alt 1 UE: Sheet 7 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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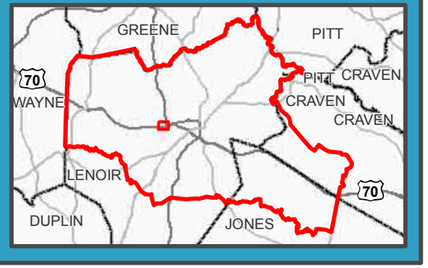

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

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**Alt 1 UE: Sheet 8 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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# Kinston Bypass
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Figure 3
Noise Receivers and
Detailed Study Alternatives

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**Alt 1 UE: Sheet 9 of 45**

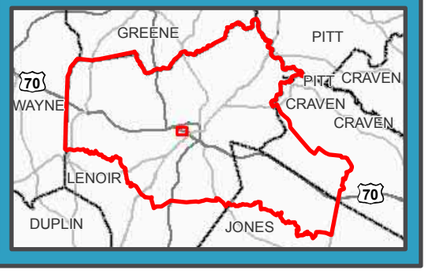
## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

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## Alt 1 UE: Sheet 10 of 45

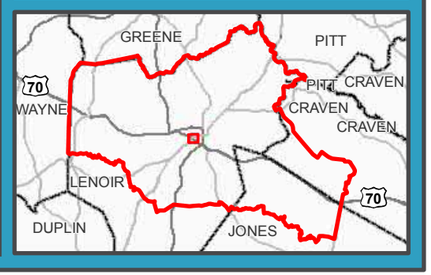
### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
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Figure 3
Noise Receivers and
Detailed Study Alternatives

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## Alt 1 UE: Sheet 11 of 45

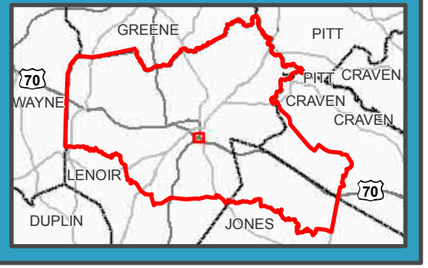
### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE: Sheet 12 of 45

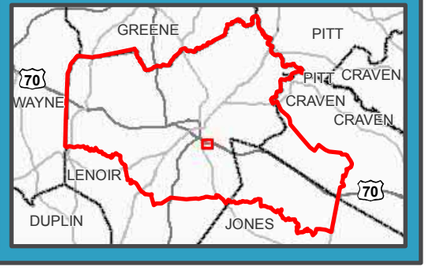
### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE: Sheet 13 of 45

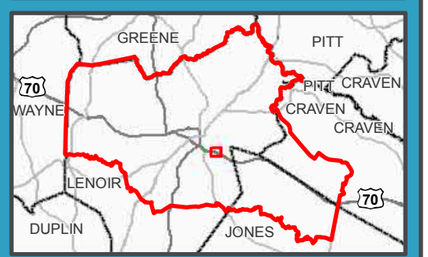
## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

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## Alt 1 UE: Sheet 14 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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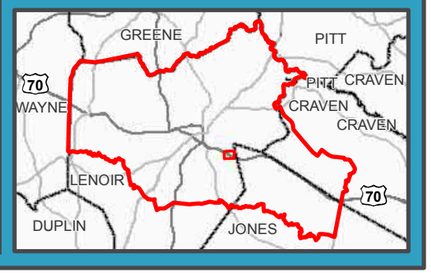
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE: Sheet 15 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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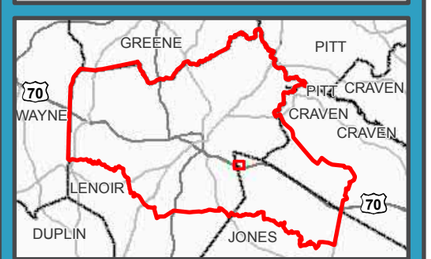



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE: Sheet 16 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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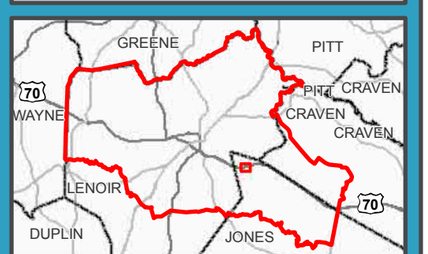

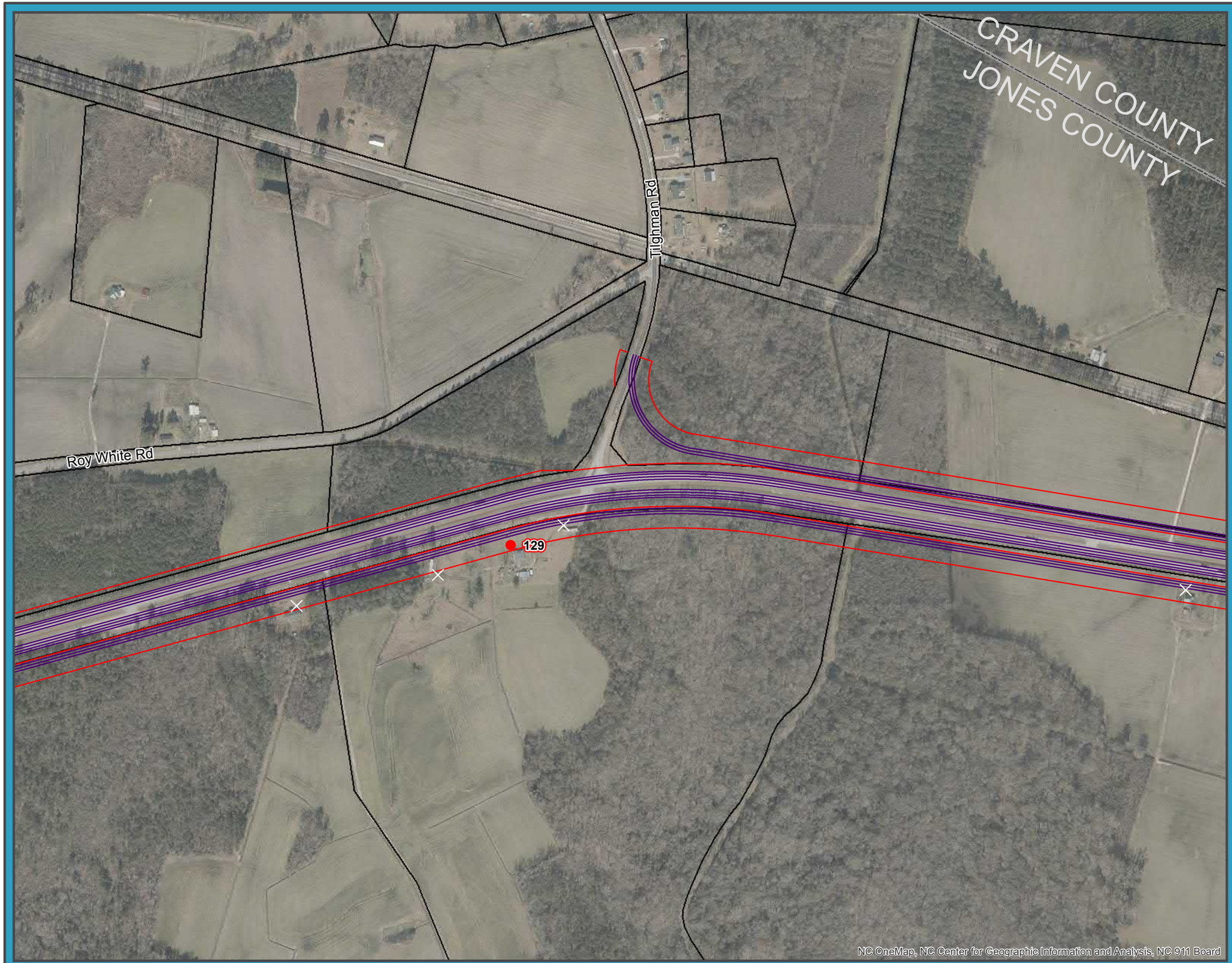


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE: Sheet 17 of 45

### Legend

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- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
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0 400 Feet

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# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 1 UE: Sheet 18 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE
- Proposed Right of Way
- Proposed Noise Barrier
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- County

0 400 Feet

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CRAVEN COUNTY
JONES COUNTY
NSA 70-50
132
131
133
ST12
Burkett Rd
SR#1005
W Old Dover Rd
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 1 UE: Sheet 19 of 45**

## Legend

- Noise Measurement Locations
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- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
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- Proposed Noise Barrier
- Parcels
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0 400 Feet

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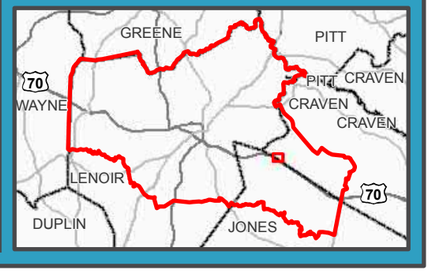

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 1 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE SB
- Proposed Noise Barrier
- Proposed Right of Way
- Parcels
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0 400 Feet

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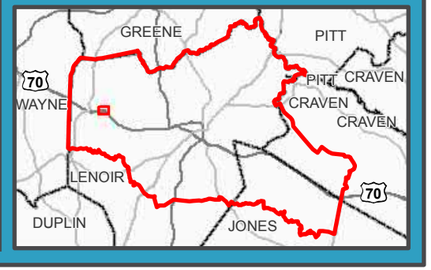


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 2 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE SB
- Proposed Noise Barrier
- Proposed Right of Way
- Parcels
- County

0 400 Feet

N

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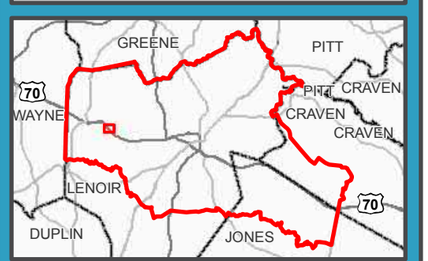

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 3 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
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- Proposed Right of Way
- Parcels
- County

0 400 Feet

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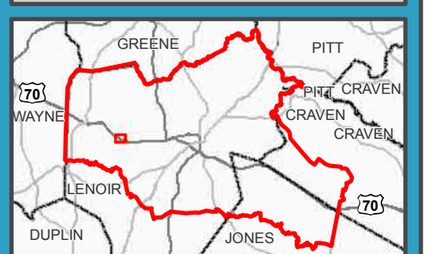

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 4 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE SB
- Proposed Noise Barrier
- Proposed Right of Way
- Parcels
- County

0 400 Feet

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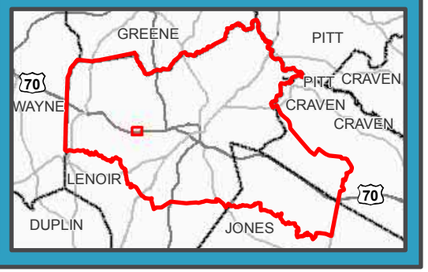

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 6 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE SB
- Proposed Noise Barrier
- Proposed Right of Way
- Parcels
- County

0 400 Feet

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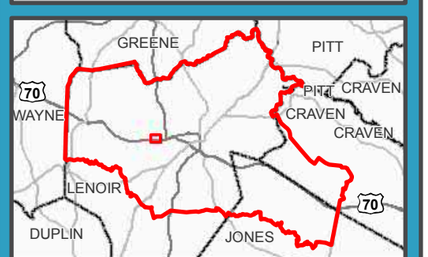


SR#2001
SR#2002
SR#2003
NSA 70-17
48
49
50
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 7 of 45

### Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
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- Proposed Right of Way
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0 400 Feet

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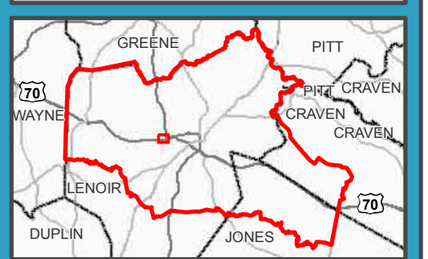


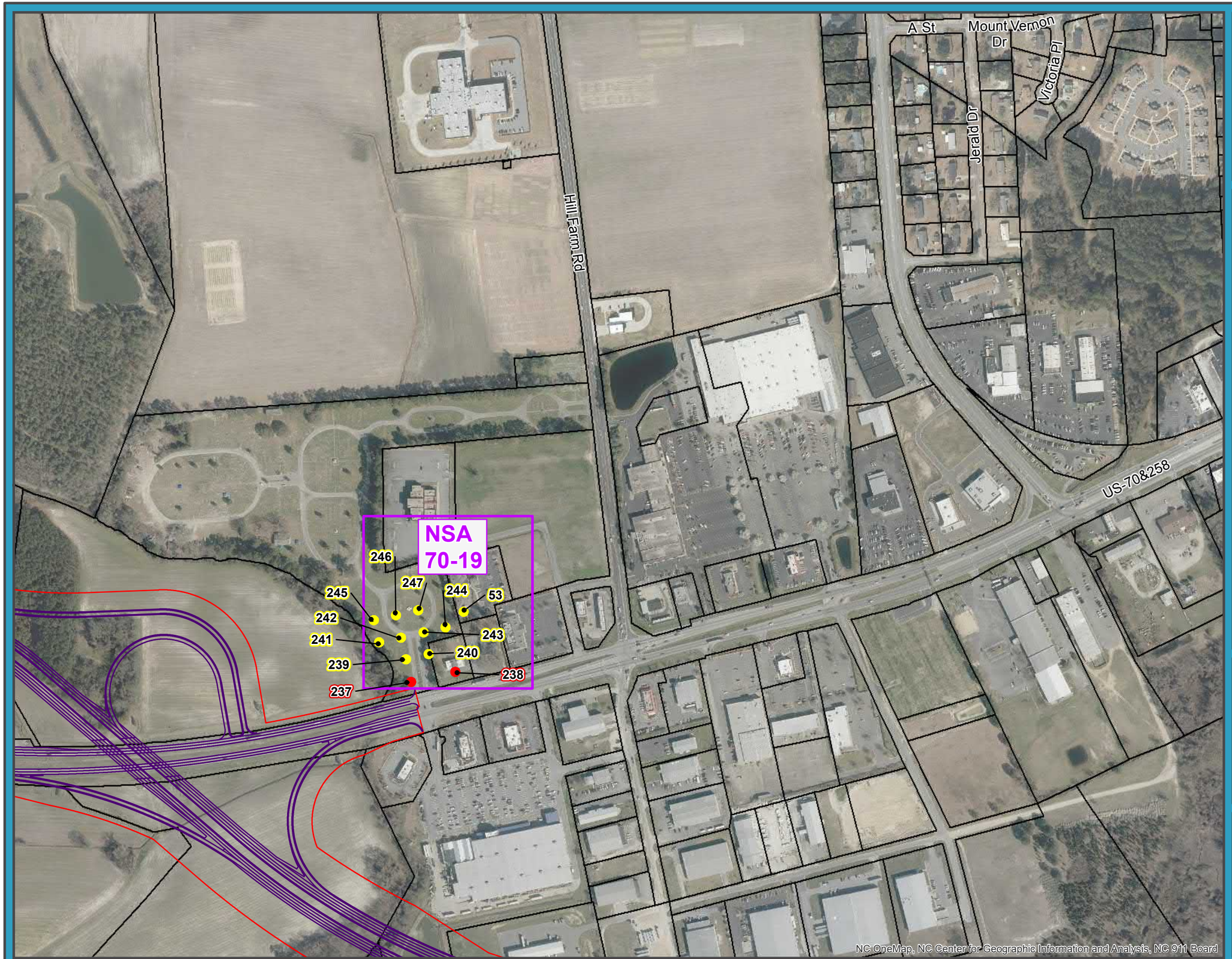

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 12 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
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0 400 Feet

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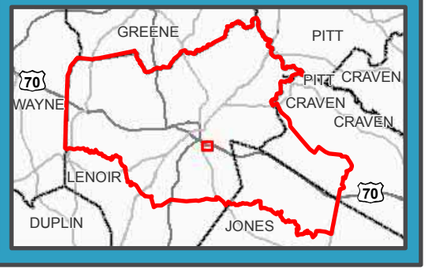

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 13 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
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0 400 Feet

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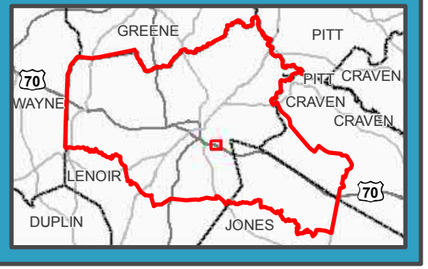

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 14 of 45

### Legend

- Noise Measurement Locations
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0 400 Feet

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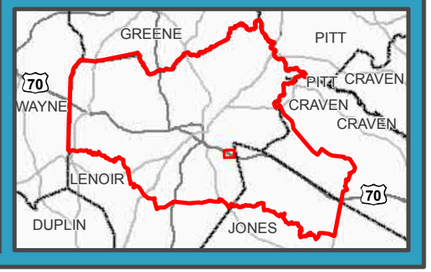

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 15 of 45

### Legend

- Noise Measurement Locations
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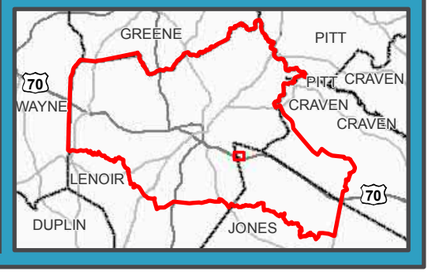


British Rd
LENOIR COUNTY
JONES COUNTY
Caswell Station Rd
NSA WF-02
NSA WF-01
480
479
481
483
482
127
LT01
Bill Smith Rd
Wyse Fork Rd
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 16 of 45

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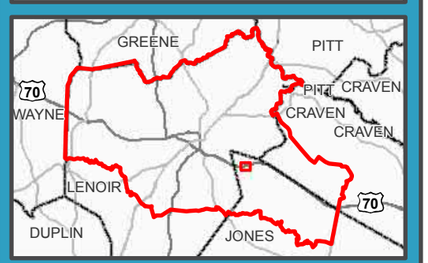


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May 2018

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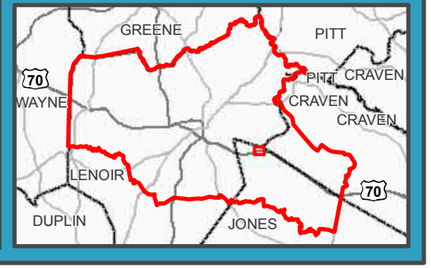

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Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 18 of 45

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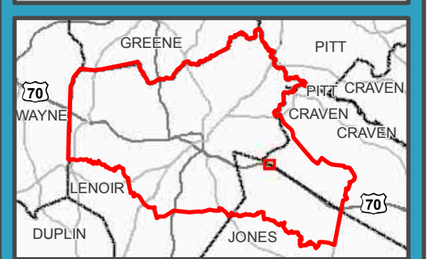


CRAVEN COUNTY
JONES COUNTY
NSA 70-50
132
131
133
ST12
Burkett Rd
SR#1005
Old Dover Rd
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

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Figure 3
Noise Receivers and
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May 2018

## Alt 1 UE SB: Sheet 19 of 45

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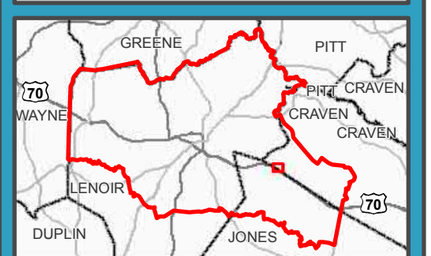


NSA 70-52

485 486 487 488 489 491 492 493 494 134 ST12

Avery Rd
Dover Fort Barnwell Rd
W Old Dover Rd
Johnson St
N West St
W Kornegay St
N Main St
SR#1005
Burl St
W Wilson St
E Wilson St
W Railroad St
E Railroad St
S Main St
Whitley St

CRAVEN COUNTY
JONES COUNTY

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 20 of 45

## Legend

- Noise Measurement Locations
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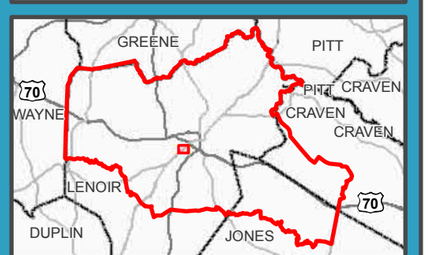

# Kinston Bypass
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Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 21 of 45

## Legend

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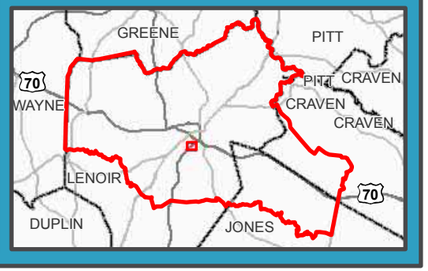



NSA 258-02
NSA 258-01
NSA 258-03

312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 336 337 338 339 340 341 343 342 344 345 346 347 348 349

ST19
Richlands Rd
Ferguson Ln
Fordham Ln
Leeward Ln
Hartley Dr
Cabin St
Oakdale Dr
Harbor St
Ok St
Louise Ln
W 1st St
Lakeside Dr
Brody St
1st Ave
Darden Dr
Collier-Loftin Rd

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 1 UE SB: Sheet 22 of 45

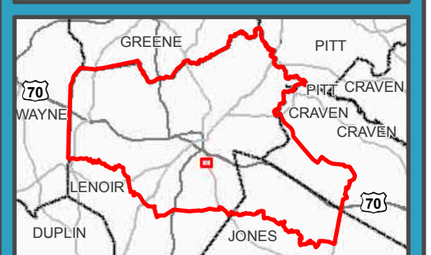
## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 1 UE SB
- Proposed Noise Barrier
- Proposed Right of Way
- Parcels
- County

0 400 Feet

N

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 1 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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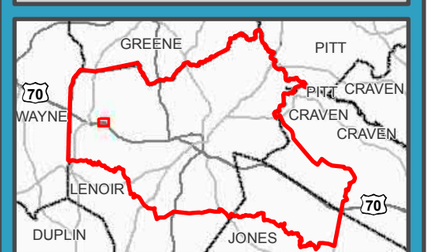

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 2 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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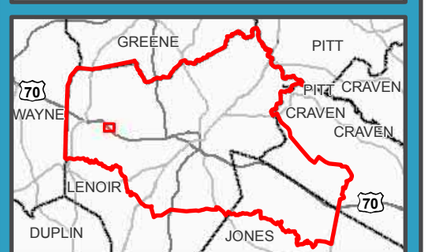

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 3 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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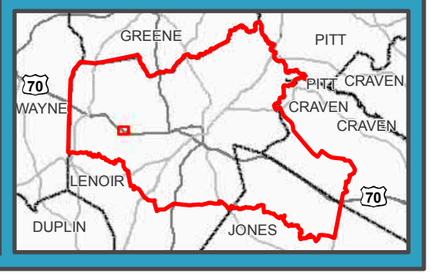
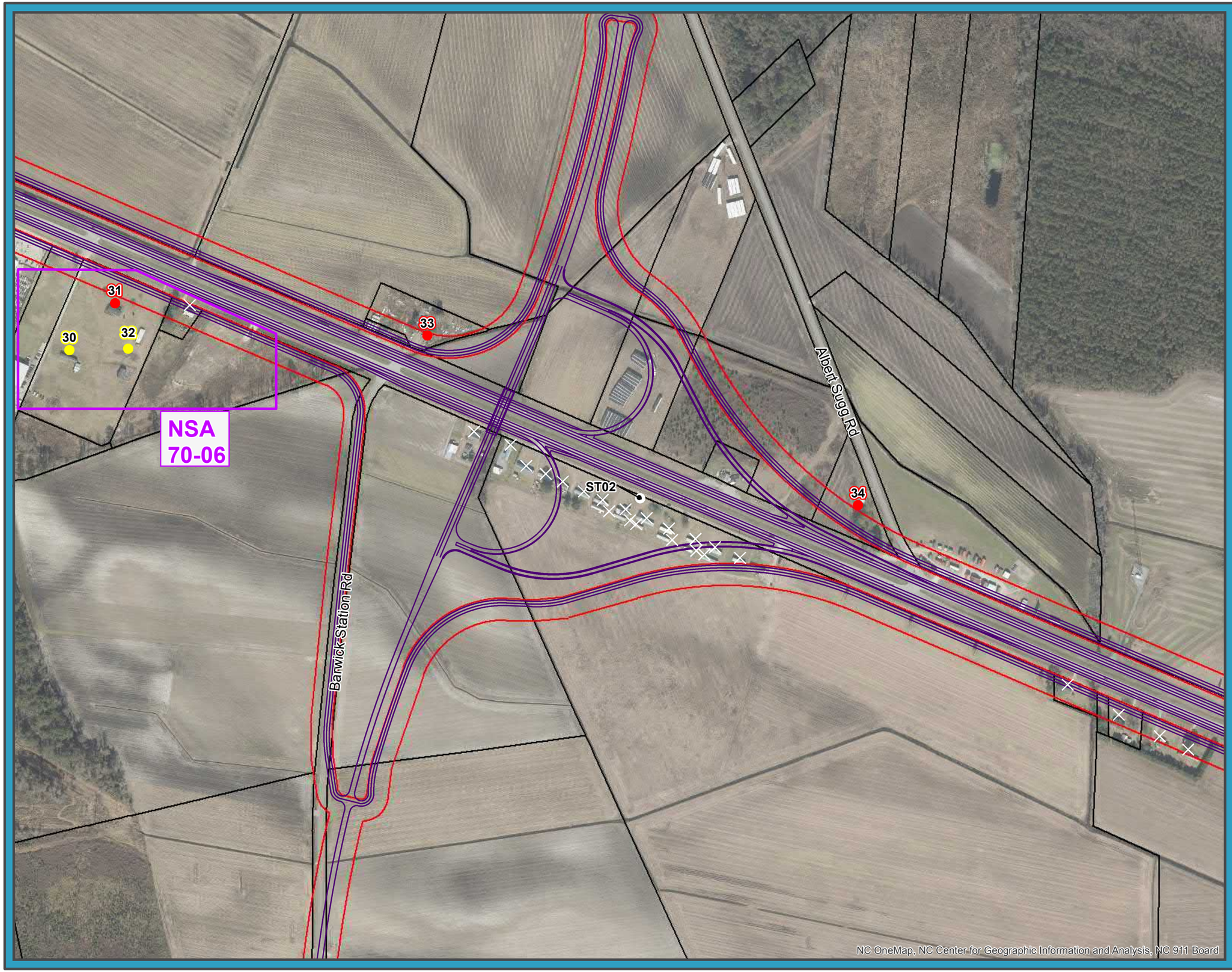


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

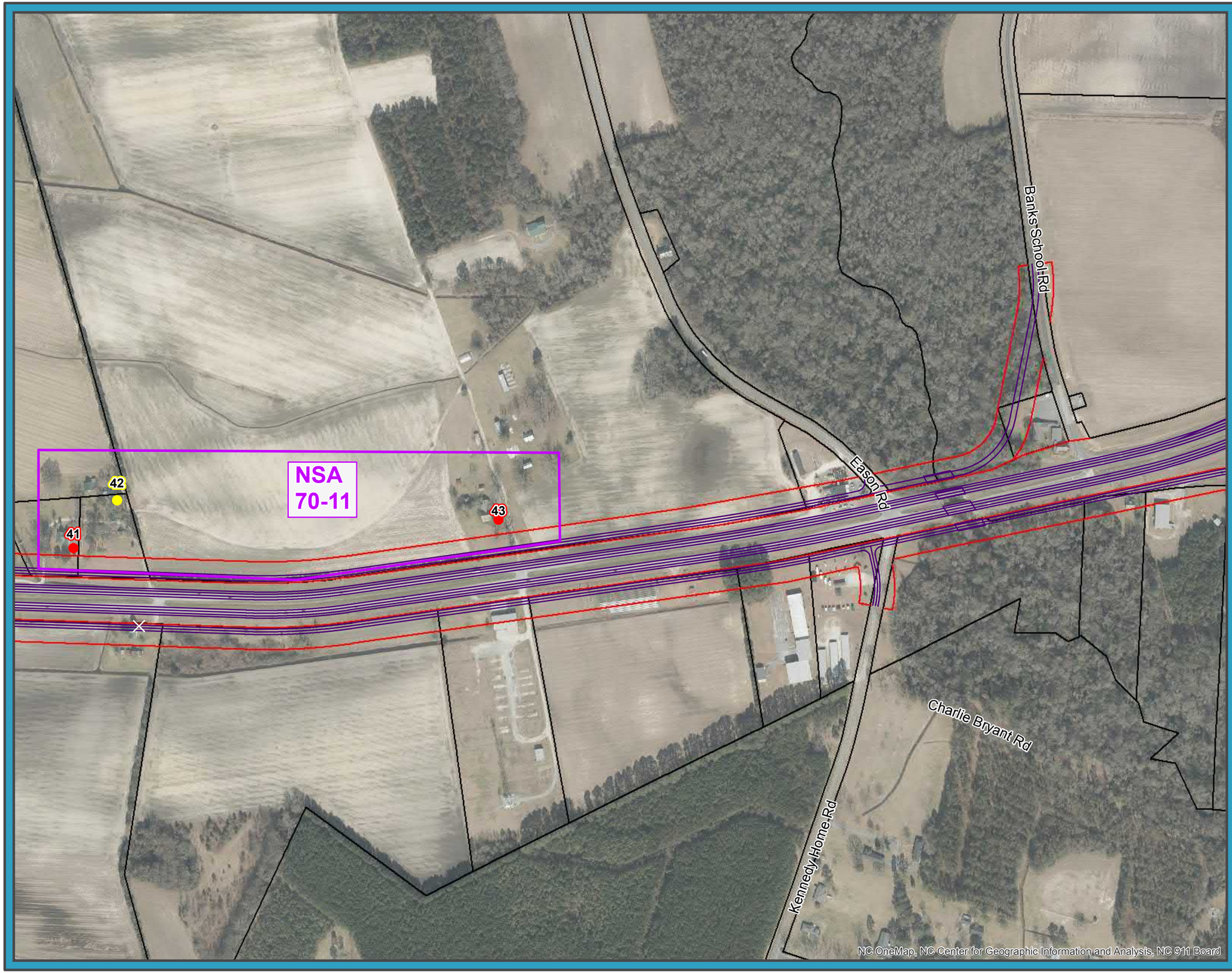
**Alt 11: Sheet 4 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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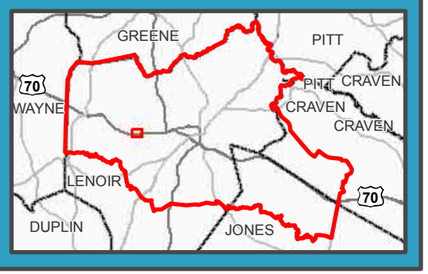


**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 5 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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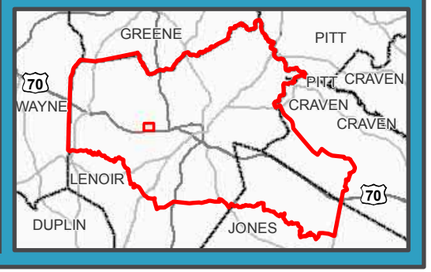
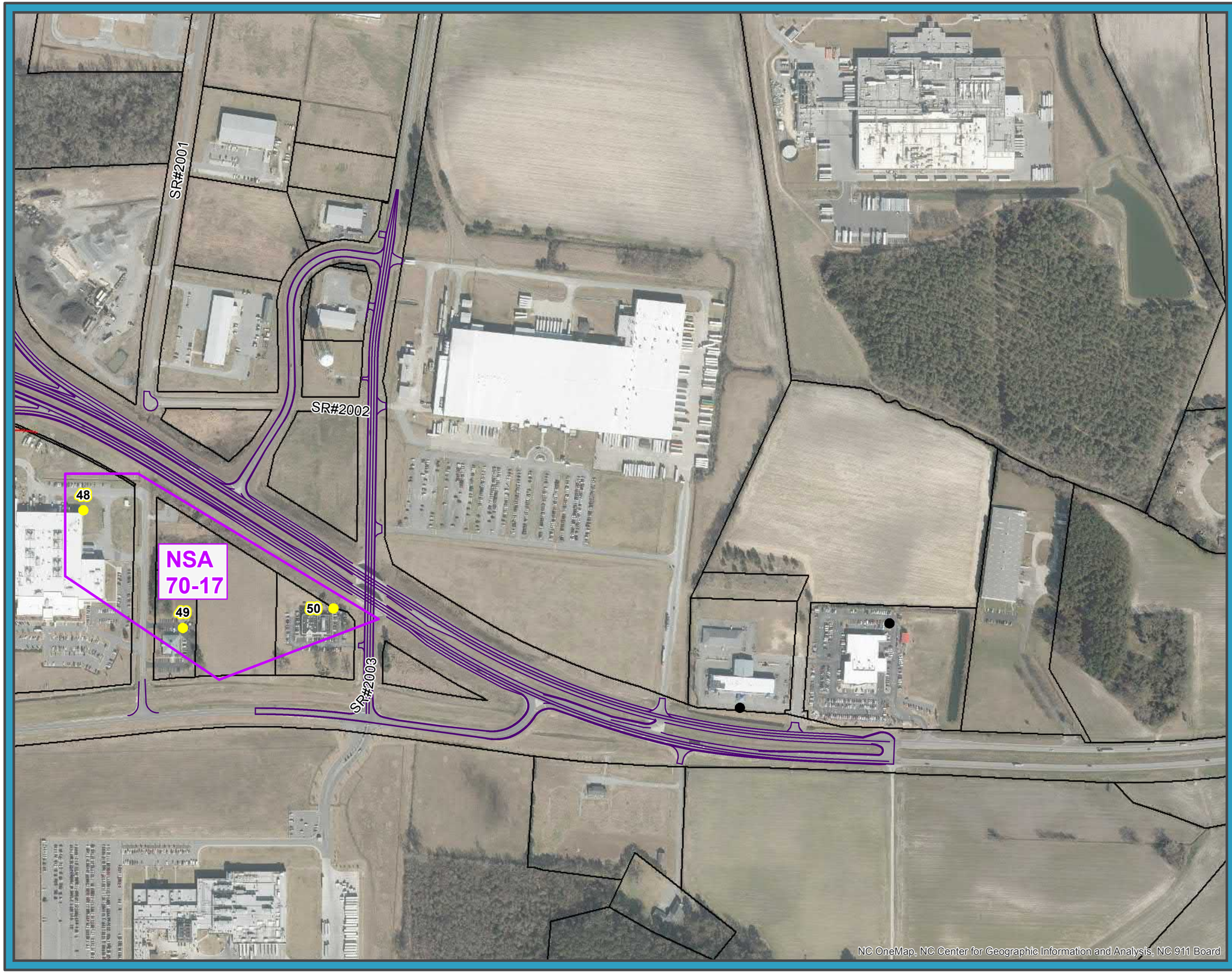
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.






# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 6 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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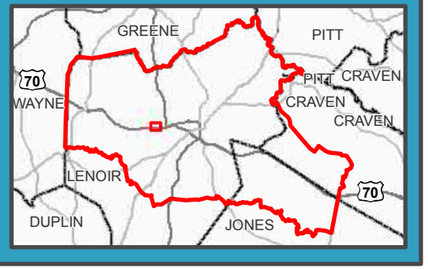
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

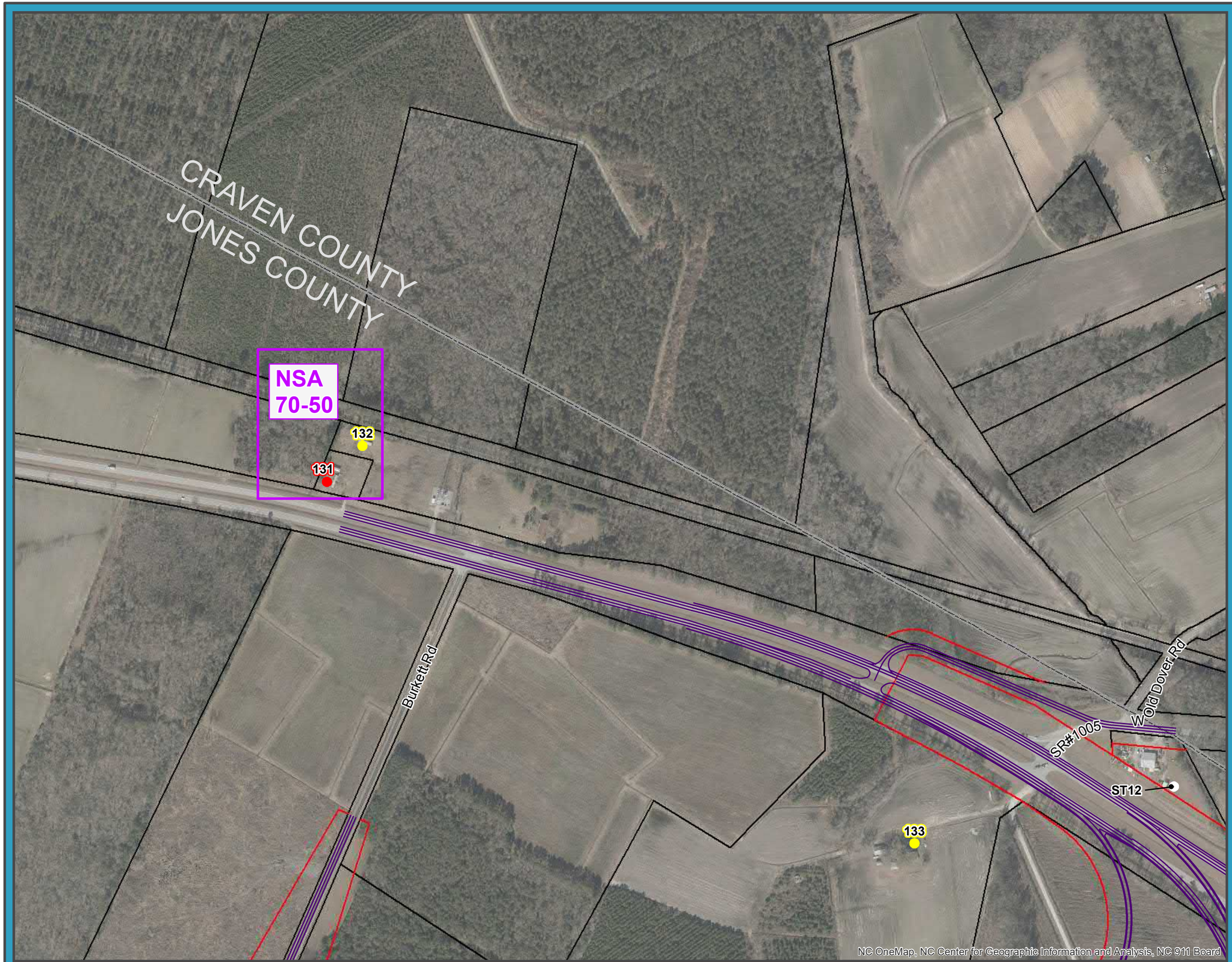
**Alt 11: Sheet 18 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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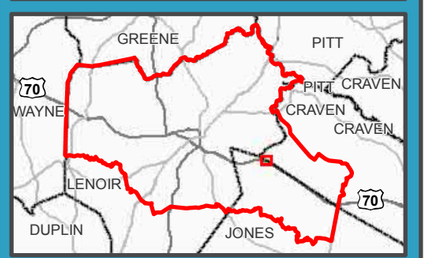
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 19 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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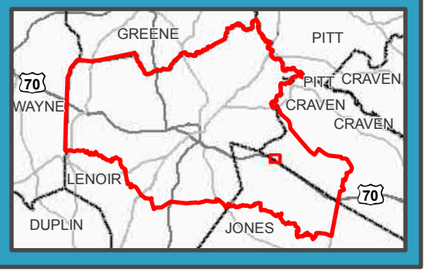


**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 24 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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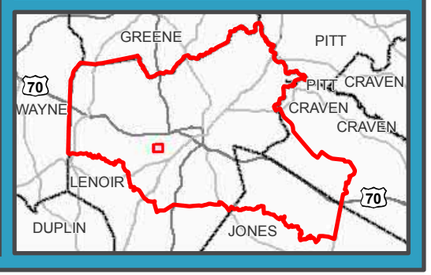
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 25 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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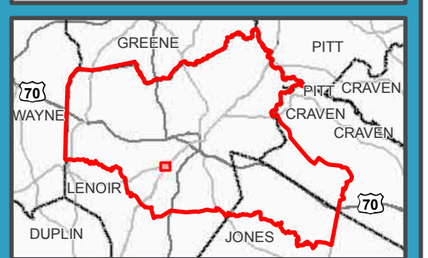
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 26 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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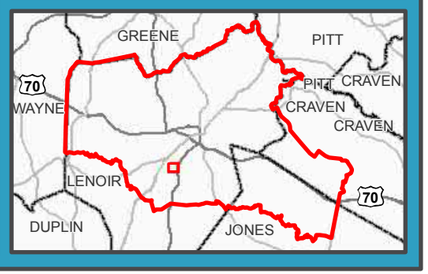
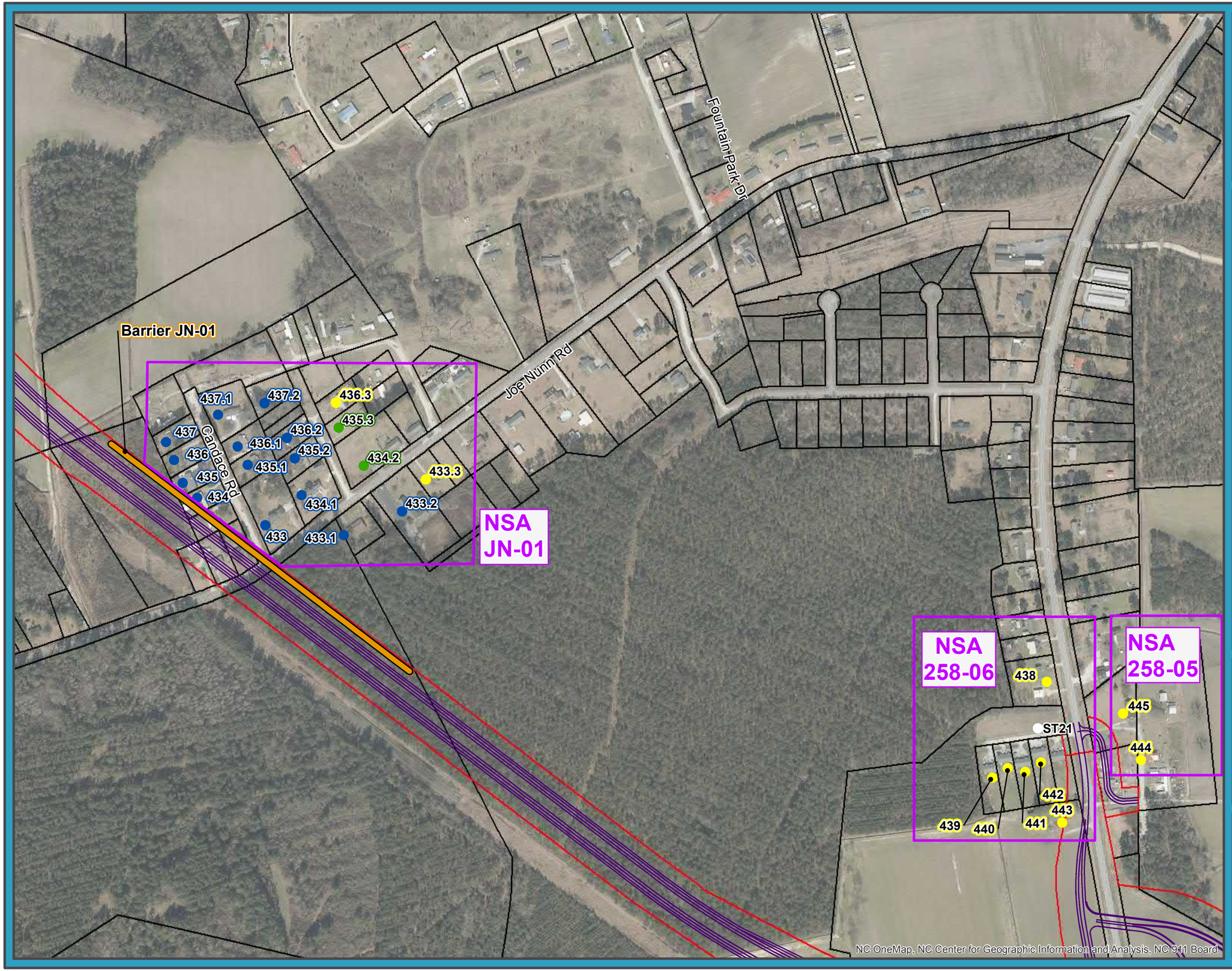
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 27 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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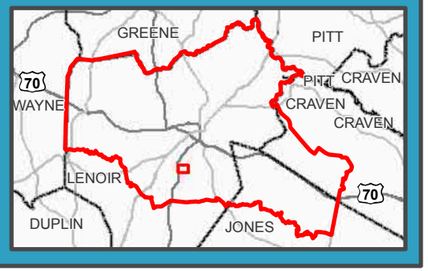

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 28 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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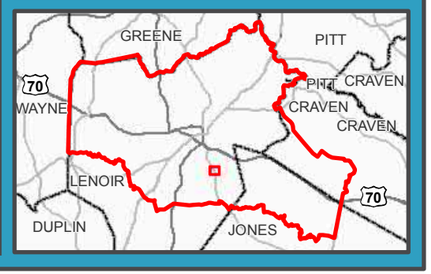

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 29 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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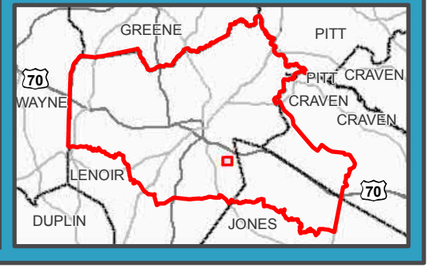


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 11: Sheet 44 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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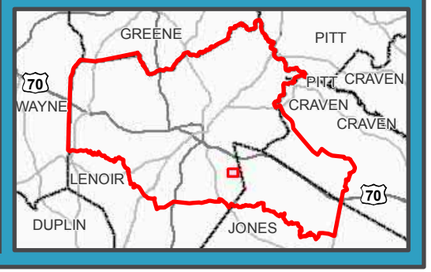

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 11: Sheet 45 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 11
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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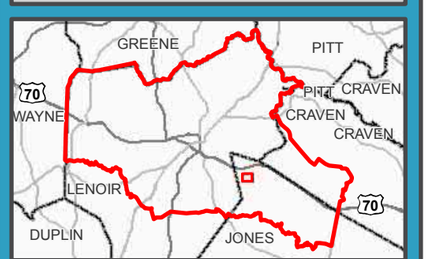

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 1 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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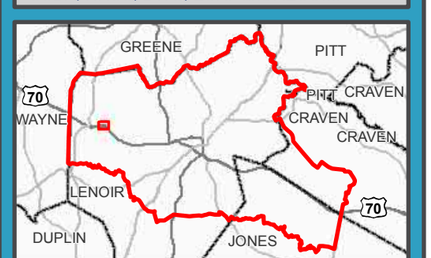

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 2 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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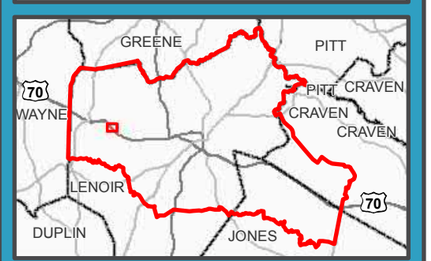


NSA 70-03
NSA 70-04
NSA 70-05
Norbert Hill Rd
Ray Lynn Dr
8
9
10
11
12
13
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16
17
18
19
20
27
28
29
LT03

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 3 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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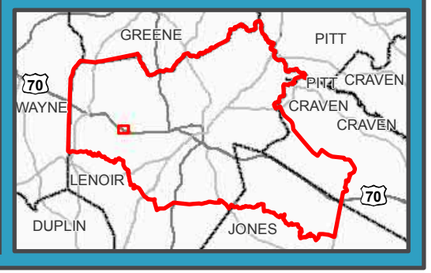


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 4 of 45**

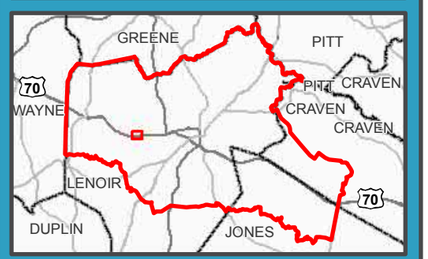
## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.




NSA 70-11

42
41
43

Banks School Rd
Eason Rd
Charlie Bryant Rd
Kennedy Home Rd

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board


**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 5 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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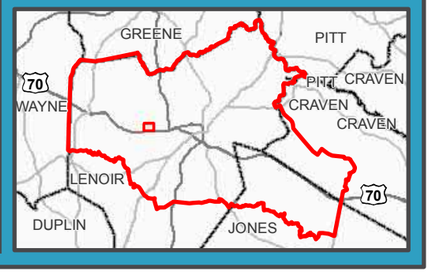

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 6 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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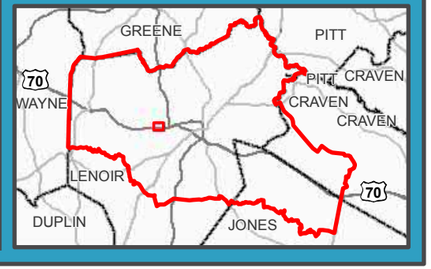


SR#2001
SR#2002
SR#2003
48
49
50
NSA
70-17

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 15 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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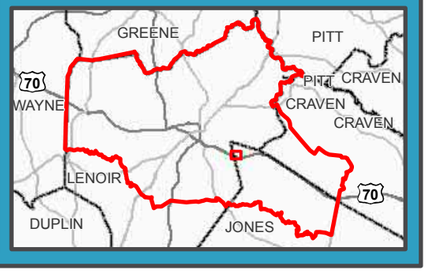
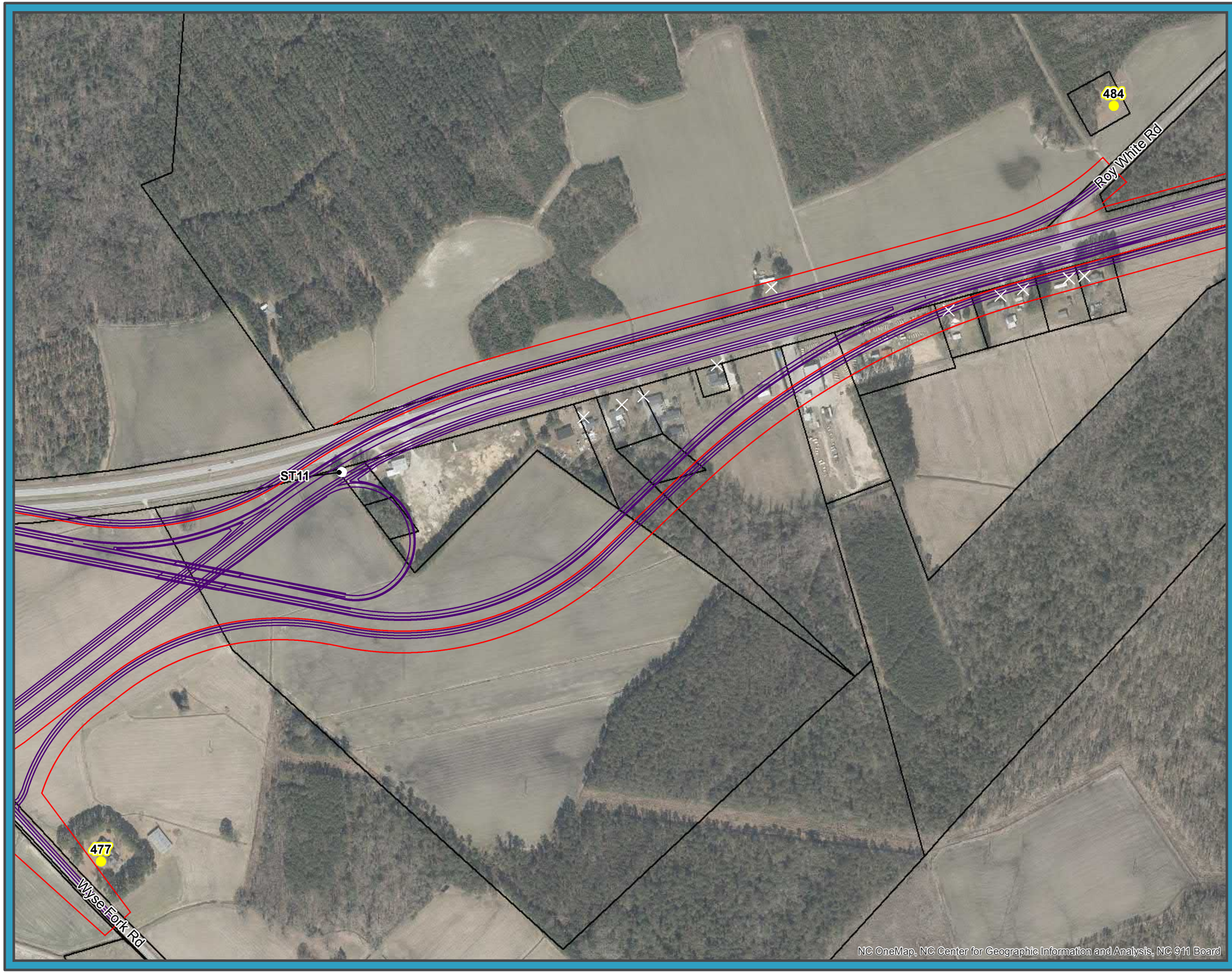


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018




## Alt 12: Sheet 16 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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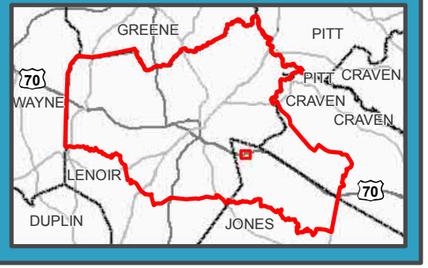


**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 17 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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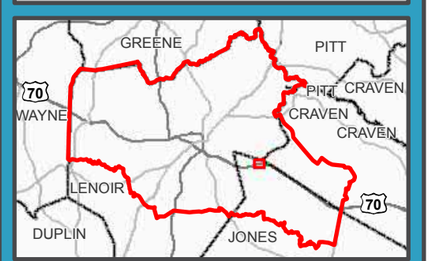

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 18 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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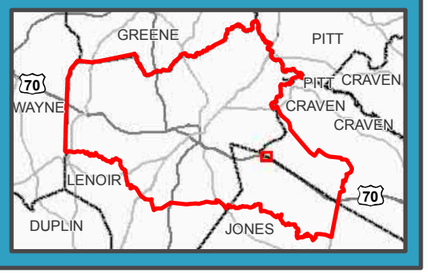


CRAVEN COUNTY
JONES COUNTY
NSA 70-50
132
131
133
ST12
Burkett Rd
SR#1005
W Old Dover Rd
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 19 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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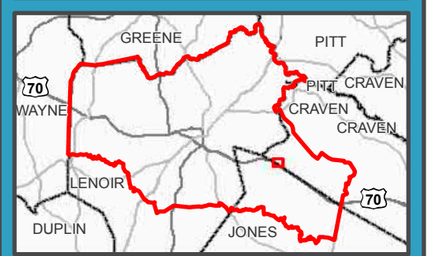


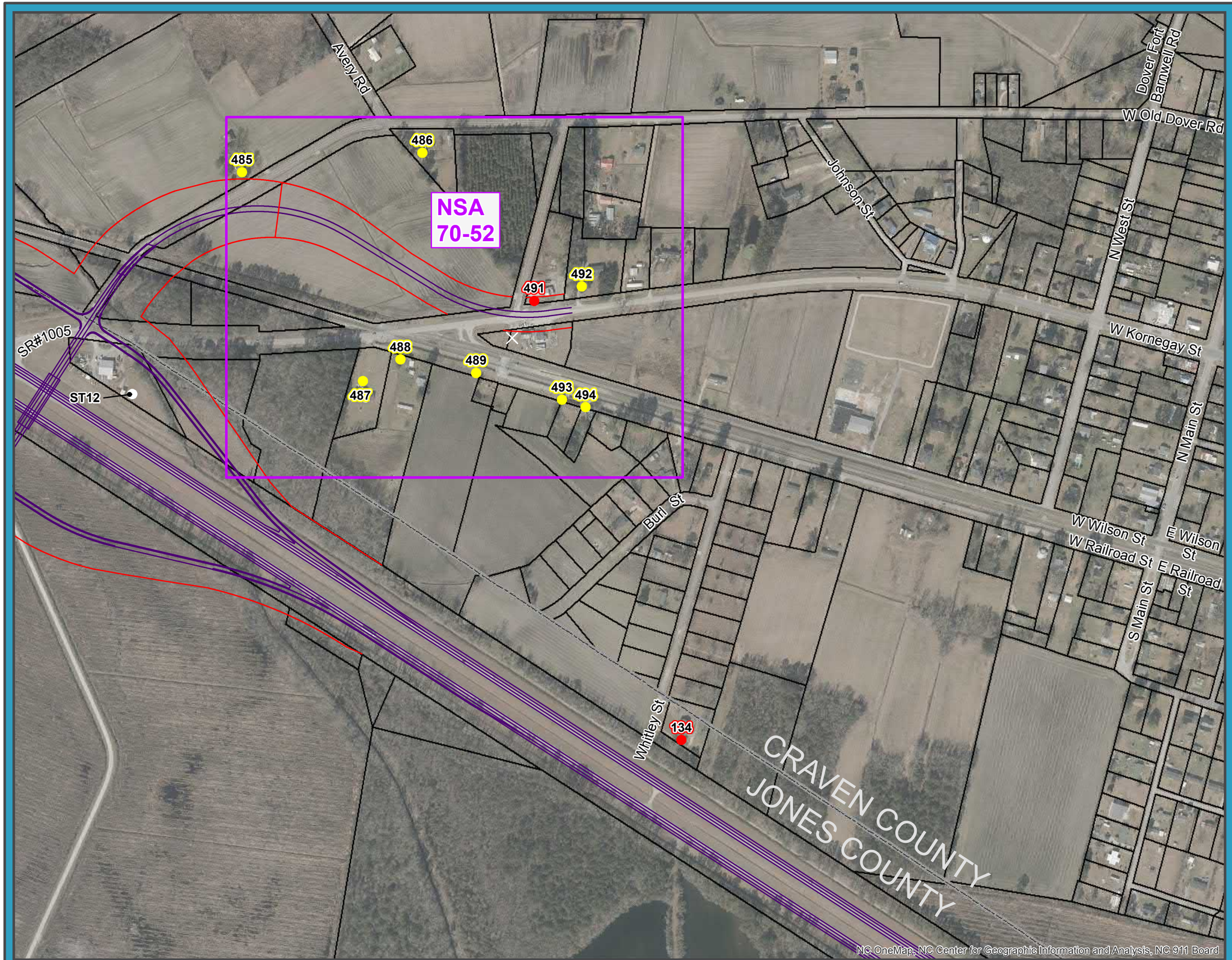


**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 24 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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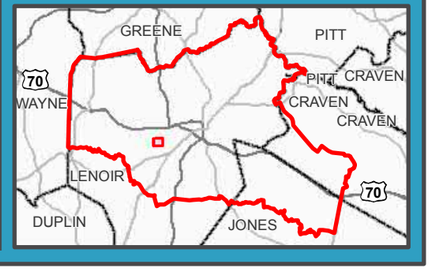
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 25 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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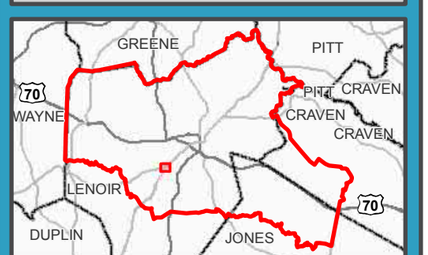


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 26 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

Barrier JN-01

NSA JN-01

NSA 258-06

NSA 258-05

Joe Nunn Rd

Fountain Park Dr

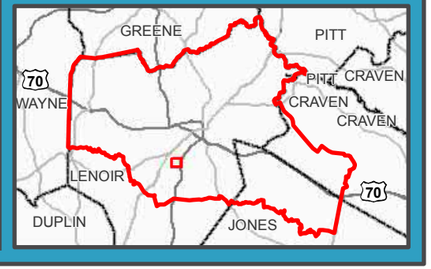
Candace Rd

437.1 437.2 436.3 437 436.1 436.2 435.3 436 435.2 434.2 435 435.1 434.1 433.3 434 433.2 433 433.1

438 445 ST21 440 442 444 439 441 443

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

This map is for reference only.
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 27 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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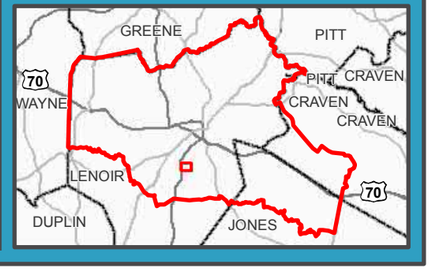
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.




# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 28 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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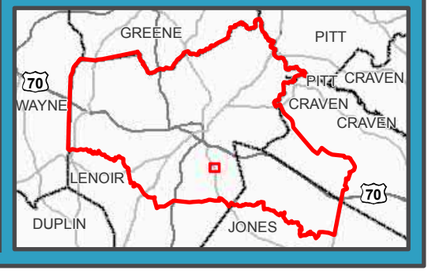
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 29 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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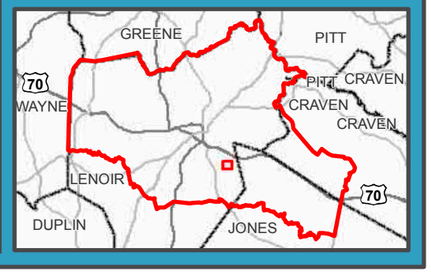


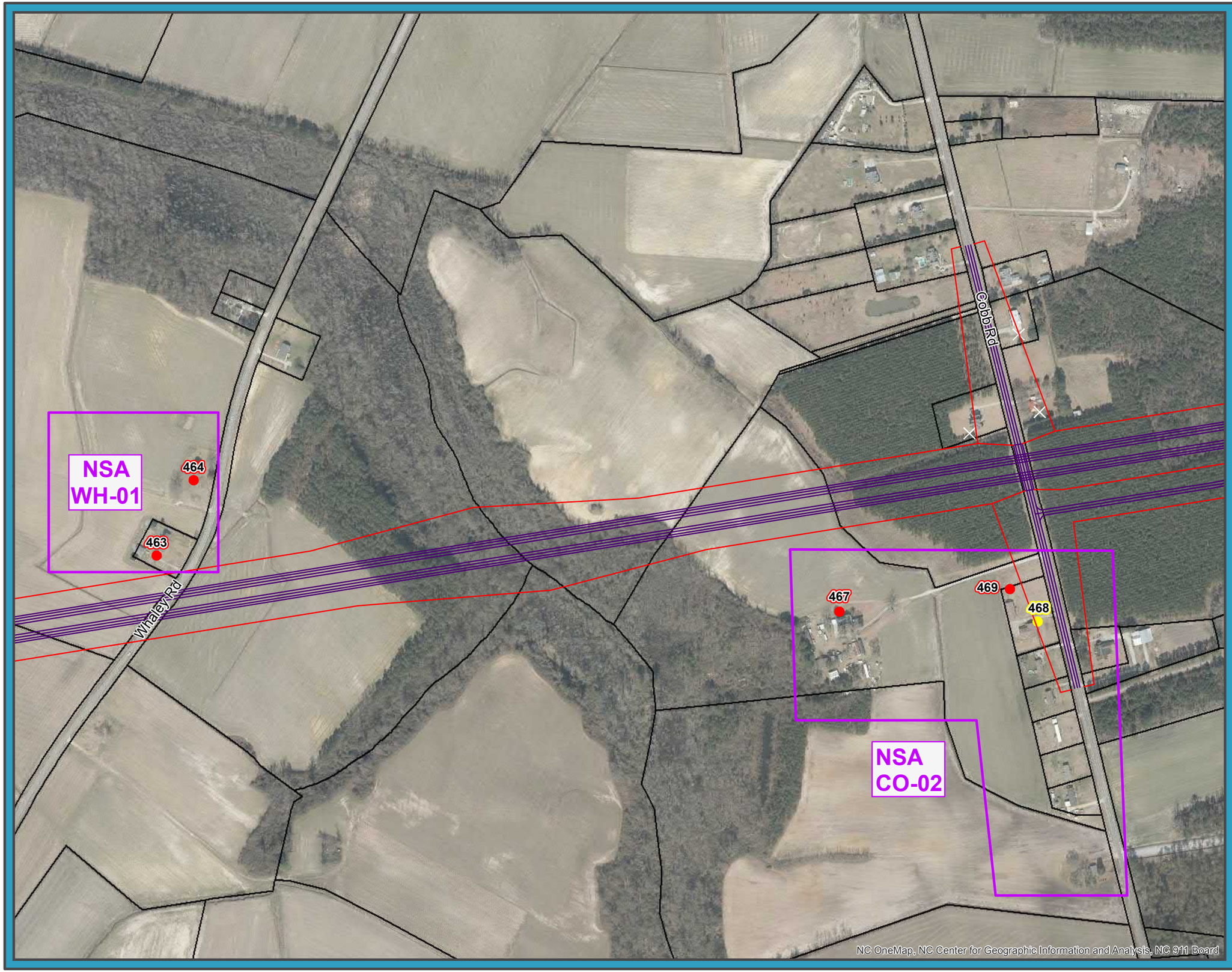


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 12: Sheet 30 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 12
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

N

0 400 Feet

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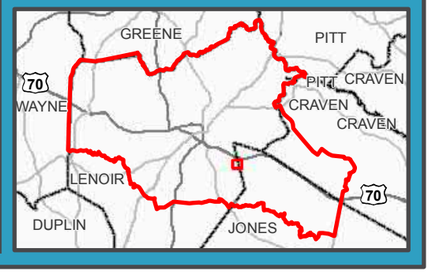

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 1 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 2 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

NSA 70-03
NSA 70-04
NSA 70-05
Norbert Hill Rd
Ray Lynn Dr
LT03

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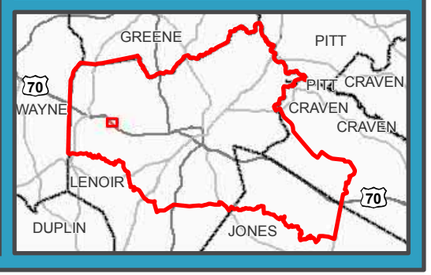
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.



# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 3 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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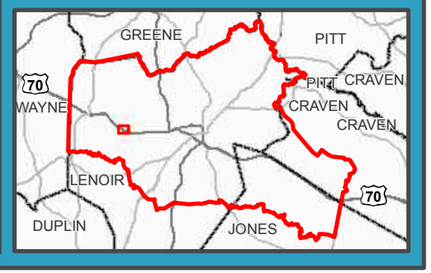

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 4 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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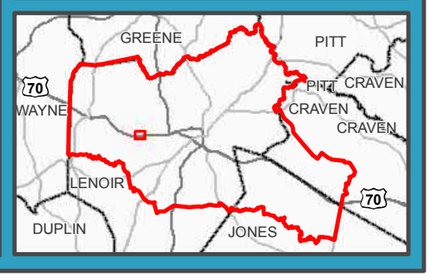


NSA 70-11

41 42 43

Banks School Rd
Eason Rd
Kennedy Home Rd
Charlie Bryant Rd

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018


## Alt 31: Sheet 5 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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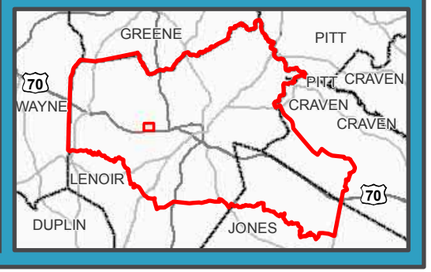

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 6 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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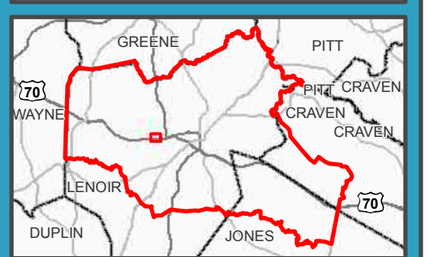
Sources: CGIA, NCDOT, NCDENR, Craven County, NCDCM, NCEM, Lenoir County, Pitt County, Kinston Planning Department, NCOneMap, NCWRC, NCSHPO,EPA, USFWS, USDA, NRCS, DWQ, ESRI and AECOM.




SR#2001
SR#2002
SR#2003
48
49
50
NSA 70-17

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

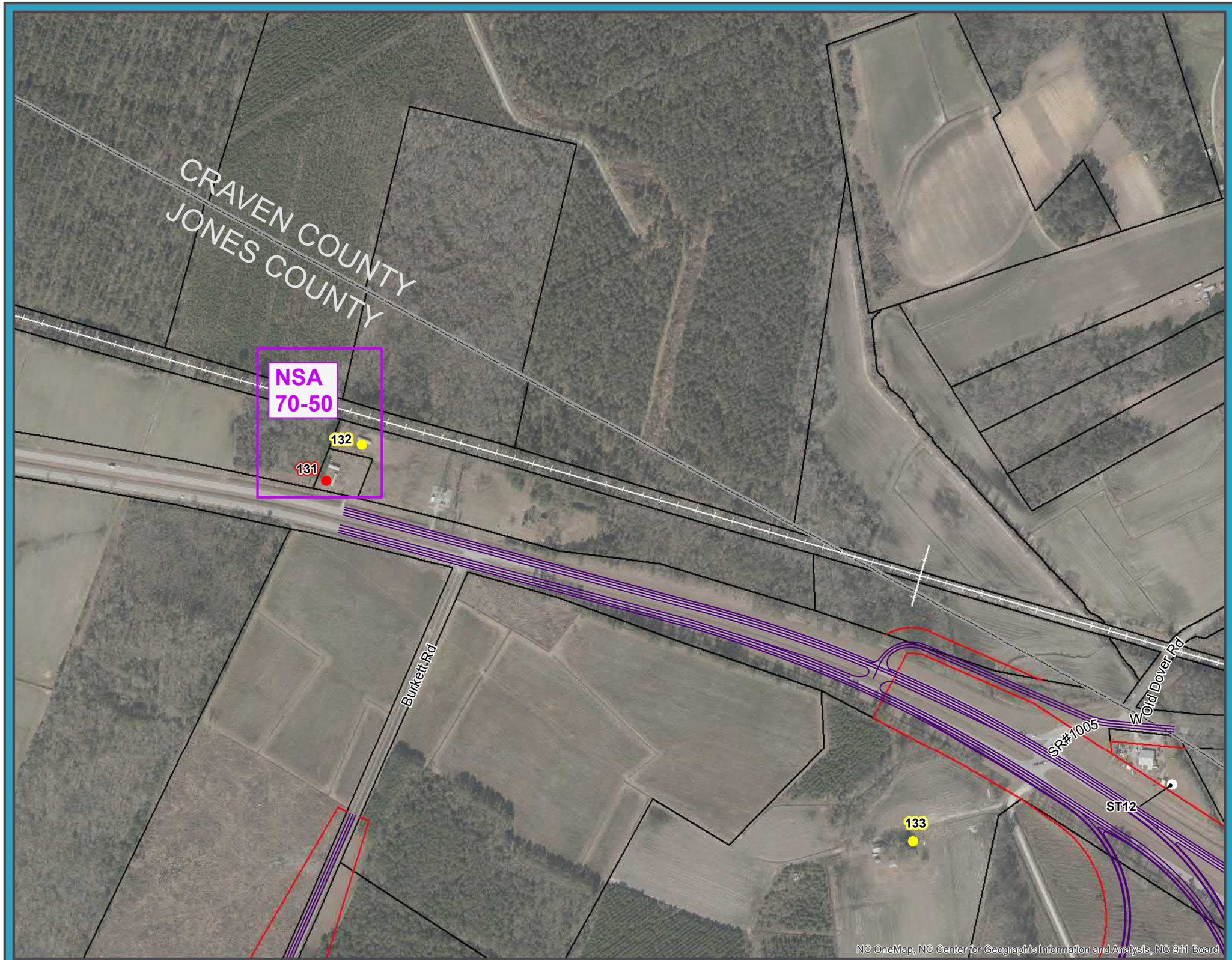
**Alt 31: Sheet 18 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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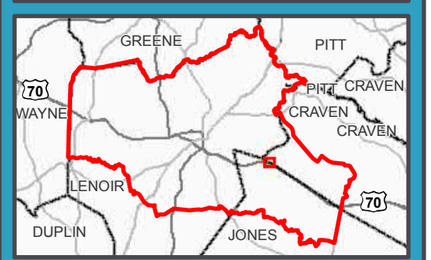

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 19 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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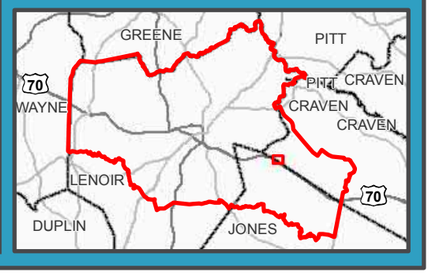

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 23 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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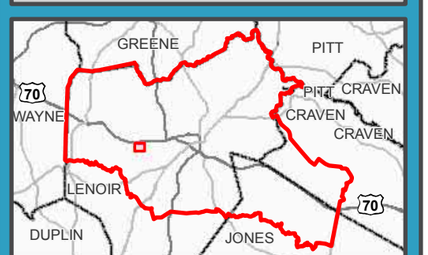

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 25 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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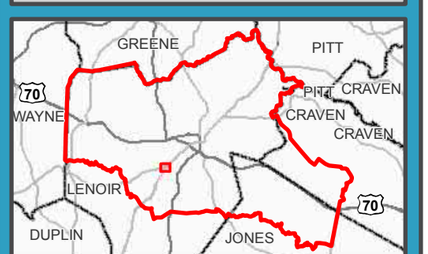

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 26 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

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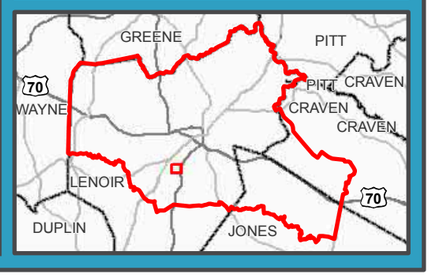


Barrier JN-01

NSA JN-01

NSA 258-06

NSA 258-05

ST21

Fountain Park Dr

Joe Nunn Rd

Candace Rd

437 436 435 434 433 437.1 437.2 436.1 436.2 435.1 435.2 434.1 433.1 436.3 435.3 434.2 433.3 433.2 438 440 439 442 441 443 445 444

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 27 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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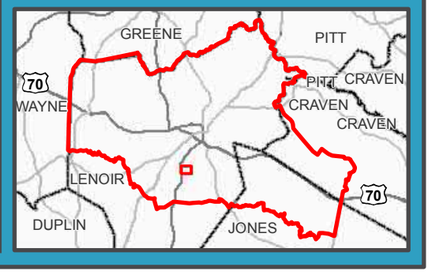

# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 28 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

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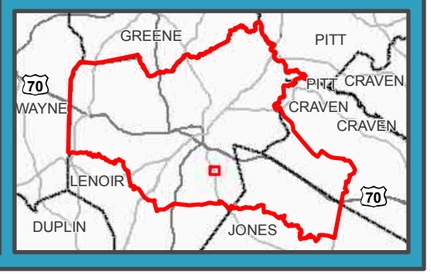

**Kinston Bypass**
**STIP Project No. R-2553**

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

**Alt 31: Sheet 29 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

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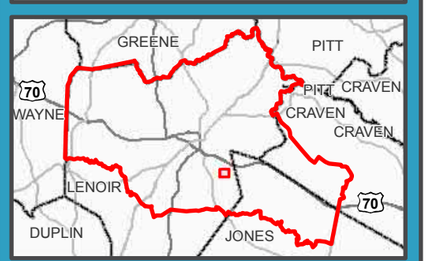


NSA WH-01
464
463
466.1
466
Cobb Rd
Murray Cir
Whaley Rd
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

## Alt 31: Sheet 44 of 45

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

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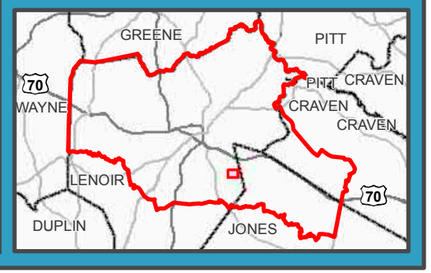


# Kinston Bypass
# STIP Project No. R-2553

Figure 3
Noise Receivers and
Detailed Study Alternatives

May 2018

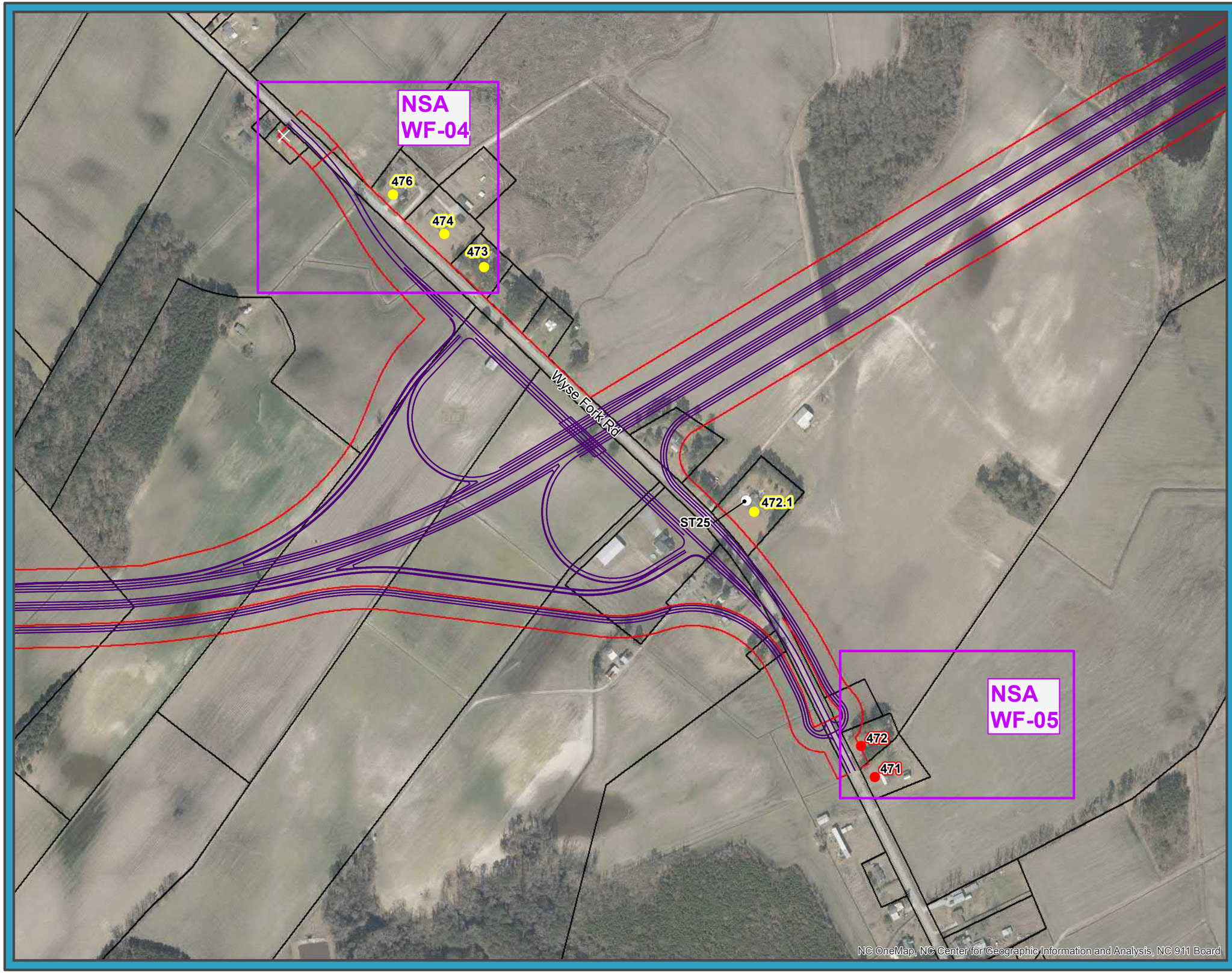
**Alt 31: Sheet 45 of 45**

## Legend

- Noise Measurement Locations
- Impacted, Not Benefited
- Impacted and Benefited
- Benefited, Not Impacted
- Not Impacted, Not Benefited
- Not Noise Sensitive
- Right of Way Take
- Alternative 31
- Proposed Right of Way
- Proposed Noise Barrier
- Parcels
- County

0 400 Feet

N

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