Final Noise Analysis Technical Report

Nolana Loop
From FM 1426 (Raul Longoria Road) to FM 88 (Texas Avenue)

CSJ: 0921-02-361 & 0921-02-169

Prepared by: Hidalgo County
Date: April 2018

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I. Introduction

This technical report discusses the noise impacts resulting from the proposed Nolana Loop project located within the City of San Juan and rural Hidalgo County, Texas. The logical termini and construction limits for the Nolana Loop project are from Farm to Market (FM) 1426 (Raul Longoria Road) to FM 88 (Texas Avenue); a length of 9.8 miles. See **Figure 1** for the project location map. Nolana Loop is functionally classified as an urban street collector. The proposed project has been assigned two Control Section Job (CSJ) numbers by the Texas Department of Transportation (TxDOT) for accounting purposes (see **Table 1**). This project is being proposed by Hidalgo County, with TxDOT oversight.

Table 1: Project CSJ Numbers

CSJ	From	To
0921-02-361	FM 1426	0.25 mile East of FM 907
0921-02-169	0.25 mile East of FM 907	FM 88

A. Existing Roadway

The proposed project utilizes 7.3 miles of existing right-of-way (ROW) where possible along Earling Road and Mile 11 ½ Road. The existing 22-foot-wide rural roadway consists of two 11-foot-wide travel lanes within a varying 30 to 120-foot-wide ROW. Drainage for the roadway is handled through roadside ditches. See **Figure 2** for the existing typical section. The existing speed limit is 30 miles per hour (MPH). There is no existing roadway from Victoria Road east to FM 88, a distance of approximately 2.5 miles.

B. Proposed Roadway

The scope of the proposed project is widen the existing roadway along Earling Road and Mile 11 ½ Road and extend the roadway partially on new location to FM 88.

Nolana Loop would be constructed as an 84-foot-wide urban roadway consisting of four 12-foot-wide travel lanes, one 16-foot-wide continuous left turn lane, two 10-foot-wide shoulders, and six-foot-wide sidewalks on both sides of the roadway within a 120-foot-wide ROW. Drainage would be handled by a storm drain system. See **Figure 3** for the proposed typical section. The design speed of the proposed roadway is 55 MPH; the speed was based on parameters that will safely allow drivers to travel the roadway. The posted speed limit will be determined by the city/county by court action based on speed surveys, typical section, surrounding land use, and accident data after construction.

Seven existing outfalls located within the project limits would be dredged, as needed, to improve drainage in the area. All dredging would occur within existing ROW.

The proposed project would require 82.6 acres (277 parcels) of new ROW, seven (7) residential relocations, and one (1) business relocation.

Table 2 reflects the Average Daily Traffic (ADT) for the years 2018 and 2038 on Nolana Loop as provided by TxDOT's Transportation Planning and Programming (TPP) Division.

Table 2: Average Daily Traffic

	From	To	K-Factor	2018	2038	Light Duty (Percent)	Medium Duty (Percent)	Heavy Duty (Percent)
Nolana Loop	FM 1426	FM 88	15.3	7,900	11,100	94.5	2.8	2.7

II. Noise Analysis

This analysis was accomplished in accordance with TxDOT's (Federal Highway Administration [FHWA] approved) *Guidelines for Analysis and Abatement of Roadway Traffic Noise* (2011). Sound from highway traffic is generated primarily from a vehicle's tires, engine, and exhaust. It is commonly measured in decibels and is expressed as "dB." Sound occurs over a wide range of frequencies. However, not all frequencies are detectable by the human ear; therefore, an adjustment is made to the high and low frequencies to approximate the way an average person hears traffic sounds. This adjustment is called A-weighting and is expressed as "dB(A)." Also because traffic sound levels are never constant due to the changing number, type, and speed of vehicles, a single value is used to represent the average or equivalent sound level and is expressed as "Leq." The traffic noise analysis typically includes the following elements:

- Identification of land use activity areas that might be impacted by traffic noise.
- Determination of existing noise levels.
- Prediction of future noise levels.
- Identification of possible noise impacts.
- Consideration and evaluation of measures to reduce noise impacts.

As indicated on **Table 3**, FHWA has established the following Noise Abatement Criteria (NAC) for various land use activity areas that are used as one of two means to determine when a traffic noise impact would occur.

Table 3: FHWA Noise Abatement Criteria (NAC)

Activity Category	FHWA dB(A) Leq	Description of Land Use Activity Areas
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	**67 (exterior)**	Residential
C	**67 (exterior)**	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios,

Activity Category	FHWA dB(A) Leq	Description of Land Use Activity Areas
		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 non-profit institutional structures, radio studios, recording studios, schools, and television studios.
E	**72 (exterior)**	Motels, hotels, offices, restaurants/bars, and other developed lands, properties 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.

A noise impact would occur when either the absolute or relative criterion is met:

- Absolute criterion: the predicted noise level at a receiver approaches, equals, or exceed the NAC. "Approach" is defined as one dBA below the NAC. For example: a noise impact would occur at a Category B residence if the noise level is predicted to be 66 dBA or above.

- Relative criterion: the predicted noise level substantially exceeds the existing noise level at a receiver even though the predicted noise level does not approach, equal, or exceed the NAC. “Substantially exceeds” is defined as more than 10 dBA. For example: a noise impact would occur at a Category B residence if the existing level is 54 dBA and the predicted level is 65 dBA (11 dBA increase).

When a traffic noise impact occurs, noise abatement measures must be considered. A noise abatement measure is any positive action taken to reduce the impact of traffic noise on an activity area. To determine the existing ambient sound levels within the project area, a field survey that was conducted on June 13, 2017 at six locations along the sections of new location roadway (**Figure 4**). Three measurements, lasting eight minutes each, were taken at each location for a total of 18 measurements. During the field survey, measurement locations were selected based on their proximity to the project site and noise sensitive receivers. The sound levels were measured using the Casella 480 Noise Meter. The FHWA Traffic Noise Modeling (TNM) software 2.5 was used to calculate existing and predicted traffic noise levels. The model primarily considers the number, type, and speed of vehicles; highway alignment and grade; cuts, fills and natural berms; surrounding terrain features; and the locations of activity areas likely to be impacted by the associated traffic noise.

Existing and predicted traffic noise levels were modeled at receiver locations (**Table 4** and **Figure 5**) that represent the land use activity areas adjacent to the proposed project that might be impacted by traffic noise and potentially benefit from feasible and reasonable noise abatement. The receivers

denoted by an asterisk in **Table 4** indicate ambient noise levels were utilized for the existing noise levels.

Table 4: Traffic Noise Levels (dBA Leq)

TRAFFIC NOISE LEVELS (dBA Leq)						
Receiver	**NAC Category**	**NAC Level**	**Existing 2018**	**Predicted 2038**	**Change (+/-)**	**Noise Impact**
R1 Residence	B	67	58	67	+9	Yes
R1a Residence	B	67	58	66	+8	Yes
R2 Residence	B	67	54	62	+8	No
R3 Residence	B	67	61	66	+5	Yes
P1 Park	C	67	47	56	+9	No
R4 Residence	B	67	63	68	+5	Yes
R4a Residence	B	67	51	58	+7	No
R5 Residence	B	67	55	61	+6	No
R6 Residence	B	67	52	59	+7	No
R7 Residence	B	67	50	57	+7	No
R8 Residence	B	67	49	57	+8	No
R9 Residence	B	67	53	60	+7	No
R10 Residence	B	67	57	65	+8	No
R11 Residence	B	67	57	66	+9	Yes
R12 Residence	B	67	55	63	+8	No
R13 Residence	B	67	51	58	+7	No
R14 Residence	B	67	53	61	+8	No
R15 Residence	B	67	54	62	+8	No
R16 Residence	B	67	56	64	+8	No
R17 Residence	B	67	53	60	+7	No
R17a Residence	B	67	54	63	+9	No
R18 Residence	B	67	58	67	+9	Yes
R19 Residence	B	67	55	63	+4	No
R20 Residence	B	67	59	67	+8	Yes
R21 Residence	B	67	59	68	+9	Yes

TRAFFIC NOISE LEVELS (dBA Leq)						
Receiver	**NAC Category**	**NAC Level**	**Existing 2018**	**Predicted 2038**	**Change (+/-)**	**Noise Impact**
R22 Residence	B	67	54	61	+7	No
R23 Residence	B	67	57	64	+7	No
R24 Residence	B	67	56	65	+9	No
R25 Residence	B	67	57	64	+7	No
R26 Residence	B	67	56	64	+8	No
R27 Residence	B	67	54	61	+7	No
R28 Residence	B	67	56	64	+8	No
R29 Residence	B	67	52	60	+8	No
R30 Residence	B	67	55	62	+7	No
R31 Residence	B	67	52	59	+7	No
R32 Residence	B	67	55	64	+9	No
R33 Residence	B	67	59	66	+7	Yes
R34 Residence	B	67	58	67	+9	Yes
R35 Residence	B	67	60	69	+9	Yes
R36 Residence	B	67	56	63	+7	No
R37 Residence	B	67	58	66	+8	Yes
R38 Residence	B	67	54	64	+10	No
R39 Residence	B	67	60	65	+5	No
R40 Residence*	B	67	60	61	+1	No
R40a Residence*	B	67	60	67	+7	Yes
R41 Residence	B	67	52	62	+10	No
R42 Residence	B	67	57	65	+8	No
R43 Residence	B	67	55	63	+8	No
R44 Residence	B	67	53	62	+9	No
R45 Residence	B	67	55	63	+8	No
R46 Residence	B	67	55	62	+7	No
R47 Residence	B	67	54	63	+9	No
R48 Residence	B	67	57	64	+7	No

TRAFFIC NOISE LEVELS (dBA Leq)						
Receiver	**NAC Category**	**NAC Level**	**Existing 2018**	**Predicted 2038**	**Change (+/-)**	**Noise Impact**
C1 Church	D	52	43	51	+8	Yes
R49 Residence	B	67	60	66	+6	Yes
R50 Residence*	B	67	52	67	+15	Yes
R51 Residence*	B	67	52	66	+14	Yes
R52 Residence*	B	67	54	67	+13	Yes
R53 Residence*	B	67	54	68	+14	Yes
R54 Residence*	B	67	54	57	+3	No
R55 Residence*	B	67	65	64	-1	No
R56 Residence*+	B	67	68	68	0	Yes
C2 Cemetery*+	C	67	68	68	0	Yes

*Utilized ambient noise levels for existing

+Utilized decibel addition of ambient and modeled noise levels for the predicted condition

As indicated in **Table 4**, the proposed project would result in a traffic noise impacts at 21 of the 63 total receivers. The following noise abatement measures were considered: traffic management, alteration of horizontal and/or vertical alignments, acquisition of undeveloped property to act as a buffer zone, and the construction of noise barriers.

Before any abatement measure can be proposed for incorporation into the project, it must be both feasible and reasonable. In order to be "feasible," the abatement measure must be able to reduce the noise level at greater than 50 percent of impacted, first row receivers by at least five dB(A); and to be "reasonable," it must not exceed the cost-effectiveness criterion of $25,000 for each receiver that would benefit by a reduction of at least five dBA and the abatement measure must be able to reduce the noise level at least one impacted, first row receiver by at least seven dBA.

Traffic management: Control devices could be used to reduce the speed of the traffic; however, the minor benefit of one dBA per five mph reduction in speed does not outweigh the associated increase in congestion and air pollution. Other measures such as time or use restrictions for certain vehicles are prohibited on state highways.

Alteration of horizontal and/or vertical alignments: Any alteration of the existing alignment would displace existing businesses and residences, require additional ROW and not be cost effective/reasonable.

Buffer zone: the acquisition of undeveloped property to act as a buffer zone is designed to avoid rather than abate traffic noise impacts and, therefore, is not feasible.

Noise barriers: This is the most commonly used noise abatement measure. Noise barriers were evaluated for each of the impacted receiver locations.

Noise Barriers would not be feasible and reasonable for any of the following impacted receivers and, therefore, are not proposed for incorporation into the project:

R1: This receiver represents one residence at the southeast intersection of Nolana Loop and FM 1426 (Raul Longoria Road) with a driveway facing the roadway. A continuous noise barrier would restrict access to this residence. Gaps in a noise barrier would satisfy access requirements, but the resulting non-continuous barrier segments would not be sufficient to achieve the minimum, feasible reduction of seven dBA at one receiver. Based on preliminary calculations, a noise barrier up to 14 feet in height would not be sufficient to achieve the minimum, feasible reduction of seven dBA at one receiver. A barrier at this location would not be feasible or reasonable.

R1a: This receiver represents one residence at the northeast intersection of Nolana Loop and FM 1426 (Raul Longoria Road). Based on preliminary calculations, a noise barrier approximately 10 feet in height would reduce noise levels by at least seven dBA at one receiver; however, the barrier would cost $61,380 and exceed the $25,000 per benefitted receiver. A barrier at this location would be feasible; however, would not be reasonable.

R3: This receiver represents three residences at the Jenica/Jesenia Subdivision. Based on preliminary calculations, a noise barrier approximately 14 feet in height would reduce noise levels by at least seven dBA at one receiver and by at least five dBA for greater than 50 percent of the adjacent receivers. The barrier would cost $132,804 per benefitted receiver and exceed the cost of $25,000 per benefited receiver. A barrier at this location would be feasible; however, would not be reasonable.

R4: This receiver represents two residences with driveways facing the roadway. A continuous noise barrier would restrict access. Gaps in a noise barrier would satisfy access requirements but the resulting non-continuous barrier segments would not be sufficient to achieve the minimum feasible reduction of seven dBA at one receiver and by at least five dBA for greater than 50 percent of the adjacent receivers. A barrier at this location would be neither feasible nor reasonable.

R11: This receiver represents two residences at the Las Maribels Subdivision. Based on preliminary calculations, a noise barrier up to 20 feet in height would not achieve the reduction of seven dBA at one receiver and by at least five dBA for greater than 50 percent of the adjacent receivers. A barrier at this location would be neither feasible nor reasonable.

R18, R20, & R21: These receivers represent a total of six residences in the Overland Park Subdivision. Based on preliminary calculations, a noise barrier approximately 10 feet in height would achieve the reduction by at least seven dBA at one receiver and by at least five dBA for greater than 50 percent of the adjacent receivers. The barrier would cost $206,460 and exceed the $25,000 per benefited receiver. A barrier at this location would be feasible; however, would not be reasonable.

R33: This receiver represents three residences with driveways facing the roadway. A continuous noise barrier would restrict access to these residences. Gaps in a noise barrier would satisfy access requirements but the resulting non-continuous barrier segments would not be sufficient to achieve the minimum feasible reduction of seven dBA at one receiver and by at least five dBA for greater than 50 percent of the adjacent receivers. A barrier at this location would be neither feasible nor reasonable.

R34, 35, & 37: These receivers represent a total of 20 residences in the Goolie Meadows Park Subdivision. Because all of the representative receivers within the neighborhood had predicted noise impacts, a noise barrier was analyzed for the length of the subdivision. A three-sectioned noise barrier, with existing roadway points, was analyzed. Based on preliminary calculations, a noise barrier approximately 10 feet in height would achieve the reduction by at least seven dBA at one receiver and by at least five dBA at greater than 50 percent of the adjacent receivers. Of the total 20 residences, 17 would be benefited. The barrier would cost $514,818 and exceed $25,000 per benefited receiver. A barrier at this location would be feasible; however, would not be reasonable.

R40a: This receiver represents one residence. Based on preliminary calculations, a noise barrier approximately 12 feet in height would reduce noise levels by at least seven dBA at one receiver. The barrier would cost $66,960 and would exceed $25,000 per benefitted receiver. A barrier at this location would be feasible; however, would not be reasonable.

C1: This receiver represents one church located at the intersection of FM 493 and Mile 11 ½ North Road in the Cheyenne subdivision. Based on preliminary calculations, a noise barrier up to 20 feet in height would not reduce noise levels by at least seven dBA at one receiver. A noise barrier at this location would not be feasible or reasonable.

R49: This receiver represents one residence with a driveway facing the roadway. A continuous noise barrier would restrict access. Gaps in a noise barrier would satisfy access requirements, but the resulting non-continuous barrier segments would not be sufficient to achieve the minimum feasible reduction of at least seven dBA at one receiver. A noise barrier at this location would not be feasible or reasonable.

R52 & R53: These receivers represent a total of six residences in the Victoria Groves subdivision. Because both the receivers are located within one neighborhood, two barriers were analyzed; one on the north side (3 residences) of the roadway and one on the south side (3 residences). A noise barrier approximately eight feet in height would achieve the reduction by at least seven dBA at one receiver and by least five dBA for greater than 50 percent of the adjacent receivers. The barrier would cost $181,440 and exceed $25,000 per benefited receiver. A barrier at this location would be feasible; however, it would not be reasonable.

C2 & R59: These receivers represent one cemetery and one residence. Based on preliminary calculations, a noise barrier approximately 14 feet in height would reduce noise levels by at least seven dBA at one receiver. The barrier would cost $302,400 and would exceed $25,000 per benefitted receiver. A barrier at this location would be feasible; however, would not be reasonable.

Noise barriers would be feasible and reasonable for the following impacted receivers and are proposed to be incorporated into the project:

R50 & R51: These receivers represent a total of 16 residences in the Hopi Estates Subdivision adjacent to the proposed project just west of Victoria Road. Because all of the representative receivers within the neighborhood had predicted noise impacts, a noise barrier was analyzed for the length of the subdivision. Based on preliminary calculations, a noise barrier approximately 12 feet in height and 1,303 feet in length would reduce noise levels by at least seven dBA at one receiver and by at least five dBA for greater than 50 percent of the adjacent receivers. Of the total 16 residences, 15 would be benefited. The total cost of the barrier is $281,448, or $18,763 per benefited receiver. The barrier would not exceed $25,000 per benefited receiver; therefore, the barrier is feasible and reasonable.

Table 6 shows the information for the proposed barrier that is reasonable and feasible. See **Figure 5** for the location of the noise barrier.

Table 6: Noise Barrier Proposal (Preliminary)

Barrier	Representative Receiver(s)	Total # Benefited	Length (feet)	Height (feet)	Total Cost	$/Benefited Receiver
Hopi Estates						
1	R50 & R51	15	1,303	12	$281,448	$18,763

Any subsequent project design changes may require a re-evaluation of this preliminary noise barrier proposal. The final decision to construct the proposed noise barriers would not be made until completion of the project design, utility evaluation, and polling of adjacent property owners.

To avoid noise impacts that may result from future development of properties adjacent to the project, local officials responsible for land use control programs should ensure, to the maximum extent possible, no new activities are planned or constructed along or within the following predicted (2038) noise impact contours (See **Table 7**).

Table 7: Traffic Noise Contour

Land Use	Impact	Distance from ROW
Residential (B)	66 dB(A)	55 feet
Other Developed (E)	71 dB(A)	5 feet

Noise associated with the construction of the project is difficult to predict. Heavy machinery, the major source of noise in construction, is constantly moving in unpredictable patterns. However, construction normally occurs during daylight hours when occasional loud noises are more tolerable. None of the receivers are expected to be exposed to construction noise for a long duration; therefore, any extended disruption of normal activities is not expected. Provisions would be included in the plans and specifications that require the contractor to make every reasonable effort to minimize construction noise through abatement measures such as work-hour controls and proper maintenance of muffler systems.

A copy of this traffic noise analysis will be available to local officials. On the date of approval of this document (Date of Public Knowledge), Hidalgo County, FHWA, and TxDOT are no longer responsible for providing noise abatement for new development adjacent to the project.

This report was written on behalf of the Texas Department of Transportation by

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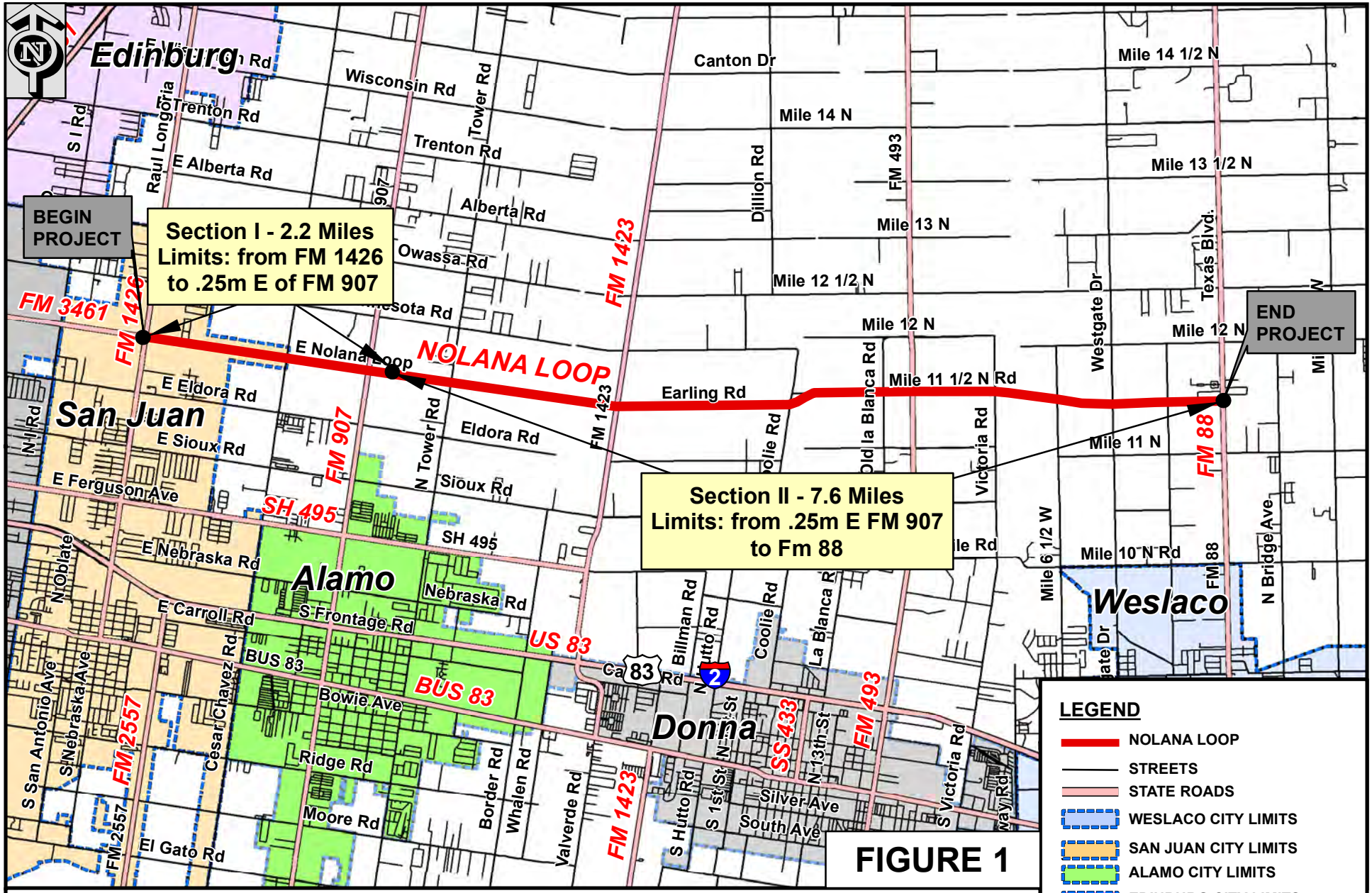

FIGURE 1

NOLANA LOOP LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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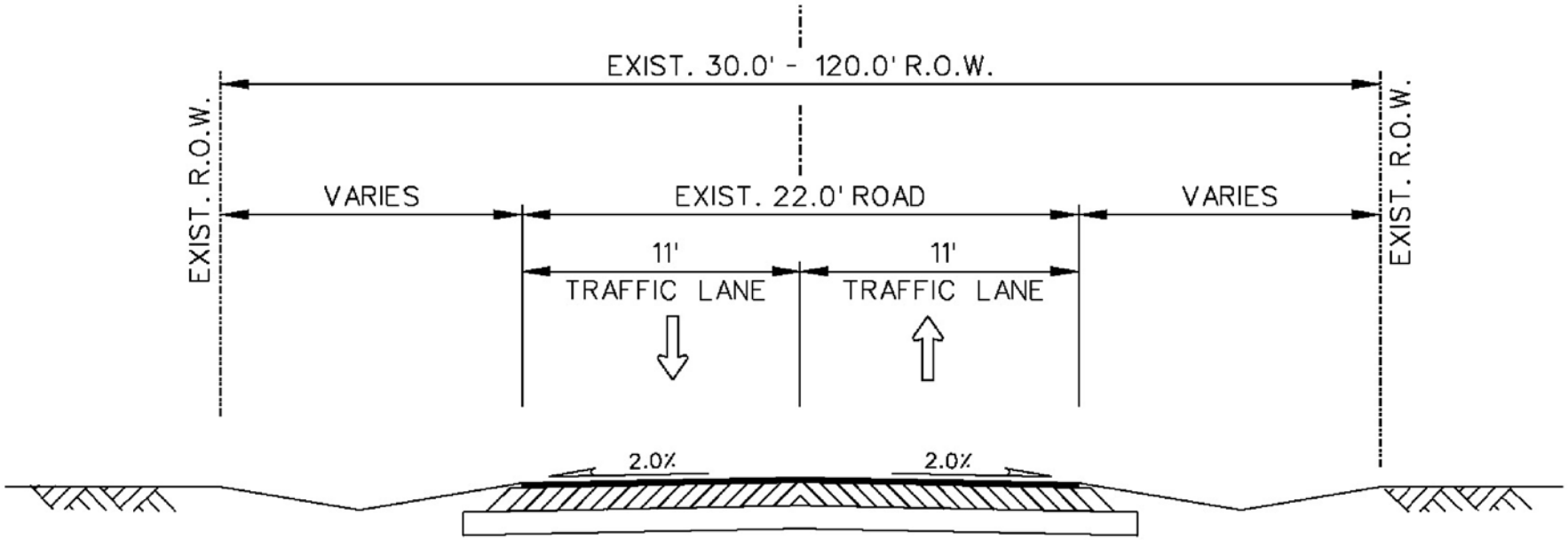

FIGURE 2

NOLANA LOOP EXISTING TYPICAL SECTION
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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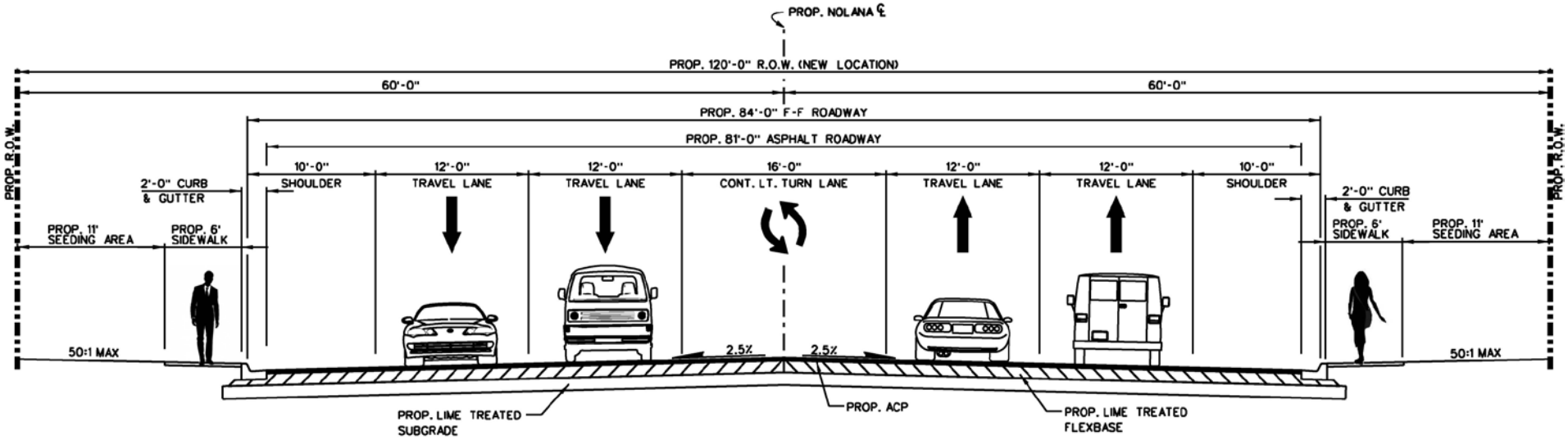

FIGURE 3

NOLANA LOOP PROPOSED TYPICAL SECTION
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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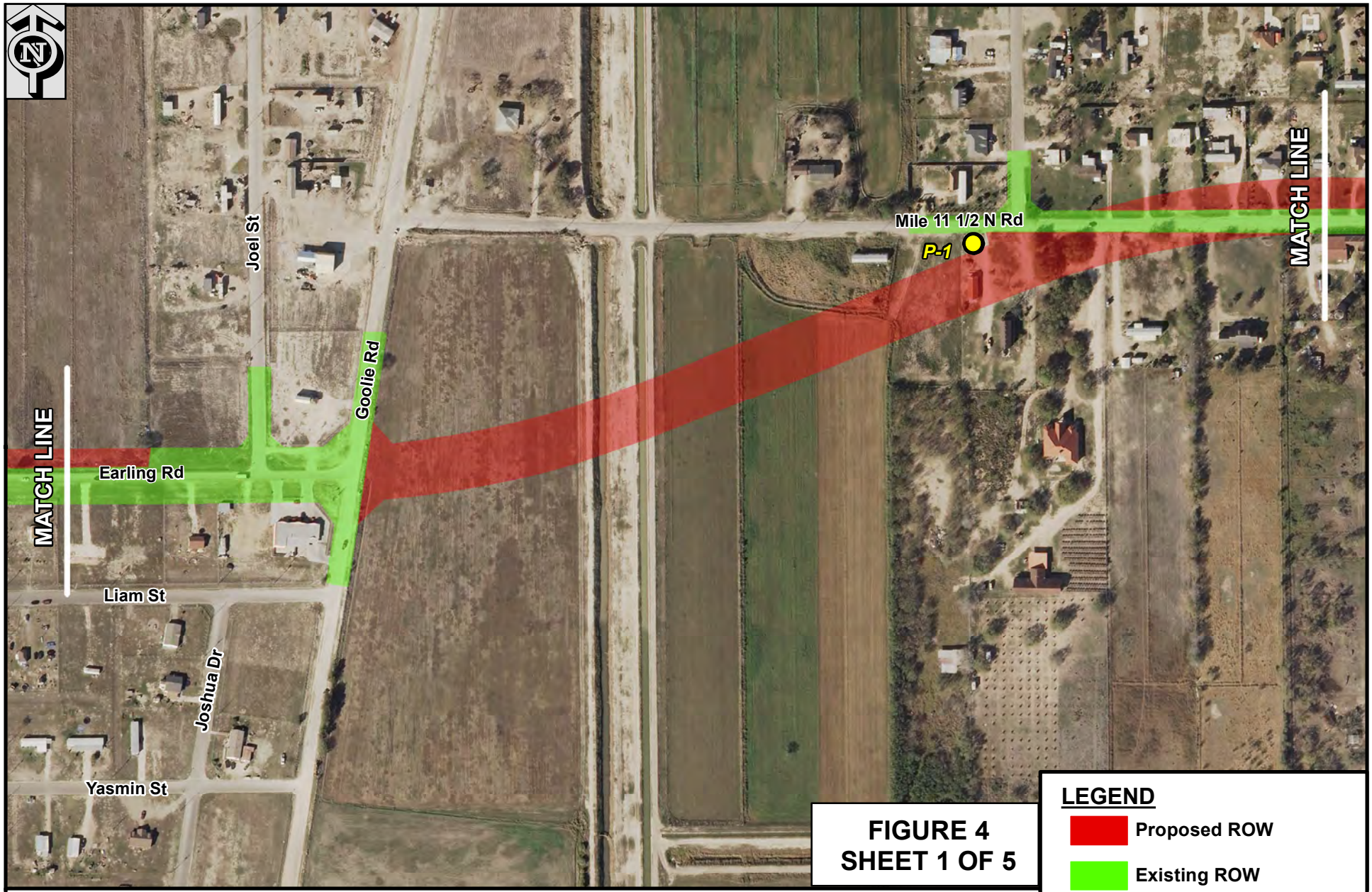

FIGURE 4
SHEET 1 OF 5

LEGEND

- Proposed ROW
- Existing ROW
- Noise Meter Point

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP AMBIENT SOUND LEVEL POINTS MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

THE COUNTY OF HIDALGO TEXAS

Texas Department of Transportation

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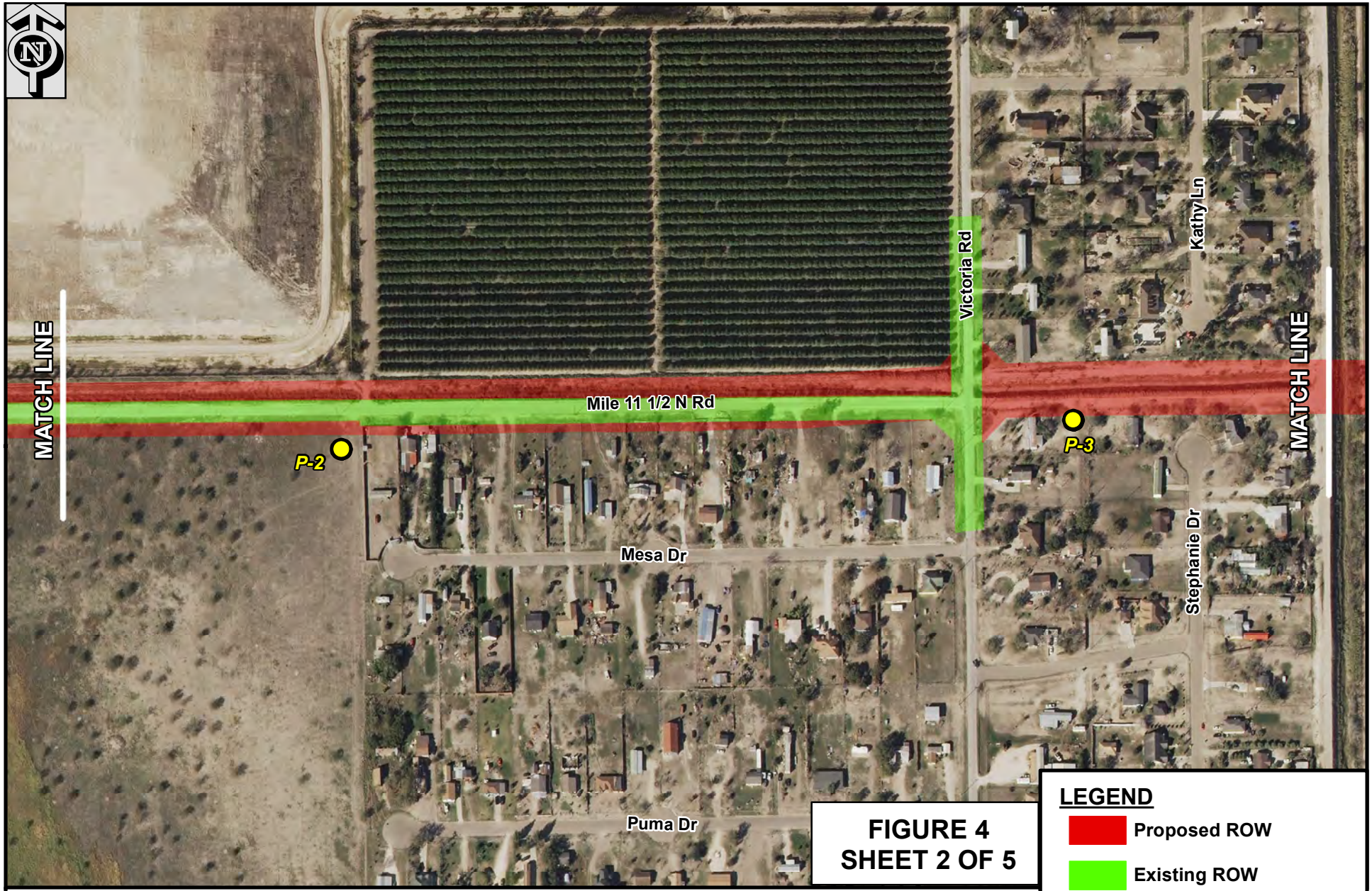

FIGURE 4
SHEET 2 OF 5

LEGEND

- Proposed ROW
- Existing ROW
- Noise Meter Point

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP AMBIENT SOUND LEVEL POINTS MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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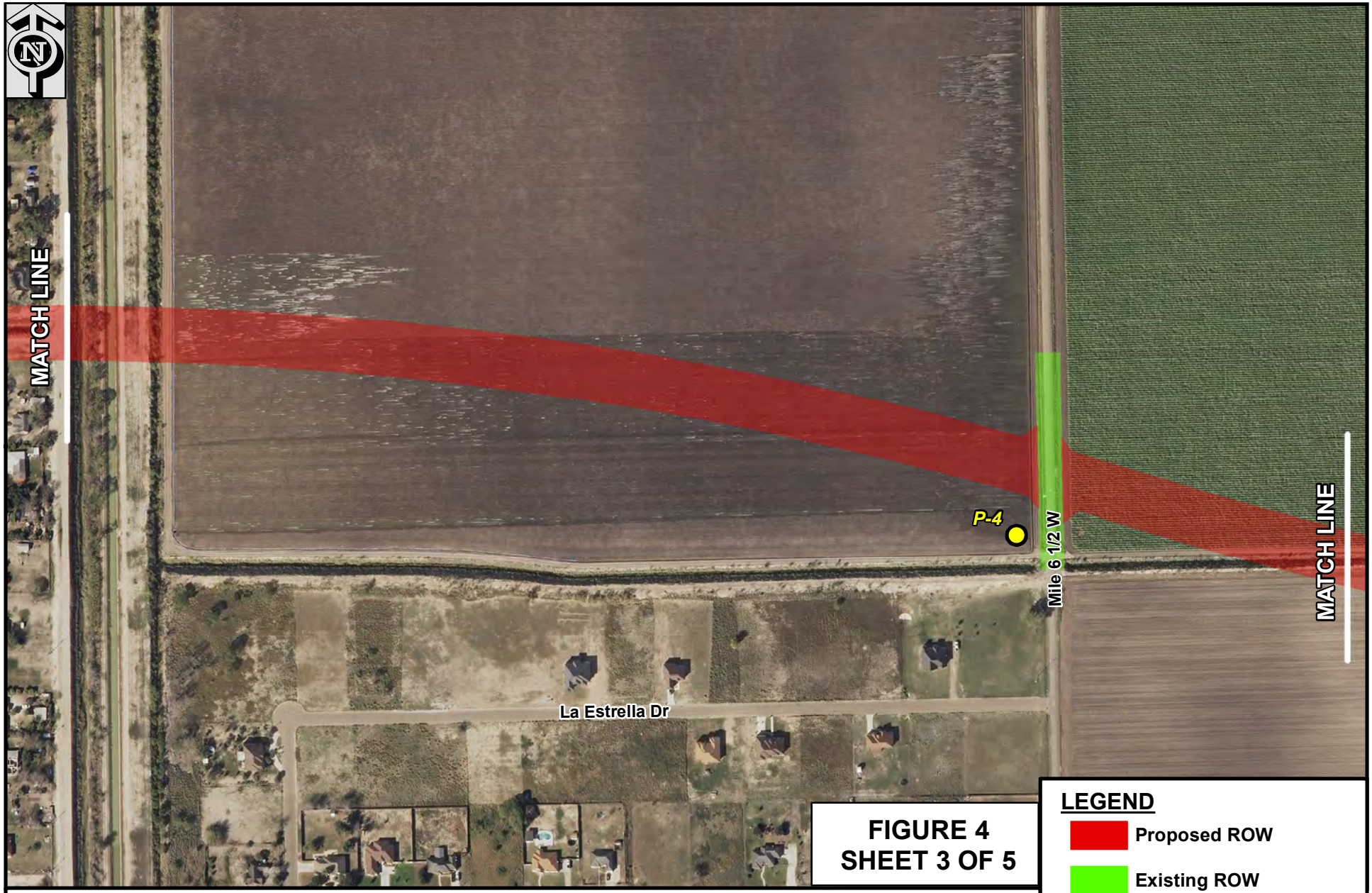

FIGURE 4
SHEET 3 OF 5

LEGEND

- Proposed ROW
- Existing ROW
- Noise Meter Point

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP AMBIENT SOUND LEVEL POINTS MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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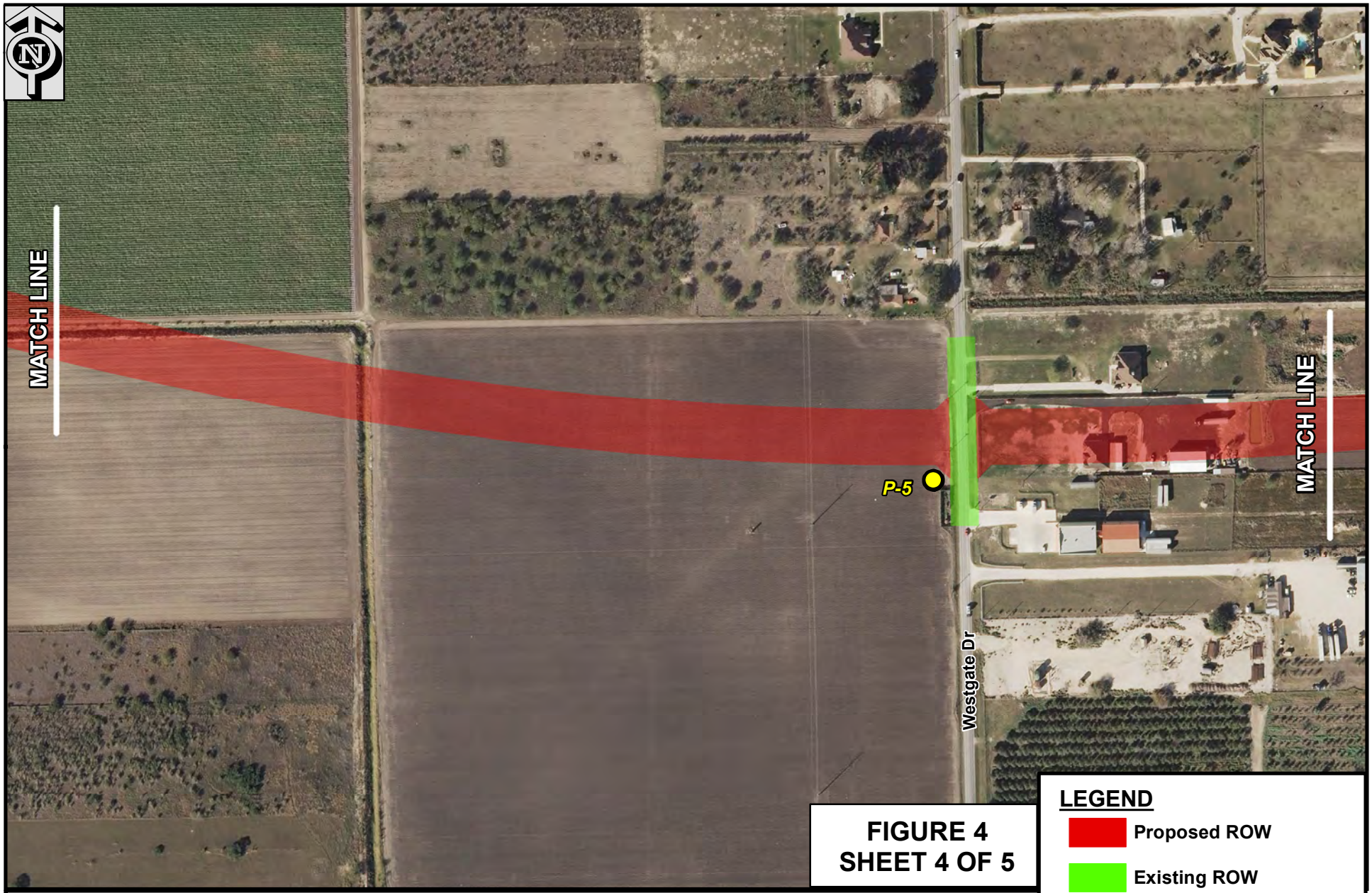

FIGURE 4
SHEET 4 OF 5

LEGEND

- Proposed ROW
- Existing ROW
- Noise Meter Point

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP AMBIENT SOUND LEVEL POINTS MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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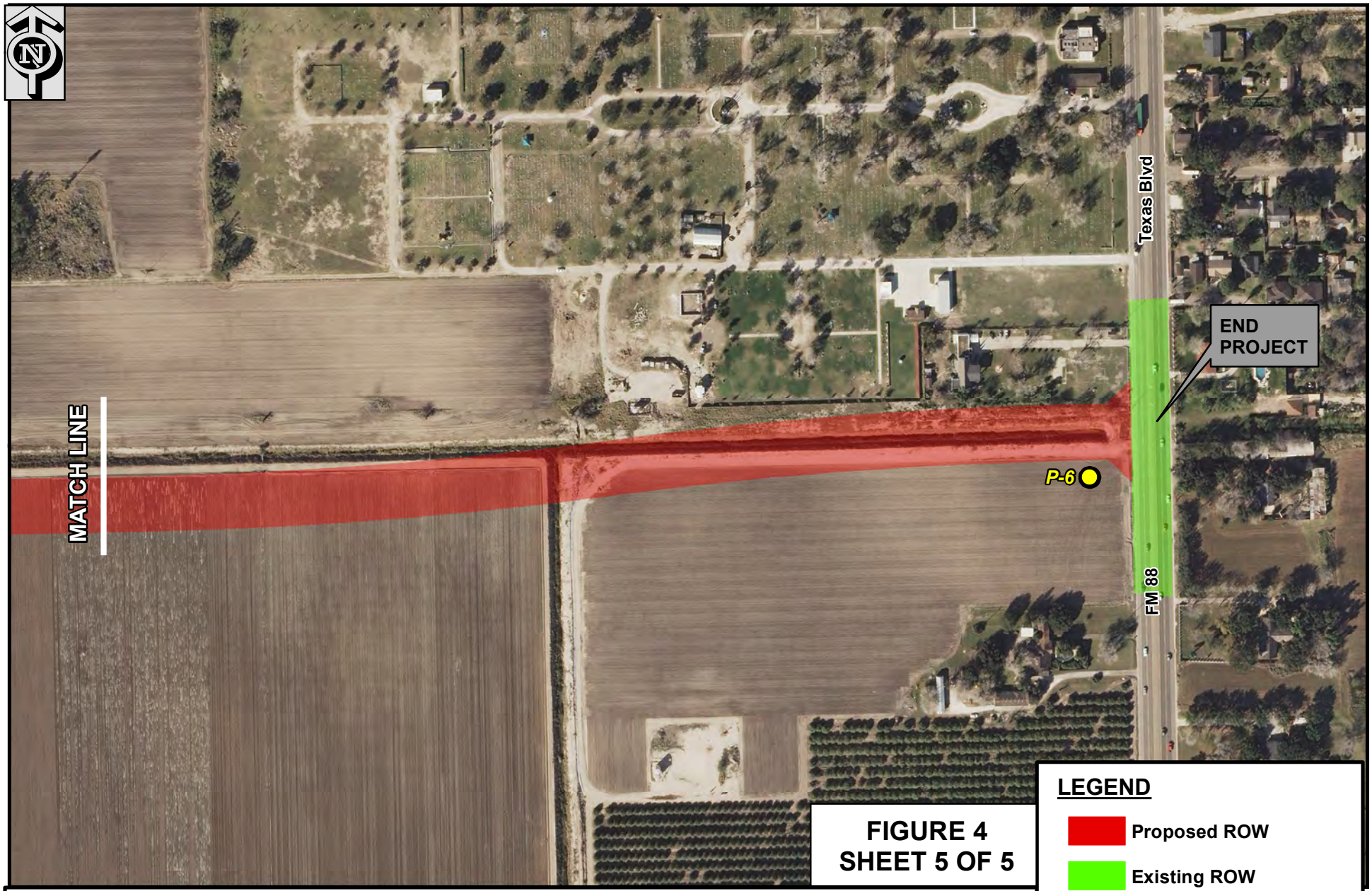

FIGURE 4
SHEET 5 OF 5

LEGEND

- Proposed ROW
- Existing ROW
- Noise Meter Point

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP AMBIENT SOUND LEVEL POINTS MAP

CSJ:0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

Document Path: G:\GIS I\PROJECTS\HIDALGO\NOLANA LOOP\2017\ENVIRONMENTAL\TECHNICAL REPORTS\NOISE\FIG 4-5 AMBIENT SOUND MAP.mxd

FIGURE 5
SHEET 1 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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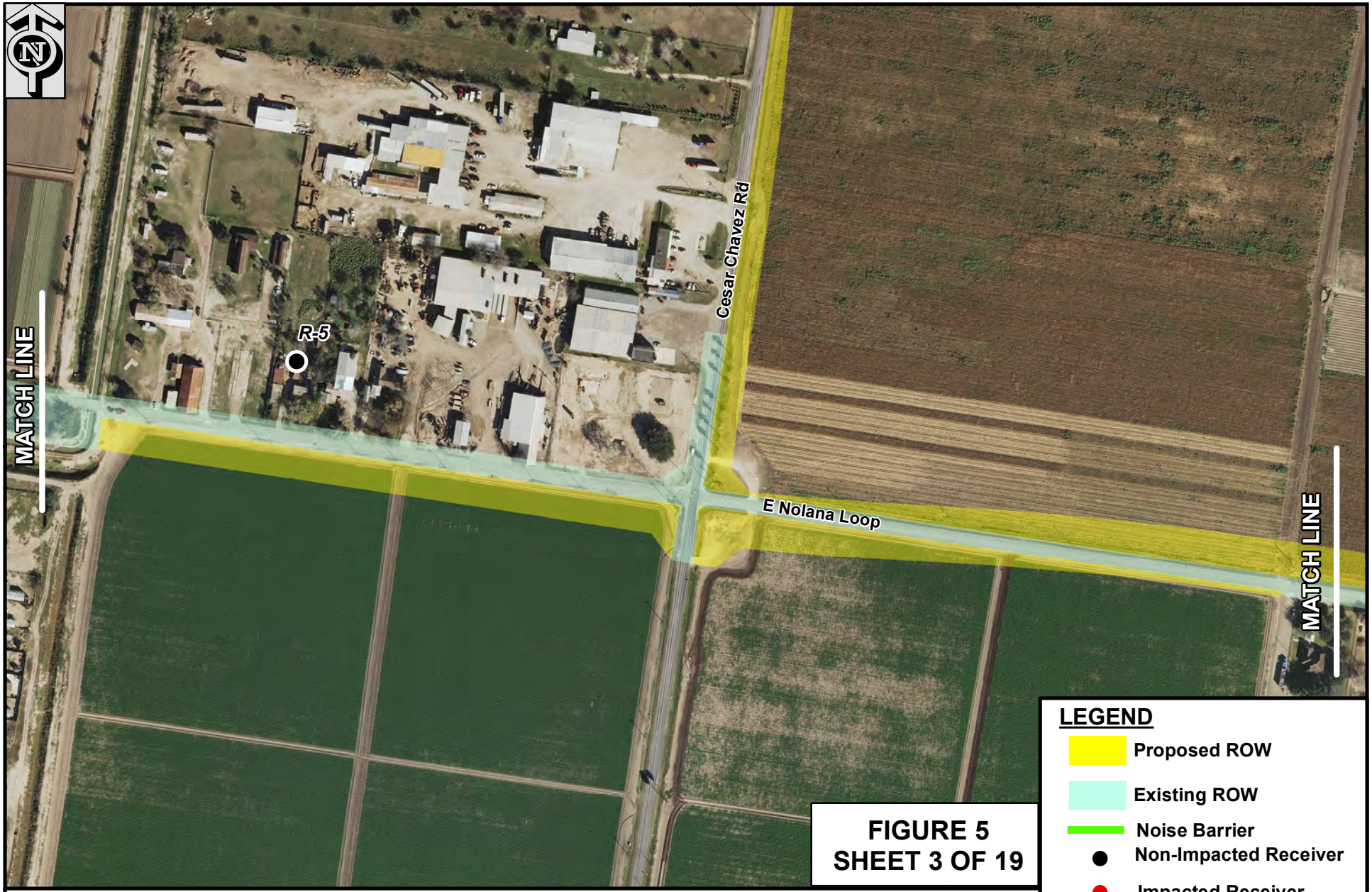

FIGURE 5
SHEET 3 OF 19

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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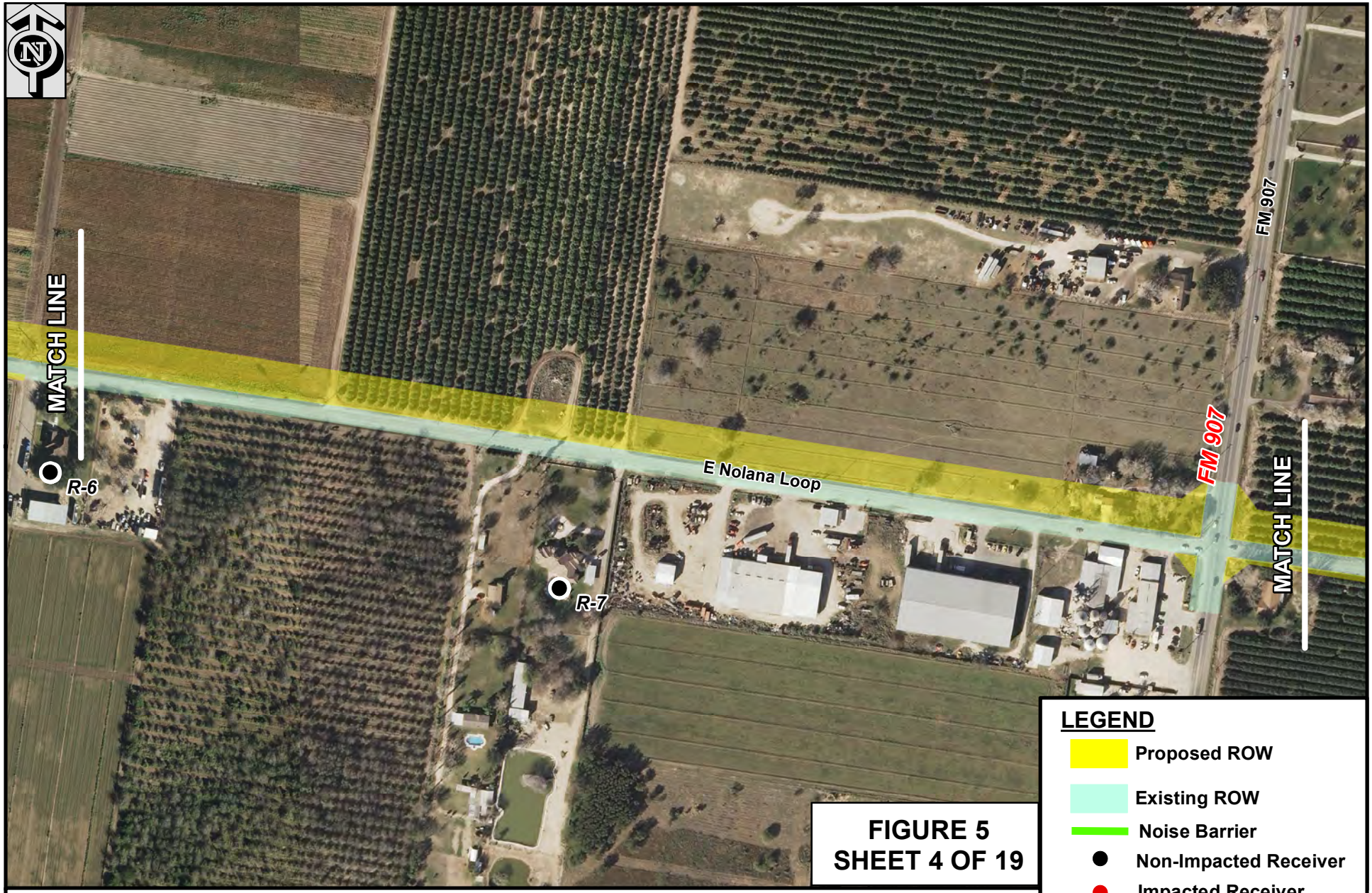

FIGURE 5
SHEET 4 OF 19

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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FIGURE 5
SHEET 5 OF 19

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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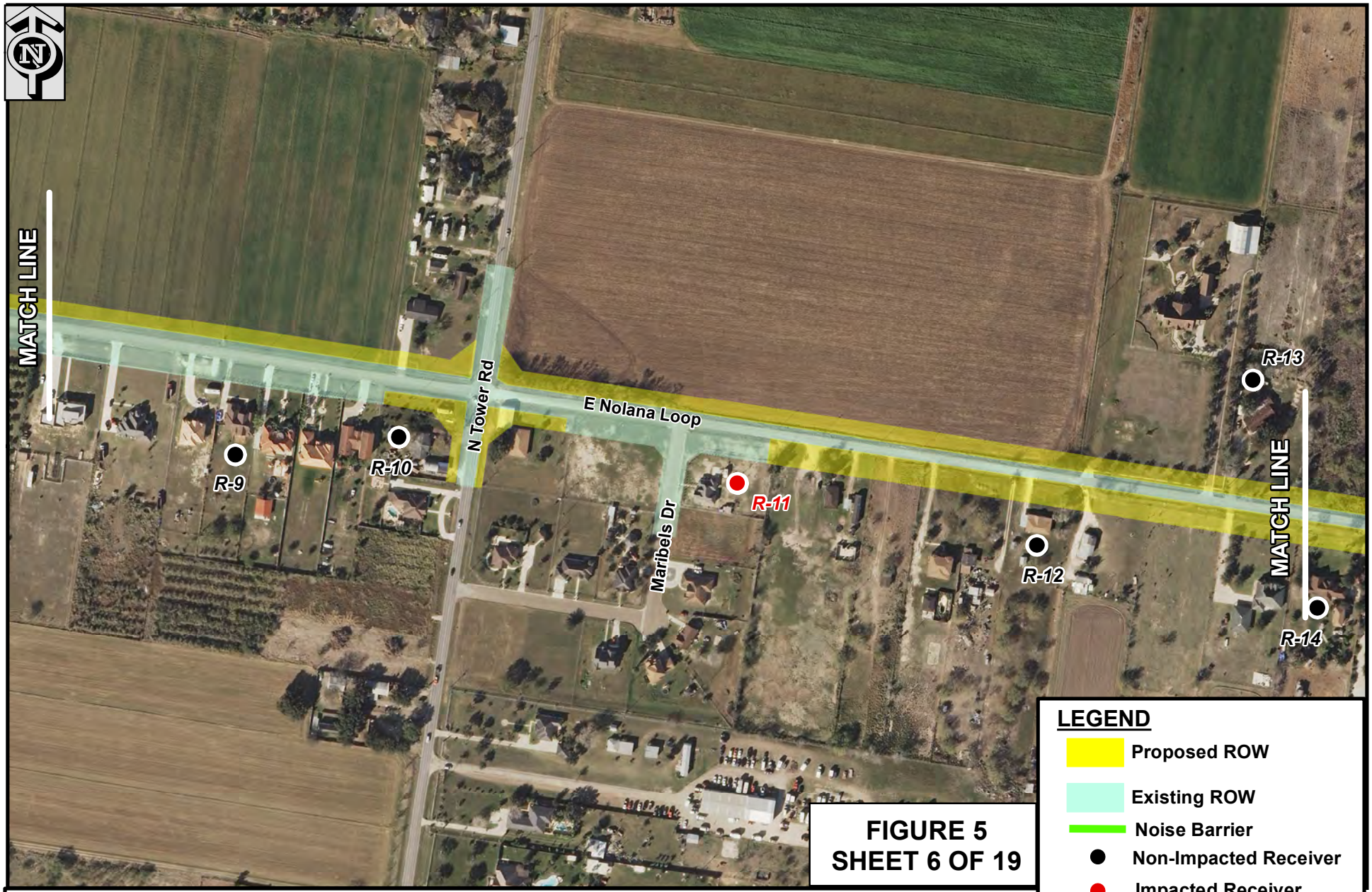

FIGURE 5
SHEET 6 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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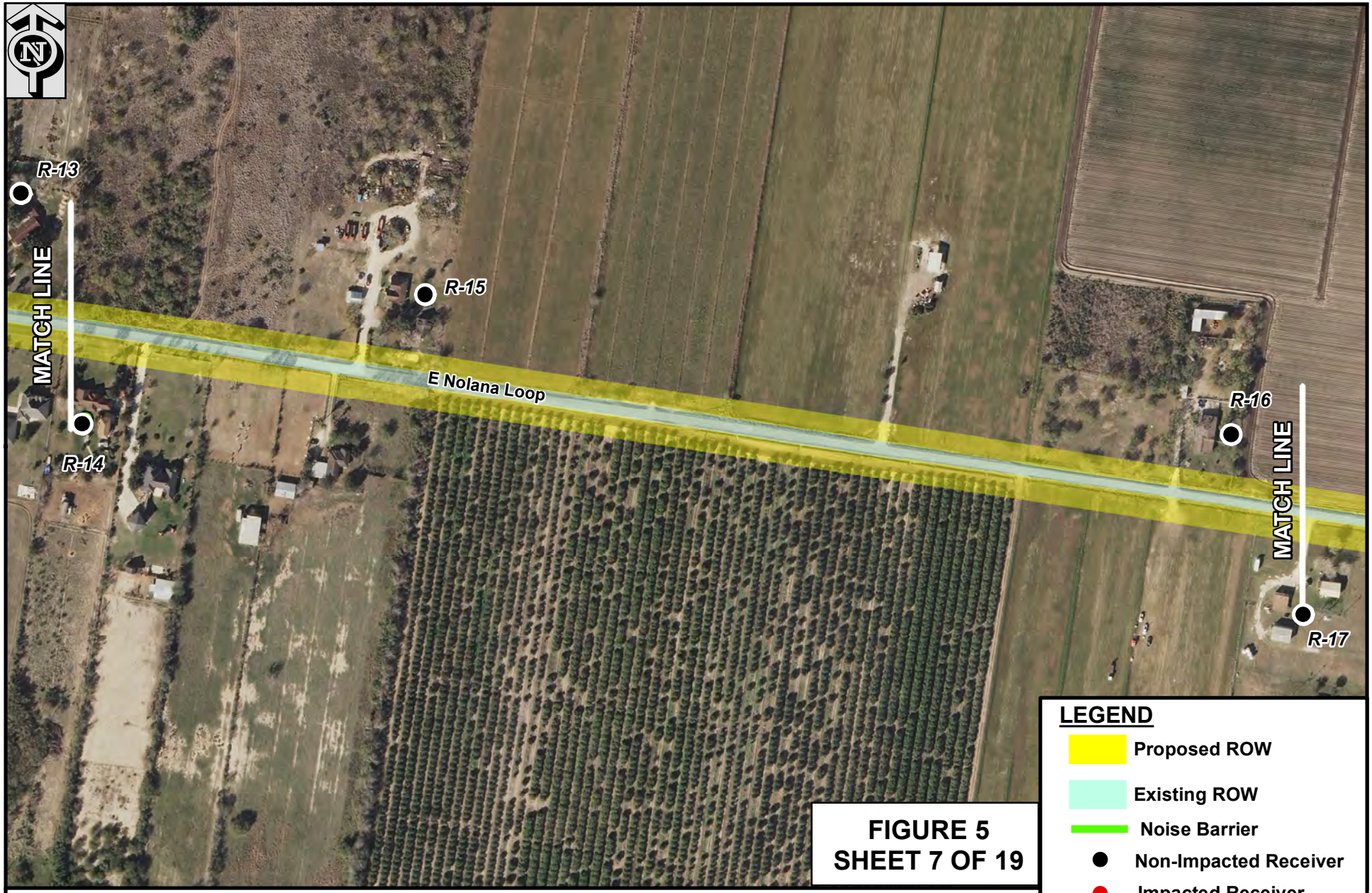

FIGURE 5
SHEET 7 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

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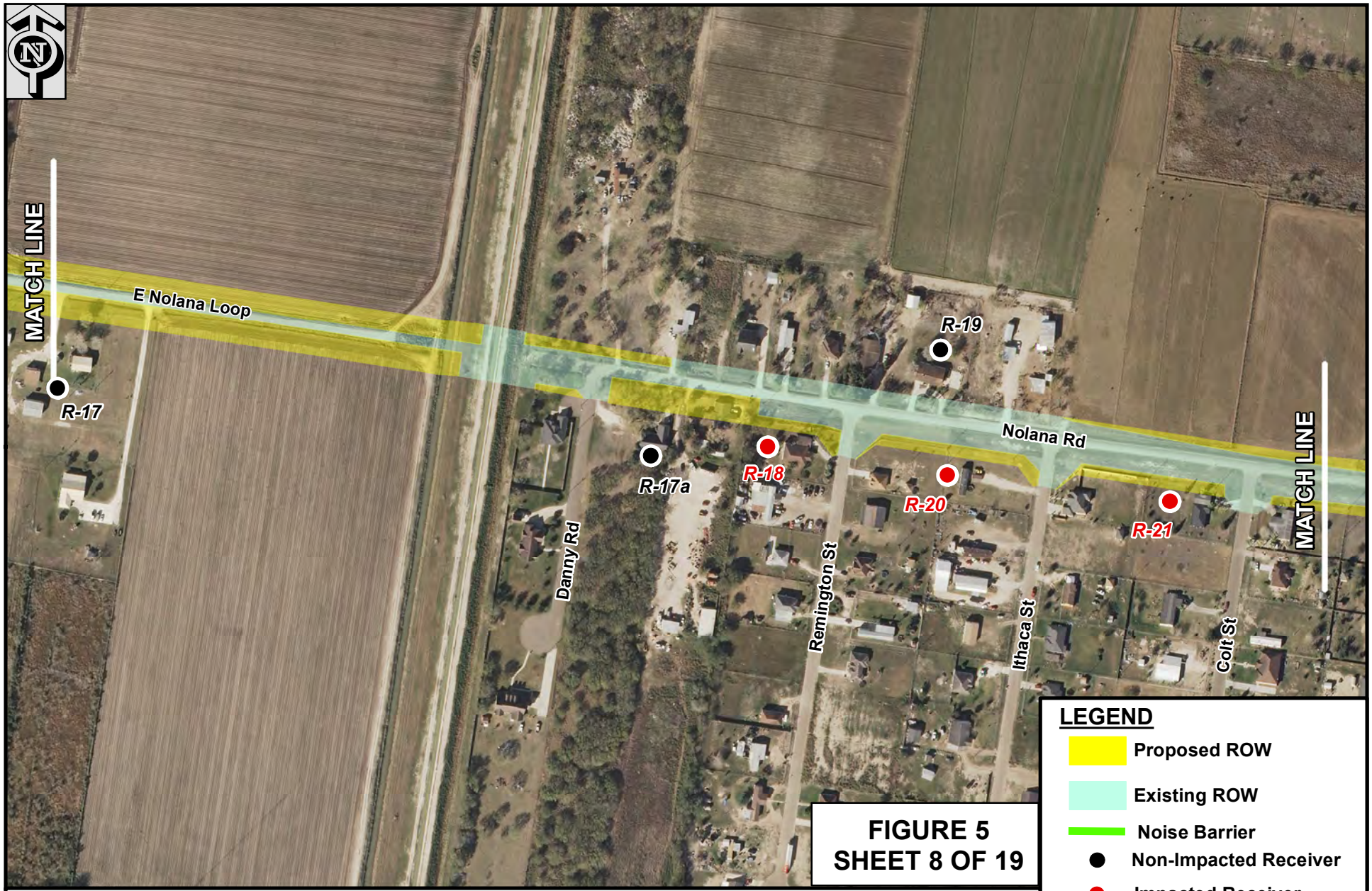

FIGURE 5
SHEET 8 OF 19

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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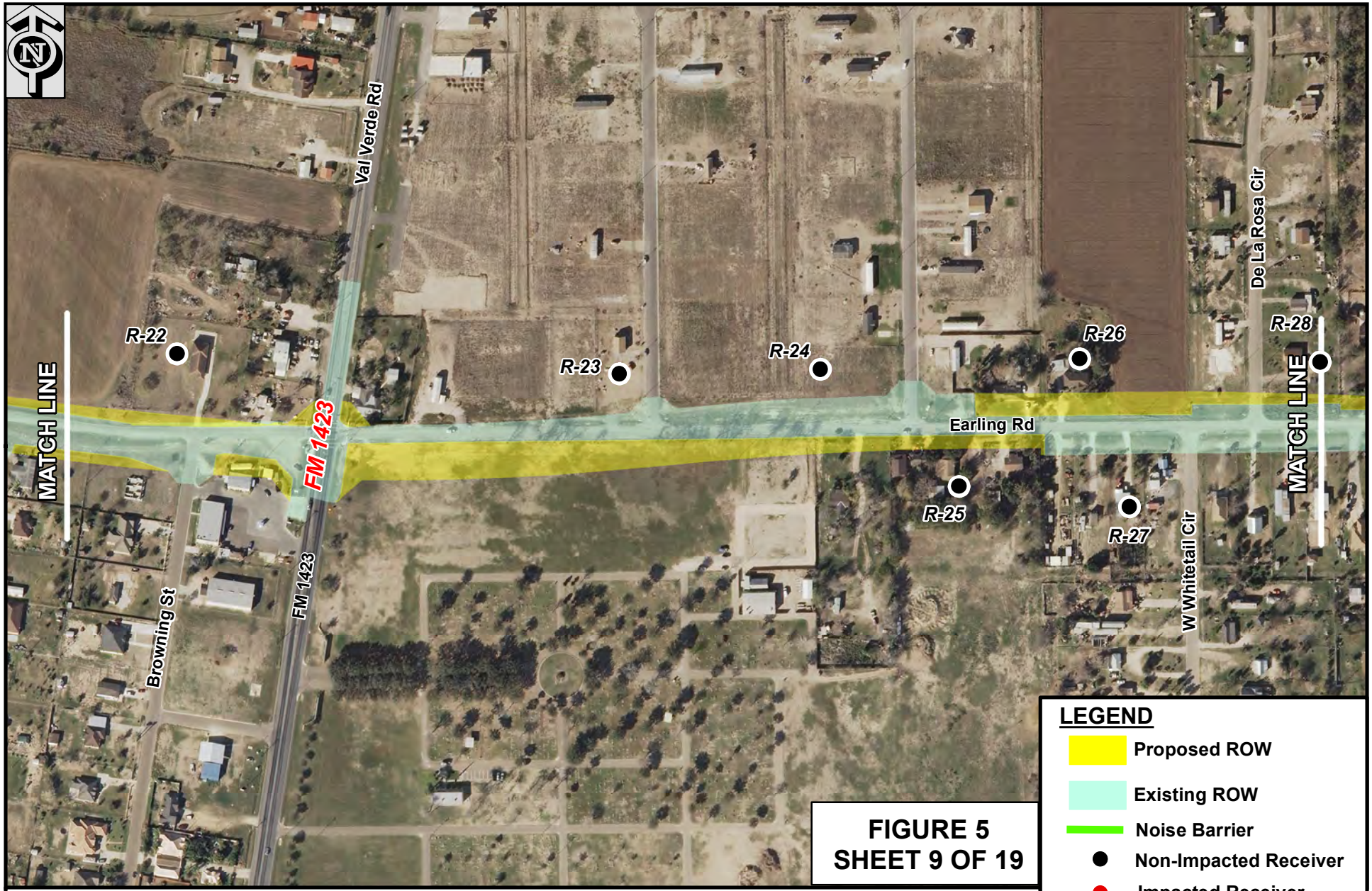

FIGURE 5
SHEET 9 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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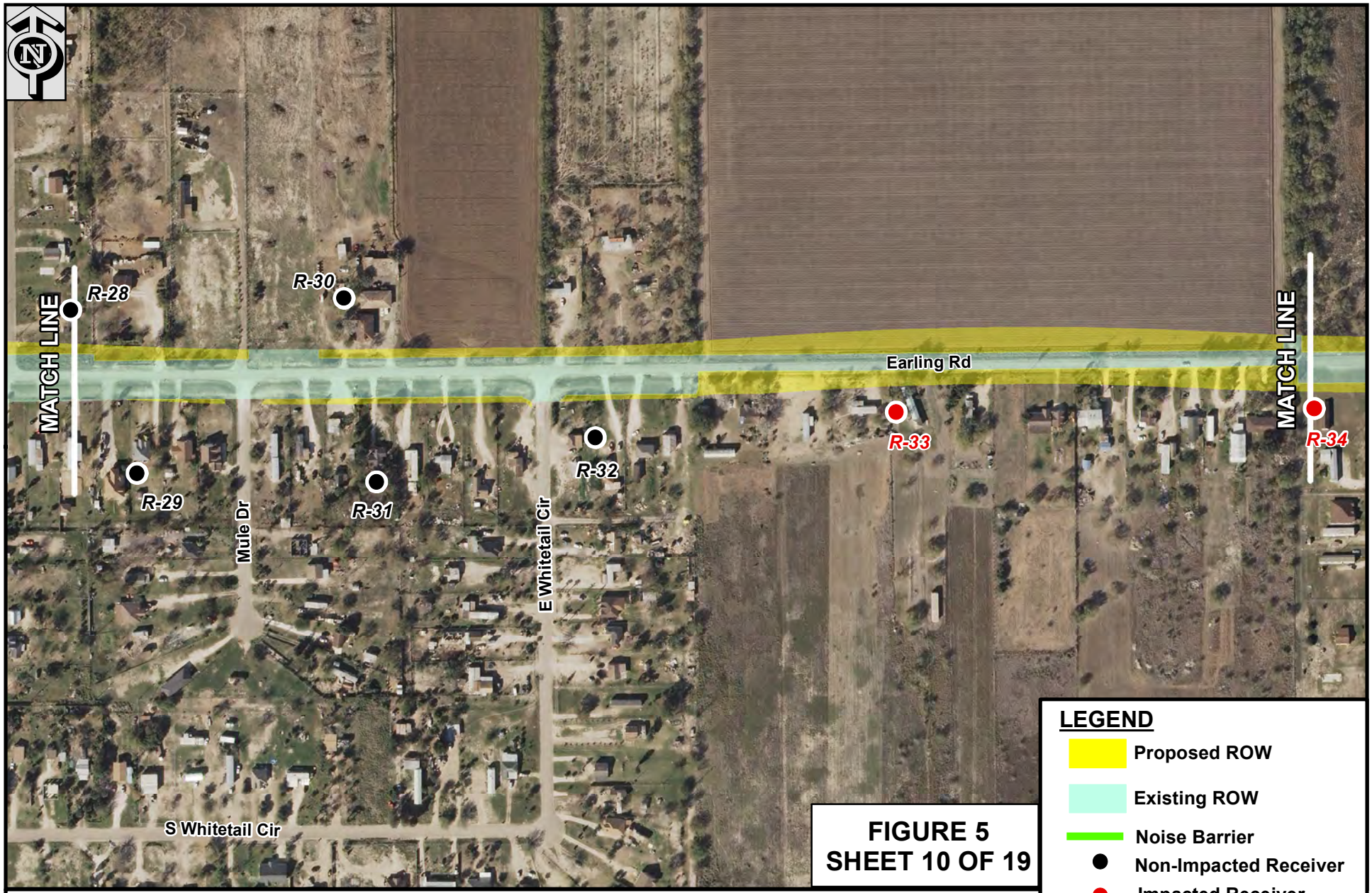

FIGURE 5
SHEET 10 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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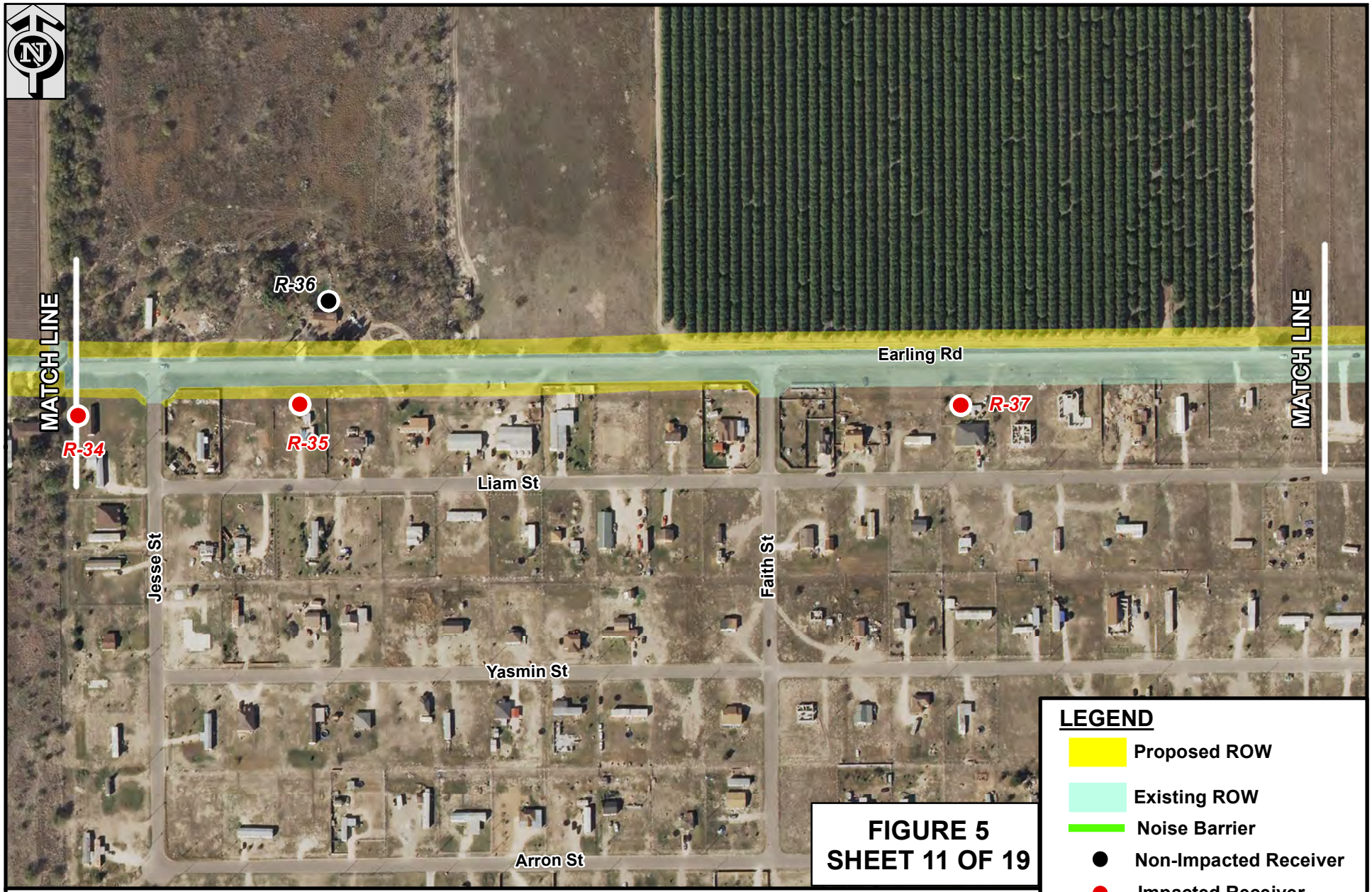

FIGURE 5
SHEET 11 OF 19

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

Texas Department of Transportation

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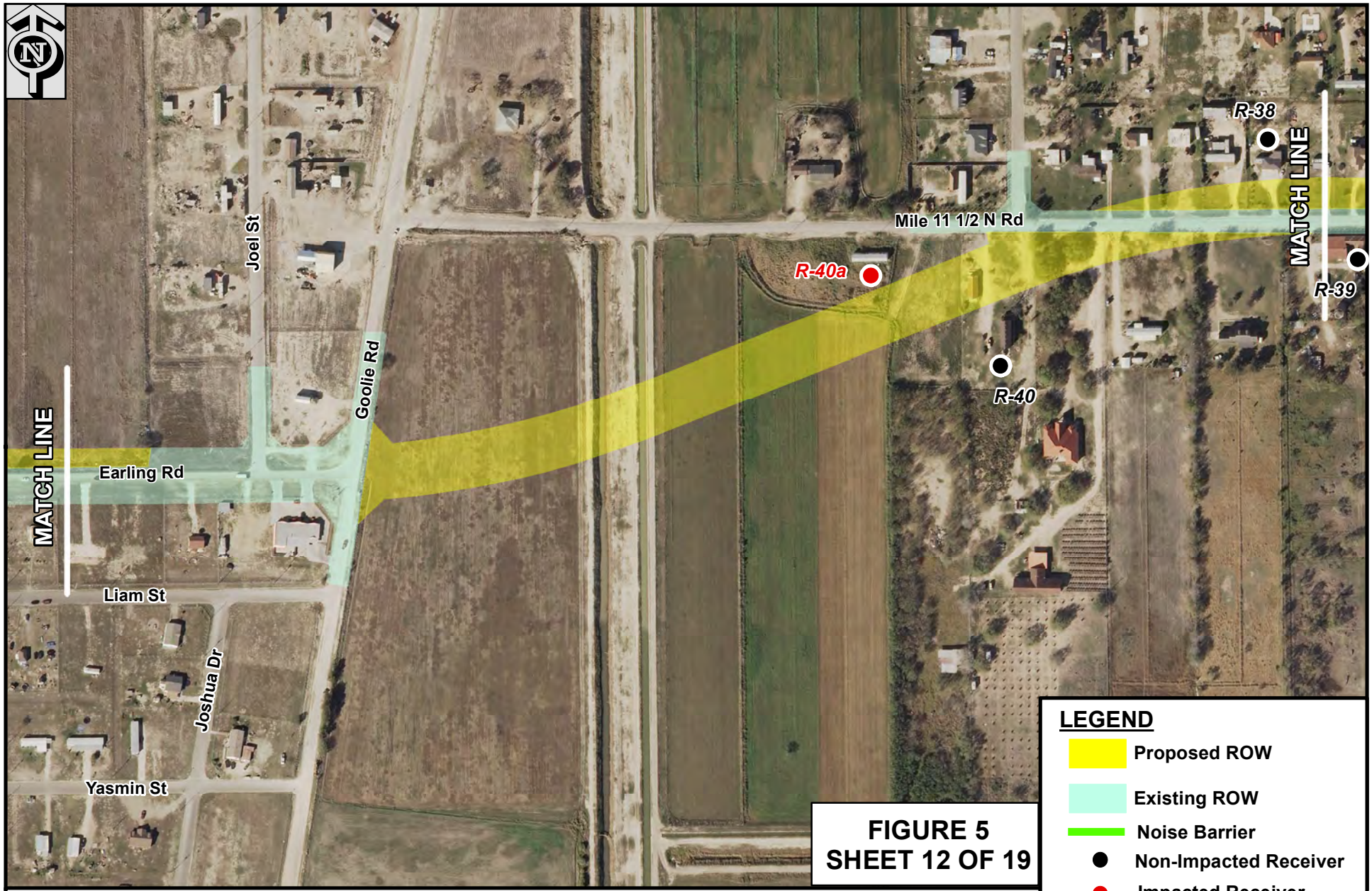

FIGURE 5
SHEET 12 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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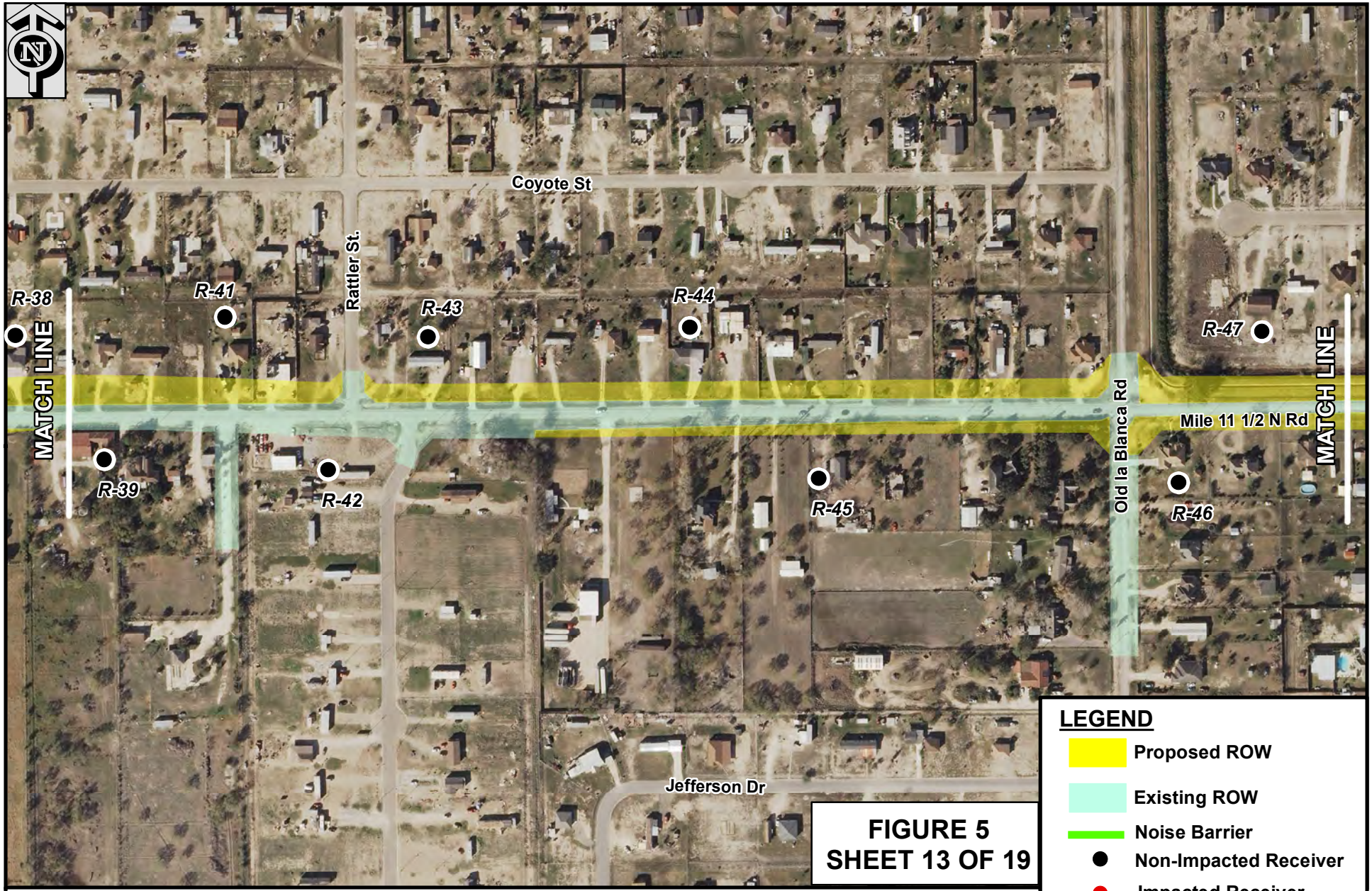

NOLANA LOOP NOISE RECEIVER LOCATION MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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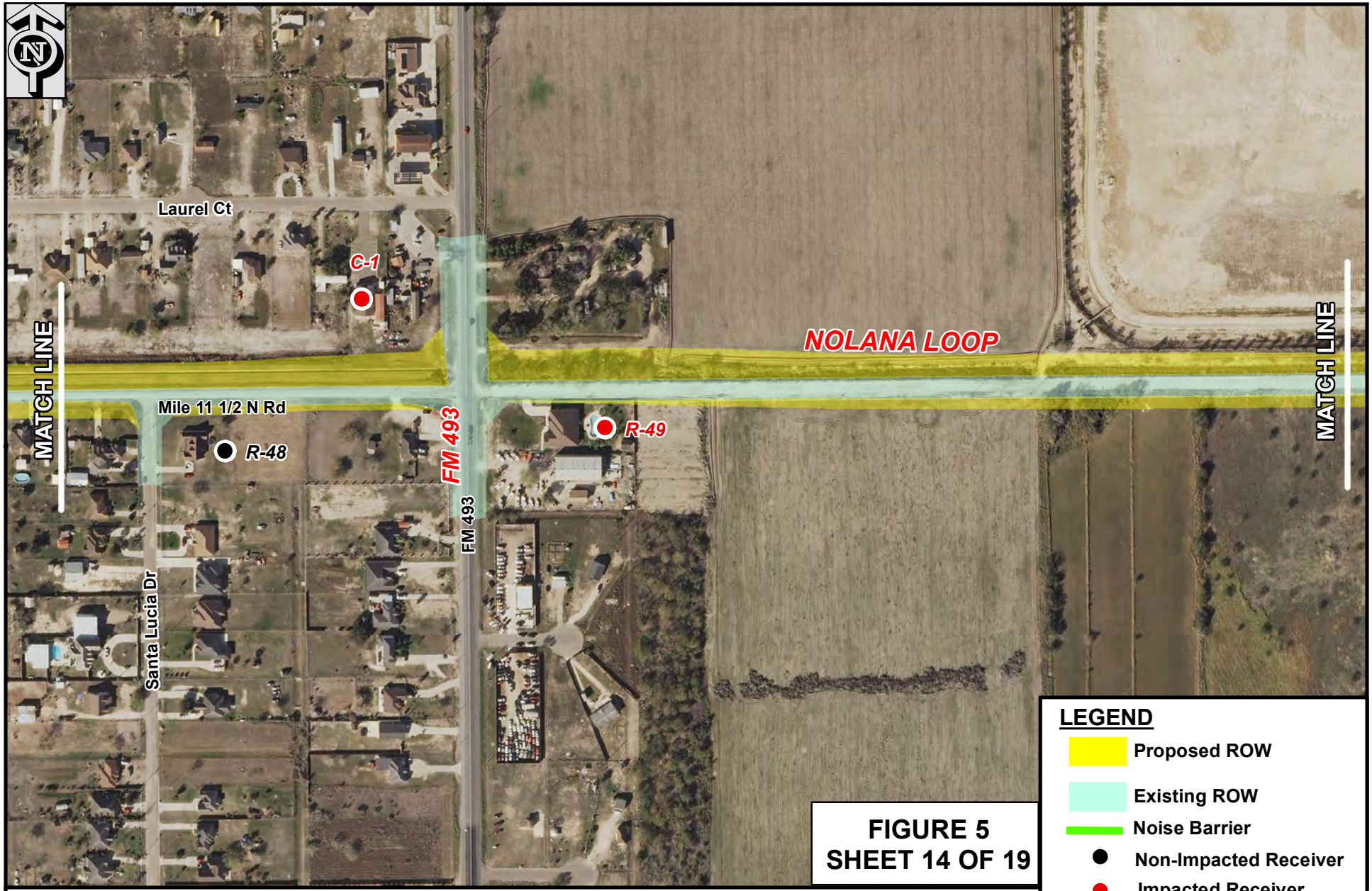

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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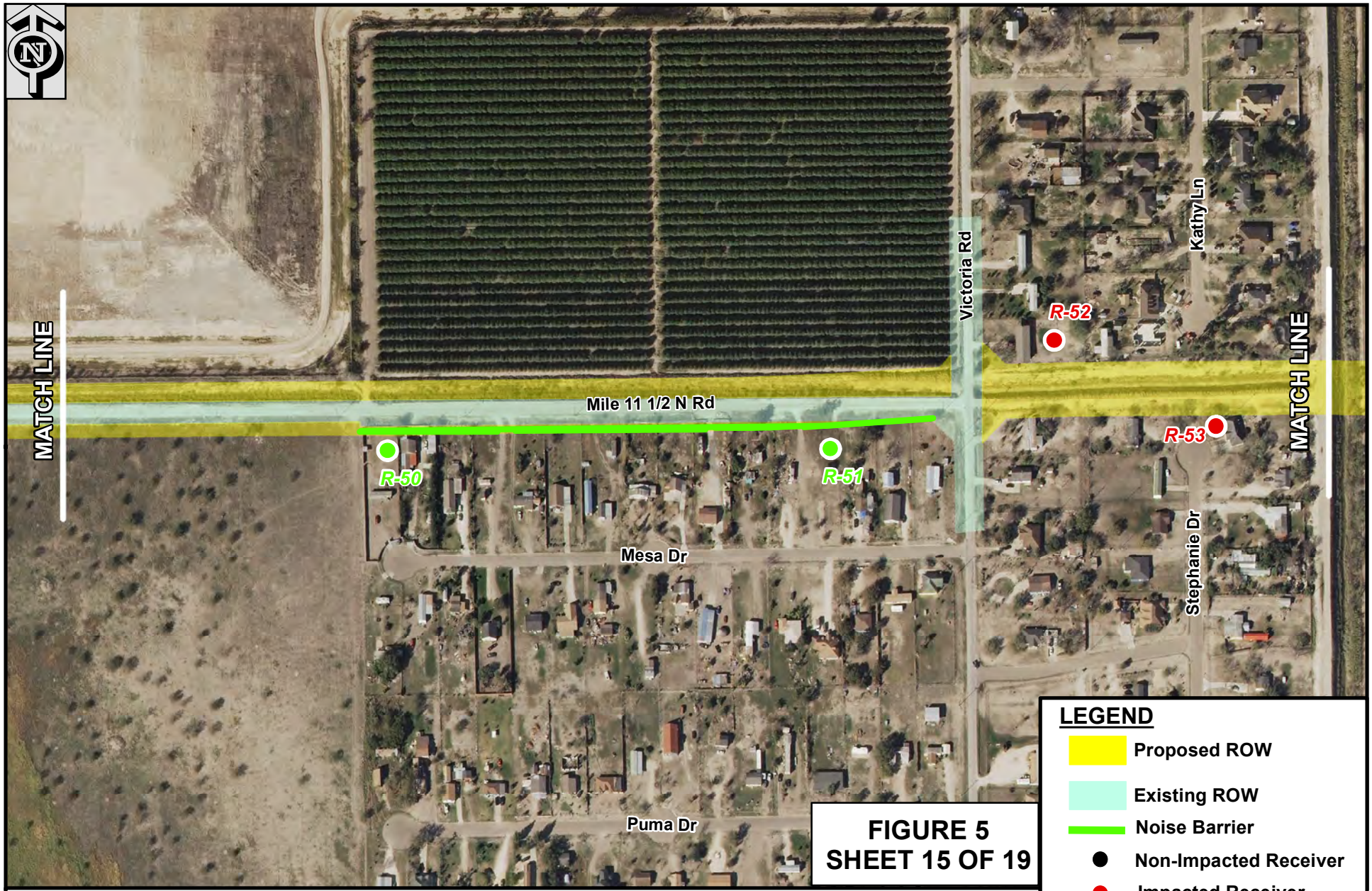

FIGURE 5
SHEET 15 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP

CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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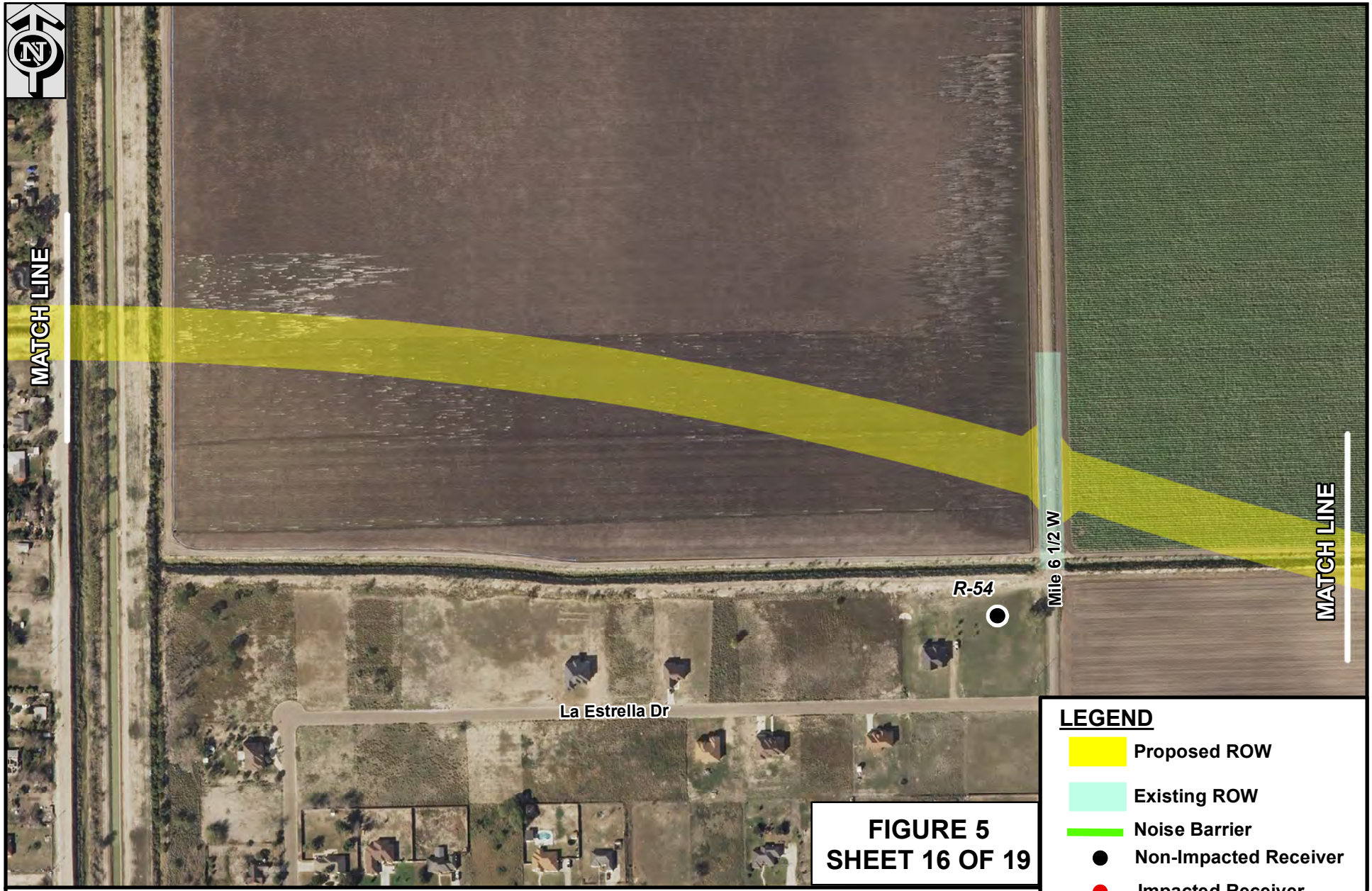

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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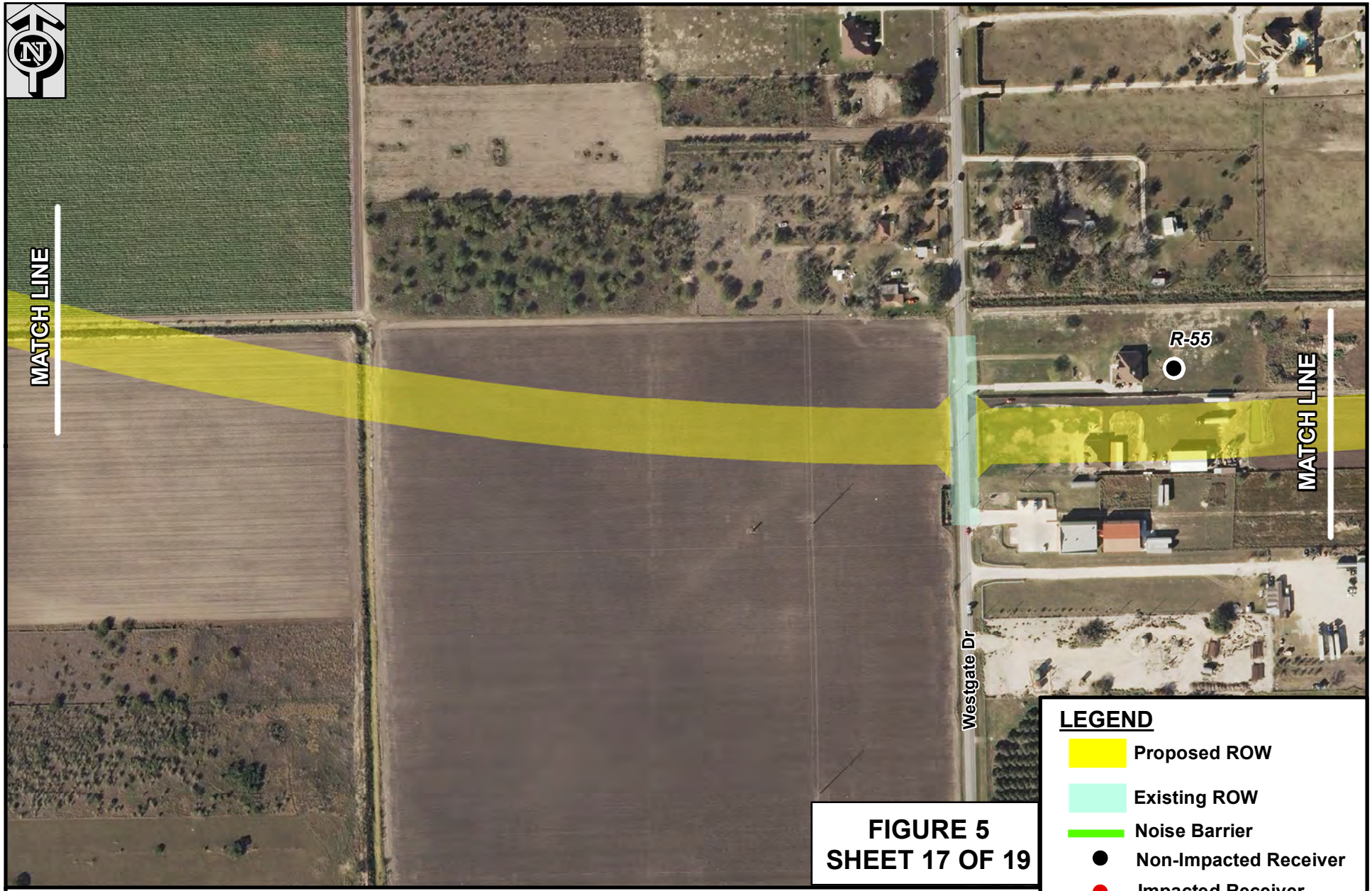

FIGURE 5
SHEET 17 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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FIGURE 5
SHEET 18 OF 19

LEGEND

- Proposed ROW
- Existing ROW
- Noise Barrier
- Non-Impacted Receiver
- Impacted Receiver
- Benefitted Receiver

310 155 0 310
Feet
1 inch = 300 feet

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ-0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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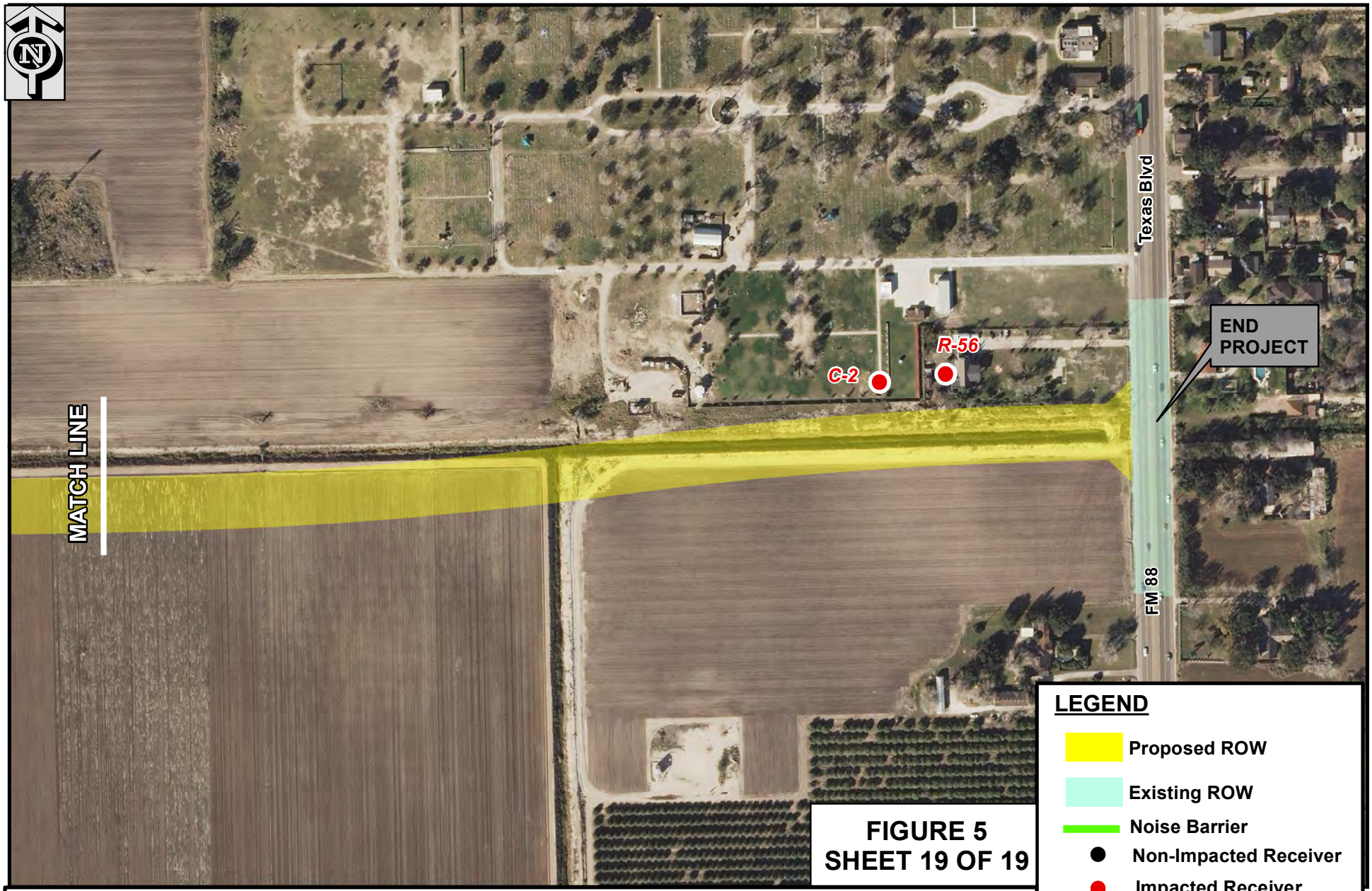

FIGURE 5
SHEET 19 OF 19

NOLANA LOOP NOISE RECEIVER LOCATION MAP
CSJ:0921-02-169 & 0921-02-361

FROM FM 1426 (RAUL LONGORIA) TO FM 88 (TEXAS BLVD)
APPROX. TOTAL PROJECT LENGTH 9.8 MILES

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