APPENDIX D
Noise Analysis

NDOR
Nebraska Department of Roads
Planning and Project Development

Memorandum

Date: July 14, 2015

To: Carrie Wencel, Highway Environmental/NEPA Specialist, Planning and Project Development

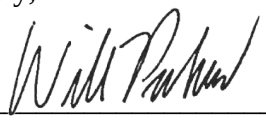
Cc: Jon Barber, Highway Environmental Program Manager, Planning and Project Development

From: Will Packard, Highway Environmental Specialist, Planning and Project Development

Subject: Noise Approval Memo for the City of Omaha project 120th St. – Stonegate Dr. to Roanoke Blvd (C.N. 22277, MAPA-5009(3))

The NDOR Noise Section staff has reviewed and approved the noise analysis report for the City of Omaha project 120th St. – Stonegate Dr. to Roanoke Blvd prepared by Schemmer Associates. The noise report is consistent with the current NDOR Noise Analysis and Abatement Policy dated July 11, 2013.

Sincerely,



7/14/15

Name Date

Will Packard, Highway Environmental Specialist
Planning and Project Development
NDOR

NOISE ANALYSIS

120th STREET

STONEGATE DRIVE TO ROANOKE BOULEVARD

CITY OF OMAHA, DOUGLAS COUNTY, NEBRASKA

PROJECT NO. OPW 50949 MAPA-5009(3) 22277

JULY 10, 2015

Prepared By:
The Schemmer Associates

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NATURE OF NOISE

Noise is a sound that is produced by pressure variations created in the surrounding are by the vibration of some material body. It is typically defined as unwanted sound. The human response to noise is subjective and can vary greatly from person to person. Factors that can influence individual response include the loudness, frequency, and time pattern; the amount of background noise present before an intruding noise; and the nature of the activity that the noise affects.

MEASUREMENT OF SOUND

The typical unit of measure of sound is the decibel (dB) which is a logarithmic function of the actual sound pressure measured in micropascals. The sensitivity of the human ear to sounds of different frequencies is measured by the A-weighted decibel scale (dBA). A 10-dBA change in noise levels is judged by most people as a doubling of sound level. The smallest change in noise level that a human ear can perceive is about 3-dBA. Increases of 5-dBA or more are clearly noticeable. The typical A-weighted decibel value of a conversation ranges between 44 and 65dBA.

Noise levels in a quiet rural area at night are typically between 32 and 35 dBA. Quiet urban nighttime noise levels range from 40 to 50 dBA. Noise levels during the day in a noisy urban area are frequently as high as 70 to 80 dBA. Noise levels above 110 dBA become intolerable and then painful; levels higher than 80 dBA over continuous periods can result in hearing loss. Constant noises tend to be less noticeable than irregular or periodic noises.

Common Sounds	**Decibel Level (dBA)**
Jet Plane (300 feet)	140
Accelerating Motorcycle at few feet away	110
Diesel Truck at 10 feet	90
Diesel Truck at 110 feet	80
Normal Conversation	60
Average Whisper	20
Threshold of Hearing	0

REGULATORY STANDARDS

The Federal Highway Administration (FHWA) has published guidelines for preparing noise studies and conducting noise abatement measures in the Code of Federal Regulations (CFR) Part 772 which help protect the health and welfare, to provide noise abatement criteria, and to establish requirements for traffic noise information to be given to those officials who have planning and zoning authority in the project area.

Specifically, a noise impact occurs when either of the following criteria is satisfied:

1. The predicted traffic noise level approaches or exceeds the NAC in Table 1.
2. The predicted traffic noise level substantially exceeds the existing sound level.

The Noise Abatement Criteria (NAC) in Table 1 developed by FHWA describe activities and sound level thresholds to determine "approach or exceed" impacts. The approach criterion has been defined as 1 dBA less than the abatement criteria shown below.

FHWA NOISE ABATEMENT CRITERIA

[Hourly A-weighted Sound Level_decibels (dB(A))]

Activity Category	Activity[1] Leq(h)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve and important public need where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	Exterior	Residential
C[2]	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 structure, radio stations, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structure, radio studios, recording studios, schools, television studios.
E[2]	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

For example, using NAC Category B (67 dBA), 66 dBA is considered an impact. Further, "substantially exceeds" is defined as 15 dB(A) or more. For highway noise impact assessments, the sound level is expressed as an average hourly equivalent $L_{eq(h)}$ dB, that has been A-weighted. Therefore, $L_{eq(h)}$ dBA is a single number descriptor of sound that is an average of the time-varying sound level over all frequencies sensitive to humans. For a given highway geometry, traffic volume, speed, and mix respective to noise sensitive areas along the project corridor, $L_{eq\ (h)}$ dBA represents the noisiest traffic hour.

The viability of noise abatement measures identified in (CFR) Part 772 must be evaluated if either impact definition is met.

NOISE PREDICTION METHOD

Traffic Noise Model (TNM 2.5) was used to predict the Leq(h) dBA noise levels at specific receptor locations. FHWA assisted in the development of TNM, approving it as the main software for noise modeling related to roadway noise projects. To process the noise levels for a specific project, numerous attributes are placed into the model. These include roadway and receptor locations and elevations, traffic volumes, traffic speed and mix, terrain features and barriers. TNM then uses this data to calculate the anticipated noise level for each receptor. The model was used to analyze noise levels for the year 2038 build and year 2038 no-build alternatives.

The traffic noise levels shown in the study are predicted for "peak hour" noise levels and are reported in Leq(h) dBA. The traffic volume used for this "peak hour" period is the Design Hourly Volume (DHV).

The receptors used in this study, shown on the maps in Appendix A, are located at specific locations in relation to the housing units that would be the most impacted by the proposed roadway improvements. Table 1 (Appendix B) lists each receptor, the distance from each receptor to the proposed road centerline, and the computed noise levels for the future noise levels. The last column in Table 1 is the Leq(h) dBA noise abatement criteria which are part of the 23 CFR Part 772 guidelines that are used in evaluating a noise impact.

PROJECT DESCRIPTION

The City of Omaha desires to provide an adequate network of city arterials that carry local traffic to the surrounding highway and local street network. Commercial and residential growth in the northwest portion of Omaha has significantly increased traffic volumes along the 120th Street corridor. To accommodate the growth in traffic, and to improve safety along the corridor, the City of Omaha plans to improve 120th Street from approximately 200-feet north of Stonegate Drive to Roanoke Boulevard (the Project). The Project is approximately 1-mile long and includes a bridge over the Big Papillion Creek. The City of Omaha plans to develop the project through the Nebraska Department of Roads (NDOR) and the Federal Highway Administration (FHWA).

The existing roadway section north of West Maple Road along the Project corridor is a two-lane roadway with open drainage and no curb-and-gutter or sidewalks. Commercial properties border the corridor between Maple Street and Stonegate Drive, and primarily recreational areas border the corridor north of West Maple Road. Roanoke Boulevard serves as a primary exit and

entrance to an established neighborhood and proposed commercial development. The existing segment of 120th Street, south of the Project, is a four-lane facility with sidewalks and curb and gutter. The existing segment of 120th Street north of Roanoke Boulevard to Fort Street has previously been widened to four lanes with a raised median. The intersecting roadways of West Maple Road and Fort Street are multi-lane facilities. No future projects on 120th Street are planned within the next six years north or south of this Project. Existing 120th Street from West Maple Road to Roanoke Boulevard has an existing roadway flood occurrence of 10-20 years. NDOR criteria shall be reviewed to establish the best possible profile for the development of this area and the safety of the traveling public.

The MAPA 2030 Long Range Transportation Plan shows 120th Street along the Project corridor as a future four-lane facility on the 2005-2020 Street and Highway Improvements Map. Additionally, the Project is identified for fiscal year 2016 construction in MAPA's 2013-2018 Transportation Improvement Program. The segment of 120th Street is identified on the Federal Functional Classification System as a minor arterial.

Traffic Parameters

The future (2038) traffic volumes were developed from MAPA's travel demand model and future turning movement counts were derived through a process using existing and future daily volumes. Project was pre-determined to be four-lane divided roadway. Additional traffic analysis confirmed turning movement configurations at the intersections of 120th and Maple Road as well as 120th and Emmet Street.

The resulting traffic study provided the traffic parameters, including posted speed limit, Average Daily Traffic (ADT), and Design Hourly Volume (DHV) for the existing and design years for several segments of the roadway within this project. The DHV was used for the prediction of noise levels. Breaking out the truck traffic, the analysis put heavy truck traffic at 1% of the volume and medium truck traffic at 2%. Heavy trucks include vehicles that typically have three or more axles, and generally have a gross vehicle mass/weight greater than 26,000 pounds. Medium trucks typically have two axles, six wheels and generally have a gross vehicle mass/weight greater than 10,000 pounds but less than 26,000 pounds.

The following traffic volumes were used to evaluate this project:

TABLE 1: TRAFFIC VOLUMES

Roadway Segment	Traffic Counts	2018 Volume	2038 Volume
120th	ADT	15,634	37,650
(north of Maple)	DHV (All Vehicles)	1,563	3,765
	2% Medium Trucks	31	75
	1% Heavy Trucks	16	38
120th	ADT	22,563	25,457
(south of Maple)	DHV (All Vehicles)	2,256	2,546
	2% Medium Trucks	45	51
	1% Heavy Trucks	23	25
Maple	ADT	36,654	44,229
(west of 120th)	DHV (All Vehicles)	3,665	4,423
	2% Medium Trucks	73	88
	1% Heavy Trucks	37	44
Maple	ADT	39,206	48,528
(east of 120th)	DHV (All Vehicles)	3,921	4,853
	2% Medium Trucks	78	97
	1% Heavy Trucks	39	49

DESIGN ALTERNATIVES

Traffic noise levels associated with existing conditions, no-build scenario and 3 design alternatives associated with the build scenarios were predicted for this noise study and are described below:

- Existing: the existing design involves a two-lane facility through most of the project area.
- No-build: this alternative evaluates not constructing the proposed project.
- Centered Alignment: this alternative includes widening the roadway to a fourlane divided facility in which the proposed centerline of the widened roadway cross-section is centered on the existing roadway centerline alignment.
- 20-ft Left Alignment: this alternative includes widening the roadway to a four-lane divided facility in which the proposed centerline of the widened roadway crosssection is shifted 20-ft. left (or west) of the existing roadway centerline alignment.
- 40-ft Left Alignment: this alternative includes widening the roadway to a four-lane divided facility in which the proposed centerline of the widened roadway crosssection is shifted 40-ft. left (or west) of the existing roadway centerline alignment.

The three design alternatives were evaluated in order to assess the preferred alternative from an engineering design perspective. However, due to the close similarity of the build alternatives, only two alternatives; No-build and 20-ft Left Alignment; will be considered and evaluated in the NEPA environmental evaluation of the project.

FIELD MEASUREMENTS

To check the existing noise levels against the model's results, tests were taken at three sites, separate from the 38 receptor locations and 48 receptors. These sites were added to the model and are displayed in Map 1 in Appendix B. Each site was placed in closer proximity to 120th Street than any of the other receptor locations in the nearby area. The results of each test are displayed below:

TABLE 2: CHECK SITE NOISE RESULTS

	Modeled Noise Level (dBA)	Tested Noise Level (dBA)	Difference
Check Site A	59.3	57.7	-1.6
Check Site B	65.3	63.0	-2.3
Check Site C	66.6	63.6	-3

All three check receivers tested out lower than the model predictions for receivers in the same location. Overall, the average of the three was 2.3 dBA lower than the model.

TRAFFIC NOISE ANALYSIS

The Nebraska Department of Roads (NDOR) generally considers a noise impact exists if one of the following criteria are met or exceeded.

1. The predicted design-year noise levels approach or exceed noise abatement criteria established within 23 CFR 772. Approach is defined as 1 decibel less than the Noise Abatement Criteria (NAC) for categories A-E.
2. The predicted design-year noise levels are more than 15 decibels higher than existing noise levels. This constitutes a "Substantial Increase over Existing Noise Level". A substantial noise increase is a noise impact, even if the future noise level is lower than the NAC.

The existing conditions model indicated that one (1) of the 38 receptors has a noise impact that approach or exceed the noise criteria (67 dBA for type B and C land uses, 72 dBA for type E land uses). The noise levels for residents and businesses ranged from 51.8 to 67.4 dBA. It was indicated that Receivers14 & 14A were in violation of the noise criteria (see Receivers Map, Appendix B). The results of the noise analysis are shown on Table A1, Appendix A.

The 2038 no-build situation indicated that 1 of the 38 receptors have a noise impact. The noise levels in the 2038 no-build scenario ranged from 53.2 to 68.6 dBA. The results of the noise analysis are shown on Table A2, Appendix A.

Based on the aforementioned Criteria No. 1, the 2038-build Center Alignment scenario indicated that 2 of the subject 38 receptors would have a noise impact. The noise levels in the 2038-build Center Alignment scenario ranged from 53.5 to 71.1 dBA. The results of the noise analysis are shown on Table A3, Appendix A.

Based on the aforementioned Criteria No. 1, the 2038-build 20' Left Alignment scenario indicated that 2 of the subject 38 receptors (Receivers 6/6A and 14/14A) would have a noise impact. The noise levels in the 2038-build 20' Left Alignment scenario ranged from 54.3 to 69.2 dBA.. The results of the noise analysis are shown on Table A4, Appendix A.

Based on the aforementioned Criteria No. 1, The 2038-build 40' Left Alignment scenario indicated that 2 of the subject 38 receptors (Receivers 6/6A and 14/14A) would have a noise impact. The noise levels in the 2038-build 40' Left Alignment scenario ranged from 55.4 to 68.1 dBA. The results of the noise analysis are shown on Table A5, Appendix A.

The noise contours from the 66 and 71 dBA levels of the 2038-build Center Alignment scenario, the 2038-build 20' Left and the 2038-build 40' Left Alignment scenario have been mapped out, with the resulting maps in Appendix B.

NOISE ABATEMENT MEASURES

Noise abatement measures must be considered where predicted levels approach or exceed the abatement criteria, or when the predicted levels substantially exceed the existing levels (157 CFR, Section 722.11).

Noise Barriers

Noise barriers are a type of abatement measure in areas where the future traffic is predicted to create a noise impact. Each noise barrier must be evaluated as feasible or reasonable or the barrier will not be considered for construction. The NDOR Noise Abatement Policy (2011) was used for guidance in evaluating the feasibility and reasonableness of individual noise barriers. As provided in this policy, feasibility involves engineering considerations and is judged under the following criteria:

FEASIBILITY

Acoustic Feasibility - A noise abatement device is considered acoustically feasible when 60% of the front row impacted receivers located directly behind the noise wall achieves a 5 dB(A) noise reduction. Other significant noise levels within the project area will not prevent acoustic feasibility as long as TNM demonstrates that a wall achieves the 5 dB(A) noise reduction from traffic alone.

Engineering Feasibility - The determination that it is possible to design and construct a noise abatement measure. The following items will be considered in determining Engineering feasibility:

1. Can the barrier be designed to fit the topography and still be maintained?
2. Can the exposed height of a noise barrier be built at 30 feet high or less?
3. Safety concerns:
    A. Can the barrier be located beyond the clear recovery zone?
    B. Can the barrier be incorporated into existing or designed highway barriers?

If any of the feasibility items 1-3 are checked "NO", the site will be considered not feasible. If the site is considered not feasible, a reasonable analysis will not be done.

REASONABLENESS

There are three reasonableness factors or "tests" that must be met for a noise abatement measure to be considered reasonable.

1. Noise reduction design goal of 7 dB(A). A minimum of 40% of benefited front row receptors directly behind the noise wall (noise wall must extend entirely across benefited receptor's property line) must achieve a 7 dB(A) noise reduction in order for noise abatement to be reasonable.

2. Cost Effectiveness. Noise abatement must be cost effective. NDOR defines cost effectiveness as dollars per benefited receiver. Based on construction price estimates for 2010, NDOR utilizes $44/ft2 for barrier costs. If the cost per benefited receiver is greater than $40,000, the site will be considered not reasonable. The cost of utility relocation, drainage control, and ROW acquisition will be factored into the cost effectiveness of noise abatement. Aesthetic treatment is not factored into cost.

3. Viewpoints of the property owners and residents of the benefited receptors. When it is determined that it would be feasible to provide noise abatement for a site, and a preliminary determination has been made that abatement would be reasonable, a noise abatement public informational meeting will be held as part of the process for a final determination of whether abatement would be reasonable. The benefited property owners and residents will be given an opportunity to vote in the form of a ballot vote. NDOR defines a benefited receptor as achieving at least a 5 dB(A) reduction.

Feasibility/Reasonableness – Design Year Centered Alignment

Utilizing the frontage formula for locating receptors on Category C properties as per NDOR's Noise Analysis and Abatement Policy (2011), ten places of frequent human use indicated 20 receptors that needed to be analyzed so each receptor was counted as 2 receptors for noise abatement analysis purposes.

The following is a description of the proposed barrier location and an evaluation of the feasibility and/or reasonableness. The receptors are shown on the maps contained in Appendix B, showing the predicted noise levels and noise contours for the design year 2038.

Location 1: The location of noise receptor numbers (Receiver 6/6A) and 14 (Receiver 14/14A) are on a ball park's bleachers facing ball fields east of 120th Street. The bleachers for the ball field near Receiver 13 are approximately 8 feet from the proposed "back of curb" of the roadway under this alignment. It has been determined that this ball field would have to be purchased or moved to another location if this alignment was chosen. Due to this, construction of a noise wall at this location is not feasible.

Feasibility/Reasonableness – Design Year 20' Left Alignment

The following is a description of the proposed barrier location and an evaluation of the feasibility and/or reasonableness. The receptors are shown on the maps contained in Appendix B, showing the predicted noise levels and noise contours for the design year 2038.

Location 1: The location of noise receptor numbers (Receiver 6/6A) and 14 (Receiver 14/14A), are on a ball park's bleachers facing ball fields east of 120th Street. As the ballpark is considered Activity Category C, the entire ball park would have to be analyzed for abatement. To receive a 5dBA reduction, a barrier wall would extend 1,320 feet along the western side of the ball fields, with two breaks in the wall of approximately 70 feet in length for parking lot access. The height of the wall would be 30 feet, the maximum height allowed as per NDOR standards, to obtain a 5dBA reduction for 10 of the 20 front row receptors (50.0%). As this is less than the minimum 60% required of front row receptors to meet the reduction requirement for an Acoustic Feasibility Design Goal, the construction of the wall would not be considered feasible.

Feasibility/Reasonableness – Design Year 40' Left Alignment

The following is a description of the proposed barrier location and an evaluation of the feasibility and/or reasonableness. The receptors are shown on the maps contained in Appendix B, showing the predicted noise levels and noise contours for the design year 2038.

Location 1: The location of noise receptor numbers 6 (Receiver 6/6A) and 14 (Receiver 14/14A), are on a ball park's bleachers facing ball fields east of 120th Street. As the ballpark is considered Activity Category C, the entire ball park would have to be analyzed for abatement. To receive a 5dBA reduction, a barrier wall would extend 1,320 feet along the western side of the ball fields, with two breaks in the wall of approximately 70 feet in length for parking lot access. The height of the wall would be 30 feet to obtain a 5dBA reduction for 14 of the 20 front row receptors (70.0%). However, only 4 of the 20 front row receptors (20%) would be able to achieve a 7dBA reduction. As this is less than the minimum 40% required of front row receptors to meet the reduction requirement for the Noise Reduction Design Goal, the construction of the wall would not be considered reasonable.

Earth Berms

The construction of an earth berm serves as a noise barrier that can help to reduce traffic noise levels if located between the traffic noise source and the impacted receptor. Earth berms are typically a more accepted way of dealing with noise as they are effective in reducing traffic noise, but are also athletically pleasing. Earth berms were evaluated for noise barriers but are not considered feasible due to the topography and the space restrictions between the roadway and the already undersized parking lots for the ball fields. Space constraints make noise walls the only suitable noise barrier alternative.

Buffer zones

Buffer zones provide enough distance between the noise source and the impacted receptors in order to reduce noise impacts. Buffer zones are typically used in undeveloped areas where a substantial amount of right-of-way can be obtained prior to development. Most of the land along 120th Street has been developed, making buffer zones not feasible.

Alteration of Horizontal and Vertical Alignments

Noise abatement measures that include the alteration of horizontal and/or vertical alignments can be incorporated to reduce traffic noise impacts where the receptors are typically on one side of the roadway or where the elevation can be adjusted. Moving the centerline away from the source may reduce the noise impacts enough to be in compliance. This was considered for 120th Street, however the existence of receptors on both sides of the street made this alternative impractical.

Traffic Management Measures

The use of traffic management measures was evaluated as noise abatement measure. Traffic management may include reduced speed limits or the prohibition of certain vehicle types, mainly trucks, as a noise abatement measure. Trucks can be prohibited from certain streets or roads, or permitted to use specific streets or roads only during daylight hours. These options may not be feasible for this project since the proposed roadway will be a main trafficway for this portion of Omaha. Also the impacted uses are recreational, requiring use during daylight hours.

Detour Noise Impacts

Due to the proposed cut and fill operations and the need to relocate utilities, each segment of the 120th Street improvements will be constructed to provide local access, but may be closed to through traffic. Although an analysis of the routing of the through traffic has not been completed at this time, through traffic can be detoured to 108th or 132nd Streets if closure to through traffic is deemed necessary. Detour noise impacts are not anticipated to be substantial and are temporary based on the segment of 120th Street that would be under construction.

Construction Noise Impacts

In addition to the long-term traffic noise impacts, construction noise impacts need to also be considered. The noise sensitive receptors immediately adjacent to this project are of concern to the noise considerations of this project. Construction activities typically produce short-term increases in noise levels at these locations. The FHWA has created the Roadway Construction Noise Model (RCNM) to assess the impact of construction noise. As in this project, many times construction is often held within relatively close proximity to residential and commercial properties, monitoring and avoiding the most significant impacts of construction noise upon surrounding properties should be of paramount concern.

Although the calculation of construction noise levels is not specifically necessary to the development of a noise study in most instances, FHWA guidance requests it for complex and controversial or major urban projects.

The construction activities in this project will likely include site clearing, excavation, earth movement, paving, and the installation of signage and traffic control devices. Although work will be done within the time constraints of applicable local municipal ordinances, if any work is required during nighttime periods, all required permits would be obtained from the local municipality. These permits are likely to include conditions and restrictions on specific activities during nighttime hours to reduce the impact of construction noise on adjoining properties.

To control roadway construction noise, numerous aspects will be reviewed, including but not limited to: design considerations, sequence of operations, source controls, site controls, and time and activity constraints. Additionally community awareness and the development of proper complaint mechanisms for proper resolution will also be of considered.

TABLE 3: REFERENCE CONSTRUCTION EQUIPMENT SOUND EMISSION LEVELS (dBA)

Equipment Description	Impact Device?	EL L_{max} at 50 ft (dBA)	UF Usage Factor (%)
Backhoe	No	80	50
Bar Bender	No	80	10
Blasting	Yes	94	NA
Chain Saw	No	85	20
Compactor (ground)	No	80	35
Compressor (air)	No	80	40
Concrete Batch Plant	No	83	NA
Concrete Mixer Truck	No	85	50
Concrete Pump Truck	No	82	10
Concrete Saw	No	90	40
Crane	No	85	NA
Dozer	No	85	30
Drum Mixer	No	80	NA
Dump Truck	No	84	40
Excavator	No	85	40
Flat Bed Truck	No	84	30
Front End Loader	No	80	40
Generator	No	82	50
Generator (<25KVA, VMS Signs)	No	70	50
Grader	No	85	40
Grapple (on backhoe)	No	85	10
Impact Pile Driver	Yes	95	NA
Jackhammer	Yes	85	10
Paver	No	85	80
Pickup Truck	No	55	50
Pneumatic Tools	No	85	40
Pumps	No	77	30
Scraper	No	85	30
Sheers (on backhoe)	No	85	NA
Slurry Plant	No	78	NA
Slurry Trenching Machine	No	82	NA
Vacuum Street Sweeper	No	80	NA
Ventilation Fan	No	85	NA
Vibratory Concrete Mixer	No	80	30
Vibratory Pile Driver	No	95	NA
Welder/Torch	No	73	10

Information for Local Officials

It is important for local officials to promote noise compatible planning of undeveloped land in order to avoid future noise impacts and possible noise mitigation measures. This involves developing properties at distances from the roadway that would be beyond the noise impact contours shown on the figures in Appendix B. The undeveloped land within the noise study area is isolated to properties between Roanoke Drive and Big Papillion Creek. Table 4 illustrates that residences or receptors in Category B, C and E (refer to the FHWA Noise Abatement Criteria Table) would have a defined noise impact if they were built at or within the distances shown. Categories B and C are impacted at 66 dB(A) while category E is impacted at 71 dB(A). The distances in Table 4 were measured from the edge of pavement of the proposed roadway and calculated using 2038 traffic volumes from Roanoke Drive to Big Papillion Creek. NDOR strongly urges developers to build beyond the distances listed in Table 4 in order to avoid future noise impacts and mitigation.

TABLE 4: DISTANCE TO NOISE CONTOURS

Location	Distance from edge of pavement to future contour (2038)	
	66 dB(A) contour (ft)	71 dB(A) contour (ft)
West Side of 120th St - Roanoke Drive to Big Papillion Creek	55	15
East Side of 120th St. - Undeveloped Land Between Roanoke Dr. and Keystone Park	60	25

CONCLUSIONS

The existing conditions model indicated that one (1) of the 38 receptors has a noise impact that approach or exceed the noise criteria (67 dBA for type B and C land uses, 72 dBA for type E land uses). The noise levels for residents and businesses ranged from 51.8 to 67.4 dBA. It was indicated that Receiver 14 was in violation of the noise criteria (see Receivers Map, Appendix B).

The 2038 no-build situation indicated that 1 of the 38 receptors have a noise impact. The noise levels in the 2038 no-build scenario ranged from 53.2 to 68.6 dBA.

The 2038-build Center Alignment scenario indicated that 2 of the subject 38 receptors would have a noise impact. The noise levels in the 2038-build Center Alignment scenario ranged from 53.5 to 71.1 dBA. A noise barrier was evaluated to be not feasible for this scenario as the bleachers for the ball park near Receivers 14/14A are approximately 8 feet from the proposed "back of curb" of the roadway under this alignment. It has been determined that this ball park would have to be purchased or moved to another location if this alignment was chosen. Therefore, a noise barrier is not warranted at this location.

The 2038-build 20' Left Alignment scenario indicated that 2 of the subject 38 receptors (Receivers 6/6A and 14/14A) would have a noise impact. The noise levels in the 2038-build 20' Left Alignment scenario ranged from 54.3 to 69.2 dBA. The height of the wall would be 30 feet, the maximum height allowed as per NDOR standards, to obtain a 5dBA reduction for 10 of the 20 front row receptors (50.0%). As this is less than the minimum 60% required of front row receptors to meet the reduction requirement for an Acoustic Feasibility Design Goal, the construction of the wall would not be considered feasible.

The 2038-build 40' Left Alignment scenario indicated that 2 of the subject 38 receptors (Receivers 6/6A and 14/14A) would have a noise impact. The noise levels in the 2038-build 40' Left Alignment scenario ranged from 55.4 to 68.1 dBA. The height of the wall would be 30 feet to obtain a 5dBA reduction for 14 of the 20 front row receptors (70.0%). However, only 4 of the 20 front row receptors (20%) would be able to achieve a 7dBA reduction. As this is less than the minimum 40% required of front row receptors to meet the reduction requirement for the Noise Reduction Design Goal, the construction of the wall would not be considered reasonable.

Noise abatement measures including noise barriers, buffer zones, horizontal and vertical alignment, and traffic management measures were found to be not feasible and/or reasonable. Detour noise impacts are not applicable for construction of this proposed roadway. Construction noise impacts are temporary and limited to the time of the construction..

To evaluate the predicted noise impact on existing and future construction, noise contours were created of the three 2038-build scenarios. The noise contours from the 66 and 71 dBA levels of the 2038-build Center Alignment scenario, the 2038-build 20' Left Alignment scenario and the 2038-build 40' Left Alignment scenario have been mapped out, with the resulting maps in Appendix B.

GENERAL COMMENTS

In the event that any changes in the nature, design, or location of the project are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing.

BIBLIOGRAPHY

1. FHWA Traffic Noise Model (TNM) version 2.5.

2. 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.

3. Nebraska Department of Roads, Noise Abatement Policy, 2011.

4. FHWA, PB83-152561 Sound Procedures for Measuring Highway Noise, November 1982.

5. FHWA, RD-77-108, Highway Traffic Noise Prediction Model, December 1978.

APPENDIX A

TABLE A1 - RESULTS OF NOISE ANALYSIS
120th STREET – EXISTING NOISE LEVELS
EMMET STREET TO ROANOKE BOULEVARD
CITY OF OMAHA, DOUGLAS COUNTY, NEBRASKA
PROJECT NO. OPW 50949 MAPA-5009(3) 22277

Name	Existing LAeq1h	LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h
		Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		
Receiver 1 - Business	51.8	51.8	71	0.0	15	----	51.8
Receiver 2 - Business	55.2	55.2	71	0.0	15	----	55.2
Receiver 3 - Mini Golf	60	60	66	0.0	15	----	60
Receiver 4 - Undeveloped	60.2	60.2	71	0.0	15	----	60.2
Receiver 5 & 5A - Ball Park	53.5	53.5	66	0.0	15	----	53.5
Receiver 6 & 6A - Ball Park	61.8	61.8	66	0.0	15	----	61.8
Receiver 7 & 7A - Ball Park	51.4	51.4	66	0.0	15	----	51.4
Receiver 8 & 8A - Ball Park	53.5	53.5	66	0.0	15	----	53.5
Receiver 9 & 9A - Ball Park	59.8	59.8	66	0.0	15	----	59.8
Receiver 10 & 10A - Ball Park	53	53	66	0.0	15	----	53
Receiver 11 & 11A - Ball Park	54.7	54.7	66	0.0	15	----	54.7
Receiver 12 &12A - Ball Park	49	49	66	0.0	15	----	49
Receiver 13 & 13A - Ball Park	58.2	58.2	66	0.0	15	----	58.2
Receiver 14 & 14A - Ball Park	67.4	67.4	66	0.0	15	Snd Lvl	67.4
Receiver 15 - Golf Course	59	59	66	0.0	15	----	59
Receiver 16 - Golf Course	59.6	59.6	66	0.0	15	----	59.6
Receiver 17 - Golf Course	52.6	52.6	66	0.0	15	----	52.6
Receiver 18 - Golf Course	58.5	58.5	66	0.0	15	----	58.5
Receiver 19 - Golf Course	57	57	66	0.0	15	----	57
Receiver 20 - Golf Course	58.4	58.4	66	0.0	15	----	58.4
Receiver 21 - Soccer Field	57.5	57.5	66	0.0	15	----	57.5
Receiver 22 - Soccer Field	58	58	66	0.0	15	----	58
Receiver 23 - Business	64.9	64.9	71	0.0	15	----	64.9
Receiver 24 - Business	61.8	61.8	71	0.0	15	----	61.8
Receiver 25 - Business	64.3	64.3	71	0.0	15	----	64.3
Receiver 26 - Business	61.2	61.2	71	0.0	15	----	61.2
Receiver 27 - Business	62.7	62.7	71	0.0	15	----	62.7
Receiver 28 - Residential	59.3	59.3	66	0.0	15	----	59.3
Receiver 29 - Residential	59.6	59.6	66	0.0	15	----	59.6
Receiver 30 - Residential	59.9	59.9	66	0.0	15	----	59.9
Receiver 31 - Business	60.1	60.1	66	0.0	15	----	60.1
Receiver 32 - Business	63.3	63.3	66	0.0	15	----	63.3
Receiver 33 - Business	63.5	63.5	66	0.0	15	----	63.5
Receiver 34 - Business	63.6	63.6	66	0.0	15	----	63.6
Receiver 35 - Business	63.6	63.6	66	0.0	15	----	63.6
Receiver 36 - Business	62.8	62.8	71	0.0	15	----	62.8
Receiver 37 - Business	62.8	62.8	71	0.0	15	----	62.8
Receiver 38 - Business	58.5	58.5	71	0.0	15	----	58.5

TABLE A2 - RESULTS OF NOISE ANALYSIS
120th STREET – 2038 NO-BUILD LEVELS
EMMET STREET TO ROANOKE BOULEVARD
CITY OF OMAHA, DOUGLAS COUNTY, NEBRASKA
PROJECT NO. OPW 50949 MAPA-5009(3) 22277

Name	Existing LAeq1h	LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h
		Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		
Receiver 1 - Business	51.8	53.2	71	1.4	15	----	53.2
Receiver 2 - Business	55.2	56.7	71	1.5	15	----	56.7
Receiver 3 - Mini Golf	60	61.6	66	1.6	15	----	61.6
Receiver 4 - Undeveloped	60.2	62	71	1.8	15	----	62
Receiver 5 & 5A - Ball Park	53.5	55.7	66	2.2	15	----	55.7
Receiver 6 & 6A - Ball Park	61.8	63.4	66	1.6	15	----	63.4
Receiver 7 & 7A - Ball Park	51.4	53.7	66	2.3	15	----	53.7
Receiver 8 & 8A - Ball Park	53.5	55.7	66	2.2	15	----	55.7
Receiver 9 & 9A - Ball Park	59.8	61.6	66	1.8	15	----	61.6
Receiver 10 & 10A - Ball Park	53	55.2	66	2.2	15	----	55.2
Receiver 11 & 11A - Ball Park	54.7	56.9	66	2.2	15	----	56.9
Receiver 12 &12A - Ball Park	49	51.2	66	2.2	15	----	51.2
Receiver 13 & 13A - Ball Park	58.2	60.4	66	2.2	15	----	60.4
Receiver 14 & 14A - Ball Park	67.4	68.6	66	1.2	15	Snd Lvl	68.6
Receiver 15 - Golf Course	59	60.8	66	1.8	15	----	60.8
Receiver 16 - Golf Course	59.6	61.2	66	1.6	15	----	61.2
Receiver 17 - Golf Course	52.6	54.8	66	2.2	15	----	54.8
Receiver 18 - Golf Course	58.5	60.8	66	2.3	15	----	60.8
Receiver 19 - Golf Course	57	59.4	66	2.4	15	----	59.4
Receiver 20 - Golf Course	58.4	60.9	66	2.5	15	----	60.9
Receiver 21 - Soccer Field	57.5	59.3	66	1.8	15	----	59.3
Receiver 22 - Soccer Field	58	60	66	2.0	15	----	60
Receiver 23 - Business	64.9	67.1	71	2.2	15	----	67.1
Receiver 24 - Business	61.8	63.5	71	1.7	15	----	63.5
Receiver 25 - Business	64.3	65.5	71	1.2	15	----	65.5
Receiver 26 - Business	61.2	62.5	71	1.3	15	----	62.5
Receiver 27 - Business	62.7	63.7	71	1.0	15	----	63.7
Receiver 28 - Residential	59.3	60.5	66	1.2	15	----	60.5
Receiver 29 - Residential	59.6	60.4	66	0.8	15	----	60.4
Receiver 30 - Residential	59.9	60.6	66	0.7	15	----	60.6
Receiver 31 - Business	60.1	60.6	66	0.5	15	----	60.6
Receiver 32 - Business	63.3	64	66	0.7	15	----	64
Receiver 33 - Business	63.5	64.4	66	0.9	15	----	64.4
Receiver 34 - Business	63.6	64.6	66	1.0	15	----	64.6
Receiver 35 - Business	63.6	64.8	66	1.2	15	----	64.8
Receiver 36 - Business	62.8	63.2	71	0.4	15	----	63.2
Receiver 37 - Business	62.8	63.4	71	0.6	15	----	63.4
Receiver 38 - Business	58.5	59.9	71	1.4	15	----	59.9

TABLE A3 - RESULTS OF NOISE ANALYSIS
120th STREET – 2038 CENTERED ALIGNMENT LEVELS
EMMET STREET TO ROANOKE BOULEVARD
CITY OF OMAHA, DOUGLAS COUNTY, NEBRASKA
PROJECT NO. OPW 50949 MAPA-5009(3) 2227

Name	Existing LAeq1h	LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h
		Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		
Receiver 1 - Business	51.8	53.5	71	1.7	15	----	53.5
Receiver 2 - Business	55.2	56.3	71	1.1	15	----	56.3
Receiver 3 - Mini Golf	60	61.4	66	1.4	15	----	61.4
Receiver 4 - Undeveloped	60.2	62.8	71	2.6	15	----	62.8
Receiver 5 & 5A - Ball Park	53.5	56.2	66	2.7	15	----	56.2
Receiver 6 & 6A - Ball Park	61.8	66.8	66	5.0	15	Snd Lvl	66.8
Receiver 7 & 7A - Ball Park	51.4	54.7	66	3.3	15	----	54.7
Receiver 8 & 8A - Ball Park	53.5	56.6	66	3.1	15	----	56.6
Receiver 9 & 9A - Ball Park	59.8	63.9	66	4.1	15	----	63.9
Receiver 10 & 10A - Ball Park	53	56.4	66	3.4	15	----	56.4
Receiver 11 & 11A - Ball Park	54.7	58	66	3.3	15	----	58
Receiver 12 &12A - Ball Park	49	52.7	66	3.7	15	----	52.7
Receiver 13 & 13A - Ball Park	58.2	62.1	66	3.9	15	----	62.1
Receiver 14 & 14A - Ball Park	67.4	71.1	66	3.7	15	Snd Lvl	71.1
Receiver 15 - Golf Course	59	62	66	3.0	15	----	62
Receiver 16 - Golf Course	59.6	63.6	66	4.0	15	----	63.6
Receiver 17 - Golf Course	52.6	56.1	66	3.5	15	----	56.1
Receiver 18 - Golf Course	58.5	61.8	66	3.3	15	----	61.8
Receiver 19 - Golf Course	57	58.8	66	1.8	15	----	58.8
Receiver 20 - Golf Course	58.4	59.2	66	0.8	15	----	59.2
Receiver 21 - Soccer Field	57.5	61.5	66	4.0	15	----	61.5
Receiver 22 - Soccer Field	58	61.3	66	3.3	15	----	61.3
Receiver 23 - Business	64.9	65.1	71	0.2	15	----	65.1
Receiver 24 - Business	61.8	61.9	71	0.1	15	----	61.9
Receiver 25 - Business	64.3	65.6	71	1.3	15	----	65.6
Receiver 26 - Business	61.2	61.2	71	0.0	15	----	61.2
Receiver 27 - Business	62.7	62.4	71	-0.3	15	----	62.4
Receiver 28 - Residential	59.3	59.1	66	-0.2	15	----	59.1
Receiver 29 - Residential	59.6	59.1	66	-0.5	15	----	59.1
Receiver 30 - Residential	59.9	58.9	66	-1.0	15	----	58.9
Receiver 31 - Business	60.1	59.1	66	-1.0	15	----	59.1
Receiver 32 - Business	63.3	63	66	-0.3	15	----	63
Receiver 33 - Business	63.5	63.7	66	0.2	15	----	63.7
Receiver 34 - Business	63.6	63.8	66	0.2	15	----	63.8
Receiver 35 - Business	63.6	64.1	66	0.5	15	----	64.1
Receiver 36 - Business	62.8	61.9	71	-0.9	15	----	61.9
Receiver 37 - Business	62.8	62.6	71	-0.2	15	----	62.6
Receiver 38 - Business	58.5	59.3	71	0.8	15	----	59.3

TABLE A4 - RESULTS OF NOISE ANALYSIS
120th STREET – 2038 20' LEFT ALIGNMENT LEVELS
EMMET STREET TO ROANOKE BOULEVARD
CITY OF OMAHA, DOUGLAS COUNTY, NEBRASKA
PROJECT NO. OPW 50949 MAPA-5009(3) 22277

Name	Existing LAeq1h	LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h
		Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		
Receiver 1 - Business	51.8	54.3	71	2.5	15	----	54.3
Receiver 2 - Business	55.2	57.4	71	2.2	15	----	57.4
Receiver 3 - Mini Golf	60	62.8	66	2.8	15	----	62.8
Receiver 4 - Undeveloped	60.2	63.5	71	3.3	15	----	63.5
Receiver 5 & 5A - Ball Park	53.5	56.8	66	3.3	15	----	56.8
Receiver 6 & 6A - Ball Park	61.8	66.5	66	4.7	15	Snd Lvl	66.5
Receiver 7 & 7A - Ball Park	51.4	54.8	66	3.4	15	----	54.8
Receiver 8 & 8A - Ball Park	53.5	56.8	66	3.3	15	----	56.8
Receiver 9 & 9A - Ball Park	59.8	63.6	66	3.8	15	----	63.6
Receiver 10 & 10A - Ball Park	53	54.7	66	1.7	15	----	54.7
Receiver 11 & 11A - Ball Park	54.7	54.9	66	0.2	15	----	54.9
Receiver 12 &12A - Ball Park	49	51.5	66	2.5	15	----	51.5
Receiver 13 & 13A - Ball Park	58.2	60.6	66	2.4	15	----	60.6
Receiver 14 & 14A - Ball Park	67.4	69.2	66	1.8	15	Snd Lvl	69.2
Receiver 15 - Golf Course	59	61.2	66	2.2	15	----	61.2
Receiver 16 - Golf Course	59.6	62.1	66	2.5	15	----	62.1
Receiver 17 - Golf Course	52.6	56	66	3.4	15	----	56
Receiver 18 - Golf Course	58.5	61.4	66	2.9	15	----	61.4
Receiver 19 - Golf Course	57	58.8	66	1.8	15	----	58.8
Receiver 20 - Golf Course	58.4	59	66	0.6	15	----	59
Receiver 21 - Soccer Field	57.5	63.3	66	5.8	15	----	63.3
Receiver 22 - Soccer Field	58	62.8	66	4.8	15	----	62.8
Receiver 23 - Business	64.9	65.2	71	0.3	15	----	65.2
Receiver 24 - Business	61.8	62.3	71	0.5	15	----	62.3
Receiver 25 - Business	64.3	65.9	71	1.6	15	----	65.9
Receiver 26 - Business	61.2	61.6	71	0.4	15	----	61.6
Receiver 27 - Business	62.7	62.5	71	-0.2	15	----	62.5
Receiver 28 - Residential	59.3	59.1	66	-0.2	15	----	59.1
Receiver 29 - Residential	59.6	59.1	66	-0.5	15	----	59.1
Receiver 30 - Residential	59.9	58.9	66	-1.0	15	----	58.9
Receiver 31 - Business	60.1	59.1	66	-1.0	15	----	59.1
Receiver 32 - Business	63.3	63	66	-0.3	15	----	63
Receiver 33 - Business	63.5	63.7	66	0.2	15	----	63.7
Receiver 34 - Business	63.6	63.8	66	0.2	15	----	63.8
Receiver 35 - Business	63.6	64.1	66	0.5	15	----	64.1
Receiver 36 - Business	62.8	61.9	71	-0.9	15	----	61.9
Receiver 37 - Business	62.8	62.6	71	-0.2	15	----	62.6
Receiver 38 - Business	58.5	59.3	71	0.8	15	----	59.3

TABLE A5 - RESULTS OF NOISE ANALYSIS
120th STREET – 2038 40' LEFT ALIGNMENT LEVELS
EMMET STREET TO ROANOKE BOULEVARD
CITY OF OMAHA, DOUGLAS COUNTY, NEBRASKA
PROJECT NO. OPW 50949 MAPA-5009(3) 22277

Name	Existing LAeq1h	LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h
		Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		
Receiver 1 - Business	51.8	55.4	71	3.6	15	----	55.4
Receiver 2 - Business	55.2	57.7	71	2.5	15	----	57.7
Receiver 3 - Mini Golf	60	62.9	66	2.9	15	----	62.9
Receiver 4 - Undeveloped	60.2	64.5	71	4.3	15	----	64.5
Receiver 5 & 5A - Ball Park	53.5	57.4	66	3.9	15	----	57.4
Receiver 6 & 6A - Ball Park	61.8	67.1	66	5.3	15	Snd Lvl	67.1
Receiver 7 & 7A - Ball Park	51.4	55.7	66	4.3	15	----	55.7
Receiver 8 & 8A - Ball Park	53.5	57.6	66	4.1	15	----	57.6
Receiver 9 & 9A - Ball Park	59.8	64.2	66	4.4	15	----	64.2
Receiver 10 & 10A - Ball Park	53	56.7	66	3.7	15	----	56.7
Receiver 11 & 11A - Ball Park	54.7	57.8	66	3.1	15	----	57.8
Receiver 12 &12A - Ball Park	49	52.8	66	3.8	15	----	52.8
Receiver 13 & 13A - Ball Park	58.2	60.8	66	2.6	15	----	60.8
Receiver 14 & 14A - Ball Park	67.4	68.1	66	0.7	15	Snd Lvl	68.1
Receiver 15 - Golf Course	59	61	66	2.0	15	----	61
Receiver 16 - Golf Course	59.6	60.8	66	1.2	15	----	60.8
Receiver 17 - Golf Course	52.6	55.6	66	3.0	15	----	55.6
Receiver 18 - Golf Course	58.5	60.3	66	1.8	15	----	60.3
Receiver 19 - Golf Course	57	58.3	66	1.3	15	----	58.3
Receiver 20 - Golf Course	58.4	59	66	0.6	15	----	59
Receiver 21 - Soccer Field	57.5	64.5	66	7.0	15	----	64.5
Receiver 22 - Soccer Field	58	64.4	66	6.4	15	----	64.4
Receiver 23 - Business	64.9	65.8	71	0.9	15	----	65.8
Receiver 24 - Business	61.8	61.6	71	-0.2	15	----	61.6
Receiver 25 - Business	64.3	64.9	71	0.6	15	----	64.9
Receiver 26 - Business	61.2	60.6	71	-0.6	15	----	60.6
Receiver 27 - Business	62.7	61.9	71	-0.8	15	----	61.9
Receiver 28 - Residential	59.3	59.2	66	-0.1	15	----	59.2
Receiver 29 - Residential	59.6	59.2	66	-0.4	15	----	59.2
Receiver 30 - Residential	59.9	59	66	-0.9	15	----	59
Receiver 31 - Business	60.1	59	66	-1.1	15	----	59
Receiver 32 - Business	63.3	63.1	66	-0.2	15	----	63.1
Receiver 33 - Business	63.5	63.6	66	0.1	15	----	63.6
Receiver 34 - Business	63.6	63.8	66	0.2	15	----	63.8
Receiver 35 - Business	63.6	64	66	0.4	15	----	64
Receiver 36 - Business	62.8	61.9	71	-0.9	15	----	61.9
Receiver 37 - Business	62.8	62.7	71	-0.1	15	----	62.7
Receiver 38 - Business	58.5	59.3	71	0.8	15	----	59.3

APPENDIX B

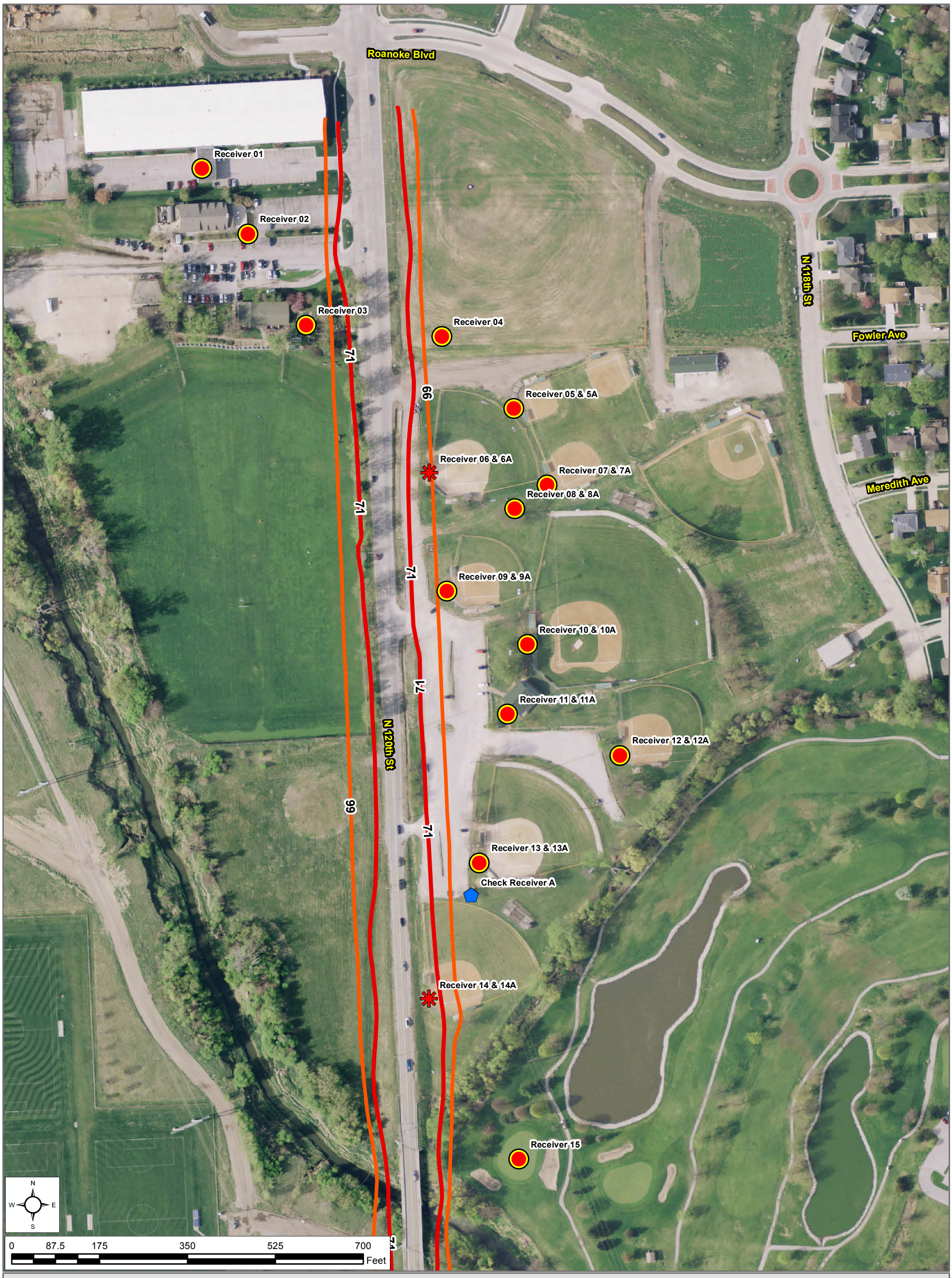


Figure 1: Centered Scenario - North

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

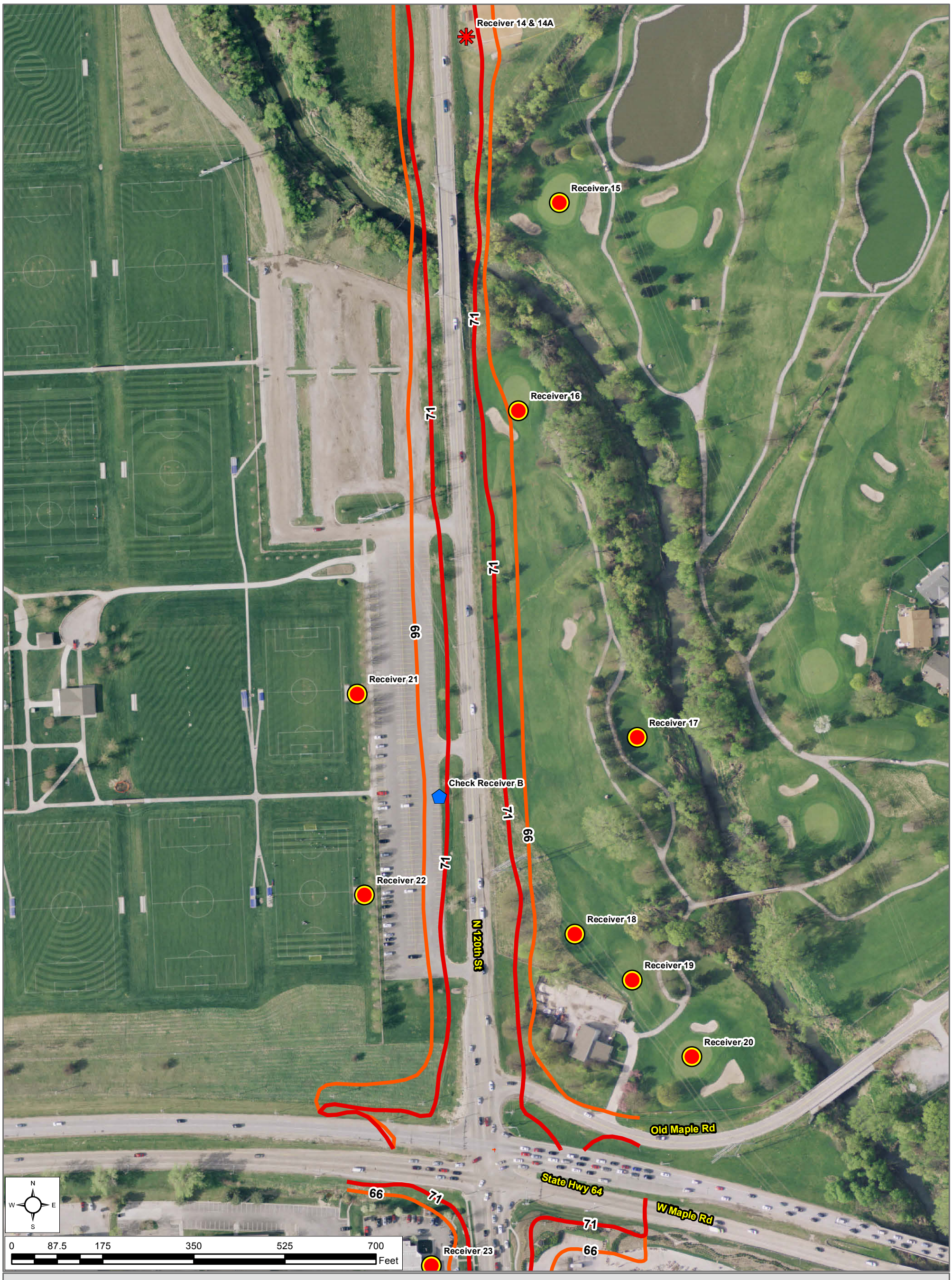


Figure 02: Centered Scenario - Middle

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

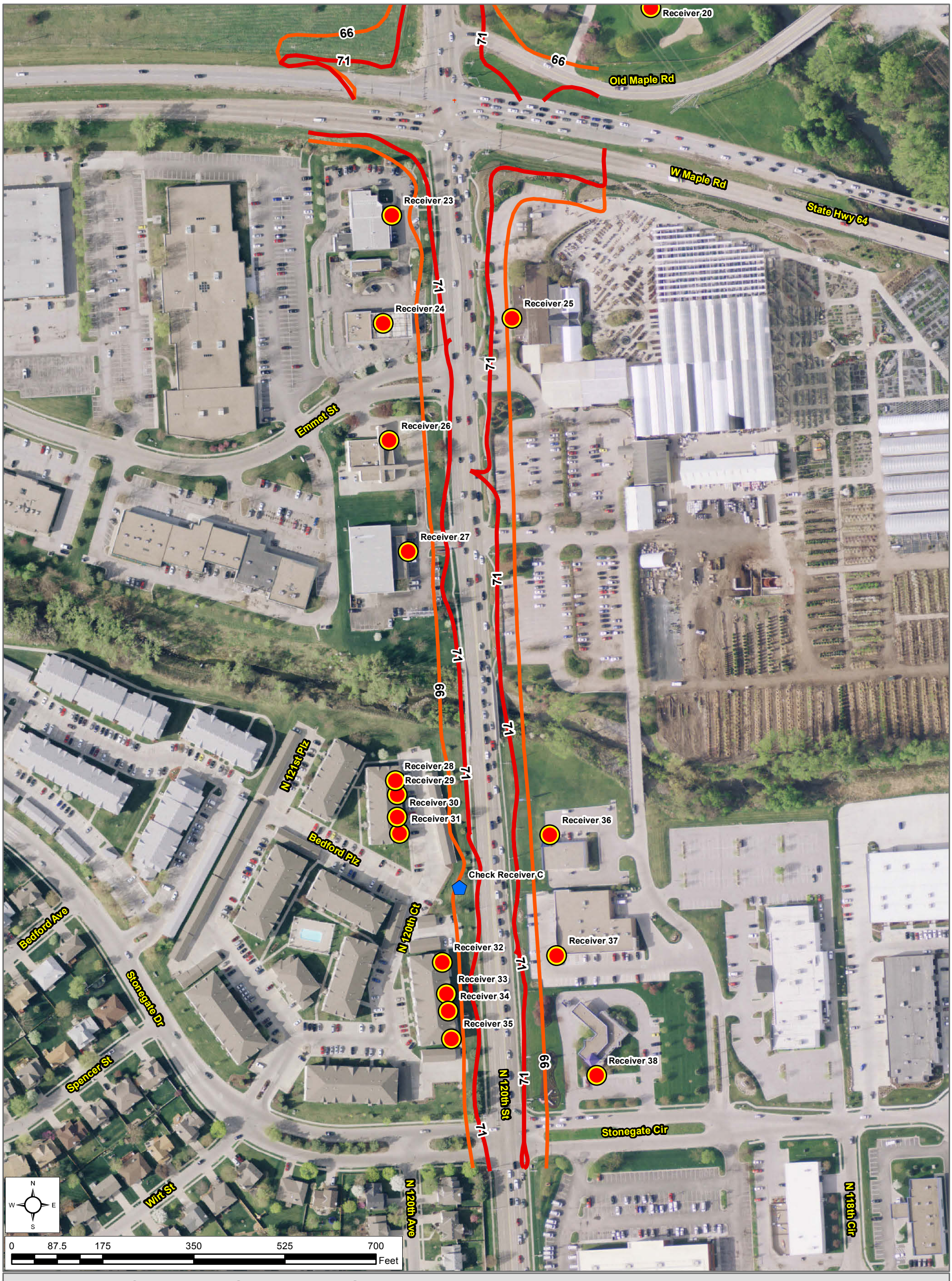


Figure 03: Centered Scenario - South

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

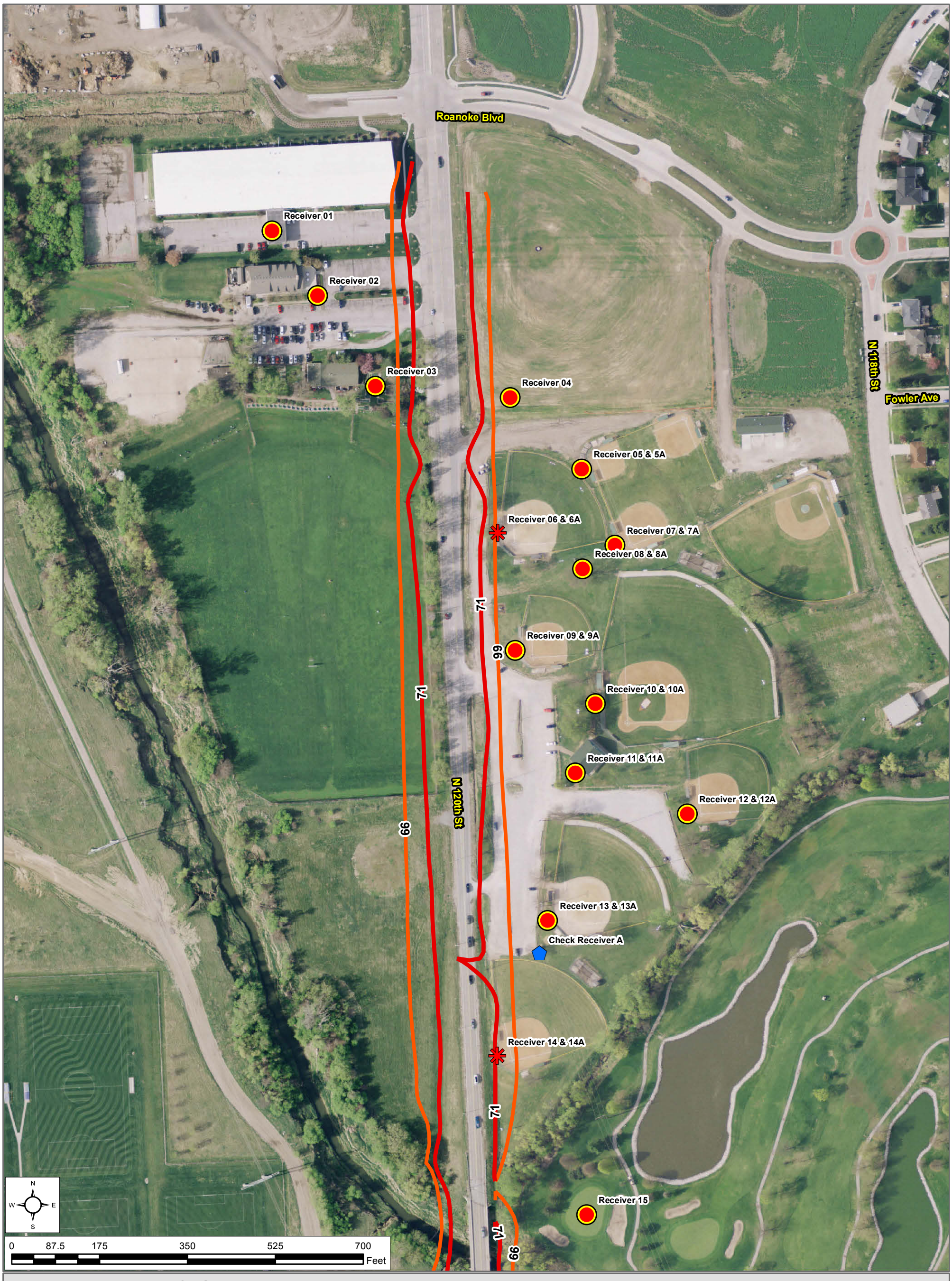


Figure 4: 20' Left Scenario - North

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

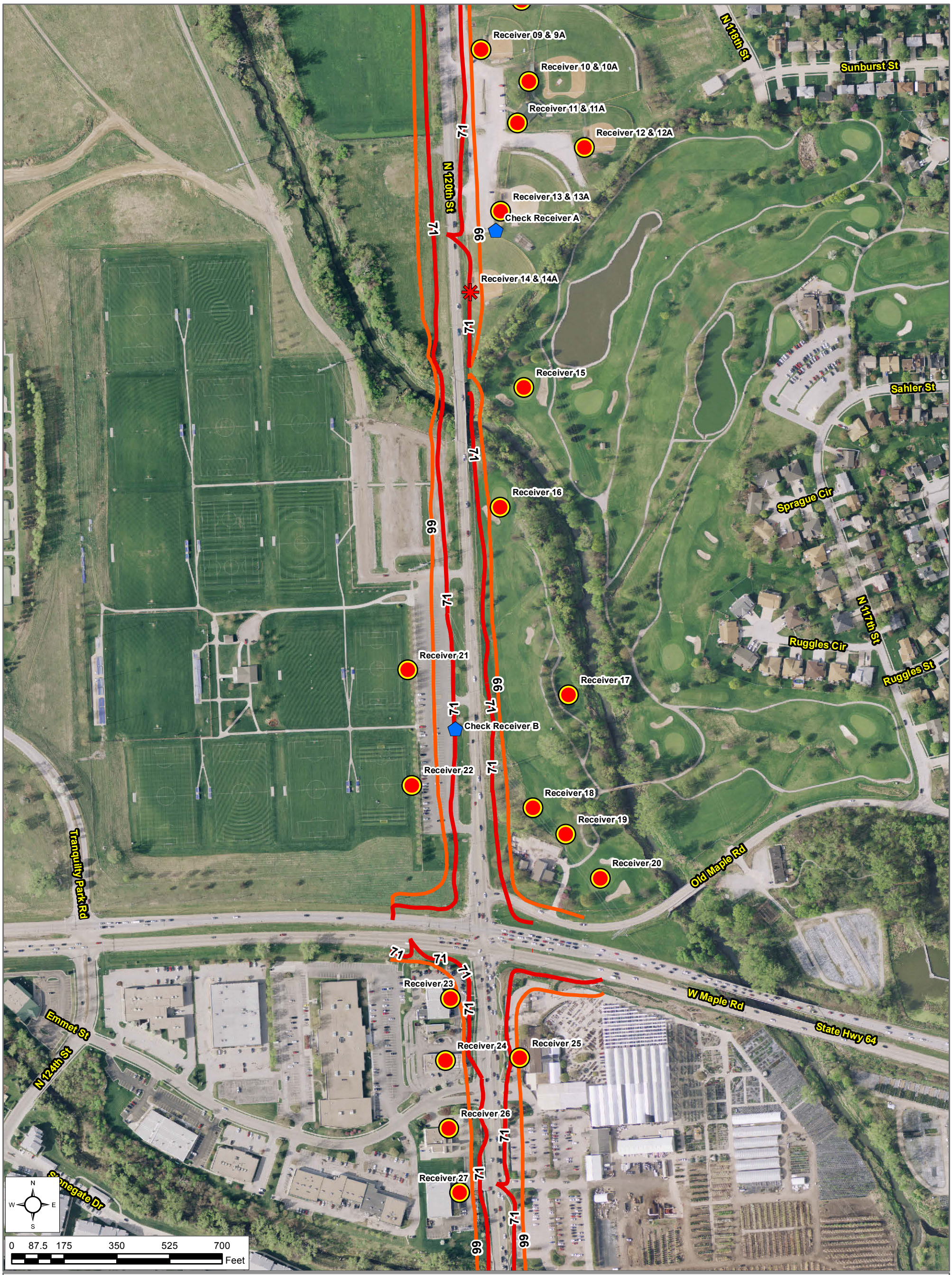


Figure 05: 20' Left Scenario - Middle

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

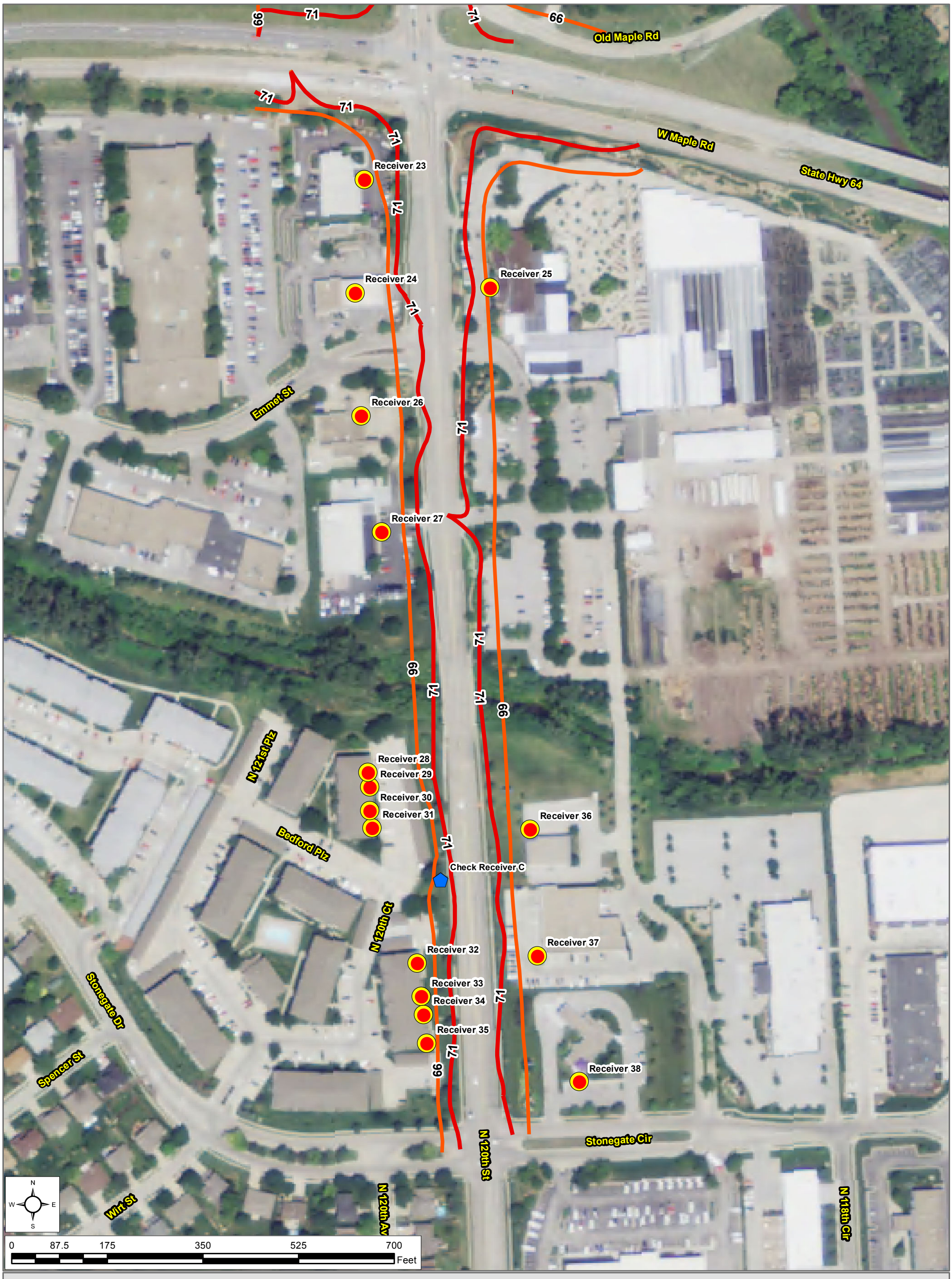


Figure 06: 20' Left Scenario - South

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

SCHEMMER

ARCHITECTS | ENGINEERS | PLANNERS

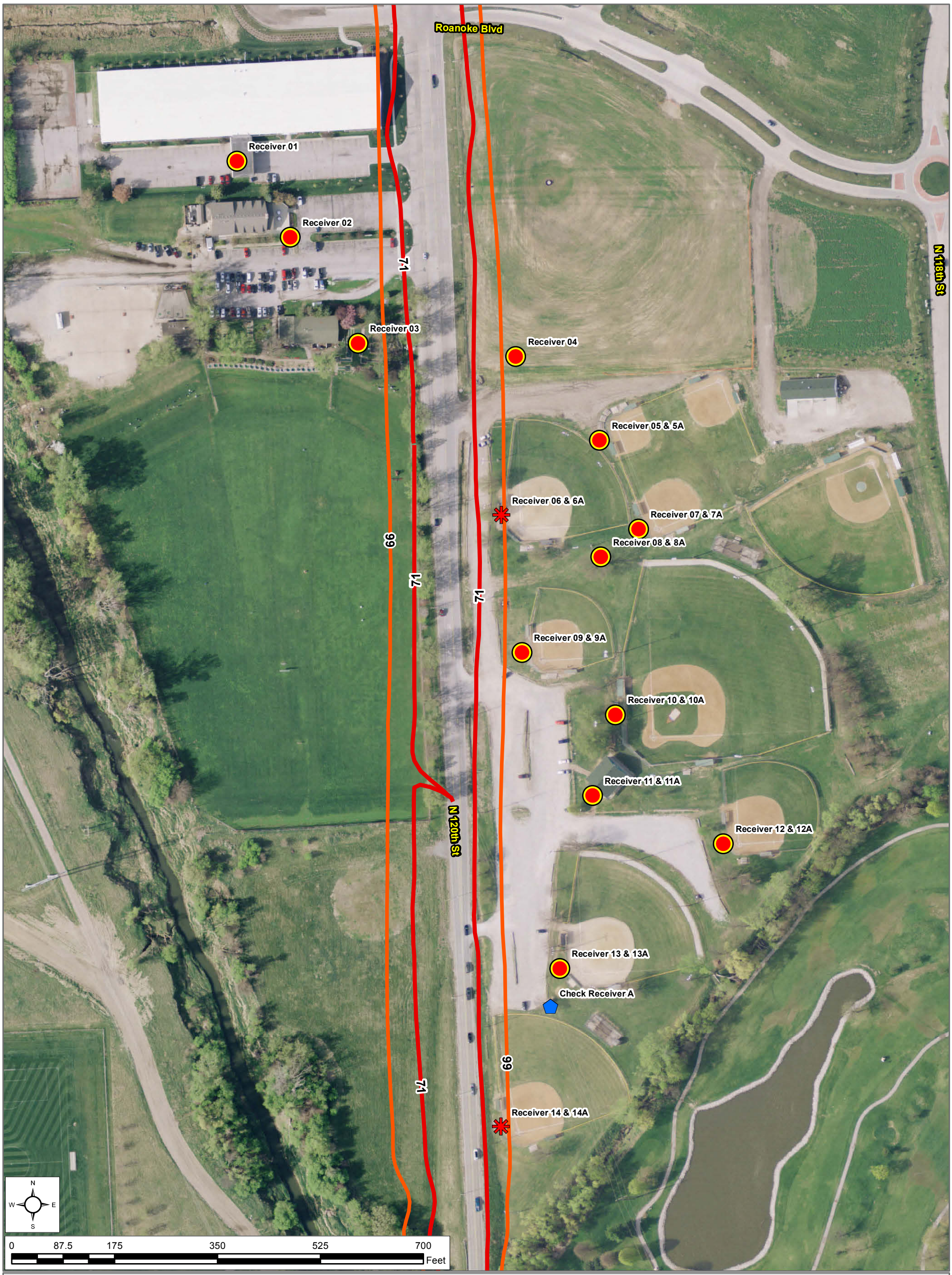


Figure 7: 40' Left Scenario - North

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

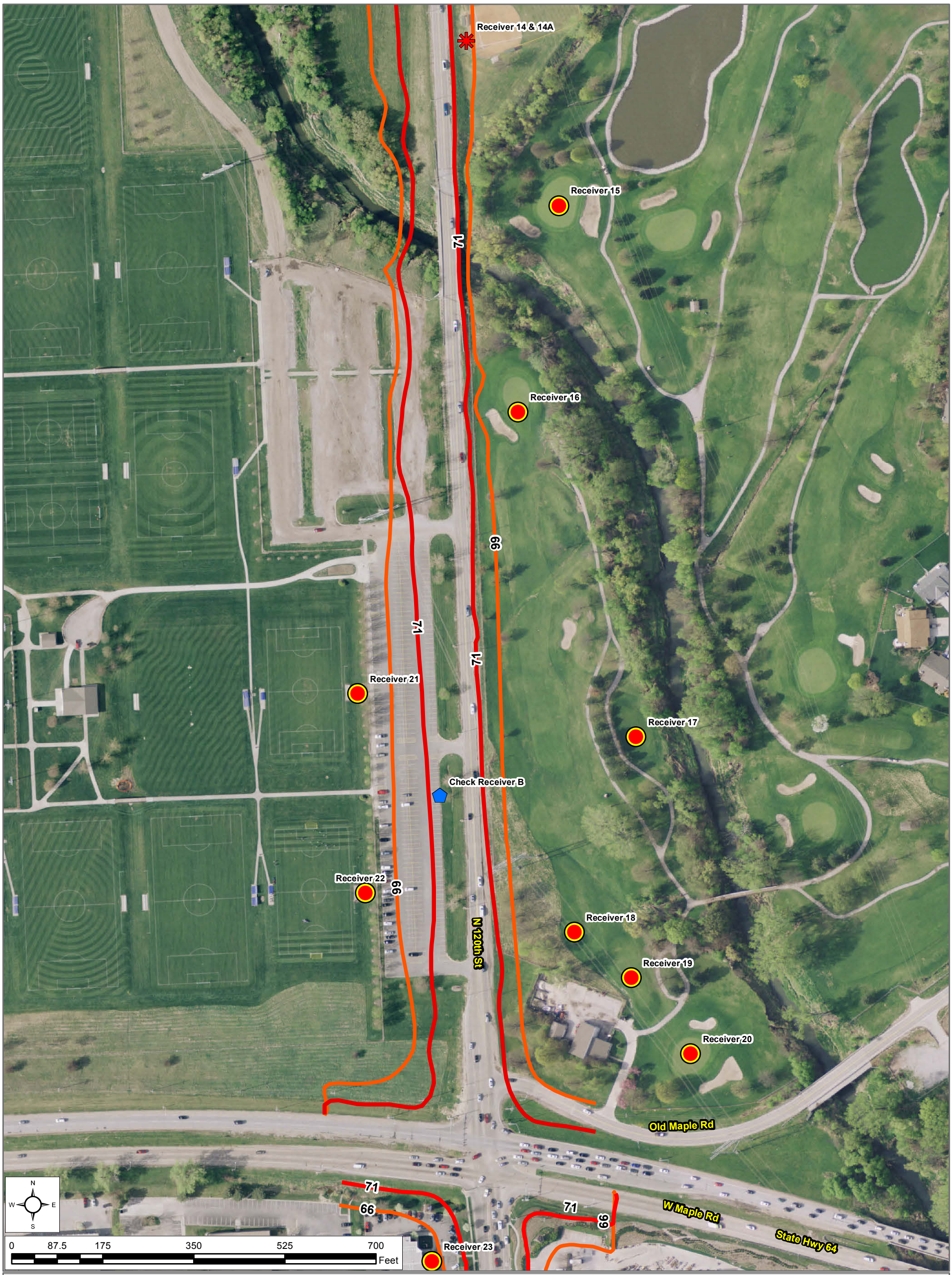


Figure 08: 40' Left Scenario - Middle

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

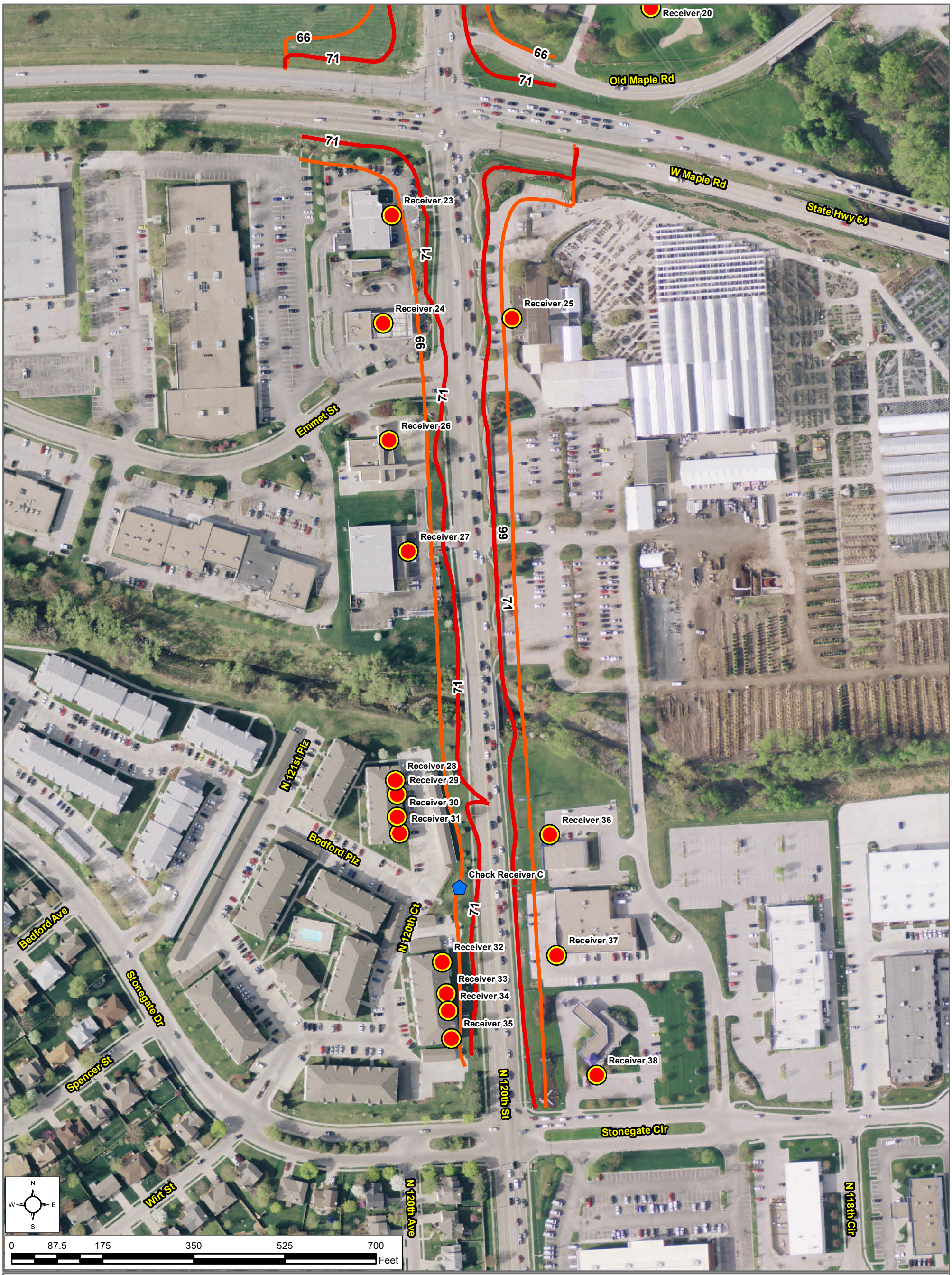


Figure 09: 40' Left Scenario - South

Legend

- Receiver
- Impacted Receiver
- Check Receiver

120th Street Reconstruction

4/19/14

TSA Project: 05538.001

CAS

Attachment 1

Technical Memorandum

TO: Jon Meyer (City of Omaha)

FROM: Schemmer
SUBJECT: Noise Analysis, Traffic Volume Update for 120th Street and West Maple Road
PROJECT: 120th Street Stonegate to Fort, MAPA-5009(3) CN 22277
OPW 50949

DATE: March 13th, 2017

Executive Summary

This memo details the update to traffic volumes on 120th Street from 2010 to 2035 MAPA model to the 2010 to 2040 MAPA model with comparisons to the volumes included with the noise analysis approved in July, 2015. The current noise analysis utilized the 2010 to 2035 MAPA model and projected growth for 2018 and 2038. MAPA released the 2040 model in 2014. As part of this memo, the 2040 projected volumes are further refined with turning movement counts collected by the City of Omaha in 2013.

1.0 Existing Traffic Counts

Metro Area Planning Organization (MAPA) provided the previous 2010 and 2035 traffic volumes for the intersection of 120th Street and West Maple Road. The 2035 MAPA model is the basis of the current noise analysis using average annual growth volumes for 2018 and 2038.

The City conducted intersection turning movement counts (TMC) at the study intersection on a typical weekday in December, 2013.

The 2013 average daily traffic volumes (ADT) are shown in Table 1 for comparison to MAPA 2010 base model volumes and noise analysis, Table 1 traffic volumes.

Table 1. Existing ADT MAPA and TMC

Location	2010 (base model)	2013 TMC	2018 Noise Study
120th Street, North of West Maple Road	**11,000**	**13,300**	**15,634**
120th Street, South of West Maple Road	**21,500**	**22,800**	**22,563**
West Maple Road, West of 120th Street	**34,000**	**39,500**	**36,654**
West Maple Road, East of 120th Street	**36,000**	**40,700**	**39,206**

2.0 Traffic Projections

In spring 2014, MAPA released the latest update to its travel demand model (TDM) that includes the 2040 traffic forecast. The 2040 projections are lower for 120th Street north of West Maple and higher for the south, east, and west approaches as compared with the 2035 projections, which are shown in Table 2, along with the 2010 ADT

that was used in MAPA's base model.

Table 2. MAPA TDM ADT Projection Comparison

Location	2010 (base model)	2035 (projection)	2040 (projection)
120th Street, North of West Maple Road	**11,000**	**33,000**	**19,000**
120th Street, South of West Maple Road	**21,500**	**25,000**	**25,000**
West Maple Road, West of 120th Street	**34,000**	**43,000**	**47,000**
West Maple Road, East of 120th Street	**36,000**	**47,000**	**48,000**

The differences between the 2035 and 2040 traffic projections arise from many factors. MAPA is using updated technology and software for the land planning aspect of the TDM inputs, which relies on more accurate land use data than MAPA's previous land use model, and therefore produces improved traffic projections. The actual travel demand modeling software itself remains the same (TransCAD). Additionally, the roadway network in the 2040 TDM was updated to reflect the current MAPA Transportation Plan, which (among other improvements) reflects widening West Maple Road from 4-lanes to a 6-lanes and revised land use and growth along 120th Street north of West Maple Road.

3.0 Future Traffic Volumes

Based on MAPA's 2010 and 2035 volumes, the noise analysis used the average annual growth rate to project 2038 volumes, which are shown in Table 3.

Table 3. Year 2010, 2035, 2038 (Extrapolated) ADT Comparison

Location	2010	2035	2038
120th Street, North of West Maple Road	**11,000**	**33,000**	**37,650**
120th Street, South of West Maple Road	**21,500**	**25,000**	**25,457**
West Maple Road, West of 120th Street	**34,000**	**43,000**	**44,229**
West Maple Road, East of 120th Street	**36,000**	**47,000**	**48,528**

Based on MAPA's 2010 and 2040 volumes, an interpolated growth rate was calculated to project annual growth. The calculated annual growth rate from the MAPA 2010 to 2040 model was applied to the City of Omaha 2013 ADT from turning movement counts for the intersection of 120th Street and West Maple Road to project 2040 ADT which are shown in Table 4.

Table 4. Year 2013 ADT from TMC, 2040 ADT Projection

Location	2013 City Counts	2040 (projection)
120th Street, North of West Maple Road	**13,300**	**20,600**
120th Street, South of West Maple Road	**22,800**	**26,300**
West Maple Road, West of 120th Street	**39,500**	**50,600**
West Maple Road, East of 120th Street	**40,700**	**53,700**

4.0 Conclusions

The 2038 ADT projections from Table 3 were compared to the 2040 ADT projections from Table 4, and are shown in Table 5.

Table 5. Year 2013, 2038, and 2040 ADT Comparison (calculated from peak hour volume)

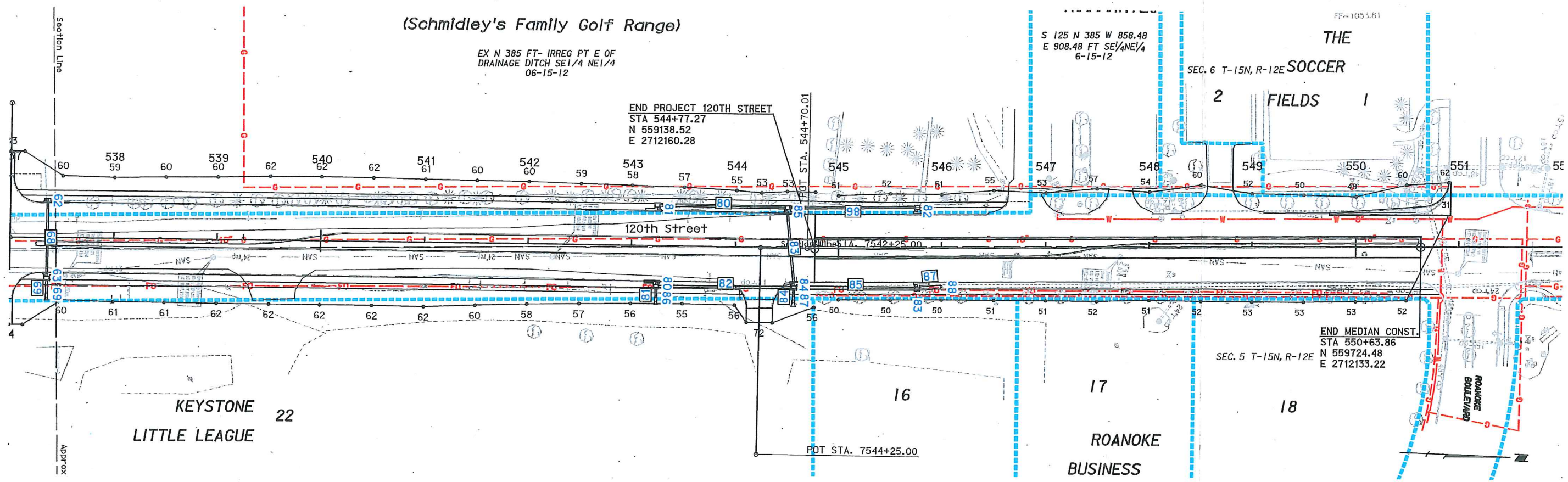
Location	2013 City Counts	2038 Noise Analysis	2040 (projection)	% Change 2038 to 2040
120th Street, North of West Maple Road	**13,300**	**37,650**	**20,600**	**- 55%**
120th Street, South of West Maple Road	**22,800**	**25,457**	**26,300**	**+ 3%**
West Maple Road, West of 120th Street	**39,500**	**44,229**	**50,600**	**+ 14%**
West Maple Road, East of 120th Street	**40,700**	**48,528**	**53,700**	**+ 11%**

When considering the effects on traffic noise resulting from an increase or decrease in traffic volumes, a doubling (+100% change) or halving (-50% change) is required to produce a ±3 dBA difference, which is the minimum perceptible difference to human ears. Comparing the 2038 ADT projections to the 2040 ADT projections, the maximum percent increase is approximately 14% while a decline of 55% is projected for north of West Maple Road.

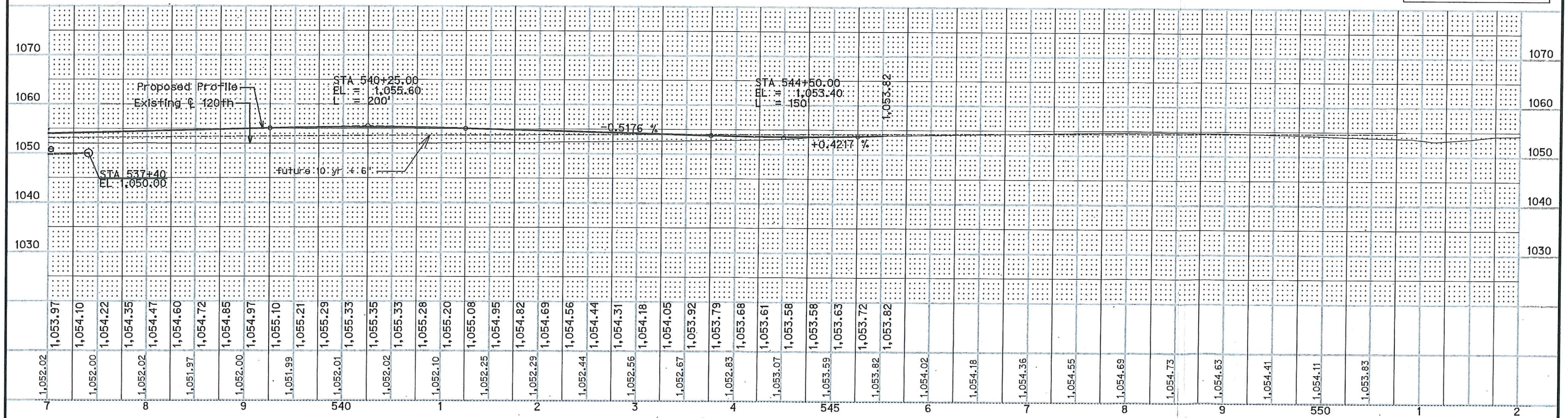
The noise analysis approved in July, 2015 indicated abatement measures were found to be not feasible or reasonable. The amount of change on 120th Street north of West Maple is greater than the 25% change stipulated by NDOR for a re-evaluation of noise impacts, however, the reduction in volume would reduce noise. Thus, the updated volumes would not significantly change the findings of the noise analysis. As a result, the current findings of the noise analysis should be considered valid.

120TH STREET - CITY OF OMAHA

PROJECT NO.	C.N.
MAPA-5009(3)	22277



PRELIMINARY PLAN
NOT FINAL - SUBJECT TO CHANGE



GRAPHIC SCALE : FEET (50 0 25 50)

PLAN & PROFILE

CITY OF OMAHA PUBLIC WORKS DEPARTMENT	OPW-50949	SHEET NO. 6

...\Plan sheets\05538001 PP6.dgn
4/23/2010