Draft Traffic Noise Analysis Report

TH 10 Rum River Bridge Project

Report Version 2.0

Minnesota Department of Transportation
Metro District

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SP 0215-76

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Chapter 1 Introduction

The purpose of this noise analysis is to evaluate and document the effect of the proposed Trunk Highway (TH) 10 Rum River Bridge and Ferry Street Interchange Project (SP 0215-76) on traffic generated noise levels. The proposed project includes Federal-aid funding sources; therefore, an environmental review under the National Environmental Policy Act (NEPA) is required. The project has been identified as a Class II action under NEPA. A Minnesota Department of Transportation (MnDOT) trunk highway Categorical Exclusion determination will be prepared for the project.

This traffic noise analysis was completed following the procedures and guidance described in the 2017 MnDOT Noise Requirements for Type I Federal-aid Projects as per 23 CFR 772 (effective July 10, 2017).[1] MnDOT's noise requirements apply to all projects administered by MnDOT that exceed mandatory Environmental Quality Board (EQB) thresholds for highway projects and/or Federal Highway Administration (FHWA) Title 23 Code of Federal Regulations (CFR) Part 772 impact criteria.

1.1 General Project Description

The TH 10 Rum River Bridge and Ferry Street Interchange Project is in the City of Anoka, Anoka County, Minnesota. Figure 1.1 includes a state location map. Figure 1.2 includes a project area map.

The project includes reconstruction of TH 10 bridge over the Rum River. The bridge profile would be raised by approximately two feet to provide additional clearance over the Rum River for bridge maintenance and recreational users on the river. The TH 10/47/169 (Ferry Street) interchange would be reconstructed as a single-point urban interchange. Reconstruction along Ferry Street would extend from Calhoun Street south of TH 10 to Pleasant Street north of TH 10. The Gray Street intersection with Ferry Street would be closed, and the Maple Lane intersection would be modified to right-in/right-out only. Auxiliary lanes would be constructed on eastbound and westbound TH 10 between Ferry Street and 7th Avenue. The existing 4th Avenue bridge over TH 10 would be removed and reconstructed. There would be a profile change on the 4th Avenue bridge to provide clearance over TH 10. The existing Rum River Regional Trail bridge over TH 10 would be removed. The Rum River Regional Trail would be reconstructed on a new alignment along the 4th Avenue bridge over TH 10.

[1] The 2017 MnDOT noise requirements document is available online on the MnDOT Office of Environmental Stewardship webpage at http://www.dot.state.mn.us/environment/noise/pdf/2017-noise-requirements.pdf.

Figure 1.1 State Location Map

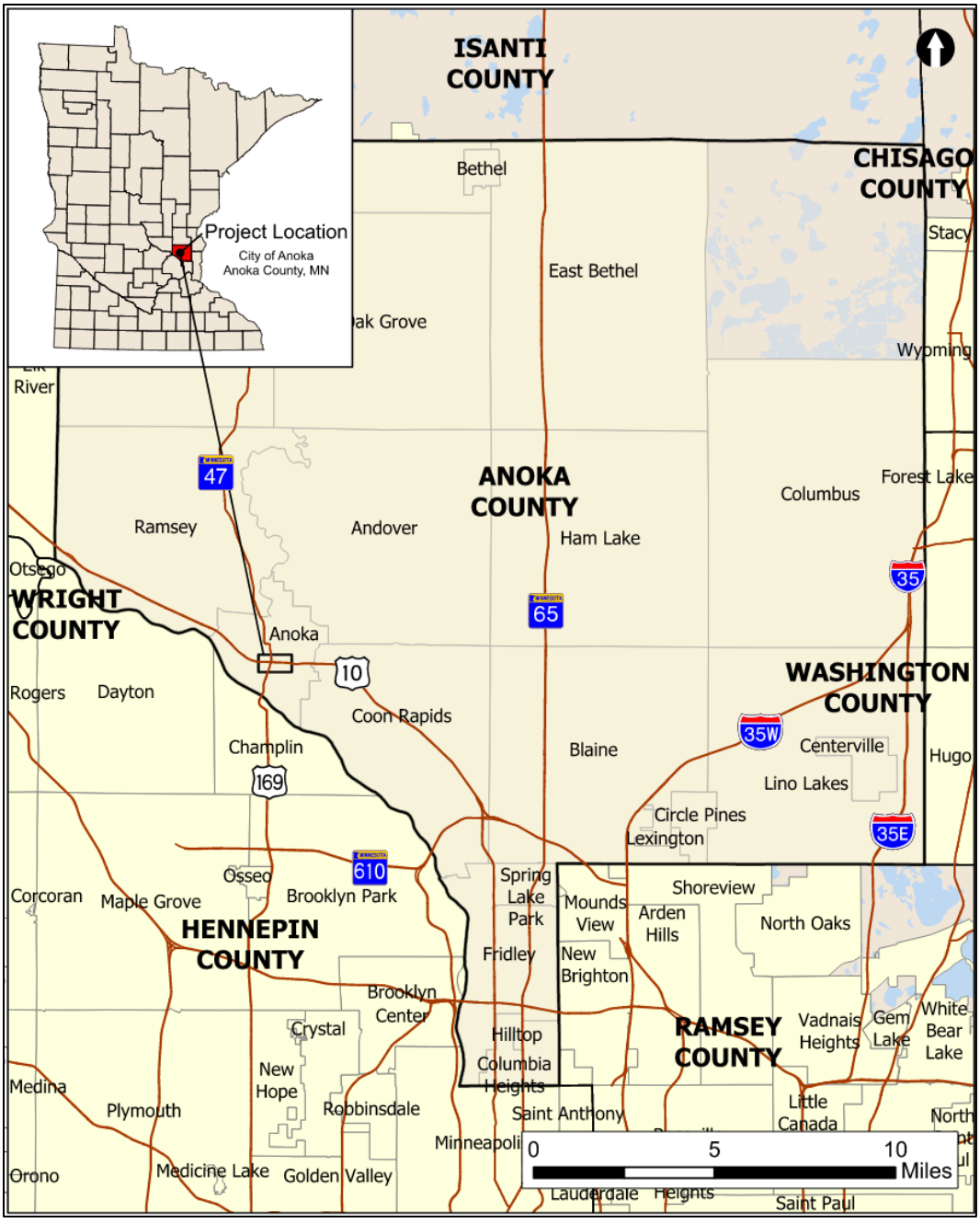
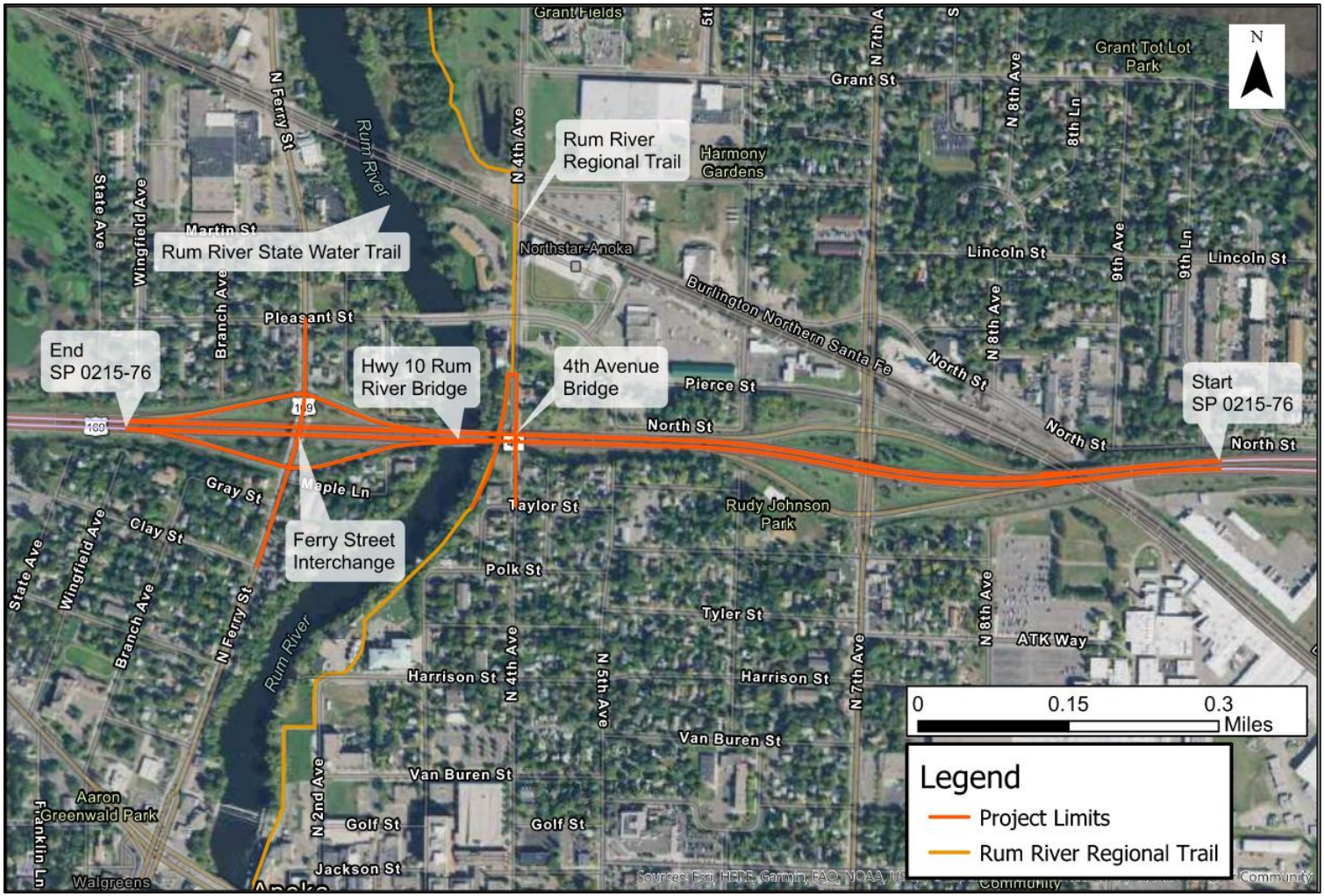


Figure 1.2 Project Location Map



The TH 10 bridge over 7th Avenue and the TH 10 bridge over the BNSF Railway would be rehabilitated. Additional project features include stormwater basins, utility relocations, retaining walls, sidewalk reconstruction, and driveway reconstruction. The total project length along Ferry Street is approximately 0.4 miles. The total project length along TH 10 is approximately 1.1 miles.

1.2 Background Information On Noise

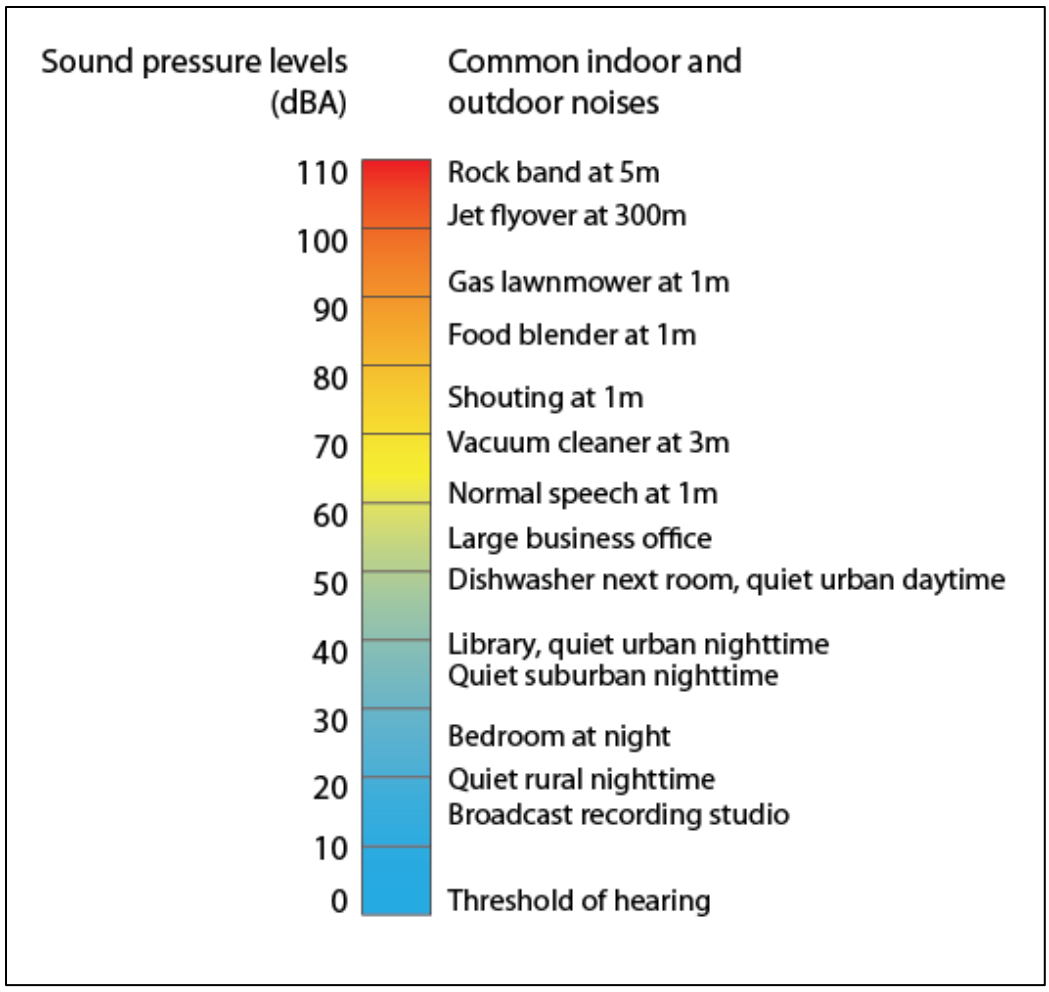
Noise is defined as any unwanted sound. Sound travels in a wave motion and produces a sound pressure level. This sound pressure level is commonly measured in decibels. Decibels (dB) represent the logarithm of the ratio of a sound energy relative to a reference sound energy. For highway traffic noise, an adjustment, or weighting, of the high- and low- pitched sound is made to approximate the way that an average person hears sound. The adjusted sound levels are stated in units of "A-weighted decibels" (dBA). A sound increase of 3 dBA is barely noticeable by the human ear, a 5 dBA increase is clearly noticeable, and a 10 dBA increase is heard as twice as loud. For example, if the sound energy is doubled (i.e., the amount of traffic doubles), there is a 3 dBA increase in noise, which is just barely noticeable to most people. On the other hand, if traffic increases by a factor of ten times, the resulting sound level will increase by about 10 dBA and be heard to be twice as loud.

In Minnesota, traffic noise impacts are evaluated by measuring and/or modeling the equivalent steady-state sound level. The equivalent steady-state sound level contains the same acoustic energy as the time-varying sound level over a stated period of time. This number is referred to as the Leq level, with Leq(h) being the hourly value of Leq. The Leq is analogous to the "average" sound level over a given period of time.

Along with the volume of traffic and other factors (e.g., topography of the area and vehicle speed) that contribute to the loudness of traffic noise, the distance of a receptor from a sound's source is also a key factor. Sound level decreases as distance from a source increases. A general rule regarding sound level decrease due to increasing distance from a line source (roadway) that is commonly used is: beyond approximately 50 feet from the sound source, each doubling of distance from the line source over hard ground (such as pavement or water) will reduce the sound level by 3 dBA, whereas each doubling of distance over soft ground (such as vegetated or grassy ground) results in a sound level decrease of 4.5 dBA.

Figure 1.3 provides a rough comparison of the noise levels of some common noise sources.

Figure 1.3 Decibel Level of Common Noise Sources



Source: Minnesota Pollution Control Agency. Noise Pollution accessed February 11, 2020 and available at https://www.pca.state.mn.us/air/noise-pollution.

1.3 Federal Traffic Noise Regulations

The FHWA's traffic noise regulation is described in 23 Code of Federal Regulations (CFR) Part 772 (Procedures for Abatement of Highway Traffic Noise and Construction Noise). 23 CFR 772 requires the identification of highway traffic noise impacts and the evaluation of potential noise abatement measures, along with other considerations, in conjunction with the planning and design of a Federal-aid highway project. The MnDOT requirements for implementation of the requirements of 23 CFR 772 is described in the *MnDOT Noise Requirements for Type I Federal-aid Projects* (effective July 10, 2017). The MnDOT noise requirements applies to all projects that receive Federal-aid funds or projects that are subject to FHWA approval.

A traffic noise impact analysis is required for all Type I Federal-aid projects. Type I projects are defined in 23 CFR 772.5. The TH 10 Rum River Bridge and Ferry Street Interchange Project meets the definition of a Type I project. The project includes the addition of auxiliary lanes on TH 10 between Ferry Street and 7th Avenue. Therefore, a traffic noise analysis is required for the project.

1.3.1 Traffic Noise Impact Criteria

Federal Noise Abatement Criteria

Under FHWA criteria and regulations, traffic noise impacts are determined in two ways. First, future build worst hour noise levels are compared to FHWA Noise Abatement Criteria (NAC). Table 1.1 lists the FHWA noise abatement criteria by land use activity category. If a future build worst hour noise level approaches or exceeds the NAC noise level, then an impact exists. A noise level approaches NAC when it is within 1 dBA of the NAC noise level. For example, 66 dBA (Leq) is defined as "approaching" the noise abatement criterion for residential land uses (Activity Category B). Second, future build worst hour noise levels are compared with the existing no-build noise levels. If the future level is greater than the existing level by 5 dBA or more (i.e., substantial increase), an impact exists.

Table 1.1 23 CFR 772: Federal Noise Abatement Criteria

Activity Category	Activity Criteria Leq(h) (1)	Evaluation Location	Activity Descriptions
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, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.

Activity Category	Activity Criteria Leq(h) [1]	Evaluation Location	Activity Descriptions
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E [2] [3]	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	--	--	Undeveloped lands that are not permitted.

(1) The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

(2) Includes undeveloped lands permitted for this activity category.

(3) Hotels and motels that function as apartment buildings are classified under Activity Category B.

Minnesota State Noise Standards

In 2016, the Commissioners of the Minnesota Pollution Control Agency (MPCA) and MnDOT agreed that the traffic noise regulations and mitigation requirements from the FHWA are sufficient to determine reasonable mitigation measures for highway noise. By this agreement, existing and newly constructed segments of highway projects under MnDOT's jurisdiction are statutorily exempt from Minnesota State Noise Standard (Minnesota Rule 7030) if the project applies the FHWA traffic noise requirements. As a result, any required noise analysis will follow FHWA criteria and regulations only. Projects will no longer directly address Minnesota Rule 7030.

Chapter 2 Analysis Methodology

2.1 Affected Environment

The project is in the City of Anoka in Anoka County, Minnesota. Existing land uses along the project segment of TH 10 include residential, commercial, industrial, and parkland. Greenhaven Golf Club is a publicly owned golf course on the north side of TH 10 west of Ferry Street. Rudy Johnson Park is a publicly owned park on the south side of TH 10 at 7th Avenue. The Rum River Regional Trail crosses TH 10 between the Rum River and 4th Avenue. The Rum River also is designated as a State Water Trail.

2.2 Traffic Noise Monitoring

2.2.1 Noise Level Monitoring Results

Noise level monitoring is commonly performed during a noise study to document existing noise levels and to validate the noise model for the project (see discussion of "Field Measurements and Predicted Noise Levels" below). Existing noise levels were monitored at six representative locations in the project area along TH 10. The layout figures in Appendix A and data sheets in Appendix B illustrate the field measurement locations.

- Monitoring Site 1 (Site M1) is the front yard of a single-family residence on the north side of TH 10 between 4th Avenue and 7th Avenue (523 North Street, Anoka).
- Monitoring Site 2 (Site M2) is the back yard of a single-family residence on the south side of TH 10 between 4th Avenue and 7th Avenue (525 Taylor Street, Anoka).
- Monitoring Site 3 (Site M3) is the front yard of a single-family residents on the north side of TH 10 between Ferry Street and the Rum River (2502 Maple Avenue, Anoka).
- Monitoring Site 4 (Site M4) is between two single-family residences on the north side of TH 10 between Greenhaven Golf Club and Ferry Street (2511 Wingfield Avenue and 2508 Wingfield Avenue, Anoka).
- Monitoring Site 5 (Site M5) is in the side yard of a single-family residence on the south side of TH 10 between commercial uses and Ferry Street (2339 State Avenue, Anoka).

- Monitoring Site 6 (Site M6) is between a single-family residence and apartment building on the south side of TH 10 between Ferry Street and the Rum River (2409 Maple Lane and 2410 Maple Lane, Anoka).

Daytime noise levels were collected on October 17, 2019 at the six receptor locations described above. Noise levels were monitored at each location for 15 to 30 minutes. A trained noise monitoring technician was present at each session for the entire field measurement session to ensure correct operation of the sound level meter (SLM). Appendix B includes field measurement data sheets. Table 2.1 presents the field measurement results.

Table 2.1 Field Measurement Summary Results

Monitoring Site ID	Location Description	Start Time	End Time	Measured Level, Leq, dBA
Site M1	Single-family residence (523 North Street)	12:19 PM	12:34 PM	**70.5**
Site M2	Single-family residence (525 Taylor Street)	12:48 PM	1:18 PM	**73.9**
Site M3	Single-family residence (2502 Maple Avenue)	1:33 PM	1:48 PM	**76.6**
Site M4	Single-family residences (2511 and 2508 Wingfield Avenue)	1:37 PM	1:52 PM	**67.6**
Site M5	Single-family residence (2339 State Avenue)	2:14 PM	2:29 PM	**72.2**
Site M6	Single-family residence and apartments (2409 and 2410 Maple Lane)	2:41 PM	2:56 PM	**70.5**

Bold numbers approach or exceed the Federal noise abatement criterion (see Table 1.1).

2.2.2 Field Measurements and Predicted Noise Levels

Table 2.2 lists the field measurement results and computer modeling results for existing traffic noise levels. Computer modeling results are based on traffic volumes observed during field measurements. The speed used for TH 10 was the existing posted speed (60 miles per hour, mph).

Table 2.2 Field Measurements and Predicted Noise Levels

Monitoring Site ID	Measured Level, Leq, dBA	Predicted Noise Level, Leq, dBA	Difference (Predicted-Field) (Leq, dBA)	Difference ≤ 3.0 dBA, Leq
Site M1	**70.5**	**72.4**	1.9	Yes
Site M2	**73.9**	**73.7**	-0.2	Yes
Site M3	**76.6**	**74.3**	-2.3	Yes
Site M4	**67.6**	**70.7**	3.1	No
Site M5	**72.2**	**74.0**	1.8	Yes
Site M6	**70.5**	**73.5**	3.0	Yes

Bold numbers approach or exceed the Federal noise abatement criterion (see Table 1.1).

A discrepancy equal to or less than 3.0 dBA between field measurements and predicted levels is considered acceptable for noise model validation. Modeled noise levels ranged from 2.3 dBA below field measurements to 3.1 dBA greater than field measurements. Predicted traffic noise levels at five of the six monitoring site locations are within 3.0 dBA of field measurements. The predicted traffic noise level at one location (Site M4) was 0.1 dBA above the 3.0 dBA threshold between field measurements and predicted levels.

It is considered better to over-predict uncorrected traffic noise levels, which yields a worst-cast scenario, compared to underpredicted noise levels when determining traffic noise impacts and abatement effectiveness. Therefore, no adjustments to the noise model are necessary.

2.3 Worst Hourly Traffic Noise Analysis

In general, higher traffic volumes, vehicle speeds, and greater numbers of heavy trucks increase the loudness of highway traffic noise. The worst hourly traffic noise impact typically occurs when traffic is flowing more freely (e.g., level of service C conditions) and when heavy truck volumes are the greatest. For determining the worst-case traffic noise hour for the proposed project, traffic noise levels for three time periods (morning, midday, afternoon) were modeled at 35 receptor locations in the project area. The worst hourly traffic noise analysis considered the appropriate classified traffic mix (e.g., cars, medium trucks, heavy trucks) and directional split (e.g., eastbound and westbound TH 10) in traffic during each analysis period. The speeds used for the model predictions were posted speeds (e.g., 60 mph for TH 10).

Table 2.3 summarizes the L_{eq} levels for each of the three time periods. Based on this analysis, it was determined that the afternoon period from 4:00 p.m. to 5:00 p.m. represents the worst-case traffic noise hour. Modeled noise levels for most of the representative receptor locations listed in Table 2.3 were higher during the 4:00 p.m. to 5:00 p.m. period compared to the other times of the day. The 4:00 p.m. to 5:00

p.m. period represents a period of higher overall traffic volumes at the start of the afternoon peak hour.

Table 2.3 Worst Hourly Traffic Noise Summary (Existing Modeled Noise Levels By Time Period)

Receptor ID	Land Use	Federal Activity Category	7:00-8:00 a.m. dBA, Leq	12:00-1:00 p.m. dBA, Leq	4:00-5:00 p.m. dBA, Leq
A1	Residential	B	**71.5**	**71.3**	**72.0**
A9	Residential	B	60.3	60.2	60.9
A15	Residential	B	56.9	56.7	57.4
A26	Retail Facility	F	68.4	68.0	68.7
B1	Retail Facility	F	65.0	64.8	65.4
B5	Residential	B	55.9	55.8	56.6
B10	Residential	B	**68.9**	**68.3**	**69.0**
B15	Residential	B	60.1	59.2	59.7
C1	Office	E	50.5	49.6	50.3
C8	Residential	B	61.5	61.0	61.7
C13	Residential	B	65.0	64.7	65.5
C20	Industrial	F	60.5	60.3	61.3
D1	Residential	B	64.3	63.6	64.3
D5	Residential	B	65.4	64.7	65.3
D9	Retail Facility	F	61.5	61.7	62.4
D13	Residential	B	57.2	56.5	57.1
E1	Residential	B	**67.2**	**66.1**	**66.9**
E15	Residential	B	62.1	61.4	61.9
E30	Residential	B	**73.8**	**72.9**	**73.5**
E47	Residential	B	53.8	53.1	53.7
F1	Residential	B	52.5	52.8	53.4
F15	Residential	B	50.9	50.3	50.8
F29	Residential	B	56.2	55.4	56.0
F43	Residential	B	**73.2**	**72.4**	**72.9**
G1	Retail Facility	F	60.7	59.5	60.2
G14	Residential	B	57.7	56.7	57.4
G29	Residential	B	55.9	55.5	56.2
G44	Residential	B	53.1	53.2	54.0
H1	Industrial	F	49.2	49.1	49.8
H11	Residential	B	56.4	55.9	56.7
H22	Residential	B	59.9	59.4	60.4

Receptor ID	Land Use	Federal Activity Category	7:00-8:00 a.m. dBA, Leq	12:00-1:00 p.m. dBA, Leq	4:00-5:00 p.m. dBA, Leq
H34	Residential	B	58.0	57.5	58.2
R5	Park	C	64.0	63.6	64.3
R26	Trail	C	**77.1**	**76.2**	**77.0**
R36	Park	C	63.6	62.8	63.6

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italic numbers exceed 23 CFR 774.15 thresholds.

2.4 Traffic Noise Modeling

Noise modeling was done using the FHWA's noise prediction program Traffic Noise Model (TNM), version 2.5. This model uses traffic volumes, speed, class of vehicle (cars, medium trucks, heavy trucks, buses, and motorcycles), and the typical characteristics of the roadway being analyzed (e.g., roadway width, horizontal alignment, vertical profile, etc.) to predict traffic noise levels.

Traffic data for noise model input files included existing and future (year 2040) No Build Alternative and Build Alternative forecast traffic volumes for the project segment of TH 10. Year 2040 was identified as the future year for analysis because this is the current horizon year for travel demand forecasts for the project area. The modeled speed for TH 10 for existing conditions and the 2040 No Build Alternative was 60 mph because this is the existing posted speed. The modeled speed for TH 10 under the 2040 Build Alternative was 60 mph because this is the design speed for the project.

The hour of analysis was the 4:00 p.m. to 5:00 p.m. hour (see Worst Hourly Traffic Noise Analysis discussion above). The 4:00 p.m. to 5:00 p.m. hour was determined to represent approximately eight percent of the daily traffic volumes for the project segment of TH 10. Table 2.4 includes the directional split and traffic characteristics on eastbound and westbound TH 10 during the worst noise hour for existing conditions and the future (year 2040) No Build and Build Alternatives.

Table 2.4 TH 10 Traffic Characteristics (Worst Traffic Noise Hour)

Roadway	Directional Split	Vehicle Mix (% Cars)	Vehicle Mix (% Medium Trucks)	Vehicle Mix (% Heavy Trucks)	Vehicle Mix (% Buses)	Vehicle Mix (% Motor cycles)
Eastbound TH 10	46%	96.0%	1.0%	3.0%	0%	0%
Westbound TH 10	54%	96.0%	1.0%	3.0%	0%	0%

Eastbound and westbound TH 10 between Ferry Street and 7th Avenue.

Chapter 3 Predicted Noise Levels and Noise Impacts

3.1 Noise Receptors

Traffic noise impacts were assessed by modeling noise levels at receptor sites likely to be affected by the proposed project. Traffic noise levels were modeled at 316 receptor locations along TH 10 from east of the Main Street interchange to east of the TH 10 bridge over the BNSF Railway representing residences, retail facilities, industrial uses, parkland, and trails.

Greenhaven Golf Course is located on the north side of TH 10, west of Ferry Street. Rudy Johnson Park is on the south side of TH 10, west of 7th Avenue. One receptor location was assigned for each 100 feet of frontage in an improved area of frequent use in both properties within 500 feet of the project corridor. [2]

The Rum River Regional Trail is along the east side of the Rum River and crosses over TH 10 at 4th Avenue. The Rum River also is a State Water Trail. One receptor location was assigned for each 250 feet of trail perpendicular to TH 10 within 500 feet of the project corridor.

The layout figures in Appendix A illustrate modeled receptor locations. Table 3.1 identifies the land use and the Federal noise abatement criterion (NAC) for each modeled receptor location.

3.2 Noise Model Results

Table 3.1 tabulates the results of the noise modeling analysis for existing conditions, the 2040 No Build Alternative, and the 2040 Build Alternative. The results of the traffic noise modeling analysis are summarized below.

3.2.1 Existing Conditions

Existing L_{eq} noise levels at modeled receptor locations in the project area range from 43.1 dBA to 76.9 dBA. Modeled L_{eq} noise levels approach or exceed the Federal noise abatement criterion for Activity Category B at 42 receptor locations and exceed the Federal noise abatement criterion for Activity Category C at three receptor locations. Modeled L_{eq} noise levels at all other receptor locations are below Federal noise abatement criteria.

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[2] Minnesota Department of Transportation. July 10, 2017. *Noise Requirements for MnDOT and Other Type I Federal-aid Projects*. Appendix A, Guidance on Selection and Use of Noise Analysis Locations, Assigning Noise Receptors for Activity Category C.

Table 3.1 TH 10 Rum River Bridge and Ferry Street Interchange Traffic Noise Model Results

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
A1 (1)	Residential	B	**72.0**	**72.9**	0.9	**73.1**	1.1
A2 (1)	Residential	B	64.6	65.5	0.9	**66.3**	1.7
A3 (1)	Residential	B	61.5	62.4	0.9	62.3	0.8
A4 (1)	Residential	B	59.5	60.3	0.8	61.2	1.7
A5 (1)	Residential	B	54.6	55.5	0.9	55.7	1.1
A6 (1)	Residential	B	54.4	55.2	0.8	55.4	1.0
A7 (1)	Residential	B	49.6	50.3	0.7	49.8	0.2
A8 (3)	Residential	B	56.7	57.6	0.9	56.5	-0.2
A9 (1)	Residential	B	60.9	61.7	0.8	60.4	-0.5
A10 (1)	Residential	B	64.0	64.9	0.9	64.7	0.7
A11 (1)	Residential	B	**70.4**	**71.3**	0.9	**72.1**	1.7
A12 (1)	Residential	B	65.5	**66.4**	0.9	**66.1**	0.6
A13 (1)	Residential	B	61.6	62.5	0.9	62.2	0.6
A14 (1)	Residential	B	58.8	59.7	0.9	58.5	-0.3
A15 (1)	Residential	B	57.4	58.3	0.9	57.5	0.1
A16 (1)	Residential	B	51.2	51.9	0.7	51.7	0.5
A17 (1)	Residential	B	57.1	57.8	0.7	57.0	-0.1
A18 (1)	Residential	B	54.4	55.2	0.8	54.7	0.3
A19 (1)	Residential	B	57.8	58.5	0.7	57.5	-0.3
A20 (1)	Residential	B	61.3	62.1	0.8	61.9	0.6
A21 (1)	Residential	B	64.7	65.6	0.9	63.6	-1.1
A22 (1)	Residential	B	65.8	**66.5**	0.7	--	--
A23 (1)	Residential	B	62.6	63.4	0.8	63.3	0.7

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
A24 (1)	Residential	B	57.5	58.3	0.8	56.6	-0.9
A25 (1)	Retail Facility	F	52.7	53.5	0.8	52.0	-0.7
A26 (1)	Retail Facility	F	68.7	69.2	0.5	66.6	-2.1
B1 (1)	Retail Facility	F	65.4	66.1	0.7	64.2	-1.2
B2 (1)	Residential	B	57.2	57.8	0.6	56.7	-0.5
B3 (1)	Retail Facility	F	58.9	59.5	0.6	59.3	0.4
B4 (1)	Residential	B	56.2	56.9	0.7	56.9	0.7
B5 (1)	Residential	B	56.6	57.3	0.7	57.2	0.6
B6 (1)	Residential	B	56.9	57.6	0.7	56.8	-0.1
B7 (1)	Residential	B	60.6	61.3	0.7	60.0	-0.6
B8 (1)	Residential	B	62.1	62.8	0.7	61.0	-1.1
B9 (1)	Residential	B	**66.7**	**67.5**	0.8	**66.6**	-0.1
B10 (1)	Residential	B	**69.0**	**69.8**	0.8	**69.6**	0.6
B11 (1)	Residential	B	**71.0**	**71.8**	0.8	**72.1**	1.1
B12 (1)	Residential	B	56.6	57.4	0.8	57.1	0.5
B13 (1)	Residential	B	59.0	59.8	0.8	60.9	1.9
B14 (1)	Residential	B	57.6	58.4	0.8	60.0	2.4
B15 (1)	Residential	B	55.9	56.7	0.8	58.9	3.0
B16 (1)	Residential	B	54.7	55.4	0.7	57.4	2.7
B17 (1)	Residential	B	53.3	54.1	0.8	56.2	2.9
C1 (1)	Business Office	E	50.2	50.9	0.7	51.4	1.2
C2 (1)	Business Office	E	54.7	55.4	0.7	57.8	3.1
C3 (1)	Vacant	G	55.4	56.1	0.7	55.1	-0.3
C4 (1)	Residential	B	53.7	54.4	0.7	54.9	1.2
C5 (1)	Residential	B	59.3	60.0	0.7	62.1	2.8

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
C6 (1)	Residential	B	54.6	55.4	0.8	55.0	0.4
C7 (1)	Residential	B	61.2	61.9	0.7	61.6	0.4
C8 (1)	Residential	B	61.3	62.1	0.8	61.9	0.6
C9 (1)	Residential	B	**72.3**	**73.1**	0.8	**72.3**	0.0
C10 (1)	Residential	B	**72.4**	**73.2**	0.8	**72.6**	0.2
C11 (1)	Residential	B	**71.4**	**72.2**	0.8	**71.7**	0.3
C12 (1)	Residential	B	**66.1**	**66.9**	0.8	64.8	-1.3
C13 (1)	Residential	B	65.4	**66.2**	0.8	64.5	-0.9
C14 (1)	Residential	B	**68.1**	**68.8**	0.7	**67.7**	-0.4
C15 (1)	Maintenance Facility	F	56.0	56.8	0.8	54.8	-1.2
C16 (1)	Maintenance Facility	F	51.7	52.4	0.7	52.4	0.7
C17 (1)	Retail Facility	F	59.2	60.0	0.8	59.3	0.1
C18 (1)	Industrial	F	66.0	66.7	0.7	66.5	0.5
C19 (1)	Industrial	F	56.5	57.2	0.7	56.9	0.4
C20 (1)	Industrial	F	61.4	62.2	0.8	61.8	0.4
C21 (1)	Daycare	C	64.0	64.7	0.7	63.8	-0.2
D1 (1)	Residential	B	64.0	64.7	0.7	65.3	1.3
D2 (1)	Residential	B	64.5	65.2	0.7	65.7	1.2
D3 (1)	Residential	B	64.1	64.8	0.7	65.3	1.2
D4 (1)	Residential	B	64.9	65.5	0.6	65.4	0.5
D5 (1)	Residential	B	65.5	**66.1**	0.6	**66.4**	0.9
D6 (1)	Residential	B	65.8	**66.5**	0.7	**66.9**	1.1
D7 (1)	Residential	B	**66.3**	**67.0**	0.7	**67.4**	1.1

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
D8 (1)	Business Office	E	63.0	63.7	0.7	63.7	0.7
D9 (1)	Retail Facility	F	62.4	63.0	0.6	63.2	0.8
D10 (1)	Residential	B	59.9	60.5	0.6	61.0	1.1
D11 (1)	Residential	B	58.3	59.0	0.7	59.3	1.0
D12 (1)	Residential	B	57.9	58.6	0.7	58.7	0.8
D13 (1)	Residential	B	57.1	57.8	0.7	58.0	0.9
D14 (1)	Residential	B	58.2	58.9	0.7	60.3	2.1
D15 (1)	Residential	B	58.3	59.0	0.7	60.6	2.3
E1 (1)	Residential	B	**66.8**	**67.5**	0.7	**67.5**	0.7
E2 (1)	Restaurant/Bar	E	62.4	63.0	0.6	63.4	1.0
E3 (1)	Residential	B	59.4	60.1	0.7	60.8	1.4
E4 (1)	Residential	B	58.1	58.8	0.7	59.3	1.2
E5 (1)	Residential	B	59.5	60.2	0.7	60.5	1.0
E6 (1)	Residential	B	59.5	60.3	0.8	60.7	1.2
E7 (1)	Residential	B	59.0	59.7	0.7	60.2	1.2
E8 (1)	Residential	B	59.3	60.0	0.7	60.3	1.0
E9 (1)	Residential	B	58.2	58.9	0.7	59.3	1.1
E10 (1)	Residential	B	57.2	57.9	0.7	58.3	1.1
E11 (1)	Residential	B	56.0	56.8	0.8	57.0	1.0
E12 (1)	Residential	B	56.1	56.8	0.7	57.1	1.0
E13 (1)	Residential	B	55.8	56.6	0.8	56.7	0.9
E14 (1)	Place of Worship	C	55.8	56.5	0.7	56.6	0.8
E15 (1)	Residential	B	61.9	62.7	0.8	62.9	1.0
E16 (1)	Residential	B	59.8	60.6	0.8	60.8	1.0

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
E17 (1)	Residential	B	61.8	62.5	0.7	62.9	1.1
E18 (1)	Residential	B	62.4	63.1	0.7	63.4	1.0
E19 (1)	Residential	B	61.5	62.2	0.7	62.5	1.0
E20 (1)	Residential	B	62.4	63.2	0.8	63.3	0.9
E21 (1)	Residential	B	64.7	65.5	0.8	65.6	0.9
E22 (1)	Residential	B	**73.2**	**74.0**	0.8	**74.1**	0.9
E23 (1)	Residential	B	**73.3**	**74.1**	0.8	**74.2**	0.9
E24 (1)	Residential	B	**73.2**	**74.0**	0.8	**74.1**	0.9
E25 (1)	Residential	B	**73.0**	**73.8**	0.8	**73.9**	0.9
E26 (1)	Residential	B	**73.2**	**73.9**	0.7	**74.0**	0.8
E27 (1)	Residential	B	**73.2**	**74.0**	0.8	**74.0**	0.8
E28 (1)	Residential	B	**73.1**	**73.9**	0.8	**73.9**	0.8
E29 (1)	Residential	B	**73.2**	**73.9**	0.7	**73.8**	0.6
E30 (1)	Residential	B	**73.5**	**74.3**	0.8	**74.0**	0.5
E31 (1)	Residential	B	**71.9**	**72.6**	0.7	**72.5**	0.6
E32 (1)	Residential	B	65.3	**66.3**	1.0	**67.4**	2.1
E33 (1)	Residential	B	62.3	63.1	0.8	64.2	1.9
E34 (1)	Residential	B	63.8	64.6	0.8	65.7	1.9
E35 (1)	Residential	B	62.0	62.7	0.7	63.5	1.5
E36 (1)	Residential	B	65.7	**66.7**	1.0	**67.4**	1.7
E37 (1)	Residential	B	58.7	59.5	0.8	60.5	1.8
E38 (1)	Residential	B	**70.9**	**71.5**	0.6	**72.3**	1.4
E39 (4)	Residential	B	**70.9**	**71.5**	0.6	**72.3**	1.4
E40 (1)	Residential	B	57.9	58.6	0.7	59.4	1.5
E41 (1)	Residential	B	63.5	64.4	0.9	65.8	2.3

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
E42 (1)	Business Office	E	50.4	51.2	0.8	51.6	1.2
E43 (1)	Business Office	E	53.9	54.7	0.8	56.5	2.6
E44 (1)	Residential	B	56.6	57.4	0.8	58.8	2.2
E45 (1)	Residential	B	56.1	56.5	0.4	58.2	2.1
E46 (1)	Residential	B	52.9	53.7	0.8	53.9	1.0
E47 (1)	Residential	B	53.7	53.9	0.2	53.9	0.2
E48 (1)	Residential	B	55.0	55.8	0.8	55.5	0.5
E49 (1)	Residential	B	46.6	47.3	0.7	50.2	3.6
E50 (1)	Residential	B	44.8	45.5	0.7	45.9	1.1
E51 (1)	Residential	B	47.6	48.4	0.8	50.1	2.5
E52 (1)	Residential	B	50.8	51.5	0.7	51.3	0.5
E53 (1)	Residential	B	51.6	52.3	0.7	52.3	0.7
E54 (1)	Residential	B	47.9	48.7	0.8	51.4	3.5
E55 (1)	Residential	B	50.6	51.4	0.8	50.5	-0.1
E56 (1)	Residential	B	47.9	48.7	0.8	53.3	5.4
E57 (1)	Residential	B	53.9	54.7	0.8	55.2	1.3
E58 (1)	Residential	B	53.9	54.7	0.8	55.0	1.1
E59 (1)	Residential	B	53.5	54.2	0.7	54.4	0.9
F1 (1)	Residential	B	53.2	53.8	0.6	56.0	2.8
F2 (1)	Residential	B	48.9	49.5	0.6	50.4	1.5
F3 (1)	Residential	B	54.2	54.8	0.6	56.9	2.7
F4 (1)	Residential	B	52.6	53.1	0.5	55.0	2.4
F5 (1)	Residential	B	53.9	54.5	0.6	56.5	2.6
F6 (1)	Residential	B	50.8	51.4	0.6	52.0	1.2
F7 (1)	Residential	B	50.9	51.5	0.6	53.3	2.4

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
F8 (1)	Residential	B	50.6	51.2	0.6	52.2	1.6
F9 (1)	Residential	B	54.4	54.9	0.5	55.9	1.5
F10 (1)	Residential	B	57.6	58.2	0.6	59.0	1.4
F11 (1)	Residential	B	57.8	58.3	0.5	59.1	1.3
F12 (1)	Residential	B	54.4	55.0	0.6	56.7	2.3
F13 (1)	Residential	B	51.6	52.1	0.5	53.7	2.1
F14 (1)	Residential	B	54.4	55.0	0.6	56.1	1.7
F15 (2)	Residential	B	51.0	51.7	0.7	51.9	0.9
F16 (2)	Residential	B	54.1	54.8	0.7	56.6	2.5
F17 (1)	Residential	B	59.3	59.9	0.6	60.2	0.9
F18 (1)	Residential	B	61.7	62.4	0.7	62.5	0.8
F19 (1)	Residential	B	58.2	58.8	0.6	58.7	0.5
F20 (1)	Residential	B	60.1	60.7	0.6	60.8	0.7
F21 (1)	Residential	B	63.2	63.8	0.6	64.9	1.7
F22 (1)	Residential	B	52.3	52.9	0.6	54.2	1.9
F23 (1)	Residential	B	54.0	54.6	0.6	55.7	1.7
F24 (1)	Residential	B	56.5	57.3	0.8	56.6	0.1
F25 (1)	Residential	B	53.6	54.3	0.7	53.8	0.2
F26 (1)	Residential	B	54.5	55.2	0.7	54.7	0.2
F27 (1)	Residential	B	51.9	52.5	0.6	51.7	-0.2
F27 (1)	Residential	B	58.0	58.8	0.8	57.8	-0.2
F28 (1)	Residential	B	50.6	51.1	0.5	52.3	1.7
F29 (1)	Residential	B	53.2	53.8	0.6	54.6	1.4
F30 (1)	Residential	B	**68.4**	**69.1**	0.7	**69.3**	0.9
F31 (1)	Residential	B	63.2	63.9	0.7	64.0	0.8

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
F32 (1)	Residential	B	**69.0**	**69.7**	0.7	**71.7**	2.7
F33 (1)	Residential	B	59.3	60.1	0.8	60.9	1.6
F34 (1)	Residential	B	55.6	56.4	0.8	56.2	0.6
F35 (1)	Residential	B	58.0	58.8	0.8	59.1	1.1
F36 (1)	Residential	B	55.6	56.4	0.8	56.5	0.9
F37 (1)	Residential	B	57.6	58.4	0.8	59.0	1.4
F38 (1)	Residential	B	55.2	56.0	0.8	56.3	1.1
F39 (1)	Residential	B	57.7	58.5	0.8	59.3	1.6
F40 (1)	Residential	B	**70.5**	**71.3**	0.8	**72.8**	2.3
F41 (1)	Residential	B	**72.7**	**73.5**	0.8	**73.8**	1.1
F42 (1)	Residential	B	**70.6**	**71.4**	0.8	**72.7**	2.1
F43 (1)	Residential	B	**72.8**	**73.6**	0.8	**73.8**	1.0
F44 (1)	Residential	B	**72.8**	**73.6**	0.8	**73.8**	1.0
F45 (1)	Residential	B	**70.7**	**71.6**	0.9	**72.6**	1.9
G1 (1)	Retail Facility	E	60.2	60.9	0.7	60.4	0.2
G2 (1)	Residential	B	**67.5**	**68.3**	0.8	**67.2**	-0.3
G3 (1)	Residential	B	**67.2**	**68.1**	0.9	**67.3**	0.1
G4 (1)	Residential	B	**66.6**	**67.5**	0.9	**66.7**	0.1
G5 (1)	Residential	B	59.7	60.5	0.8	58.5	-1.2
G6 (1)	Residential	B	58.3	59.2	0.9	58.3	0.0
G7 (1)	Residential	B	56.0	56.9	0.9	56.0	0.0
G8 (1)	Residential	B	49.6	50.3	0.7	50.1	0.5
G9 (1)	Residential	B	57.4	58.3	0.9	58.9	1.5
G10 (1)	Residential	B	61.4	62.3	0.9	62.6	1.2
G11 (2)	Residential	B	**66.1**	**67.0**	0.9	**68.3**	2.2

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
G12 (2)	Residential	B	64.7	65.6	0.9	**66.6**	1.9
G13 (1)	Residential	B	57.9	58.8	0.9	59.0	1.1
G14 (1)	Residential	B	57.4	58.3	0.9	58.9	1.5
G15 (1)	Residential	B	56.4	57.3	0.9	58.2	1.8
G16 (1)	Residential	B	49.1	49.9	0.8	49.5	0.4
G17 (1)	Residential	B	54.3	55.0	0.7	55.0	0.7
G18 (1)	Residential	B	49.6	50.3	0.7	49.9	0.3
G19 (1)	Residential	B	53.8	54.5	0.7	54.5	0.7
G20 (1)	Residential	B	49.3	50.1	0.8	49.7	0.4
G21 (1)	Residential	B	51.7	52.5	0.8	53.8	2.1
G22 (1)	Residential	B	62.3	63.2	0.9	65.3	3.0
G23 (1)	Residential	B	63.4	64.2	0.8	64.6	1.2
G24 (1)	Residential	B	**66.4**	**67.0**	0.6	**66.9**	0.5
G25 (1)	Residential	B	62.0	62.8	0.8	64.4	2.4
G26 (1)	Residential	B	60.8	61.6	0.8	63.2	2.4
G27 (1)	Residential	B	60.2	61.0	0.8	62.4	2.2
G28 (1)	Residential	B	58.0	58.6	0.6	58.2	0.2
G29 (1)	Residential	B	56.2	56.8	0.6	57.5	1.3
G30 (1)	Residential	B	63.3	63.7	0.4	65.2	1.9
G31 (1)	Residential	B	56.7	57.3	0.6	58.3	1.6
G32 (1)	Residential	B	56.4	57.1	0.7	57.2	0.8
G33 (18)	Residential	B	55.2	56.0	0.8	56.1	0.9
G34 (1)	Residential	B	55.6	56.4	0.8	56.1	0.5
G35 (1)	Residential	B	53.2	53.9	0.7	53.8	0.6
G36 (1)	Residential	B	49.6	50.3	0.7	50.2	0.6

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
G37 (1)	Residential	B	50.1	50.8	0.7	51.3	1.2
G38 (1)	Residential	B	50.8	51.3	0.5	51.8	1.0
G39 (1)	Residential	B	50.0	50.6	0.6	51.3	1.3
G40 (1)	Residential	B	50.5	51.2	0.7	51.9	1.4
G41 (1)	Residential	B	51.2	51.8	0.6	52.7	1.5
G42 (1)	Residential	B	53.0	53.6	0.6	55.1	2.1
G43 (1)	Residential	B	51.3	51.9	0.6	52.0	0.7
G44 (1)	Residential	B	54.0	54.5	0.5	56.4	2.4
G45 (1)	Residential	B	56.8	57.4	0.6	59.4	2.6
G46 (1)	Residential	B	52.8	53.3	0.5	55.0	2.2
G47 (1)	Residential	B	50.3	50.9	0.6	50.6	0.3
G48 (1)	Residential	B	52.6	53.2	0.6	53.5	0.9
G49 (1)	Residential	B	51.2	51.8	0.6	52.2	1.0
G50 (1)	Residential	B	51.2	51.7	0.5	52.2	1.0
G51 (4)	Residential	B	54.7	55.2	0.5	57.4	2.7
H1 (1)	Industrial	F	49.7	50.4	0.7	50.4	0.7
H2 (1)	Business Office	E	50.0	50.7	0.7	50.6	0.6
H3 (1)	Residential	B	55.7	56.4	0.7	56.8	1.1
H4 (1)	Industrial	F	58.7	59.4	0.7	59.3	0.6
H5 (1)	Industrial	F	58.1	58.8	0.7	58.8	0.7
H6 (1)	Industrial	F	60.0	60.7	0.7	60.8	0.8
H7 (1)	Industrial	F	62.6	63.3	0.7	63.1	0.5
H8 (1)	Retail Facility	F	43.1	43.8	0.7	43.8	0.7
H9 (1)	Industrial	F	55.9	56.6	0.7	56.6	0.7
H10 (1)	Residential	B	51.3	52.0	0.7	52.8	1.5

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
H11 (1)	Residential	B	56.4	57.1	0.7	57.8	1.4
H12 (1)	Residential	B	51.0	51.7	0.7	52.7	1.7
H13 (1)	Residential	B	56.0	56.7	0.7	57.5	1.5
H14 (1)	Residential	B	57.6	58.3	0.7	61.9	4.3
H15 (1)	Residential	B	54.0	54.7	0.7	58.9	4.9
H16 (1)	Residential	B	57.8	58.5	0.7	58.5	0.7
H17 (1)	Residential	B	60.0	60.7	0.7	60.8	0.8
H18 (1)	Residential	B	57.5	58.2	0.7	62.3	4.8
H19 (1)	Residential	B	54.6	55.3	0.7	59.5	4.9
H20 (1)	Residential	B	59.1	59.8	0.7	59.7	0.6
H21 (1)	Residential	B	61.3	62.0	0.7	61.9	0.6
H22 (1)	Residential	B	59.4	60.1	0.7	61.9	2.5
H23 (1)	Residential	B	62.2	62.9	0.7	64.8	2.6
H24 (1)	Residential	B	59.9	60.6	0.7	61.7	1.8
H25 (1)	Residential	B	62.6	63.3	0.7	64.3	1.7
H26 (1)	Residential	B	60.1	60.8	0.7	60.8	0.7
H27 (1)	Residential	B	60.2	60.9	0.7	61.8	1.6
H28 (1)	Residential	B	58.0	58.7	0.7	59.5	1.5
H29 (1)	Residential	B	59.1	59.8	0.7	61.6	2.5
H30 (1)	Residential	B	57.1	57.8	0.7	59.1	2.0
H31 (1)	Residential	B	53.1	53.8	0.7	53.8	0.7
H32 (1)	Residential	B	58.2	58.9	0.7	58.9	0.7
H33 (1)	Residential	B	52.9	53.6	0.7	53.6	0.7
H34 (1)	Residential	B	58.0	58.7	0.7	58.8	0.8
H35 (1)	Residential	B	64.4	65.1	0.7	65.2	0.8

Receptor ID [1]	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
H36 (1)	Residential	B	61.6	62.3	0.7	62.1	0.5
H37 (1)	Residential	B	65.1	65.8	0.7	65.6	0.5
H38 (1)	Residential	B	62.2	62.9	0.7	62.7	0.5
H39 (1)	Residential	B	**66.4**	**67.1**	0.7	**67.2**	0.8
H40 (1)	Residential	B	**67.2**	**67.9**	0.7	**67.9**	0.7
H41 (1)	Residential	B	**67.8**	**68.5**	0.7	**68.4**	0.6
H42 (1)	Residential	B	**68.3**	**69.1**	0.8	**68.9**	0.6
R1 (1)	Golf Course	C	57.8	58.4	0.6	58.4	0.6
R2 (1)	Golf Course	C	59.6	60.2	0.6	60.1	0.5
R3 (1)	Golf Course	C	60.6	61.2	0.6	61.2	0.6
R4 (1)	Golf Course	C	62.8	63.4	0.6	63.4	0.6
R5 (1)	Golf Course	C	64.3	64.9	0.6	64.9	0.6
R6 (1)	Golf Course	C	64.2	64.9	0.7	65.0	0.8
R7 (1)	Golf Course	C	64.0	64.7	0.7	65.0	1.0
R8 (1)	Golf Course	C	64.2	65.0	0.8	65.2	1.0
R9 (1)	Golf Course	C	64.5	65.3	0.8	65.2	0.7
R10 (1)	Golf Course	C	62.6	63.4	0.8	63.0	0.4
R11 (1)	Golf Course	C	59.5	60.3	0.8	60.1	0.6
R12 (1)	Golf Course	C	57.1	57.9	0.8	57.6	0.5
R13 (1)	Trail	C	51.3	52.0	0.7	52.3	1.0
R14 (1)	Trail	C	50.5	51.2	0.7	51.2	0.7
R15 (1)	Trail	C	59.0	59.8	0.8	59.7	0.7
R16 (1)	Trail	C	**66.1**	**66.9**	0.8	65.1	-1.0
R17 (1)	Trail	C	65.7	**66.6**	0.9	64.3	-1.4
R18 (1)	Trail	C	59.4	60.2	0.8	60.4	1.0

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
R19 (1)	Trail	C	54.6	55.3	0.7	55.9	1.3
R20 (1)	Trail	C	51.5	52.2	0.7	52.6	1.1
R21 (1)	Trail	C	50.0	50.6	0.6	51.0	1.0
R22 (1)	Trail	C	50.3	50.9	0.6	51.3	1.0
R23 (1)	Trail	C	50.8	51.4	0.6	51.8	1.0
R24 (1)	Trail	C	56.5	57.2	0.7	58.5	2.0
R25 (1)	Trail	C	62.3	62.9	0.6	65.4	3.1
R26 (1)	Trail	C	**76.9**	**77.7**	0.8	**77.8**	0.9
R27 (1)	Trail	C	**70.9**	**71.6**	0.7	**71.6**	0.7
R28 (1)	Trail	C	57.1	57.9	0.8	60.8	3.7
R29 (1)	Trail	C	–	–	–	**70.2**	–
R30 (1)	Trail	C	–	–	–	**76.2**	–
R31 (1)	Trail	C	–	–	–	**78.4**	–
R32 (1)	Trail	C	–	–	–	**73.1**	–
R33 (1)	Trail	C	–	–	–	**70.5**	–
R34 (1)	Park	C	64.0	64.8	0.8	65.4	1.4
R35 (1)	Park	C	65.0	65.8	0.8	**66.6**	1.6
R36 (1)	Park	C	63.5	64.2	0.7	64.4	0.9
R37 (1)	Park	C	62.9	63.6	0.7	63.6	0.7
R38 (1)	Park	C	62.3	63.1	0.8	63.0	0.7
R39 (1)	Park	E	50.6	51.3	0.7	51.2	0.6
Federal Activity Category B	–	B	67	67	–	67	–

Receptor ID (1)	Activity Description	Federal Activity Category	Modeled Existing Leq, dBA	Modeled 2040 No Build Alternative Leq, dBA	Difference (2040 No Build – Existing) Leq, dBA	Modeled 2040 Build Alterative Leq, dBA	Difference (2040 Build – Existing) Leq, dBA
Federal Activity Category C	--	C	67	67	--	67	--
Federal Activity Category E	--	E	72	72	--	72	--
Federal Activity Category F	--	F	--	--	--	--	--

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Underlined numbers are receptors that have substantial increases in noise levels (i.e., increase from existing to 2040 Build Alternative equal to or greater than 5.0 dBA).

Italic numbers exceed 23 CFR 774.15 thresholds.

(1) Number in "Receptor ID" column is the number of residences, business/commercial establishments, or industrial establishments represented by each modeled receptor location.

3.2.2 2040 No Build Alternative

Future L_{eq} noise levels under the 2040 No Build Alternative are projected to range from 43.8 dBA to 77.7 dBA. Modeled traffic noise levels are predicted to increase by 0.2 dBA to 1.0 dBA under the 2040 No Build Alternative compared to existing conditions. Modeled L_{eq} noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category B at 50 receptor locations under the 2040 No Build Alternative. Modeled L_{eq} noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at three receptor locations under the 2040 No Build Alternative. Modeled L_{eq} noise levels at all other receptor locations are below Federal noise abatement criteria.

3.2.3 2040 Build Alternative

Future L_{eq} noise levels under the 2040 Build Alternative are projected to range from 43.8 dBA to 78.4 dBA. Modeled traffic noise levels are predicted to change by -2.1 dBA to 5.4 dBA under the 2040 Build Alternative compared to existing conditions. Modeled L_{eq} noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category B at 47 receptor locations under the 2040 Build Alternative. Modeled L_{eq} noise levels are projected to approach or exceed the Federal noise abatement criterion for Activity Category C at eight receptor locations under the 2040 Build Alternative. Modeled L_{eq} noise levels at all other receptor locations are below Federal noise abatement criteria. One modeled receptor location is projected to experience a substantial increase in noise levels (i.e., increase of 5 dBA or greater from existing to 2040 Build Alternative conditions).

Chapter 4 Consideration of Noise Abatement

MnDOT's noise requirements (July 10, 2017) describes noise abatement measures that are to be considered when a traffic noise impact has been identified with a highway improvement project (i.e., modeled traffic noise levels approach or exceed Federal noise abatement criteria, a 5 dBA or greater increase in noise levels from existing to future Build Alternative conditions). These noise abatement measures are described below.

- Construction of noise barriers (noise walls or earthen berms), including acquisition of property rights, either within or outside the highway right of way. Landscaping is not a viable noise abatement measure.
- Traffic management measures, including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.
- Alteration of horizontal and vertical alignments.
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise.
- Noise insulation of certain facilities, including: auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.

4.1 Noise Barrier Evaluation

The policies and procedures for evaluating noise barrier feasibility and reasonableness are set forth in Section 5.2 (Feasibility) and Section 5.3 (Reasonableness) of MnDOT's noise requirements (July 10, 2017). The factors for determining noise barrier feasibility and reasonableness as described in the MnDOT noise requirements document are summarized below.

4.1.1 Noise Barrier Feasibility

Noise barrier feasibility is determined based on a consideration of two factors: 1) acoustic feasibility and 2) engineering feasibility.

- **Acoustic feasibility:** For a noise barrier to be considered acoustically effective, it must achieve a noise reduction of at least 5 dBA at the impacted receptors for those receptors to be considered benefited by a noise barrier. Not every

impacted receptor must receive this minimum 5 dBA reduction; however, at least one impacted receptor must meet the minimum 5 dBA reduction for a noise barrier to achieve acoustic feasibility.

- **Engineering feasibility:** Engineering feasibility addresses whether it is possible to design and construct a proposed noise abatement measure. A sample of potential constructability considerations includes safety, topography, drainage, utilities, and maintenance considerations. Engineering considerations are also taken into consideration in determining noise barrier height. MnDOT has established a maximum noise barrier height of 20 feet above the finished ground line at the noise barrier.

The feasibility of noise barrier construction is sometimes dependent on design details that are not known until the final design phase of the project. For this traffic noise analysis, it was assumed that noise barriers were feasible with respect to engineering feasibility/constructability considerations. Gaps were included in the modeled noise barriers to accommodate driveway connections and intersecting side streets. It also was assumed that utilities in existing right of way could be relocated, proposed drainage could be maintained, and no soil corrections would be necessary for the construction of noise walls. All modeled noise barriers were located within existing TH 10 right of way limits.

4.1.2 Noise Barrier Reasonableness

Noise barrier reasonableness decisions are based on a consideration of three reasonableness factors: 1) noise reduction design goal, 2) cost effectiveness, and 3) the viewpoint of benefited residents and property owners.

Noise Reduction Design Goal

A minimum 7 dBA reduction must be achieved for at least one benefited receptor behind the noise barrier to meet MnDOT's noise reduction design goal.

Cost Effectiveness

To be considered cost-effective, the cost per individual benefited receptor (e.g., residence, commercial entity, industrial entity) should be equal to, or less than $78,500. To assess cost effectiveness, at least one benefited receptor behind the noise barrier must meet the noise reduction design goal described above. The following formula is used to determine the cost-effectiveness of the barrier:

The cost-effectiveness index is equal to the cost of the noise barrier divided by the number of individual benefited receptors (i.e., residences, commercial entities, industrial entities) that are predicted to experience noise level reductions of 5 dBA or more. Only those receptors that experience a 5 dBA or greater decibel decrease are considered in this formula. The result is a cost per benefited

receptor value (residence, commercial entity, or industrial entity represented by each modeled receptor). The cost of a noise barrier is calculated using an estimated construction cost of $36 per square foot of barrier. This price is for an acoustically absorbent concrete post/concrete panel type barrier.[3] To be considered cost-effective, the cost per individual benefited receptor must be equal to or less than $78,500 per receptor.

There are several steps to assessing the cost effectiveness of a noise barrier. First, the cost-effective noise barrier height is determined for each segment of the project area. If this noise barrier meets the reasonableness criteria and is feasible, it would be proposed for construction. Noise barrier heights up to MnDOT's maximum noise wall height of 20 feet are studied. Noise barrier cost effectiveness is studied up to the point where a modeled barrier does not meet the noise reduction design goal of a minimum 7 dBA reduction for at least one benefited receptor.

Viewpoint of Benefited Residents and Property Owners

The third criterion in determining noise barrier reasonableness is the viewpoint of benefited residents and property owners. A benefited property is defined as a receptor adjacent to a proposed noise abatement measure that receives a noise reduction equal to or greater than 5 dBA. If benefited residents and property owners indicate that a proposed noise barrier is not desired, then the noise barrier is removed from further consideration and would not be constructed with the project.

There are two steps in determining the desires of the benefited property owners and residents regarding the construction of a proposed noise abatement measures. First, the viewpoint of benefited property owners and residents is solicited through a public involvement process (e.g., open house meeting, direct mailing of a solicitation form). Second, the input received from benefited property owners and residents through this public involvement process is expressed in a vote that is weighted as follows:

The owner of a benefited property immediately adjacent to the highway right of way for the proposed project (i.e., first-row properties) receives 4 points and the resident (owner or renter) receives 2 points. The owner/resident of a benefited property receives a total of 6 points.

The owner of a benefited property not immediately adjacent to the highway right of way for the proposed project (e.g., second-row properties, third-row properties) receives 2 points and the resident (owner or renter) receives 1 point. The owner/resident of a benefited property receives a total of 3 points.

When there is no outdoor area of frequent human use associated with a benefited property, the owner of the benefited property receives a total of 4 points if the property is located immediately adjacent to the highway right of way (i.e., first-row properties). If the property is not immediately adjacent to the

[3] The concrete post and concrete panel noise wall is MnDOT's standard noise wall design.

highway right of way (i.e., second-row properties, third-row properties), the owner of the benefited property receives a total of 2 points.

Only those benefited property owners and residents, including individual units of multi-family residential buildings that are benefited receptors, regardless of floor location (e.g., first floor, second floor, etc.), have a vote according to the point system described above. Non-benefiting receptors do not receive points. MnDOT's noise requirements allows for up to two solicitation periods to request votes and determine the outcome regarding proposed noise abatement measures.

- **Initial Solicitation**: If at least 50 percent of all possible voting points from eligible voters are received after the initial request for votes, a simple majority of points cast will determine whether the proposed noise barrier will be constructed. If less than 50 percent of the possible voting points for a barrier are received after this initial request, then a second ballot will be distributed to the benefited property owners who did not respond to the first solicitation.
- **Second Request**: If the combination of the first and second solicitation results in responses for at least 25 percent of all possible points for a barrier, a simple majority of voting points cast will determine whether the proposed noise barrier will be constructed. If fewer than 25 percent of total possible points for a noise barrier are received after the second request for votes, then the barrier will not be constructed. If there is a tie, where there are equal numbers of points for and against a noise barrier, then noise barrier will be constructed.

4.1.3 Noise Barrier Analysis Results

Noise barriers (i.e., noise walls) were evaluated at modeled receptor locations adjacent to TH 10 where traffic noise levels are predicted to approach or exceed Federal noise abatement criteria under the 2040 Build Alternative, or where modeled receptor locations are projected to experience a substantial increase in noise levels from existing conditions to the 2040 Build Alternative. The layout figures in Appendix A illustrate the locations of modeled noise walls. Table C1 through Table C10 in Appendix C tabulate the modeled noise wall cost-effectiveness results.

Noise Wall 1, North Side of TH 10, West of Ferry Street (Receptor A1 through Receptor A26 and Receptor R1 through Receptor R12)

Modeled receptor locations on the north side of TH 10 and west of Ferry Street represent residential uses, retail facilities, and parkland (Greenhaven Golf Course). The retail facilities are on the west side of Ferry Street, north of the TH 10/Ferry Street interchange (Receptors A25 and A26). Modeled traffic noise levels at receptor locations in Greenhaven Golf Course (Receptor R1 through Receptor R12) are projected to be below the Federal noise abatement criterion for Activity Category C uses. Modeled traffic noise levels at receptor locations closest to TH 10 are projected

to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the north side of TH 10 and west of Ferry Street. The modeled wall begins at Greenhaven Golf Course and ends at the TH 10/169/Ferry Street interchange north ramp intersection.

An approximately 1,120-foot long, 20-foot high noise wall was modeled along the north side of TH 10, west of Ferry Street. The 20-foot high noise wall provides a 0 dBA to 11.8 dBA reduction in traffic noise levels (see Table C.1 in Appendix C). Noise Wall 1 achieved a 7 dBA reduction or greater at six receptors, and a 5 dBA reduction or greater at 16 receptors. The cost-effectiveness of the noise wall is $49,050 per benefited receptor. The approximately 1,120-foot long, 20-foot high noise wall is below MnDOT's cost effectiveness criteria of $78,500 per benefited receptor; therefore, Noise Wall 1 is proposed.

Noise Wall 2, North Side of TH 10 Between Ferry Street and Rum River (Receptor B1 through Receptor B17)

Modeled receptor locations on the north side of TH 10 between Ferry Street and the Rum River represent residential uses and retail facilities. The retail facilities are on the east side of Ferry Street, north of the TH 10/Ferry Street interchange (Receptors B1, B2, and B3). Modeled traffic noise levels at receptor locations closest to TH 10 are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the north side of TH 10 Ferry Street between Ferry Street and the Rum River. The modeled wall begins east of commercial uses along Ferry Street and ends at the TH 10 bridge over the Rum River.

An approximately 465-foot long, 20-foot high noise wall was modeled along the north side of TH 10 between Ferry Street and the Rum River. The 20-foot high noise wall provides a 0.2 dBA to 12.7 dBA reduction in traffic noise levels (see Table C.2 in Appendix C). The approximately 465-foot long, 20-foot high noise wall achieved a 7 dBA reduction or greater at two receptors, and a 5 dBA reduction or greater at three receptors. The cost-effectiveness of the noise wall is $105,975 per benefited receptor. The approximately 465-foot long, 20-foot high noise wall exceeds MnDOT's cost effectiveness criteria of $78,500 per benefited receptor and is not proposed.

A 14-foot high noise wall was the maximum noise wall height identified to achieve a 5 dBA reduction or greater at three receptors between Ferry Street and the Rum River. Therefore, a 14-foot high noise wall was evaluated.

An approximately 465-foot long, 14-foot high noise wall was modeled along the north side of TH 10 between Ferry Street and the Rum River. The 14-foot high noise wall provides a 0.1 dBA to 10.1 dBA reduction in traffic noise levels (see Table

C.3 in Appendix C). The approximately 465-foot long, 14-foot high noise wall achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at three receptors. The cost-effectiveness of the noise wall is $77,775 per benefited receptor. The approximately 465-foot long, 14-foot high noise wall is below MnDOT's cost effectiveness criteria of $78,500 per benefited receptor; therefore, Noise Wall 2 is proposed.

Modeled Wall 3, North Side of TH 10 Between 4th Avenue and 7th Avenue (Receptor C1 through Receptor C21)

Modeled receptor locations on the north side of TH 10 between 4th Avenue and 7th Avenue represent residential uses, a daycare (Receptor C21), business office uses, and industrial uses. The business office uses are on the west side of 4th Avenue, and the industrial uses are north of Pierce Avenue. Modeled traffic noise levels at receptor locations along North Street are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the north side of TH 10 between 4th Avenue and 7th Avenue. The modeled wall begins east of 4th Avenue adjacent to Receptor C21 and ends east of 6th Avenue.

An approximately 970-foot long, 20-foot high noise wall was modeled along the north side of TH 10 between 4th Avenue and 7th Avenue. The 20-foot high noise wall provides a 0.1 dBA to 15.1 dBA reduction in traffic noise levels (see Table C.4 in Appendix C). The approximately 970-foot long, 20-foot high noise wall achieved a 7 dBA reduction or greater at six receptors, and a 5 dBA reduction or greater at eight receptors. The cost-effectiveness of the noise wall is $91,118 per benefited receptor. The approximately 970-foot long, 20-foot high noise wall exceeds MnDOT's cost effectiveness criteria of $78,500 per benefited receptor and is not proposed.

A 16-foot high noise wall was the maximum noise wall height identified to achieve a 5 dBA reduction or greater at eight receptors between 4th Avenue and 7th Avenue. Therefore, a 16-foot high noise wall was evaluated.

An approximately 970-foot long, 16-foot high noise wall was modeled along the north side of TH 10 between 4th Avenue and 7th Avenue. The 16-foot high noise wall provides a 0.1 dBA to 13.3 dBA reduction in traffic noise levels (see Table C.5 in Appendix C). The approximately 970-foot long, 16-foot high noise wall achieved a 7 dBA reduction or greater at six receptors, and a 5 dBA reduction or greater at eight receptors. The cost-effectiveness of the noise wall is $74,738 per benefited receptor. The approximately 970-foot long, 16-foot high noise wall is below MnDOT's cost effectiveness criteria of $78,500 per benefited receptor; therefore, Noise Wall 3 is proposed.

Modeled Noise Wall 4, South Side of TH 10, West of Ferry Street (Receptor G1 through Receptor G52)

Modeled receptor locations on the south side of TH 10 and west of Ferry Street represent residential uses and a retail facility. The retail facility (Receptor G1) is on the south side of TH 10 at the west project limits. Modeled traffic noise levels at receptor locations closest to TH 10 are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of TH 10 and west of Ferry Street. The modeled wall begins at commercial uses west of Ferry Street and ends at the TH 10/169/Ferry Street interchange south ramp intersection.

An approximately 1,375-foot long, 20-foot high noise wall was modeled along the south side of TH 10, west of Ferry Street. The 20-foot high noise wall provides a 0 dBA to 9.7 dBA reduction in traffic noise levels (see Table C.6 in Appendix C). Noise Wall 5 achieved a 7 dBA reduction or greater at 10 receptors, and a 5 dBA reduction or greater at 19 receptors. The cost-effectiveness of the noise wall is $50,968 per benefited receptor. The approximately 1,375-foot long, 20-foot high noise wall is below MnDOT's cost effectiveness criteria of $78,500 per benefited receptor; therefore, Noise Wall 4 is proposed.

Modeled Noise Wall 5, South Side of TH 10 Between Ferry Street and Rum River (Receptor F1 through Receptor F45)

Modeled receptor locations on the south side of TH 10 between Ferry Street and the Rum River represent residential uses. Modeled traffic noise levels at receptor locations closest to TH 10 are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of TH 10 between Ferry Street and the Rum River.

An approximately 715-foot long, 20-foot high noise wall was modeled along the south side of TH 10 between Ferry Street and the Rum River. The 20-foot high noise wall provides a 0 dBA to 11.7 dBA reduction in traffic noise levels (see Table C.7 in Appendix C). Noise Wall 6 achieved a 7 dBA reduction or greater at eight receptors, and a 5 dBA reduction or greater at nine receptors. The cost-effectiveness of the noise wall is $55,233 per benefited receptor. The approximately 715-foot long, 20-foot high noise wall is below MnDOT's cost effectiveness criteria of $78,500 per benefited receptor; therefore, Noise Wall 5 is proposed.

Modeled Noise Wall 6, South Side of TH 10 Between 4th Avenue and 7th Avenue (Receptor E1 through Receptor E56 and Receptor R34 through Receptor R38)

Modeled receptor locations on the south side of TH 10 between 4th Avenue and 7th Avenue represent residential uses, business office uses, a place of worship, and

parkland (Rudy Johnson Park). Modeled traffic noise levels at receptor locations closest to TH 10 are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative. Modeled traffic noise levels at receptor locations in Rudy Johnson Park are projected to approach the Federal noise abatement criterion for Activity Category C under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of TH 10 between 4th Avenue and 7th Avenue.

An approximately 1,865-foot long, 20-foot high noise wall was modeled along the south side of TH 10 between 4th Avenue and 7th Avenue. The 20-foot high noise wall provides a 0.1 dBA to 12.8 dBA reduction in traffic noise levels (see Table C.8 in Appendix C). Noise Wall 7 achieved a 7 dBA reduction or greater at 28 receptors, and a 5 dBA reduction or greater at 34 receptors. The cost-effectiveness of the noise wall is $38,923 per benefited receptor. The approximately 1,865-foot long, 20-foot high noise wall is below MnDOT's cost effectiveness criteria of $78,500 per benefited receptor; therefore, Noise Wall 6 is proposed.

Modeled Noise Wall 7, North Side of TH 10, East of BNSF Railway (Receptor H1 through Receptor H42)

Modeled receptor locations on the north side of TH 10 east of the BNSF Railway represent residential uses, business office uses, a retail facility, and industrial uses. The business office uses, retail facility, and industrial uses are west of 9th Avenue, and the residential uses are east of 9th Avenue. Modeled traffic noise levels at residential uses east of the BNSF Railway and 9th Avenue are projected to exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the north side of TH 10, east of the BNSF Railway.

An approximately 590-foot long, 20-foot high noise wall was modeled along the north side of TH 10 and east of the BNSF Railway. The 20-foot high noise wall provides a 0.4 dBA to 6.0 dBA reduction in traffic noise levels (see Table C.9 in Appendix C). The approximately 590-foot long, 20-foot high noise wall does not meet MnDOT's noise reduction design goal; therefore, Noise Wall 7 is not proposed.

Modeled Noise Wall 8, South Side of TH 10 Between 7th Avenue and BNSF Railway (Receptor D1 through Receptor D15)

Modeled receptor locations on the south side of TH 10 between 7th Avenue and the BNSF Railway represent residential uses, a business office, and a retail facility. The business office and retail facility are along the east side of 7th Avenue, south of the entrance ramp to eastbound TH 10. Modeled traffic noise levels at residential uses between 7th Avenue and the BNSF Railway along the entrance ramp to eastbound

TH 10 are projected to approach or exceed the Federal noise abatement criterion for Activity Category B under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of TH 10 between 7th Avenue and the BNSF Railway.

An approximately 665-foot long, 20-foot high noise wall was modeled along the south side of TH 10 between 7th Avenue and the BNSF Railway. The TH 10 elevation between 7th Avenue and the BNSF Railway is 15 feet to 30 feet above the residences east of 7th Avenue. Therefore, the modeled noise wall was located along the eastbound TH 10 entrance ramp to maximize the top of the modeled noise wall elevation. The 20-foot high noise wall provides a 0 dBA to 7.8 dBA reduction in traffic noise levels (see Table C.10 in Appendix C). Noise Wall 7 achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at five receptors. The cost-effectiveness of the noise wall is $93,120 per benefited receptor. The approximately 665-foot long, 20-foot high noise wall exceeds MnDOT's cost effectiveness criteria of $78,500 per benefited receptor and is not proposed.

An 18-foot high noise wall was the maximum noise wall height identified to achieve a 7 dBA reduction at one receptor between 7th Avenue and the BNSF Railway. Therefore, an 18-foot high noise wall was evaluated.

An approximately 665-foot long, 18-foot high noise wall was modeled along the south side of TH 10 between 7th Avenue and the BNSF Railway. The 18-foot high noise wall provides a 0 dBA to 7.2 dBA reduction in traffic noise levels (see Table C.11 in Appendix C). Noise Wall 7 achieved a 7 dBA reduction or greater at one receptor, and a 5 dBA reduction or greater at four receptors. The cost-effectiveness of the noise wall is $105,510 per benefited receptor. The approximately 665-foot long, 18-foot high noise wall exceeds MnDOT's cost effectiveness criteria of $78,500 per benefited receptor and is not proposed.

An approximately 665-foot long, 16-foot high noise wall was modeled along the south side of TH 10 between 7th Avenue and the BNSF Railway. The 16-foot high noise wall provides a 0 dBA to 6.4 dBA reduction in traffic noise levels (see Table C.12 in Appendix C). The approximately 665-foot long, 16-foot high noise wall does not meet MnDOT's noise reduction design goal; therefore, Noise Wall 8 is not proposed.

Modeled Noise Wall 9, North Side of TH 10 Between Rum River and 4th Avenue (Receptor R29 and Receptor R30)

Modeled receptor locations on the north side of TH 10 between the Rum River and 4th Avenue represent the Rum River Regional Trail. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2040 Build Alternative; therefore, a noise wall was evaluated on the north side of TH 10 between the Rum River and 4th Avenue.

An approximately 135-foot long, 20-foot high noise wall was modeled along the north side of TH 10 between the Rum River and 4th Avenue. The 20-foot high noise wall provides a 0.3 dBA to 0.9 dBA reduction in traffic noise levels (see Table C.13 in Appendix C). The approximately 135-foot long, 20-foot high noise wall does not meet the minimum 5 dBA reduction to be considered acoustically feasible; therefore, Noise Wall 9 is not proposed.

Modeled Noise Wall 10, South Side of TH 10 Between Rum River and 4th Avenue (Receptor R31 through Receptor R33)

Modeled receptor locations on the north side of TH 10 between the Rum River and 4th Avenue represent the Rum River Regional Trail. Modeled traffic noise levels are projected to exceed the Federal noise abatement criterion for Activity Category C under the 2040 Build Alternative; therefore, a noise wall was evaluated on the south side of TH 10 between the Rum River and 4th Avenue.

An approximately 130-foot long, 20-foot high noise wall was modeled along the south side of TH 10 between the Rum River and 4th Avenue. The 20-foot high noise wall provides a 1.5 dBA to 1.9 dBA reduction in traffic noise levels (see Table C.14 in Appendix C). The approximately 130-foot long, 20-foot high noise wall does not meet the minimum 5 dBA reduction to be considered acoustically feasible; therefore, Noise Wall 10 is not proposed.

4.1.4 Other Noise Mitigation Techniques

Noise abatement measures other than noise walls were considered but determined not feasible and reasonable for the proposed project. These measures are summarized below.

Traffic Management Measures

Traffic management measures include such items as prohibition of certain vehicle types and time-use restrictions for certain vehicle types. These traffic management measures are not reasonable for the TH 10 corridor. These measures would be inconsistent with the function TH 10 as a principal arterial roadway, National Highway System (NHS) route, and as a major freight corridor connecting the Twin Cities to northwestern Minnesota and beyond. TH 10 from Interstate 35W (I-35W) near Mounds View to Thurston Avenue in Anoka is identified by MnDOT in the *Minnesota Statewide Freight System and Investment Plan* as a critical urban freight corridor. The project segment of TH 10 also is identified in the Metropolitan Council's *Regional Truck Highway Corridor Study* as a tier 1 freight corridor.

Modified Speed Limits

In general, a decrease in speed of approximately 20 mph is necessary for a noticeable decrease in noise levels. The existing posted speed limit on the project segment of TH 10 is 60 mph. The design speed for the project segment of TH 10 is 60 mph, and the anticipated speed limit is 60 mph. Lowering the speed limit on TH 10 would be inconsistent with its function as a principal arterial roadway and as a National Highway System route. In addition, motorists would likely not obey a substantially lower speed limit.

Vertical and Horizontal Alignment

The proposed TH 10 improvements follow the existing roadway alignment from west of Ferry Street to the BNSF Railway. The proposed TH 10 improvements are located within existing highway right of way, avoiding right of way impacts to adjacent properties. The proposed Ferry Street improvements and Ferry Street interchange follow the existing roadway alignment and are largely within the existing highway right of way limits. Changes in the TH 10 and Ferry Street alignments would increase right of way impacts for adjacent properties.

In general, the proposed vertical profile of TH 10 follows the existing roadway profile; however, the profile grade increases by approximately two feet at the Rum River bridge. The purpose of this profile change is to increase clearance over the Rum River for bridge maintenance and recreational users. The profile of Ferry Street over TH 10 was identified to design clearance requirements. Substantial changes in the Ferry Street vertical profile are not part of the project scope. Further changes to the proposed TH 10 or Ferry Street vertical profile would result in right of way impacts to adjacent properties.

Landscaping/Natural Noise Screening

Vegetation is only effective for reducing noise levels if it is at least 100 feet to 200 feet deep, a minimum of 15 feet above the line of sight, and dense enough that it cannot be seen through (e.g., evergreen vegetation that maintains its foliage year-round). It is not feasible to plant enough vegetation within existing and proposed right of way to achieve substantial noise level reductions. As such, vegetation is not a reasonable noise mitigation measure.

Exclusive Land Use Designations

Buffer zones are undeveloped, open spaces adjacent to a roadway corridor. The TH 10 corridor. Residential, commercial, industrial, and park uses are located along both sides of TH 10 from west of Ferry Street to east of the BSNF Railway. Because the project is within a developed, urban area, and because of the large amount of

land necessary to accommodate buffer zones, acquisition of land to create buffer zones is not feasible.

Noise Insulation of Non-Residential Building

Under MnDOT's noise requirements, only non-residential buildings such as schools, hospitals, and places of worship should be considered for acoustical insulation if there are no exterior areas of frequent human use associated with the property. These land uses fall under Federal Activity Category D. The Federal noise abatement criterion for interior locations under Activity Category D is 52 dBA (L_{eq}) (see Table 1.1).

If there are impacts to exterior areas of frequent human uses at an Activity Category C receptor, and exterior noise abatement is not feasible or reasonable, then an interior noise analysis is completed if the receptor also falls under Activity Category D. Interior noise mitigation is proposed only if the modeled interior noise level exceeds the Activity Category D criterion of 52 dBA (L_{eq}).

There is one daycare within the project limits. Little Blessings of Anoka Early Childhood Learning Center (Receptor C21) is on the north side of TH 10 between 4th Avenue and 7th Avenue (440 Pierce Street, Anoka). There is one place of worship within the project limits. Restoration Church (Receptor E14) is on the south side of TH 10 between 4th Avenue and 7th Avenue (503 Polk Street, Anoka). There are no hospitals, schools, or other land uses identified within Activity Category D in the project area.

Little Blessings of Anoka Early Childhood Learning Center

Little Blessings of Anoka Early Childhood Learning Center is on the north side of TH 10 between 4th Avenue and 7th Avenue and is represented by Receptor C21 (see layout figures in Appendix A, Figure 5 of 6). Receptor C21 is at the playground area on the east side of the building. The modeled noise level at Receptor C21 under the 2040 Build Alternative is 63.8 dBA (L_{eq}).

The modeled noise level at Receptor C21 is projected to below the Federal noise abatement criterion of 66 dBA for Activity Category C.[4] Receptor C21 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative. A 16-foot tall noise wall is proposed along the north side of TH 10 between 4th Avenue and 7th Avenue. This modeled wall would shield

[4] If a future build worst hour noise level approaches or exceeds the noise abatement criterion (NAC) noise level, then an impact exists. A noise level approaches NAC when it is within 1 dBA of the NAC noise level. 66 dBA (Leq) is defined as approaching the noise abatement criterion for Activity Category C.

the playground area at Receptor C21; therefore, interior noise levels were not evaluated.

Restoration Church

Restoration Church is on the south side of TH 10 between 4th Avenue and 7th Avenue and is represented by Receptor E14 (see layout figures in Appendix A, Figure 5 of 6). Receptor E14 is on the north façade of the building, closest to TH 10. The modeled noise level at Receptor E14 under the 2040 Build Alternative is 56.6 dBA (L_{eq}). The modeled noise level at Receptor E14 is projected to be below the Federal noise abatement criterion of 66 dBA for Activity Category C.[5] Receptor E14 is not projected to experience a substantial increase in traffic noise from existing conditions to the 2040 Build Alternative; therefore, interior noise levels were not evaluated.

[5] If a future build worst hour noise level approaches or exceeds the noise abatement criterion (NAC) noise level, then an impact exists. A noise level approaches NAC when it is within 1 dBA of the NAC noise level. 66 dBA (Leq) is defined as approaching the noise abatement criterion for Activity Category C.

Chapter 5 Construction Noise

The construction activities associated with implementation of the proposed project will result in increased noise levels relative to existing conditions. These impacts will primarily be associated with construction equipment and pile driving.

Table 5.1 shows peak noise levels monitored at 50 feet from various types of construction equipment. This equipment is primarily associated with site grading/site preparation, which is generally the roadway construction phase associated with the greatest noise levels.

Table 5.1 Typical Construction Equipment Noise Levels at 50 Feet

Equipment Type	Manufacturers Sampled	Total Number of Models In Sample	Peak Noise Level (dBA) (Range)	Peak Noise Level (dBA) (Average)
Backhoes	5	6	74-92	83
Front Loaders	5	30	75-96	85
Dozers	8	41	65-95	85
Graders	3	15	72-92	84
Scrapers	2	27	76-98	87
Pile Drivers	N/A	N/A	95-105	101

Source: United States Environmental Protection Agency and Federal Highway Administration

Elevated noise levels are, to a degree, unavoidable for this type of project. MnDOT will require that construction equipment be properly muffled and in proper working order. While MnDOT and its contractor(s) are exempt from local noise ordinances, it is the practice to require contractor(s) to comply with applicable local noise restrictions and ordinances to the extent that is reasonable. Advanced notice will be provided to affected communities of any planned abnormally loud construction activities. It is anticipated that night construction may sometimes be required to minimize traffic impacts and to improve safety. However, construction will be limited to daytime hours as much as possible. This project is expected to be under construction for two construction seasons. If necessary, a detailed nighttime construction mitigation plan will be developed during the project final design stage.

Any associated high-impact equipment noise, such as pile driving, pavement sawing, or jack hammering, will be unavoidable with construction of the proposed project. Pile-driving noise is associated with any bridge construction and sheet piling necessary for retaining wall construction. While pile-driving equipment results in the highest peak noise level, as shown in Table 5.1 it is limited in duration to the

activities noted above (e.g., bridge construction). The use of pile drivers, jack hammers, and pavement sawing equipment will be prohibited during nighttime hours.

Chapter 6 Conclusions and Recommendations

6.1 Traffic Noise Analysis Results

Construction of the TH 10 Rum River Bridge and Ferry Street Interchange Project is anticipated to increase modeled future traffic noise levels compared to existing conditions. Modeled L_{eq} noise levels are predicted to range from 43.8 dBA to 78.4 dBA under the 2040 Build Alternative. Modeled L_{eq} noise levels are projected to change by -2.1 dBA to 5.4 dBA under the 2040 Build Alternative compared to existing conditions.

Modeled noise levels are predicted to approach or exceed Federal noise abatement criteria at 48 modeled receptor locations representing residential land uses (Activity Category B) and at eight modeled receptor locations representing the Rum River Regional Trail (Activity Category C). One modeled receptor location is predicted to experience a substantial increase in traffic noise levels (i.e., increase of 5 dBA or greater) from existing conditions to the 2040 Build Alternative.

6.2 Consideration of Noise Abatement Measures

Noise walls were evaluated along TH 10 at modeled receptor locations that are projected to approach or exceed Federal noise abatement criteria under the 2040 Build Alternative, or experience a substantial increase from existing conditions to the 2040 Build Alternative. Ten noise walls were modeled along the project corridor. Two modeled noise walls between the Rum River and 4th Avenue did not meet the minimum 5 dBA reduction to be considered acoustically feasible. Two modeled noise walls east of 7th Avenue and the BNSF Railway did not meet MnDOT's noise reduction design goal of 7 dBA or greater.

Based upon the analysis completed following the guidelines and procedures identified in the 2017 MnDOT Noise Requirements, MnDOT intends to construct six noise walls with the project. The layout figures in Appendix A illustrate the location of the proposed noise walls. The following noise walls are being proposed as part of the project.

- Noise Wall 1 is on the north side of TH 10 and west of Ferry Street. Noise Wall 1 has a preliminary cost per benefited receptor of $49,050. Noise Wall 1 is 20 feet tall with a proposed length of 1,120 feet. Sixteen (16) benefited receptors are adjacent to Noise Wall 1.
- Noise Wall 2 is on the north side of TH 10 between Ferry Street and the Rum River. Noise Wall 2 has a preliminary cost per benefited receptor of $77,775.

Noise Wall 2 is 14 feet tall with a proposed length of 465 feet. Three (3) benefited receptors are adjacent to Noise Wall 2.

- Noise Wall 3 is on the north side of TH 10 between 4th Avenue and 7th Avenue. Noise Wall 3 has a preliminary cost per benefited receptor of $74,738. Noise Wall 3 is 16 feet tall with a proposed length of 970 feet. Eight (8) benefited receptors are adjacent to Noise Wall 3.
- Noise Wall 4 is on the south side of TH 10 and west of Ferry Street. Noise Wall 4 has a preliminary cost per benefited receptor of $50,968. Noise Wall 5 is 20 feet tall with a proposed length of 1,375 feet. Nineteen (19) benefited receptors are adjacent to Noise Wall 4.
- Noise Wall 5 is on the south side of TH 10 between Ferry Street and the Rum River. Noise Wall 5 has a preliminary cost per benefited receptor of $55,233. Noise Wall 6 is 20 feet tall with a proposed length of 715 feet. Nine (9) benefited receptors are adjacent to Noise Wall 5.
- Noise Wall 6 is on the south side of TH 10 between 4th Avenue and 7th Avenue. Noise Wall 6 has a preliminary cost per benefited receptor of $38,923. Noise Wall 7 is 20 feet tall with a proposed length of 1,865 feet. Thirty-four (34) benefited receptors are adjacent to Noise Wall 6.

6.3 Statement of Likelihood

The traffic noise analysis for the proposed noise wall described above is based upon preliminary design studies completed to date. Final noise mitigation decisions will be subject to final design considerations and the viewpoint of benefited residents and property owners.

If conditions substantially change by the time the project reaches the final design stage, noise abatement measures may not be provided. If the final plan changes substantially, receptors that would have received benefits from noise walls, along with local officials, will be notified of plans to eliminate or substantially modify a noise abatement measure prior to the final design process. This notification will explain any changes in site conditions (if any), additional site information, any design changes implemented during the final design process, and explanation of noise wall feasibility and reasonableness. A final decision regarding installation of the proposed abatement measure will be made upon completion of the project's final design and the public involvement process.

Appendix A

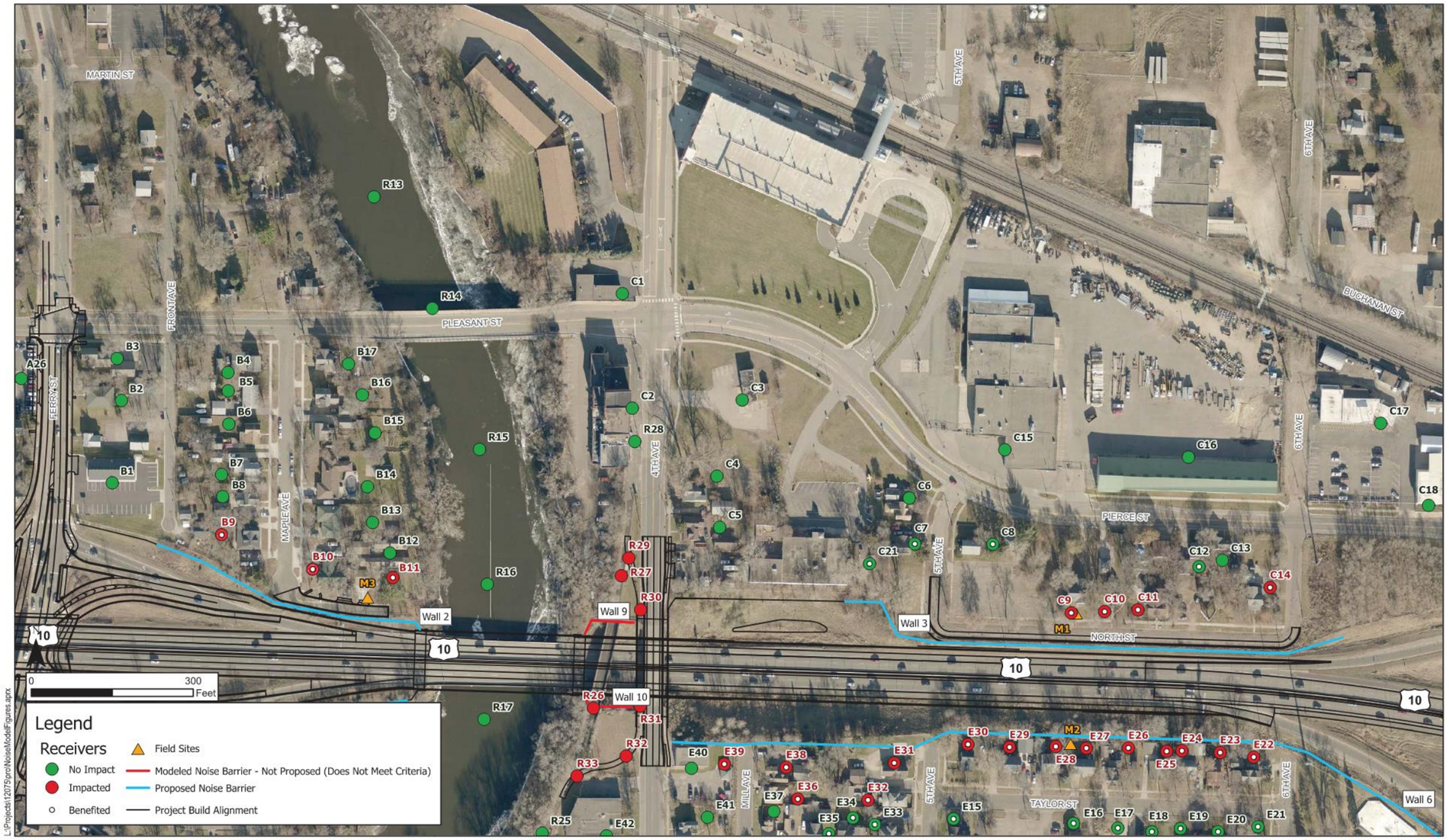
Figures

Noise Receptors and Proposed Wall Locations

MnDOT TH 10 Rum River Bridge Replacement - SP 0215-76
Anoka, MN

Figure 1 of 6

DEPARTMENT OF TRANSPORTATION

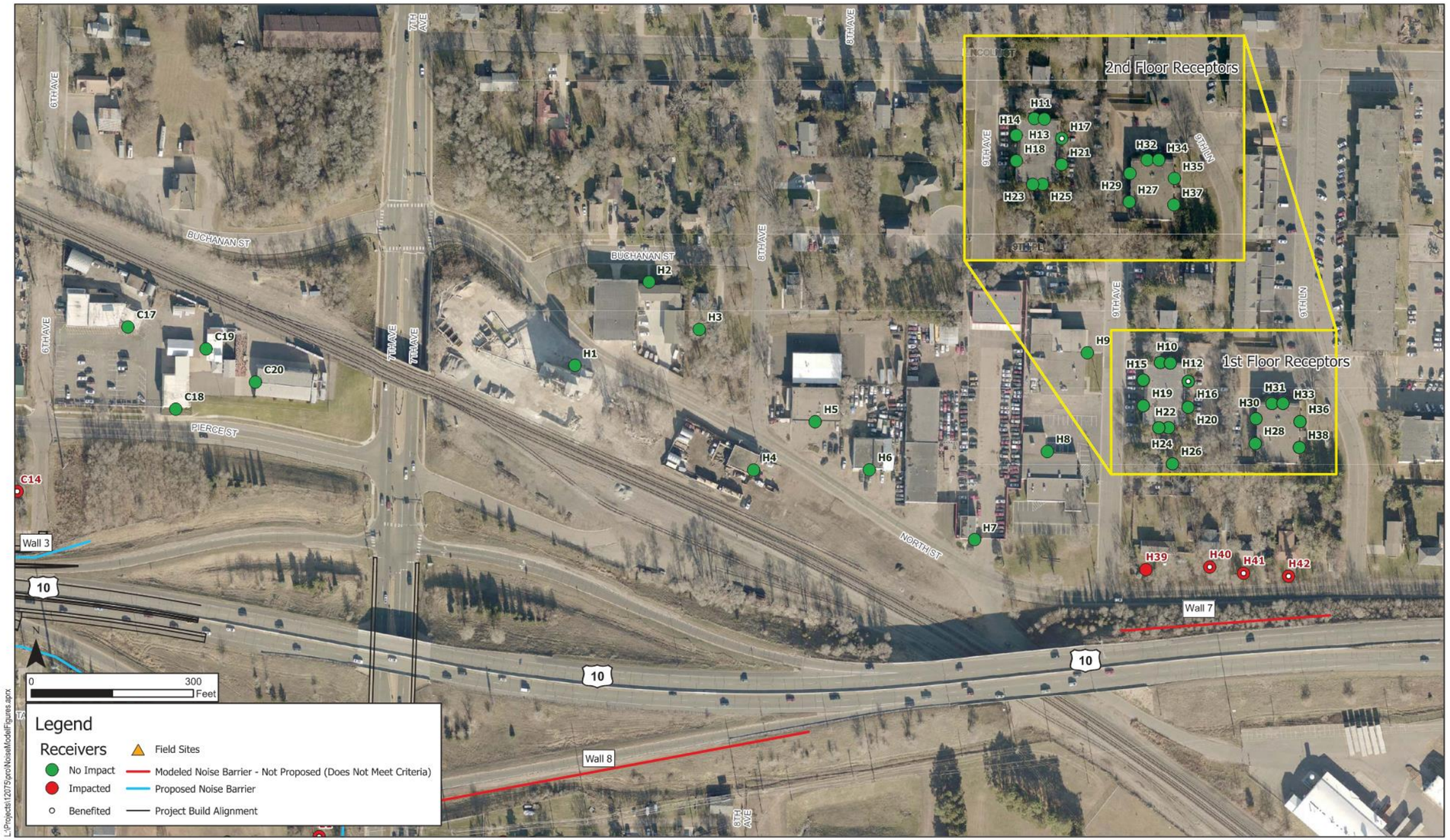


Noise Receptors and Proposed Wall Locations

MnDOT TH 10 Rum River Bridge Replacement - SP 0215-76
Anoka, MN

Figure 2 of 6

DEPARTMENT OF TRANSPORTATION



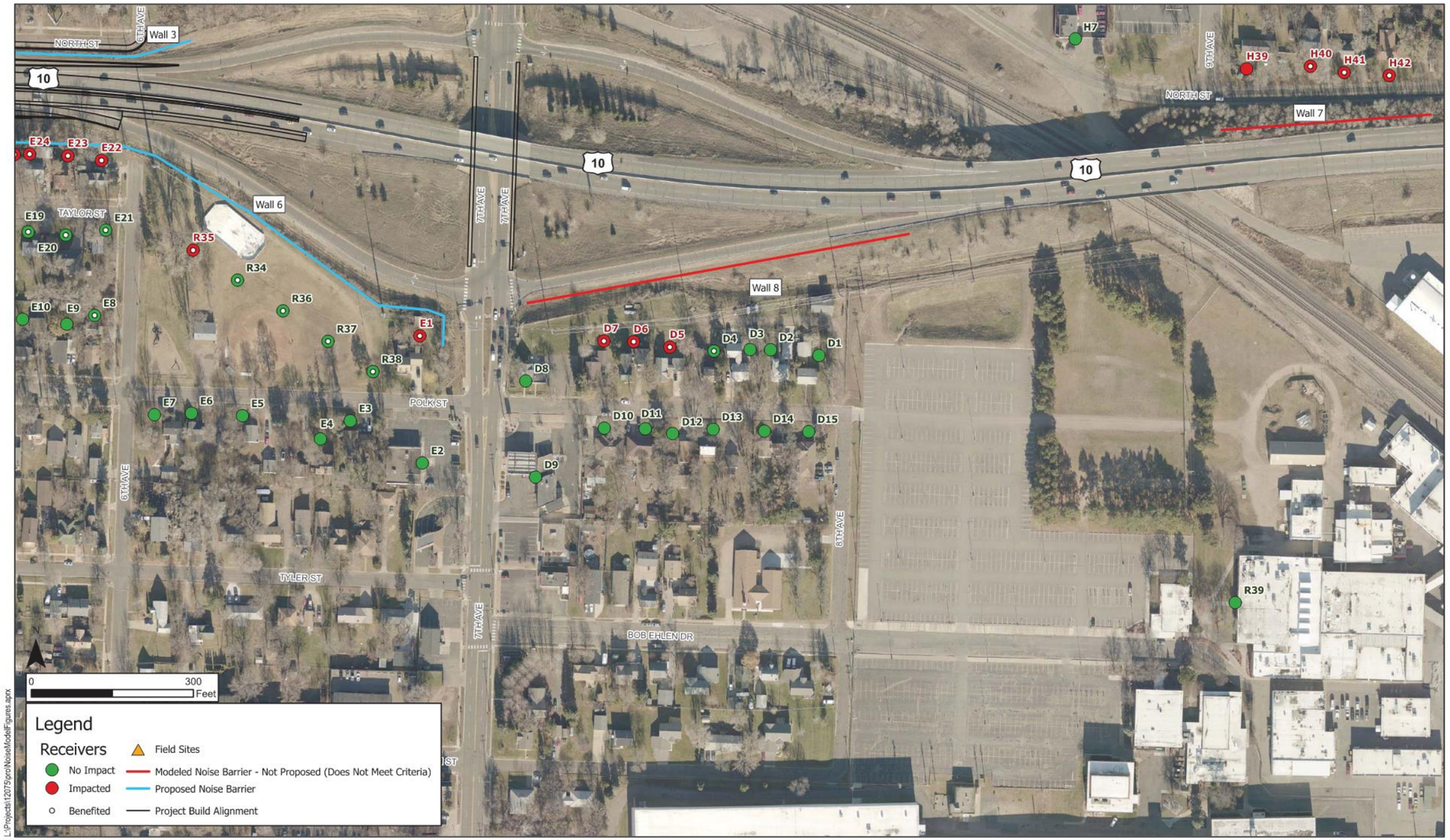
Noise Receptors and Proposed Wall Locations

MnDOT TH 10 Rum River Bridge Replacement - SP 0215-76

Anoka, MN

Figure 3 of 6

DEPARTMENT OF TRANSPORTATION

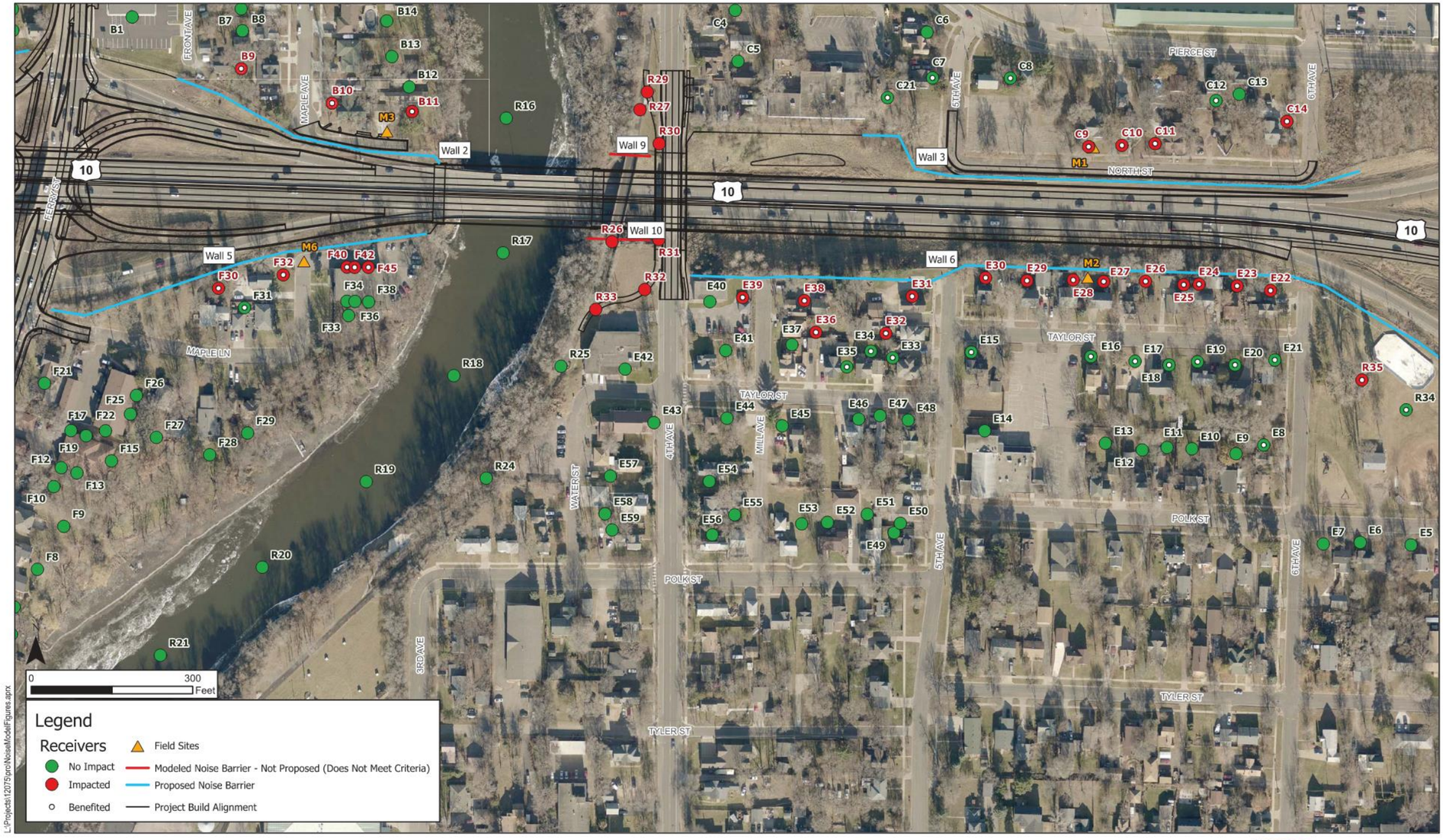


Noise Receptors and Proposed Wall Locations

MnDOT TH 10 Rum River Bridge Replacement - SP 0215-76
Anoka, MN

Figure 4 of 6

DEPARTMENT OF TRANSPORTATION

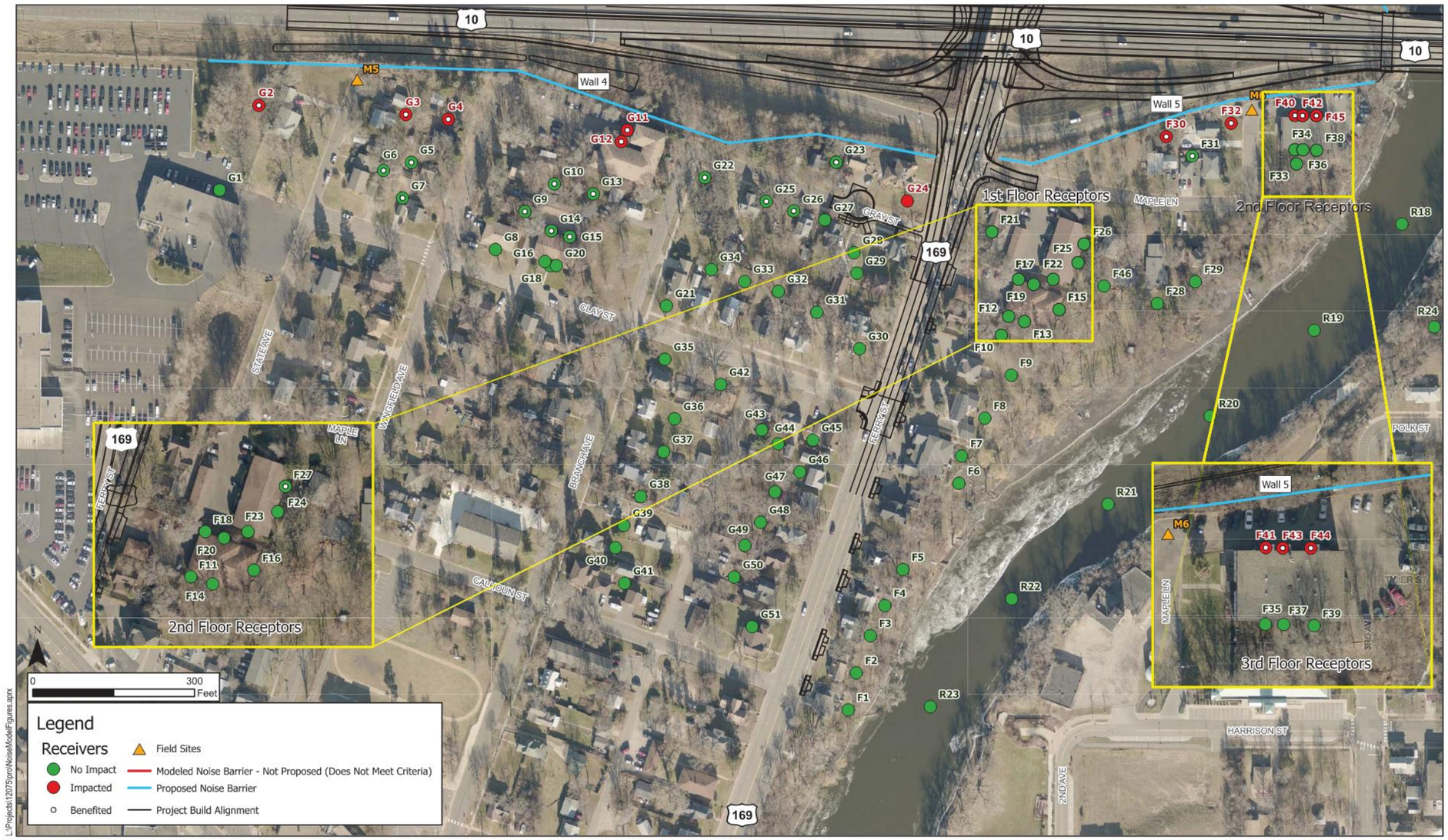


Noise Receptors and Proposed Wall Locations

MnDOT TH 10 Rum River Bridge Replacement - SP 0215-76
Anoka, MN

Figure 5 of 6

DEPARTMENT OF TRANSPORTATION



Noise Receptors and Proposed Wall Locations

MnDOT TH 10 Rum River Bridge Replacement - SP 0215-76
Anoka, MN

Figure 6 of 6

DEPARTMENT OF TRANSPORTATION

Appendix B

Field Measurement Data Sheets

Appendix B. Field Measurement Data Sheet, Site M1

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings				
Time:	**Fast**	Slow	Name:	MnDOT Metro
Weighting:	Lin.	**A**	Date:	October 17, 2019
Mic. Setting:	Fr.	**Rnd**	Project Name:	TH 10 Rum River Bridge
			Project Number:	SP 0215-76

Sound Level Meter (SLM)		**Calibrator**		
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær	
Model	Type 2250	Model	4231	
Serial No.	3000540	Serial No.	2725243	
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)		1000 Hz

Calibration

Initial Calibration	0.0 dB	Time	12:12 PM
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 1 (north side of TH 10 between 4th Avenue and 7th Avenue)
Front yard of residence (523 North Street)

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 10

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/17/2019				
Start Time	12:19 PM				
End Time	12:34 PM				
Weather	Sunny				
Temp (° F)	50° F				
Rel. Humidity (%)	59%				
Wind (mph)	7 mph				
Wind direction	South				
Road conditions	Dry				

TRAFFIC					
Test Number	WB TH 10	EB TH 10	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	534	473			
Speed Limit	60 mph	60 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	76.77				
L5	73.65				
L10	72.47				
L50	69.79				
L90	66.83				
L99	64.13				
Leq	70.48				
Lmax	81.89				
Lmin	61.39				

(See other side for plan view and cross section images)

Page 1 of 2

Plan view and cross section images

(Include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks and approximate distances)

GPS Coordinates: X: 45.205099 Y: -93.3825978

Comments:

PLAN VIEW

CROSS SECTION

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Appendix B. Field Measurement Data Sheet, Site M2

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT Metro
Time:	**Fast**	Slow	Date:	October 17, 2019
Weighting:	Lin.	**A**	Project Name:	TH 10 Rum River Bridge
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 0215-76

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration			
Initial Calibration	--	Time	--
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 2 (south side of TH 10 between 4th Avenue and 7th Avenue)
Back yard of residential property (525 Taylor Street)
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 10

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/17/2019				
Start Time	12:48 PM				
End Time	1:18 PM				
Weather	Sunny				
Temp (° F)	51° F				
Rel. Humidity (%)	56%				
Wind (mph)	6 mph				
Wind direction	SSE				
Road conditions	Dry				

TRAFFIC					
Test Number	WB TH 10	EB TH 10	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	1017	830			
Speed Limit	60 mph	60 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	79.67				
L5	77.52				
L10	76.55				
L50	73.38				
L90	68.29				
L99	62.52				
Leq	73.94				
Lmax	84.23				
Lmin	60.31				

(See other side for plan view and cross section images)

Page 1 of 2

Plan view and cross section images

(Include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks and approximate distances)

GPS Coordinates: X: 45.2046637 Y: -93.3822304

Comments:

PLAN VIEW

CROSS SECTION

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Appendix B. Field Measurement Data Sheet, Site M3

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT Metro
Time:	**Fast**	Slow	Date:	October 17, 2019
Weighting:	Lin.	**A**	Project Name:	TH 10 Rum River Bridge
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 0215-76

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration			
Initial Calibration	--	Time	--
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 3 (northeast quadrant of TH 10 and Ferry Street)
Front yard of residential property (2502 Maple Avenue)
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 10

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/17/2019				
Start Time	1:33 PM				
End Time	1:48 PM				
Weather	Sunny				
Temp (° F)	54°F				
Rel. Humidity (%)	53%				
Wind (mph)	7 mph				
Wind direction	SSE				
Road conditions	Dry				

TRAFFIC					
Test Number	WB TH 10	EB TH 10	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	462	355			
Speed Limit	60 mph	60 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	82.46				
L5	80.55				
L10	79.59				
L50	75.74				
L90	69.65				
L99	64.54				
Leq	76.62				
Lmax	85.81				
Lmin	61.24				

(See other side for plan view and cross section images)

Page 1 of 2

Plan view and cross section images

(Include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks and approximate distances)

GPS Coordinates: X: 45.2051777 Y: -93.387809

Comments:

PLAN VIEW

CROSS SECTION

Page 2 of 2

Appendix B. Field Measurement Data Sheet, Site M4

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT Metro
Time:	**Fast**	Slow	Date:	October 17, 2019
Weighting:	Lin.	**A**	Project Name:	TH 10 Rum River Bridge
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 0215-76

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration			
Initial Calibration	--	Time	--
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 4 (northwest quadrant of TH 10 and Ferry Street)
End of cul-de-sac between 2511 Wingfield Avenue and 2508 Wingfield Avenue
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 10

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/17/2019				
Start Time	1:37 PM				
End Time	1:52 PM				
Weather	Sunny				
Temp (° F)	54°F				
Rel. Humidity (%)	53%				
Wind (mph)	7 mph				
Wind direction	SSE				
Road conditions	Dry				

TRAFFIC					
Test Number	WB TH 10	EB TH 10	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	441	351			
Speed Limit	60 mph	60 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	73.56				
L5	70.89				
L10	69.77				
L50	66.09				
L90	61.05				
L99	57.58				
Leq	67.58				
Lmax	89.06				
Lmin	55.96				

(See other side for plan view and cross section images)

Page 1 of 2

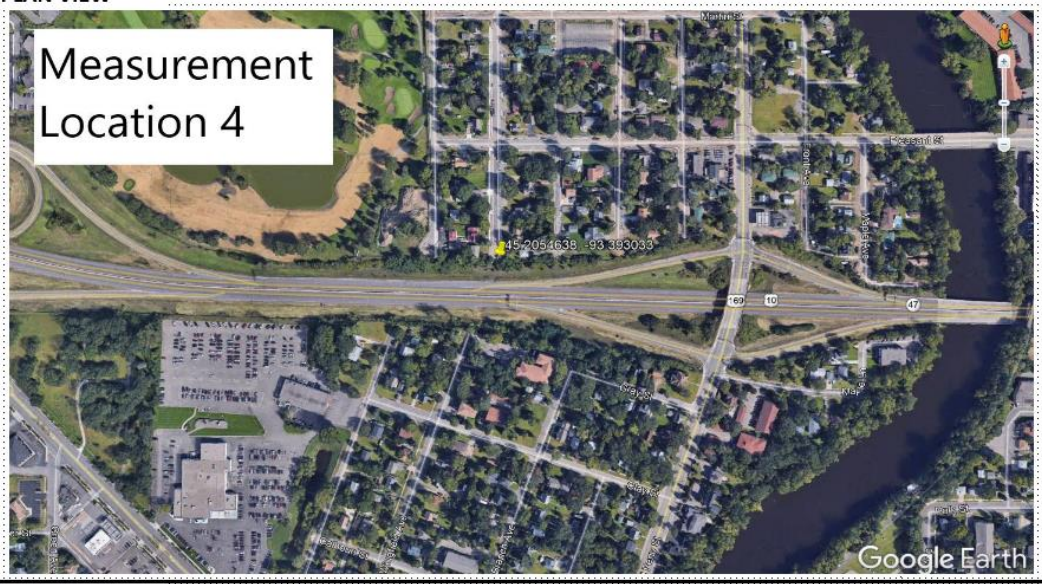
Plan view and cross section images

(Include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks and approximate distances)

GPS Coordinates: X: 45.2054638 Y: -93.393033

Comments:

PLAN VIEW



CROSS SECTION

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Appendix B. Field Measurement Data Sheet, Site M5

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings			Name:	MnDOT Metro
Time:	**Fast**	Slow	Date:	October 17, 2019
Weighting:	Lin.	**A**	Project Name:	TH 10 Rum River Bridge
Mic. Setting:	Fr.	**Rnd**	Project Number:	SP 0215-76

Sound Level Meter (SLM)		**Calibrator**	
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær
Model	Type 2250	Model	4231
Serial No.	3000540	Serial No.	2725243
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)	1000 Hz

Calibration			
Initial Calibration	--	Time	--
Final Calibration	--	Time	--

Monitor Location and Terrain Conditions: Location 5 (south side of TH 10 between Main Street and Ferry Street) Side yard of residential property (2339 State Avenue)

Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 10

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/17/2019				
Start Time	2:14 PM				
End Time	2:29 PM				
Weather	Sunny				
Temp (° F)	54°F				
Rel. Humidity (%)	53%				
Wind (mph)	7 mph				
Wind direction	SSE				
Road conditions	Dry				

TRAFFIC					
Test Number	WB TH 10	EB TH 10	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	517	346			
Speed Limit	60 mph	60 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	78.7				
L5	76.49				
L10	75.56				
L50	70.79				
L90	63.75				
L99	60.09				
Leq	72.17				
Lmax	81.49				
Lmin	57.05				

(See other side for plan view and cross section images)

Page 1 of 2

Plan view and cross section images

(Include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks and approximate distances)

GPS Coordinates: X: 45.2048127 Y: -93.3945145

Comments:

PLAN VIEW

CROSS SECTION

Page 2 of 2

Appendix B. Field Measurement Data Sheet, Site M6

FIELD MEASUREMENT DATA SHEET

Sound Level Meter (SLM) Settings				
Time:	**Fast**	Slow	Name:	MnDOT Metro
Weighting:	Lin.	**A**	Date:	October 17, 2019
Mic. Setting:	Fr.	**Rnd**	Project Name:	TH 10 Rum River Bridge
			Project Number:	12075-161

Sound Level Meter (SLM)		**Calibrator**		
Manufacturer	Bruel & Kjær	Manufacturer	Bruel & Kjær	
Model	Type 2250	Model	4231	
Serial No.	3000540	Serial No.	2725243	
Microphone	Type 4189 (Serial No. 2933208)	Calibrator Frequency (Hz)		1000 Hz

Calibration			
Initial Calibration	--	Time	--
Final Calibration	-0.09 dB	Time	2:59 PM

Monitor Location and Terrain Conditions: Location 6 (southeast quadrant of TH 10 and Ferry Street)
End of Maple Lane between 2409 Maple Lane and 2410 Maple Lane
Dominant and Observed Noise Sources: Traffic noise from vehicles traveling on TH 10

MEASURMENT INFORMATION					
Test Number	1	2	3	4	5
Date	10/17/2019				
Start Time	2:41 PM				
End Time	2:56 PM				
Weather	Sunny				
Temp (° F)	56° F				
Rel. Humidity (%)	47%				
Wind (mph)	7 mph				
Wind direction	SE				
Road conditions	Dry				

TRAFFIC					
Test Number	WB TH 10	EB TH 10	3	4	5
Autos	--	--			
Med Trucks	--	--			
Heavy Trucks	--	--			
Buses	--	--			
Motorcycles	--	--			
Total	565	364			
Speed Limit	60 mph	60 mph			

MONITOR RESULTS (dBA)					
Test Number	1	2	3	4	5
L1	76.44				
L5	73.86				
L10	73.05				
L50	69.82				
L90	65.55				
L99	63.16				
Leq	70.52				
Lmax	79.97				
Lmin	59.99				

(See other side for plan view and cross section images)

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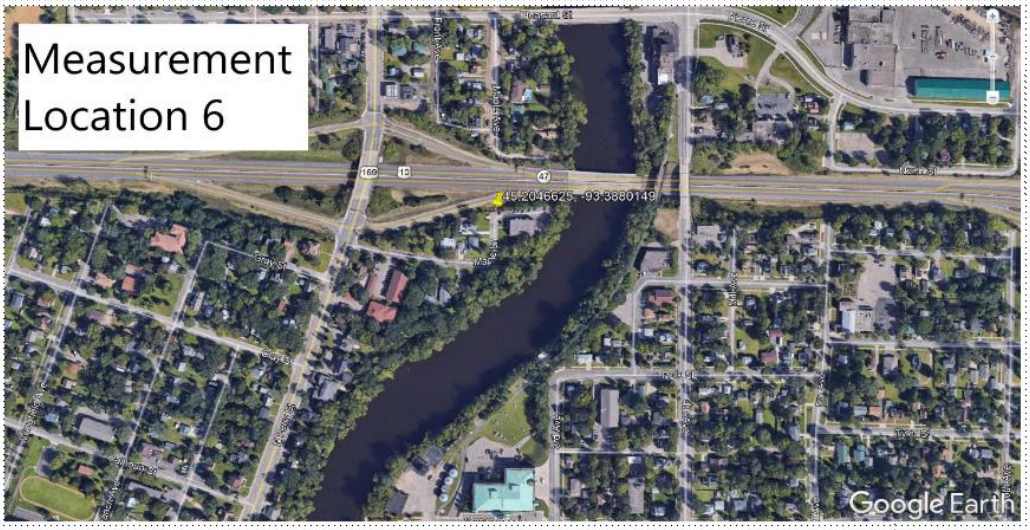
Plan view and cross section images

(Include noise source, receiver, microphone location, reflecting objects, obstructions, landmarks and approximate distances)

GPS Coordinates: X: 45.2046625 Y: -93.3880149

Comments:

PLAN VIEW



CROSS SECTION

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Appendix C

Noise Wall Cost Effectiveness Results

Table C.1 Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: North Side of TH 10, West of Ferry Street) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
A1	**73.1**	64.4	8.7	1	1	1	1,120	21,800	$784,800	$49,050
A2	**66.3**	61.1	5.2	1	1	0				
A3	62.3	57.4	4.9	1	0	0				
A4	61.2	54.5	6.7	1	1	0				
A5	55.7	49.9	5.8	1	1	0				
A6	55.4	51.4	4.0	1	0	0				
A7	49.8	48.4	1.4	1	0	0				
A8	56.5	50.6	5.9	3	3	0				
A9	60.4	52.8	7.6	1	1	1				
A10	64.7	55.5	9.2	1	1	1				
A11	**72.1**	60.3	11.8	1	1	1				
A12	**66.1**	56.2	9.9	1	1	1				
A13	62.2	53.6	8.6	1	1	1				
A14	58.5	52.0	6.5	1	1	0				
A15	57.5	52.3	5.2	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.1 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 1: North Side of TH 10, West of Ferry Street) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
A16	51.7	50.7	1.0	1	0	0	1,120	21,800	$784,800	$49,050
A17	57.0	55.9	1.1	1	0	0				
A18	54.7	50.4	4.3	1	0	0				
A19	57.5	54.1	3.4	1	0	0				
A20	61.9	56.9	5.0	1	1	0				
A21	63.6	57.4	6.2	1	1	0				
A23	63.3	62.5	0.8	1	0	0				
A24	56.6	54.0	2.6	1	0	0				
A25	52.0	47.9	4.1	1	0	0				
A26	66.6	66.6	0.0	1	0	0				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 1 (north side of TH 10, west of Ferry Street)					**16**	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.2 Noise Mitigation Cost Effectiveness Results (Modeled Wall 2: North Side of TH 10, Between Ferry Street and Rum River) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
B4	56.9	56.3	0.6	1	0	0	465	8,700	$317,925	$105,975
B5	57.2	56.4	0.8	1	0	0				
B6	56.8	55.4	1.4	1	0	0				
B7	60.0	57.5	2.5	1	0	0				
B8	61.0	57.6	3.4	1	0	0				
B9	**66.6**	58.5	8.1	1	1	1				
B10	**69.6**	56.9	12.7	1	1	1				
B11	**72.1**	**66.4**	5.7	1	1	0				
B12	57.1	55.7	1.4	1	0	0				
B13	60.9	59.2	1.7	1	0	0				
B14	60.0	59.2	0.8	1	0	0				
B15	58.9	58.4	0.5	1	0	0				
B16	57.4	56.9	0.5	1	0	0				
B17	56.2	56.0	0.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 315 feet of guardrail at $15/linear feet (LF).

Table C.3 Noise Mitigation Cost Effectiveness Results (Modeled Wall 2: North Side of TH 10, Between Ferry Street and Rum River) (14-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
B4	56.9	56.5	0.4	1	0	0	465	6,350	$233,325	$77,775
B5	57.2	56.5	0.7	1	0	0				
B6	56.8	55.6	1.2	1	0	0				
B7	60.0	57.9	2.1	1	0	0				
B8	61.0	58.1	2.9	1	0	0				
B9	**66.6**	60.3	6.3	1	1	0				
B10	**69.6**	59.5	10.1	1	1	1				
B11	**72.1**	**66.7**	5.4	1	1	0				
B12	57.1	56.0	1.1	1	0	0				
B13	60.9	59.5	1.4	1	0	0				
B14	60.0	59.3	0.7	1	0	0				
B15	58.9	58.5	0.4	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 315 feet of guardrail at $15/linear feet (LF).

Table C.3 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 2: North Side of TH 10, Between Ferry Street and Rum River) (14-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
B16	57.4	57.0	0.4	1	0	0	465	6,350	$233,325	$77,775
B17	56.2	56.1	0.1	1	0	0				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 2 (north side of TH 10 between Ferry Street and Rum River)					3	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 315 feet of guardrail at $15/linear feet (LF).

Table C.4 Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: North Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4) (5)	Cost per Benefited Receptor
C3	55.1	55.0	0.1	1	0	0	970	18,800	$728,940	$91,118
C4	54.9	54.0	0.9	1	0	0				
C5	62.1	61.8	0.3	1	0	0				
C6	55.0	50.7	4.3	1	0	0				
C7	61.6	52.6	9.0	1	1	1				
C8	61.9	53.2	8.7	1	1	1				
C9	**72.3**	58.2	14.1	1	1	1				
C10	**72.6**	58.2	14.4	1	1	1				
C11	**71.7**	56.6	15.1	1	1	1				
C12	64.8	56.4	8.4	1	1	1				
C13	64.5	60.1	4.4	1	0	0				
C14	**67.7**	61.6	6.1	1	1	0				
C15	54.8	51.1	3.7	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes $44,940 for construction of noise wall on top of retaining wall.

(5) Total noise wall cost includes 480 feet of guardrail at $15/linear feet (LF).

Table C.4 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: North Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4) (5)	Cost per Benefited Receptor
C16	52.4	50.6	1.8	1	0	0	970	18,800	$728,940	$91,118
C17	59.3	57.8	1.5	1	0	0				
C18	66.5	66.1	0.4	1	0	0				
C19	56.9	56.5	0.4	1	0	0				
C20	61.8	61.3	0.5	1	0	0				
C21	63.8	57.1	6.7	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes $44,940 for construction of noise wall on top of retaining wall.

(5) Total noise wall cost includes 480 feet of guardrail at $15/linear feet (LF).

Table C.5 Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: North Side of TH 10 Between 4th Avenue and 7th Avenue) (16-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4) (5)	Cost per Benefited Receptor
C3	55.1	55.0	0.1	1	0	0	970	15,160	$597,900	$74,738
C4	54.9	54.1	0.8	1	0	0				
C5	62.1	61.9	0.2	1	0	0				
C6	55.0	51.3	3.7	1	0	0				
C7	61.6	54.0	7.6	1	1	1				
C8	61.9	54.4	7.5	1	1	1				
C9	**72.3**	59.9	12.4	1	1	1				
C10	**72.6**	59.8	12.8	1	1	1				
C11	**71.7**	58.4	13.3	1	1	1				
C12	64.8	57.2	7.6	1	1	1				
C13	64.5	60.4	4.1	1	0	0				
C14	**67.7**	61.8	5.9	1	1	0				
C15	54.8	51.4	3.4	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes $44,940 for construction of noise wall on top of retaining wall.

(5) Total noise wall cost includes 480 feet of guardrail at $15/linear feet (LF).

Table C.5 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 3: North Side of TH 10 Between 4th Avenue and 7th Avenue) (16-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4) (5)	Cost per Benefited Receptor
C16	52.4	50.9	1.5	1	0	0	970	15,160	$597,900	$74,738
C17	59.3	57.9	1.4	1	0	0				
C18	66.5	66.1	0.4	1	0	0				
C19	56.9	56.5	0.4	1	0	0				
C20	61.8	61.3	0.5	1	0	0				
C21	63.8	57.7	6.1	1	1	0				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 3 (north side of TH 10 between 4th Avenue and 7th Avenue)					8	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes $44,940 for construction of noise wall on top of retaining wall.

(5) Total noise wall cost includes 480 feet of guardrail at $15/linear feet (LF).

Table C.6 Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: South Side of TH 10, West of Ferry Street) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
G1	60.4	58.5	1.9	1	0	0	1,375	26,900	$968,400	$50,968
G2	**67.2**	61.7	5.5	1	1	0				
G3	**67.3**	59.3	8.0	1	1	1				
G4	**66.7**	58.1	8.6	1	1	1				
G5	58.5	52.7	5.8	1	1	0				
G6	58.3	51.0	7.3	1	1	1				
G7	56.0	49.8	6.2	1	1	0				
G8	50.1	48.2	1.9	1	0	0				
G9	58.9	52.1	6.8	1	1	0				
G10	62.6	54.8	7.8	1	1	1				
G11	**68.3**	58.6	9.7	2	2	2				
G12	66.6	57.9	8.7	2	2	2				
G13	59.0	52.0	7.0	1	1	1				
G14	58.9	52.5	6.4	1	1	0				
G15	58.2	52.0	6.2	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.6 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: South Side of TH 10, West of Ferry Street) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
G16	49.5	47.4	2.1	1	0	0	1,375	26,900	$968,400	$50,968
G17	55.0	53.1	1.9	1	0	0				
G18	49.9	48.0	1.9	1	0	0				
G19	54.5	52.3	2.2	1	0	0				
G20	49.7	47.6	2.1	1	0	0				
G21	53.8	49.8	4.0	1	0	0				
G22	65.3	57.0	8.3	1	1	1				
G23	64.6	58.1	6.5	1	1	0				
G24	**66.9**	**66.6**	0.3	1	0	0				
G25	64.4	57.6	6.8	1	1	0				
G26	63.2	56.8	6.4	1	1	0				
G27	62.4	57.8	4.6	1	0	0				
G28	58.2	57.7	0.5	1	0	0				
G29	57.5	56.9	0.6	1	0	0				
G30	65.2	65.2	0.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.6 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: South Side of TH 10, West of Ferry Street) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
G31	58.3	57.6	0.7	1	0	0	1,375	26,900	$968,400	$50,968
G32	57.2	55.7	1.5	1	0	0				
G33	56.1	54.0	2.1	1	0	0				
G34	56.1	52.9	3.2	1	0	0				
G35	53.8	52.2	1.6	1	0	0				
G36	50.2	49.0	1.2	1	0	0				
G37	51.3	50.6	0.7	1	0	0				
G38	51.8	51.7	0.1	1	0	0				
G39	51.3	51.1	0.2	1	0	0				
G40	51.9	51.6	0.3	1	0	0				
G41	52.7	52.6	0.1	1	0	0				
G42	55.1	54.5	0.6	1	0	0				
G43	52.0	51.8	0.2	1	0	0				
G44	56.4	56.2	0.2	1	0	0				
G45	59.4	59.3	0.1	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.6 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 4: South Side of TH 10, West of Ferry Street) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
G46	55.0	54.9	0.1	1	0	0	1,375	26,900	$968,400	$50,968
G47	50.6	50.3	0.3	1	0	0				
G48	53.5	53.3	0.2	1	0	0				
G49	52.2	51.8	0.4	1	0	0				
G50	52.2	52.0	0.2	1	0	0				
G51	57.4	57.4	0.0	4	0	0				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 4 (south side of TH 10, west of Ferry Street)					19	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.7 Noise Mitigation Cost Effectiveness Results (Modeled Wall 5: South Side of TH 10 Between Ferry Street and Rum River) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
F1	56.0	56.0	0.0	1	0	0	715	13,700	$497,100	$55,233
F2	50.4	50.3	0.1	1	0	0				
F3	56.9	56.9	0.0	1	0	0				
F4	55.0	55.0	0.0	1	0	0				
F5	56.5	56.5	0.0	1	0	0				
F6	52.0	51.9	0.1	1	0	0				
F7	53.3	53.3	0.0	1	0	0				
F8	52.2	52.0	0.2	1	0	0				
F9	55.9	55.9	0.0	1	0	0				
F10	59.0	59.0	0.0	1	0	0				
F11	59.1	59.1	0.0	1	0	0				
F12	56.7	56.7	0.0	1	0	0				
F13	53.7	53.7	0.0	1	0	0				
F14	56.1	56.1	0.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 260 feet of guardrail at $15/linear feet (LF).

Table C.7 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 5: South Side of TH 10 Between Ferry Street and Rum River) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
F15	51.9	51.1	0.8	2	0	0	715	13,700	$497,100	$55,233
F16	56.6	55.9	0.7	2	0	0				
F17	60.2	59.7	0.5	1	0	0				
F18	62.5	61.9	0.6	1	0	0				
F19	58.7	58.0	0.7	1	0	0				
F20	60.8	59.9	0.9	1	0	0				
F21	64.9	64.8	0.1	1	0	0				
F22	54.2	54.1	0.1	1	0	0				
F23	55.7	55.6	0.1	1	0	0				
F24	56.6	53.2	3.4	1	0	0				
F25	53.8	50.6	3.2	1	0	0				
F26	54.7	50.0	4.7	1	0	0				
F27	51.7	49.3	2.4	1	0	0				
F28	52.3	51.6	0.7	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 260 feet of guardrail at $15/linear feet (LF).

Table C.7 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 5: South Side of TH 10 Between Ferry Street and Rum River) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
F29	54.6	53.4	1.2	1	0	0	715	13,700	$497,100	$55,233
F30	**69.3**	57.6	11.7	1	1	1				
F31	64.0	54.8	9.2	1	1	1				
F32	**71.7**	60.9	10.8	1	1	1				
F33	60.9	57.8	3.1	18	0	0				
F34	56.2	52.8	3.4	1	0	0				
F35	59.1	55.5	3.6	1	0	0				
F36	56.5	53.1	3.4	1	0	0				
F37	59.0	55.4	3.6	1	0	0				
F38	56.3	52.6	3.7	1	0	0				
F39	59.3	56.3	3.0	1	0	0				
F40	**72.8**	62.7	10.1	1	1	1				
F41	**73.8**	**66.3**	7.5	1	1	1				
F42	**72.7**	63.1	9.6	1	1	1				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 260 feet of guardrail at $15/linear feet (LF).

Table C.7 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 5: South Side of TH 10 Between Ferry Street and Rum River) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
F43	**73.8**	**66.8**	7.0	1	1	1	715	13,700	$497,100	$55,233
F44	**73.8**	**67.6**	6.2	1	1	0				
F45	**72.6**	64.2	8.4	1	1	1				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 5 (south side of TH 10 between Ferry Street and Rum River)					9	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 260 feet of guardrail at $15/linear feet (LF).

Table C.8 Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
E1	**67.5**	59.9	7.6	1	1	1	1,865	36,700	$1,323,375	$38,923
E2	63.4	63.1	0.3	1	0	0				
E3	60.8	58.1	2.7	1	0	0				
E4	59.3	55.4	3.9	1	0	0				
E5	60.5	57.1	3.4	1	0	0				
E6	60.7	56.7	4.0	1	0	0				
E7	60.2	56.6	3.6	1	0	0				
E8	60.3	54.7	5.6	1	1	0				
E9	59.3	54.9	4.4	1	0	0				
E10	58.3	54.4	3.9	1	0	0				
E11	57.0	53.9	3.1	1	0	0				
E12	57.1	53.7	3.4	1	0	0				
E13	56.7	53.5	3.2	1	0	0				
E14	56.6	52.6	4.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 145 feet of guardrail at $15/linear feet (LF).

Table C.8 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
E15	62.9	55.1	7.8	1	1	1	1,865	36,700	$1,323,375	$38,923
E16	60.8	55.2	5.6	1	1	0				
E17	62.9	56.2	6.7	1	1	0				
E18	63.4	56.5	6.9	1	1	0				
E19	62.5	55.7	6.8	1	1	0				
E20	63.3	55.9	7.4	1	1	1				
E21	65.6	56.9	8.7	1	1	1				
E22	**74.1**	61.3	12.8	1	1	1				
E23	**74.2**	61.7	12.5	1	1	1				
E24	**74.1**	61.8	12.3	1	1	1				
E25	**73.9**	61.7	12.2	1	1	1				
E26	**74.0**	61.8	12.2	1	1	1				
E27	**74.0**	62.8	11.2	1	1	1				
E28	**73.9**	61.9	12.0	1	1	1				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 145 feet of guardrail at $15/linear feet (LF).

Table C.8 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
E29	**73.8**	62.2	11.6	1	1	1	1,865	36,700	$1,323,375	$38,923
E30	**74.0**	62.6	11.4	1	1	1				
E31	**72.5**	63.2	9.3	1	1	1				
E32	**67.4**	58.4	9.0	1	1	1				
E33	64.2	56.5	7.7	1	1	1				
E34	65.7	57.1	8.6	1	1	1				
E35	63.5	54.6	8.9	1	1	1				
E36	67.4	58.2	9.2	1	1	1				
E37	60.5	56.9	3.6	1	0	0				
E38	**72.3**	64.8	7.5	1	1	1				
E39	**72.3**	65.2	7.1	4	4	4				
E40	59.4	57.9	1.5	1	0	0				
E41	65.8	63.1	2.7	1	0	0				
E44	58.8	57.1	1.7	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 145 feet of guardrail at $15/linear feet (LF).

Table C.8 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
E45	58.2	55.9	2.3	1	0	0	1,865	36,700	$1,323,375	$38,923
E46	53.9	51.6	2.3	1	0	0				
E47	53.9	51.4	2.5	1	0	0				
E48	55.5	51.9	3.6	1	0	0				
E49	50.2	49.8	0.4	1	0	0				
E50	45.9	45.6	0.3	1	0	0				
E51	50.1	49.3	0.8	1	0	0				
E52	51.3	50.0	1.3	1	0	0				
E53	52.3	50.9	1.4	1	0	0				
E54	51.4	51.3	0.1	1	0	0				
E55	50.5	49.0	1.5	1	0	0				
E56	53.3	53.2	0.1	1	0	0				
R34	65.4	56.9	8.5	1	1	1				
R35	**66.6**	57.6	9.0	1	1	1				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 145 feet of guardrail at $15/linear feet (LF).

Table C.8 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 6: South Side of TH 10 Between 4th Avenue and 7th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
R36	64.4	56.4	8.0	1	1	1	1,865	36,700	$1,323,375	$38,923
R37	63.6	56.3	7.3	1	1	1				
R38	63.0	57.4	5.6	1	1	0				
Total number of benefited residences, commercial, industrial establishments for Modeled Wall 6 (south side of TH 10 between 4th Avenue and 7th Avenue)					**34**	--				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 145 feet of guardrail at $15/linear feet (LF).

Table C.9 Noise Mitigation Cost Effectiveness Results (Modeled Wall 7: North Side of TH 10, East of BNSF Railway) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
H10	52.8	50.3	2.5	1	0	0	590	11,200	$403,200	N/A
H11	57.8	55.0	2.8	1	0	0				
H12	52.7	50.6	2.1	1	0	0				
H13	57.5	55.0	2.5	1	0	0				
H14	61.9	61.5	0.4	1	0	0				
H15	58.9	58.3	0.6	1	0	0				
H16	58.5	52.9	5.6	1	1	0				
H17	60.8	54.9	5.9	1	1	0				
H18	62.3	61.9	0.4	1	0	0				
H19	59.5	58.9	0.6	1	0	0				
H20	59.7	54.9	4.8	1	0	0				
H21	61.9	57.1	4.8	1	0	0				
H22	61.9	60.3	1.6	1	0	0				
H23	64.8	63.4	1.4	1	0	0				
H24	61.7	59.5	2.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.9 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 7: North Side of TH 10, East of BNSF Railway) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
H25	64.3	62.3	2.0	1	0	0	590	11,200	$403,200	N/A
H26	60.8	57.4	3.4	1	0	0				
H27	61.8	59.0	2.8	1	0	0				
H28	59.5	56.7	2.8	1	0	0				
H29	61.6	59.1	2.5	1	0	0				
H30	59.1	56.4	2.7	1	0	0				
H31	53.8	50.9	2.9	1	0	0				
H32	58.9	56.1	2.8	1	0	0				
H33	53.6	50.6	3.0	1	0	0				
H34	58.8	55.9	2.9	1	0	0				
H35	65.2	63.1	2.1	1	0	0				
H36	62.1	59.8	2.3	1	0	0				
H37	65.6	63.6	2.0	1	0	0				
H38	62.7	60.2	2.5	1	0	0				
H39	**67.2**	63.7	3.5	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.9 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 7: North Side of TH 10, East of BNSF Railway) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
H40	**67.9**	62.7	5.2	1	1	0	590	11,200	$403,200	N/A
H41	**68.4**	62.6	5.8	1	1	0				
H42	**68.9**	62.9	6.0	1	1	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

Table C.10 Noise Mitigation Cost Effectiveness Results (Modeled Wall 8: South Side of TH 10 Between 7th Avenue and BNSF Railway) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
D1	65.3	61.6	3.7	1	0	0	665	12,700	$465,600	$93,120
D2	65.7	60.4	5.3	1	1	0				
D3	65.3	59.6	5.7	1	1	0				
D4	65.4	57.6	7.8	1	1	1				
D5	**66.4**	60.5	5.9	1	1	0				
D6	**66.9**	61.4	5.5	1	1	0				
D7	**67.4**	62.9	4.5	1	0	0				
D8	63.7	63.6	0.1	1	0	0				
D9	63.2	63.2	0.0	1	0	0				
D10	61.0	60.0	1.0	1	0	0				
D11	59.3	56.9	2.4	1	0	0				
D12	58.7	56.3	2.4	1	0	0				
D13	58.0	55.4	2.6	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 560 feet of guardrail at $15/linear feet (LF).

Table C.10 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 8: South Side of TH 10 Between 7th Avenue and BNSF Railway) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
D14	60.3	58.5	1.8	1	0	0	665	12,700	$465,600	$93,120
D15	60.6	59.4	1.2	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 560 feet of guardrail at $15/linear feet (LF).

Table C.11 Noise Mitigation Cost Effectiveness Results (Modeled Wall 8: South Side of TH 10 Between 7th Avenue and BNSF Railway) (18-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
D1	65.3	61.7	3.6	1	0	0	665	11,490	$422,040	$105,510
D2	65.7	60.6	5.1	1	1	0				
D3	65.3	59.9	5.4	1	1	0				
D4	65.4	58.2	7.2	1	1	1				
D5	**66.4**	61.0	5.4	1	1	0				
D6	**66.9**	62.0	4.9	1	0	0				
D7	**67.4**	63.8	3.6	1	0	0				
D8	63.7	63.6	0.1	1	0	0				
D9	63.2	63.2	0.0	1	0	0				
D10	61.0	60.2	0.8	1	0	0				
D11	59.3	57.4	1.9	1	0	0				
D12	58.7	56.7	2.0	1	0	0				
D13	58.0	55.9	2.1	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 560 feet of guardrail at $15/linear feet (LF).

Table C.11 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 8: South Side of TH 10 Between 7th Avenue and BNSF Railway) (18-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
D14	60.3	58.6	1.7	1	0	0	665	11,490	$422,040	$105,510
D15	60.6	59.5	1.1	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 560 feet of guardrail at $15/linear feet (LF).

Table C.12 Noise Mitigation Cost Effectiveness Results (Modeled Wall 8: South Side of TH 10 Between 7th Avenue and BNSF Railway) (16-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
D1	65.3	61.8	3.5	1	0	0	665	10,280	$378,480	N/A
D2	65.7	60.9	4.8	1	0	0				
D3	65.3	60.2	5.1	1	1	0				
D4	65.4	59.0	6.4	1	1	0				
D5	**66.4**	61.7	4.7	1	0	0				
D6	**66.9**	63.1	3.8	1	0	0				
D7	**67.4**	64.8	2.6	1	0	0				
D8	63.7	63.7	0.0	1	0	0				
D9	63.2	63.2	0.0	1	0	0				
D10	61.0	60.5	0.5	1	0	0				
D11	59.3	58.0	1.3	1	0	0				
D12	58.7	57.2	1.5	1	0	0				
D13	58.0	56.3	1.7	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 560 feet of guardrail at $15/linear feet (LF).

Table C.12 continued Noise Mitigation Cost Effectiveness Results (Modeled Wall 8: South Side of TH 10 Between 7th Avenue and BNSF Railway) (16-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.) (3)	Total Cost of Wall ($36/sq. ft.) (4)	Cost per Benefited Receptor
D14	60.3	58.8	1.5	1	0	0	665	10,280	$378,480	N/A
D15	60.6	59.6	1.0	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

(3) Noise wall area includes tapers at both ends of the noise wall.

(4) Total noise wall cost includes 560 feet of guardrail at $15/linear feet (LF).

Table C.13 Noise Mitigation Cost Effectiveness Results (Modeled Wall 9: North Side of TH 10 Between Rum River and 4th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
R29	**70.2**	**69.9**	0.3	1	0	0	135	2,700	$97,200	N/A
R30	**76.2**	**75.3**	0.9	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.

Table C.14 Noise Mitigation Cost Effectiveness Results (Modeled Wall 10: South Side of TH 10 Between Rum River and 4th Avenue) (20-foot Tall Noise Wall)

Receptor ID	L_{eq} Noise Level, 2040 Build (No Noise Wall)	L_{eq} Noise Level, 2040 Build (With Noise Wall)	Reduction (in dBA) With Noise Wall	Number of Residences, Commercial, or Industrial Establishments	Number of Benefited Residences, Commercial, or Industrial Establishments (1)	Design goal reduction ≥ 7 dBA (2)	Length of Wall (feet)	Wall Area (sq. ft.)	Total Cost of Wall ($36/sq. ft.)	Cost per Benefited Receptor
R31	**78.4**	**76.9**	1.5	1	0	0	130	2,600	$93,600	N/A
R32	**73.1**	**71.2**	1.9	1	0	0				
R33	**70.5**	**68.7**	1.8	1	0	0				

Bold numbers approach or exceed Federal noise abatement criteria (see Table 1.1).

Italics numbers exceed 23 CFR 774.15 thresholds.

N/A = not applicable because none of the receptors adjacent to the modeled noise wall meet the noise reduction design goal criteria of ≥ 7 dBA.

(1) Number of benefited residences, commercial establishments, or industrial establishments with a minimum 5 dBA reduction.

(2) Noise barrier must meet MnDOT's noise reduction design goal of at least 7 dBA at a minimum of one benefited receptor behind each noise barrier.