Final Draft Traffic Noise Report,
I-94, Red Arrow Highway to Britain Avenue

Prepared for

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Table of Contents

Figures

Tables

List of Acronyms and Abbreviations

ANSI	American National Standards Institute
CNE	common noise environment
CPBU	cost per benefitted unit
dB	decibel (measure of sound pressure level on a logarithmic scale)
dBA	A-weighted decibel (sound pressure level)
DUE	dwelling unit equivalent
FHWA	Federal Highway Administration
Leq	equivalent sound level (energy averaged sound level)
Leq(1h)	A-weighted, energy average sound level during a 1-hour period
LOS	level of service
MDOT	Michigan Department of Transportation
mph	miles per hour
NAC	noise abatement criteria
NR	noise reduction
ROW	right of way
ST	short-term
TNM	Traffic Noise Model

Executive Summary

This noise analysis was conducted to assess the noise impacts associated with the MDOT I-94/M-63 (Red Arrow Highway to Britain Ave.) highway improvements in Berrien County, MI. The project involves variety of improvements to the project roadway, including full asphalt pavement rebuild; upgraded signage, drainage, and guardrails; replacement or improvements to 11 bridges; ramp realignments, resurfacing and other improvements at several interchanges; a new ramp at I-94/M-63 (Niles Road) interchange; and a new eastbound auxiliary lane between Pipestone Road and Napier Avenue.

Of the above improvements, the new ramp at M-63 and new auxiliary lane would trigger a Type I noise project, requiring a full noise analysis in accordance with FHWA and MDOT policy. The noise analysis analyzed the entire project area for noise impacts and potential noise mitigation. All noise-sensitive land uses with an outdoor use area within approximately 500 feet of the project roadways were evaluated for noise impacts and potential noise abatement in accordance with MDOT policy.

This noise study included on-site noise measurements in the project vicinity. Measurements were conducted in October 2021 to validate noise models. A total of sixteen short-term (ST) noise measurements were conducted at representative locations across the project area.

A predictive noise model was developed using the FHWA Traffic Noise Model (TNM) version 2.5 and validated against these field measurements. Noise-sensitive receptors were then identified and classified by their predicted existing and future traffic noise levels calculated in TNM. Predicted noise levels were then checked against FHWA and MDOT standards to determine traffic noise impacts in the study area. Noise abatement for impacted receptors was analyzed using TNM and assessed per MDOT feasibility and reasonableness criteria.

The analysis identified a total of ten defined Common Noise Environments (CNEs). Of these ten established CNEs, all were identified to contain impacted receptors. Noise Abatement was considered for each impacted CNE and those that were considered to be reasonable and feasible were recommended to be included in the final project, pending a public participation process to determine concurrence with benefitted receptors. A summary of these findings is presented in Table ES-1 and discussed in more detail in the body of the report.

Table ES-1 Summary of Project Impacts and Proposed Noise Abatement

CNE (walls analyzed)	Description/Location	2022 Impacts	2042 Impacts	Noise Abatement Recommendation
CNE-1 (1 wall)	Residential, commercial South of I-94, Puetz Rd. to St. Joseph Ave.	12	13	None
CNE-2 (1 wall)	Residential, cemetery, commercial, vacant land South of I-94, St. Joseph Ave. to Cleveland Ave.	34	39	Wall 2 recommended
CNE-3 (2 walls)	Residential South of I-94, Cleveland Ave. to M-63	53	60	None
CNE-4 (2 walls)	Residential, commercial, vacant land South of I-94, M-63 to Pipestone Rd.	17	19	None
CNE-5 (1 wall)	Residential, Municipal, vacant land South of I-94, Pipestone Rd. to Britain Ave.	11	12	None
CNE-6 (1 walls)	Residential, commercial, vacant land North of I-94, Britain Ave to Pipestone Rd.	29	32	Wall 6 recommended
CNE-7 (2 walls)	Residential, Commercial, hotel, park/recreational North of I-94, Pipestone Rd. To M-63	31	35	None
CNE-8 (3 walls)	Residential, church, vacant land North of I-94, M-63 to Cleveland Ave.	84	90	Wall 8a recommended Wall 8c recommended
CNE-9 (3 walls)	Residential, retirement home, commercial, vacant land. North of I-94, Cleveland Ave. to Red Arrow Hwy	44	48	Wall 9a recommended
CNE-10 (2 walls)	Residential, commercial North of I-94, Red Arrow Hwy to Puetz Rd.	15	16	None

1. Introduction and Project Description

1.1 Project Description

The project is located on I-94 from south of Puetz Road east to Britain Avenue, including the associated ramps at I-94 BL (Red Arrow Highway), M-63 (Niles Road), M-139, Pipestone Road, and Napier Avenue, in the municipalities of Lincoln, St. Joseph, Royalton, Sodus, and Benton Townships in Berrien County. The overall project length is about 11 miles. An overview of the project area is shown in Figure 1-1.

The project involves a variety of improvement to the project roadway, including full asphalt pavement rebuild; upgraded signage, drainage, and guardrails; replacement or improvements to 11 bridges; ramp realignments, resurfacing and other improvements at several interchanges; a new ramp at I-94/M-63 (Niles Road) interchange; and a new eastbound auxiliary lane between Pipestone Road and Napier Avenue.

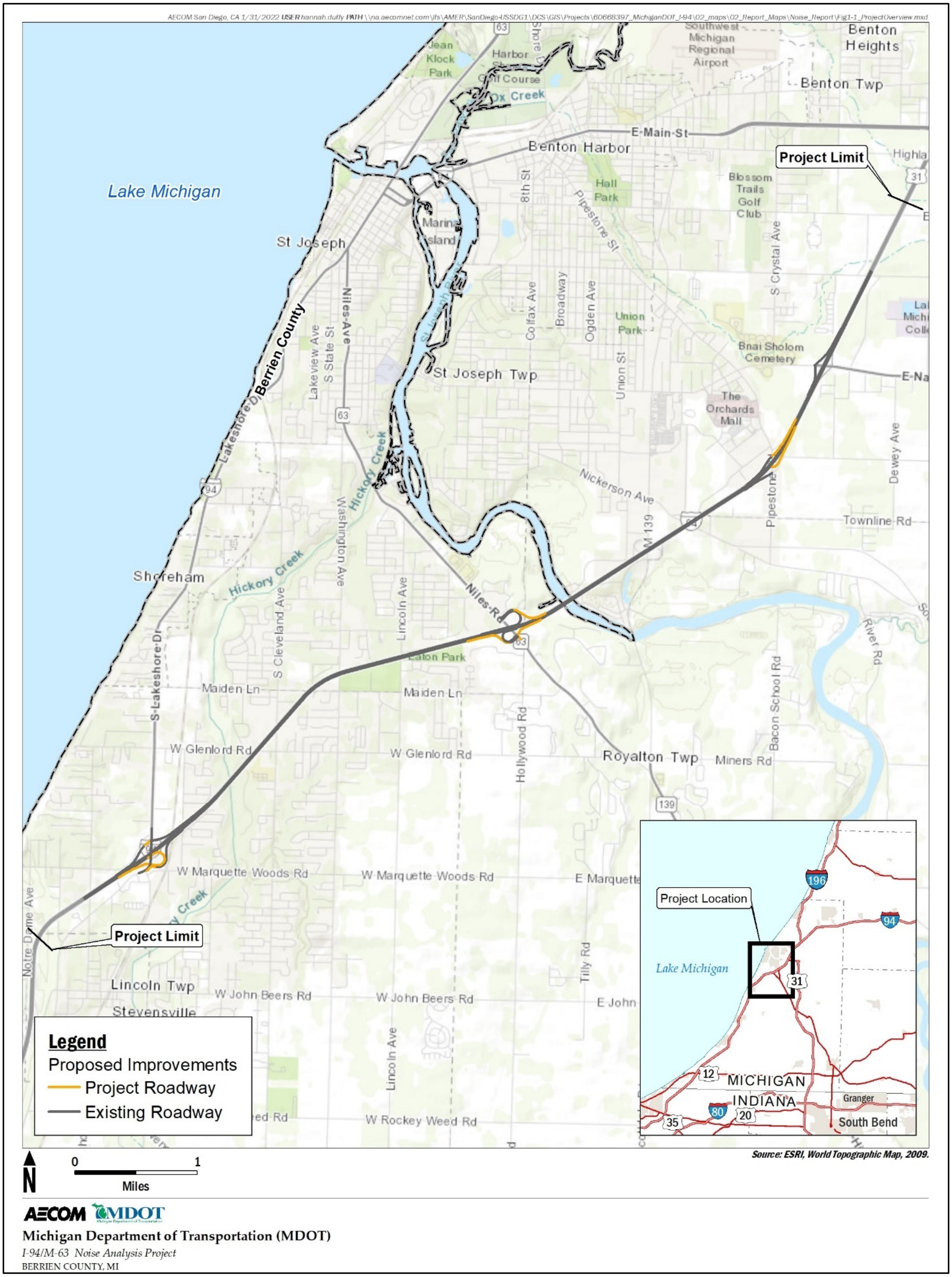
Of these improvements, the new ramp at M-63 and new auxiliary lane between Pipestone Road and Napier Ave. would trigger a Type I noise project, requiring a full noise analysis. However, in accordance with FHWA and MDOT policy, the noise analysis is required to analyze the entire project area for noise impacts and evaluate potential noise mitigation. Generally speaking, any noise sensitive properties with an outdoor use area within about 500 feet of the project roadways would need to be evaluated for noise impacts and potential noise abatement in accordance with MDOT policy. Potential impacted noise sensitive land uses in the project area include several residential neighborhoods of single-family homes, several parks and churches, a retirement home, and hotels.

1.2 Description of Alternatives

This project includes one future build alternative to be evaluated:

- Future build (includes all proposed improvements and projected traffic volumes for Year 2042)

Figure 1-1 Project Overview



2. Traffic Noise Concepts

The following glossary of acoustical terms is intended to help frame the discussion of project-generated noises and their potential effects on neighboring communities in the project area.

2.1 Glossary of Acoustical Terms

Noise: Whether something is perceived as a noise event is influenced by the type of sound, the perceived importance of the sound, and its appropriateness in the setting, the time of day, and the type of activity during which the noise occurs, and the sensitivity of the listener. Local jurisdictions may have legal definitions of what constitutes "noise" and such environmental parameters to consider.

Sound: For this analysis, sound is a physical phenomenon generated by vibrations that result in waves that travel through a medium, such as air, and result in auditory perception by the human brain.

Frequency: Sound frequency or "pitch" is measured in hertz (Hz), which is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second, it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the best human ear.

Amplitude or Level: Sound levels are measured in decibels (dB) using a logarithmic scale. A sound level of zero dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above approximately 110 dB begin to be felt inside the human ear as discomfort and eventually as pain at 120 dB and higher levels. The minimum change in the sound level of individual events that the average human ear can detect is about 1 to 2 dB. A 3 to 5 dB change is readily perceived. A change in sound level of about 10 dB usually is perceived by the average person as a doubling (or if decreasing by 10 dB, halving) of the sound's loudness. Table 2-1 shows typical indoor and outdoor sounds and their corresponding dB levels, arranged on what often is referenced as an "acoustic thermometer" to show relative loudness.

Sound pressure: Sound level usually is expressed by reference to a known standard. This report refers to sound pressure level, which is expressed on a logarithmic scale with respect to a reference value of 20 micropascals. Sound pressure level depends not only on the power of the source, but also on the distance from the source and the acoustical characteristics of the space surrounding the source.

A-weighting: Sound from a tuning fork contains a single frequency (a pure tone), but most sounds heard in the environment do not consist of a single frequency; instead, they are composed of a broad band of frequencies, differing in sound levels. The method commonly used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects the typical frequency-dependent sensitivity of average healthy human hearing. This is called "A-weighting," and the measured decibel level is referred to as A-weighted decibels (dBA).

Equivalent sound level: Environmental noise levels vary continuously and include a mixture of noise from near and distant sources. A single descriptor, energy-average sound level during a measured time interval (L_{eq}), may be used to describe such sound that is changing in level from one moment to another. L_{eq} is the energy-average sound level during a measured time interval. This is the "equivalent" constant sound level that would have to be produced by a single, steady source to equal the acoustic energy contained in the fluctuating sound level measured.

Insertion loss (IL): The IL is the reduction in noise level at a location from noise abatement means, placed in the sound path between that location and a sound source.

2.2 Fundamentals of Traffic Noise Assessment and Control

Sound Propagation

Atmospheric conditions (e.g., wind, temperature gradients, humidity) can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation. Sound traveling over an acoustically absorptive surface (e.g., grass) attenuates at a greater rate than sound traveling over a hard surface (e.g., pavement, expanses of open water). When located near either the sound source or the listener position, physical barriers (e.g., naturally occurring ridgelines or buildings, and other topography that block the line-of-sight between a source and receiver) also increase the attenuation of sound over distance.

Multiple Sound Sources

Because sound pressure levels in decibels are based on a logarithmic scale, they cannot be added or subtracted in an arithmetic fashion. Therefore, sound pressure level dB are logarithmically added on an energy summation basis. In other words, adding a new noise source to an existing noise source, both producing noise at the same level, does not double the noise level. Instead, if the difference between two noise sources is 10 dBA or more, the louder noise source dominates, and the resultant noise level is equal to the noise level of the louder source. In general, if the difference between two noise sources is 0 to 1 dBA, the resultant noise level is 3 dBA higher than the louder noise source, or both sources if they are equal. If the difference between two noise sources is 2 to 3 dBA, the resultant noise level is 2 dBA above the louder noise source. If the difference between two noise sources is 4 to 10 dBA, the resultant noise level is 1 dBA higher than the louder noise source.

How Noise is Measured

Sound can vary over an extremely large range of amplitudes. The decibel (dB) is a logarithmic unit that is the accepted standard unit for measuring the amplitude of sound because it accounts for these large variations in amplitude and reflects the way people perceive changes in sound amplitude. Different sounds may have different frequency content. Frequency content of a sound refers to its tonal quality or pitch. When describing sound and its effect on a human population, A-weighted (dBA) sound levels are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the noise signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. This filtering network has been established by the American National Standards Institute (ANSI). The A-weighted noise level has been found to correlate well with peoples' judgments of the noisiness of different sounds and has been used for many years as a measure of community noise. Table 2-1 illustrates sound pressure levels in dBA of various sound sources between 0 dBA (threshold of hearing) and 120 dBA (threshold of pain). An increase of 3 dBA in noise level can barely be perceived, while an increase of 5 dBA is readily noticeable and considered a significant noise increase. A 10 dBA increase corresponds to a subjective doubling of loudness. A relationship between changes in noise level and loudness is indicated in Table 2-2. Since noise fluctuates from moment to moment, it is common practice to condense the noise level over a specified period of time into a single number called the Equivalent Noise Level (Leq). Many surveys have shown that the Leq properly predicts annoyance, and thus this metric is commonly used for noise measurements, prediction, and impact assessment.

Table 2-1 Common Indoor and Outdoor Noise Levels

Common Outdoor Noise Levels Noise Level	Noise Level (A-weighted decibels)	Common Indoor Noise Levels
	110	Rock Band
Jet Flyover at 1000 feet	100	Inside Subway Train (NY)
Gas Lawn Mower at 3 feet		
Diesel Truck at 50 feet	90	Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		Normal Speech at 3 feet
	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
Quiet Urban Nighttime	40	Small Theater
Quiet Suburban Nighttime		Library
	30	
Quiet Rural Nighttime		Bedroom at Night
	20	
		Broadcast & Recording Studio
	10	
	0	Threshold of Hearing

Source: Adapted from Guide on Evaluation and Attenuation of Traffic Noise, AASHTO-1974

Table 2-2 Relationship between Changes in Noise Level and Perceived Loudness

Increase (or Decrease) in Noise Level	Loudness Multiplied (or Divided) by
3 decibels	1.2
6 decibels	1.5
10 decibels	2
20 decibels	4

How Highway Noise is Generated

Highway noise is generated from three primary sources: tire/pavement noise, engine noise, and exhaust noise. Tire/pavement noise is the noise generated by the rubber tires rolling over the pavement surface and may vary in intensity and character depending on the type and condition of both the tires and the pavement. For automobiles and light trucks traveling at typical highway speeds (over about 50 miles per hour [mph]), tire/pavement noise is generally the dominant noise source. For medium and heavy trucks (like large commercial delivery vehicles and long-haul tractor-trailers) engine and exhaust noise also contribute to the noise that they produce. At typical highway speeds, one large truck can produce as much noise energy as ten automobiles. How highway noise is experienced at nearby homes is controlled by several factors, including: the total number of vehicles on the highway, the percentage of large trucks, the average speed of the vehicles, the distance to the highway, obstructions blocking the view of the highway, and meteorological conditions. Generally speaking, the more vehicles, the higher percentage of large trucks or the closer one is to the highway, the greater the noise will be. Intervening obstructions, either manmade (buildings, walls, berms) or natural (such as intervening terrain) will reduce noise levels. Foliage and vegetation can reduce noise levels, but it must be dense (completely obscuring the view of the highway) and thick (on the order of 50 to 100 feet) to make a noticeable difference.

How Highway Noise Can Be Reduced

Highway noise can be reduced in several ways. Here are some of the most recognized:

Traffic Controls

The faster vehicles travel, and the higher percentage of large trucks, the louder the noise. Reduced speed limits, or more rigorously enforced existing speed limits, and heavy truck restrictions will reduce noise levels. However, the implementation of such measures is often counter to the purpose of the roadway which is the efficient movement of people and commerce for the sake of lower noise levels alone.

Land Use Controls:

Perhaps the most common sense and fiscally responsible solution to highway noise, and one favored by most highway agencies is to restrict the development of lands near highways. Restricting development of land near new highway corridors to non-noise sensitive land uses, such as commercial or industrial activities can eliminate most noise problems. However, this approach is not suitable for circumstances when land near existing or future highways has already been developed for residential land use.

Quieter Vehicle Noise Sources

Quieter vehicles mean less highway noise. For automobiles, this means quieter tires (since tire/pavement noise is the dominant noise source). For large trucks, the EPA has established standards for maximum noise levels for new and in-use trucks. The maximum noise levels for new trucks are lower than those for some older trucks, so as old trucks are phased out and replaced with newer ones the noise produced by the average truck may go down.

Noise Barrier Walls and Berms

Noise barriers, both structural walls and earthen berms, are often constructed specifically for the purpose of reducing highway noise levels. Noise barriers can be very effective for reducing noise levels at nearby homes, often reducing noise levels by as much as 10 decibels at the closest homes (a perceived halving of loudness). Noise barriers can be expensive to build, on the order of $2 million per mile. Because of their cost, the construction of noise barriers is often restricted to large highway improvement or construction projects. Some jurisdictions; however, are quite active in constructing “retrofit” noise barriers on existing highways.

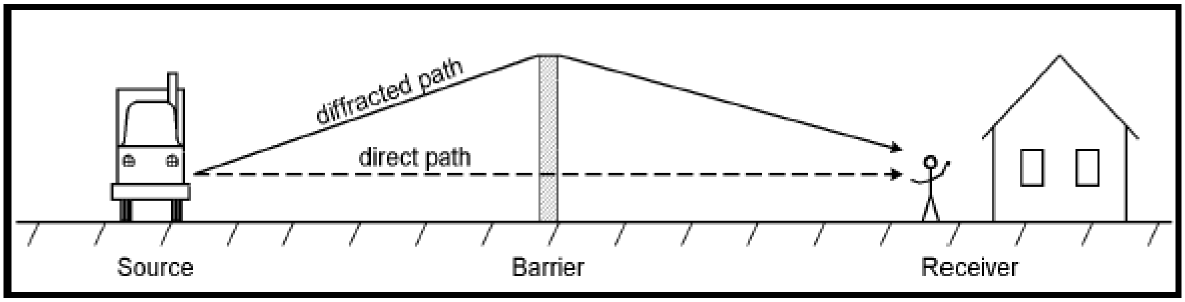
Quieter Pavements

It has long been recognized that some pavement types tend to be quieter than others. White concrete pavement, for example, is typically louder than asphalt blacktop. White concrete with tining (grooves cut into the pavement surface) is louder still. However, white concrete pavement (also known as Portland Concrete Cement, or PCC) is thought to be more durable, and perhaps safer than blacktop pavements (due to better skid resistance and drainage). There is also considerable concern that the low noise advantages of some blacktop pavements may diminish over time. As the tiny “nooks and crannies” in the blacktop pavement that give it acoustical absorption may fill up with silt and sand or become compressed over time, the acoustical benefits are reduced. The quest for quiet, safe, and durable highway pavements is currently the focus of a considerable amount of research.

How Noise Barriers Work

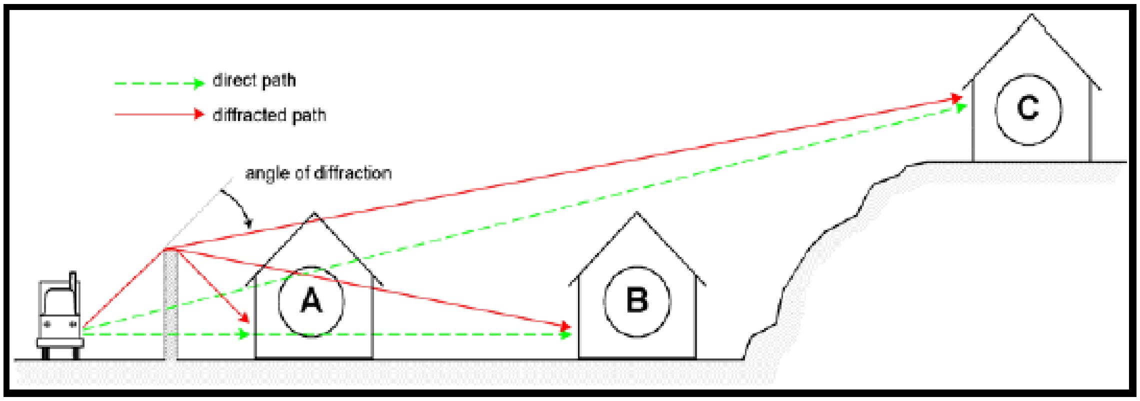
Noise barriers reduce noise levels by interrupting or lengthening the path that the noise takes between the source and the receiver. To be effective at reducing noise, noise barriers must be able to block the “line of sight” between the object producing the noise (like vehicles on the highway) and the person subjected to the noise (like residents living near the highway). The amount that the noise will be reduced is related to the path length difference between the “direct path” that the uninterrupted sound would take between the source and receiver (with no barrier) and the “diffracted path” that the sound must take going over or around the barrier, as illustrated in Figure 2-1

Figure 2-1 Simple Noise Barrier Geometry



Noise barriers may work better for some homes than for others. In Figure 2-2, below, home “A” is relatively close to the highway where the noise barrier can provide a large path length difference between the direct and diffracted paths, resulting in a substantial noise reduction (perhaps as much as 10 to 15 decibels). Home “B” is further from the barrier and the path length difference is not as great, resulting in less noise reduction (perhaps 7 to 10 decibels). Home “C” is even further from the highway and also elevated above the highway grade, providing an even smaller path length difference (resulting in a noise reduction of perhaps 3 to 5 decibels). In general, for a given barrier height and location, the further the receiver is from the barrier or the higher the receiver is elevated, the smaller the path length difference (or angle of diffraction) and the smaller the resulting noise reduction.

Figure 2-2 Path Length Difference for Varying Receiver Geometry



2.3 Regulatory Overview

2.3.1 Federal Regulations

The FHWA noise policy is contained within The Code of Federal Regulations, Title 23, Part 772 (23 CFR 772) which provides procedures for preparing operational and construction noise studies and evaluating noise abatement considered for federal and federal-aid highway projects. The code was recently updated in July of 2010. Under the current version of 23 CFR 772.5, projects are categorized as Type I, Type II, or Type III projects. The FHWA defines a Type I project as a proposed federal or federal-aid highway project for the construction of a highway on a new location, the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes. The proposed project is a Type I project as defined by the FHWA.

Type I projects include those that create a completely new noise source, as well as those that increase roadway capacity or move the traffic closer to a receptor. Type I projects include the addition of an interchange, ramp, auxiliary lane, or truck-climbing lane to an existing highway, or the widening of an existing ramp by a full lane width for its entire length. Projects unrelated to increased noise levels, such as lighting, signing, and landscaping, are not normally considered Type I projects.

Under 23 CFR 772.13, noise abatement must be considered for Type I projects if the project is predicted to result in a traffic noise impact. In such cases, 23 CFR 772 requires that the project sponsor “consider” noise abatement before adoption of the final NEPA document. This process involves identification of noise abatement measures that are reasonable, feasible, and likely to be incorporated into the project, and of noise impacts for which no apparent solution is available.

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the design year condition noise levels approach or exceed the noise abatement criteria (NAC) specified in 23 CFR 772, or design year condition noise levels create a substantial noise increase over existing noise levels. 23 CFR 772 does not specifically define the terms “substantial increase” or “approach”; these criteria are defined in the MDOT Noise Analysis and Abatement Handbook (July 13, 2011), as described in the following section.

Table 2-3 summarizes the FHWA NAC corresponding to various defined land use activity categories. Activity categories and related traffic noise impacts are determined based on the actual land use in each area.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. Interior noise impacts will only be addressed for land uses listed with Activity Category D.

Table 2-3 FHWA Noise Abatement Criteria

Activity Category	Activity Criteria		Evaluation Location	Activity description
	Leq(h)	L10(h)		
A	57	60	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	70	Exterior	Residential
C	67	70	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.
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio stations recording studios, schools, and television studios.
E	72	75	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 Either Leq(h) or L10(h) (but not both) may be used on a project.

2 The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise

3 Includes undeveloped lands permitted for this activity

2.3.2 State Regulations and Policies

MDOT has published the noise policy which provides guidelines in the analysis of highway traffic noise and the evaluation of noise abatement measures. Effective July 13, 2011, the MDOT *Highway Noise Analysis and Abatement Handbook* (hereafter referred to as “the MDOT Noise Handbook”) also includes current policies, procedures, and practices to be used by agencies that sponsor new construction or reconstruction of federal or federal-aid highway projects. The MDOT noise handbook defines that a noise impact occurs when the sound level approaches or exceeds the assigned NAC level for a specific category, which is defined as an Leq(h) sound level 1 dBA less than the NAC identified in 23 CFR 772. This means that for an Activity Category B land use (residential), a peak hour noise level of 66 dBA is considered to approach the NAC of 67 dBA and is identified as an impact. The MDOT noise handbook defines a noise increase as substantial when the predicted traffic noise levels with project implementation exceed existing noise levels by 10 dBA or greater. The MDOT noise handbook provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidelines. In addition to the NAC criteria above, the MDOT noise handbook also specifies the following definitions and policies:

Benefitted Receptor is the recipient of an abatement measure that provides a noise reduction at or above the minimum threshold of 5 dBA.

Feasible Noise Abatement Measure is an abatement measure that is acoustically feasible and meets engineering requirements for constructability. A noise abatement measure is considered feasible when it can provide at least a 5 dBA reduction to at least 75% of impacted noise receptors and meets constructability, safety, access, utility, and drainage requirements.

Reasonable Noise Abatement Measure is an abatement measure that has been determined to be cost-effective if it costs at or below the allowable cost per benefitted receptor unit (CPBU) of $49,907 and is considered acceptable to the majority of residents and property owners who benefit from the noise abatement. The MDOT design year attenuation requirement requires that a minimum of one benefitted receptor achieve at least a 10 dBA noise reduction and that at least 50% of benefitted receptors achieve a 7 dBA reduction.

3. Methods of Noise Analysis

3.1 Defining Area of Potential Impact

The extent of the noise study analysis area should include all receptors potentially impacted by the project. The FHWA does not establish a fixed distance to define the noise impact analysis area. Historically, absolute noise impacts (those areas with noise levels approaching or exceeding the NAC – 66 dBA for residential land uses) rarely exist beyond about 500 feet from the roadway. The MDOT noise handbook defines the study zone to be a minimum of 500 feet, including all noise-sensitive receptors on all sides of the highway. If an impact is identified at 500 feet, the next closest receptor would need to be analyzed until a distance where impacts are no longer identified is reached. If no receptors are located within the 500-foot zone, then the closest receptor(s) should be analyzed.

3.2 Field Measurement Procedures

Sixteen field noise measurements were conducted for this project. In general, the noise measurement procedures in the field follow recommended standard procedures, including those outlined in the FHWA's Measurement of Highway Related Noise, May 1996, and the MDOT noise handbook. Specifically, the following practices and procedures were used.

The short-term noise measurements (typically 15-25 minutes) were conducted at actual or representative receptor locations and were used primarily to validate the noise prediction model (at locations where traffic noise was dominant). Short-term noise measurements were generally conducted at exterior areas of frequent human use and were only conducted during periods of free-flowing traffic, dry roadways, and low to moderate wind speeds (less than 12 mph to avoid extraneous wind noise).

No long-term noise measurements were conducted for this study due to inclement weather.

Only ANSI (American National Standards Institute) Class I sound level meters were used for short-term measurements. The meters were subjected to a field calibration check before and after each measurement period. Calibration certificates for each meter used in the Project can be found in Appendix A.

Concurrent traffic counts (classified in auto, medium and heavy trucks, buses, and motorcycles) for the acoustically dominant road were conducted for each short-term measurement. Digital video of traffic conditions during the measurements to be subsequently counted. The traffic counts can be found in Table 3-3.

All field data were recorded on field data sheets, which included the time, name and location of the measurement, instrument information, observed meteorological data, field calibration results, a measurement site diagram, GPS coordinates, and notes regarding the dominant noise sources and any other observed acoustically relevant events (such as aircraft over-flights, emergency vehicle pass-bys, etc.). Field sheets and photographs of measurement sites can be found in Appendix A.

3.3 Analysis Objectives

The purpose of this noise analysis report is to identify, and document potential noise impacts associated with the proposed future Project and to identify feasible and reasonable abatement. The general analysis procedure for the Project noise study includes the following steps:

1. **Review Project Description:** Review the project description and project data to be analyzed and collect additional required data (including roadway design files, existing and future traffic data, land use data, etc.). Consider all alternatives, design options, and construction phasing scenarios. This information is presented in Section 1 of this report.
2. **Identify Regulatory Framework:** Investigate and establish the regulatory framework to be followed for the noise analysis, including federal, state, and local regulations and ordinances applicable to the Project. This information is presented in Section 2 of this report.
3. **Noise Analysis Methodology and Establish Existing Land Use and Noise Environment:** Investigate and document the existing noise environment for the Project area, including existing noise-sensitive land uses and existing noise levels in the Project area. These were accomplished with a careful review of local zoning information, review of aerial photography, and a site visit to the Project area. This information is presented in Section 3 of this report.
4. **Predict Future Noise Levels and Assess Noise Impacts:** Future noise levels at noise-sensitive land uses for the future build alternative are predicted using the FHWA TNM Version 2.5. For each alternative, future noise levels (as well as increases in future noise levels over existing noise levels) are assessed for compliance with the identified noise impact. This information is presented in Section 4 of this report.
5. **Evaluate Noise Abatement:** Where noise impacts are identified, evaluate potential noise abatement measures. Abatement measures are evaluated for feasibility and reasonableness according to FHWA and MDOT standards. This information is presented in Section 5 of this report.
6. **Construction Noise Considerations:** Analyze potential construction noise impacts and discuss available abatement options. This information is presented in Section 6 of this report.
7. **Information for Public Officials:** Provide or identify appropriate information for local public officials to help avoid future noise impacts. This information is presented in Section 7 of this report.

A more detailed accounting of the specific procedures involved in each of the above analysis steps is provided in the indicated report section.

3.4 Selection of Noise-Sensitive Receptors

In general, modeled noise-sensitive receptors are identified to represent potentially impacted land uses within the Project area. A common noise environment, or CNE, is generally defined as a group of receptors within the same Activity Category in Table 2-3 that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, CNEs occur between two secondary noise sources, such as interchanges, intersections, and/or cross-roads. The delineated CNEs for this Project are described in Section 3.9.2 of this report. Within each CNE, representative noise measurements and noise prediction locations are identified. Typically, each CNE would have one short-term measurement location and multiple noise prediction locations. The number and locations of the receptors (measurement and modeling locations) within each CNE are selected to adequately represent all the noise-sensitive property units (dwellings) within that CNE, and these properties may include Activity Categories A through E and G in Table 2-3 (including residential, noise-sensitive commercial, parks, schools, hotels, and undeveloped lands.). Activity Category F (agriculture, retail, industrial, transportation, and utilities), may still be located within a CNE, but would be considered a noise-compatible land use and would not require noise analysis. For residential properties, more-isolated residences would generally be modeled as individual receptors, while residences in multi-family buildings and dense neighborhoods may be modeled with one modeled receptor location representing multiple dwelling units or homes (receptors).

All noise prediction locations are placed to represent an exterior area of frequent human use of the receptor. For residential properties, this would normally be an exterior activity area between the structure and the proposed project roadway, such as a pool, patio, or play area.

3.5 Loudest Hour Noise Conditions

When determining noise impacts, traffic noise predictions must be made for the loudest noise hour (generally during level of service [LOS] C or D with high heavy truck volumes and speeds close to the posted speed limit or design speed). The loudest hour noise is typically either the peak vehicular truck hour or the peak vehicular volume hour (with LOS A through D conditions).

3.6 Noise Abatement Requirements

According to FHWA policy and the MDOT noise handbook, once a noise impact has been identified, feasible and reasonable noise abatement measures must be considered. For noise abatement, primary consideration is given to the exterior areas of frequent human use.

When traffic noise impacts are identified, noise barrier walls, at a minimum, are required to be considered. In addition to noise walls, other abatement elements may also be considered, if appropriate and applicable, including the following:

- Traffic management measures.
- Alteration of horizontal and vertical alignments.
- Acquisition of property to serve as a buffer to preempt development that would be adversely impacted by traffic noise; and
- Noise insulation (NAC D Only).

When noise barriers are considered, a noise barrier design analysis must show that the barrier is feasible. This typically requires that the barrier provides a minimum required level of noise reduction. According to the MDOT noise handbook, feasible noise barriers must provide at least 5 dBA of noise reduction to at least 75% of impacted receptors. In addition to meeting minimum noise reduction requirements, noise barriers must also meet engineering and constructability feasibility requirements in terms of safety, property and emergency access, drainage control, overhead and underground utility clearance, and other issues.

Noise barrier reasonableness is generally related to cost-effectiveness and benefitted receptors. The MDOT noise handbook expresses barrier cost-effectiveness by a quotient formula called the Cost Per Benefitted Receptor Unit (CPBU), which divides the total square-foot-cost of the barrier (at a rate of \$45.00/ft^2) by the number of benefitted dwelling units. To maintain reasonableness, the total CPBU cannot exceed \$49,907., (the total allowable cost established by MDOT for FY 2022). Barriers must also achieve the MDOT noise reduction design goal of 10 dBA reduction for at least one benefitted receptor, and 7dBA reduction for at least 50% of benefitted receptors.

If noise barriers are determined to be reasonable and feasible as defined above, then the viewpoints of property owners and residences should be taken into consideration. Approval by a simple majority (greater than 50%) of all responding benefitted owners and residences is needed to implement noise abatement. Public votes should occur during final design and could happen during the Context Sensitive Design aesthetic public input phase.

3.7 Noise Modeling Methodology

Future build noise levels, along with existing noise levels, were predicted using FHWA TNM Version 2.5, the most recent version available at the time of the analysis. All conventional modeling techniques and recommendations for TNM by both FHWA and MDOT were implemented. These included the following modeling procedures and conventions:

- TNM roadways were generally modeled as bundled roadways with no more than three lanes represented by a single modeled roadway.
- All roadway pavement types were modeled as “Average”.

- Traffic speeds and volumes for peak traffic hour as provided in the traffic data were modeled to predict worst-case noise levels. Traffic speeds and volumes used in this analysis were based on the predicted traffic data included in Table 3-1.
- Existing terrain lines (topography) and buildings were modeled where appropriate.
- All TNM inputs and models runs were reviewed for accuracy by an independent noise analyst.
- Sample TNM input/output files for this project provided in Appendix B
- All TNM model runs are available upon request

3.8 Project Traffic Data

Predicted traffic data for the Existing and Future Build were provided by MDOT. AM and PM peak values were evaluated; however, it was determined that combined Eastbound and Westbound PM peak values were greater and therefore were used in the loudest hour noise analysis. A summary of the traffic data used for this analysis can be found in Table 3-1.

Table 3-1 Existing and Future Peak Hour Traffic Volumes for Modeled Roadways

Roadways		**Existing Traffic (PM-Peak)**					
Name	**Direction**	**Autos**	**Med. Trucks**	**Heavy Trucks**	**Buses**	**Motorcycles**	**Speed**
I-94, Puetz Rd. to Britain Ave.	EB	1920	49	479	1	0	70
	WB	1371	45	342	2	2	70
Red Arrow Hwy./St. Joseph Ave*	NB	216	8	4	0	0	50
	SB	216	8	4	0	0	50
M-63	NB	790	2	3	0	5	40
	SB	744	5	13	0	4	40
Marquette Woods Rd.	EB	119	2	0	0	0	30
	WB	200	3	0	0	0	30
Glenlord Rd.	EB	298	3	0	0	0	35
	WB	298	3	0	0	0	35
Roadways		**Future-Build Traffic (PM-Peak)**					
Name	**Direction**	**Autos**	**Med. Trucks**	**Heavy Trucks**	**Buses**	**Motorcycles**	**Speed**
I-94, Puetz Rd. to Britain Ave.	EB	2154	55	537	1	0	70
	WB	1538	55	384	2	2	70
Red Arrow Hwy / St. Joseph Ave.*	NB	216	8	4	0	0	50
	SB	216	8	4	0	0	50
M-63	NB	886	2	3	0	6	40
	SB	834	6	15	0	4	40
Marquette Woods Rd.	EB	134	2	0	0	0	30
	WB	225	3	0	0	0	30
Glenlord Rd.	EB	335	3	0	0	0	35
	WB	335	3	0	0	0	35
* Based on field observations							

3.9 Existing Condition and Common Noise Environments

3.9.1 Existing Land Use and Zoning

Land uses within the Project study area are a mix of residential (single- and multi-family), parks, churches, hotels, commercial, industrial, and undeveloped land. Undeveloped areas are assumed to be available for future residential or commercial development.

3.9.2 Common Noise Environments

To better categorize the potential noise impacts and evaluate noise abatement for the various project alternatives, all the potentially impacted noise-sensitive receptors have been organized into CNEs. A CNE is defined as an area containing land uses that share a common highway traffic noise influence. Descriptions of delineated CNEs, including location, primary land use, and type of noise-sensitive receptors are listed in Table 3-2. Figures 3-1A and 3-1B show an overview of the Project area illustrating the defined CNEs.

Table 3-2 Common Noise Environments

CNE ID	Location	Land uses	Measurements Locations
CNE-1	I-94 EB, Puetz Rd. to St Joseph Ave/Red Arrow Hwy	Residential, commercial, hotel, vacant land	ST-1A
CNE-2	I-94 EB, St Joseph Ave/Red Arrow Hwy to Cleveland Ave overcrossing	Residential, cemetery, church, commercial, vacant land	ST-2, ST-2A,
CNE-3	I-94 EB, Cleveland Ave overcrossing M-63	Residential, parks, commercial, vacant land	ST-3, ST-3A
CNE-4	I-94 EB, M-63 to Pipestone Rd.	Residential, commercial, vacant land	ST-4, ST-5,
CNE-5	I-94 EB Pipestone to Britain Ave.	Residential, municipal, vacant land	ST-6,
CNE-6	I-94 WB, Britain Ave to Pipestone Rd.	Residential, commercial, vacant land	ST-7
CNE-7	I-94 WB, Pipestone Rd. to M-63	Residential, commercial, hotels, park,	ST-8, ST-9
CNE-8	I-94 WB, M-63 to Cleveland Ave overcrossing	Residential, church, vacant land	ST-9A, ST-10,
CNE-9	I-94 WB, Cleveland Ave overcrossing to Red Arrow Hwy/St. Joseph Ave.	Residential, vacant land, commercial	ST-10A, ST-11
CNE-10	I-94 WB, Red Arrow Hwy/St. Joseph Ave to Puetz Rd.	Residential, hotels	ST-12

Figure 3-1A Common Noise Environments and Noise Measurement Sites (Sheet 1)

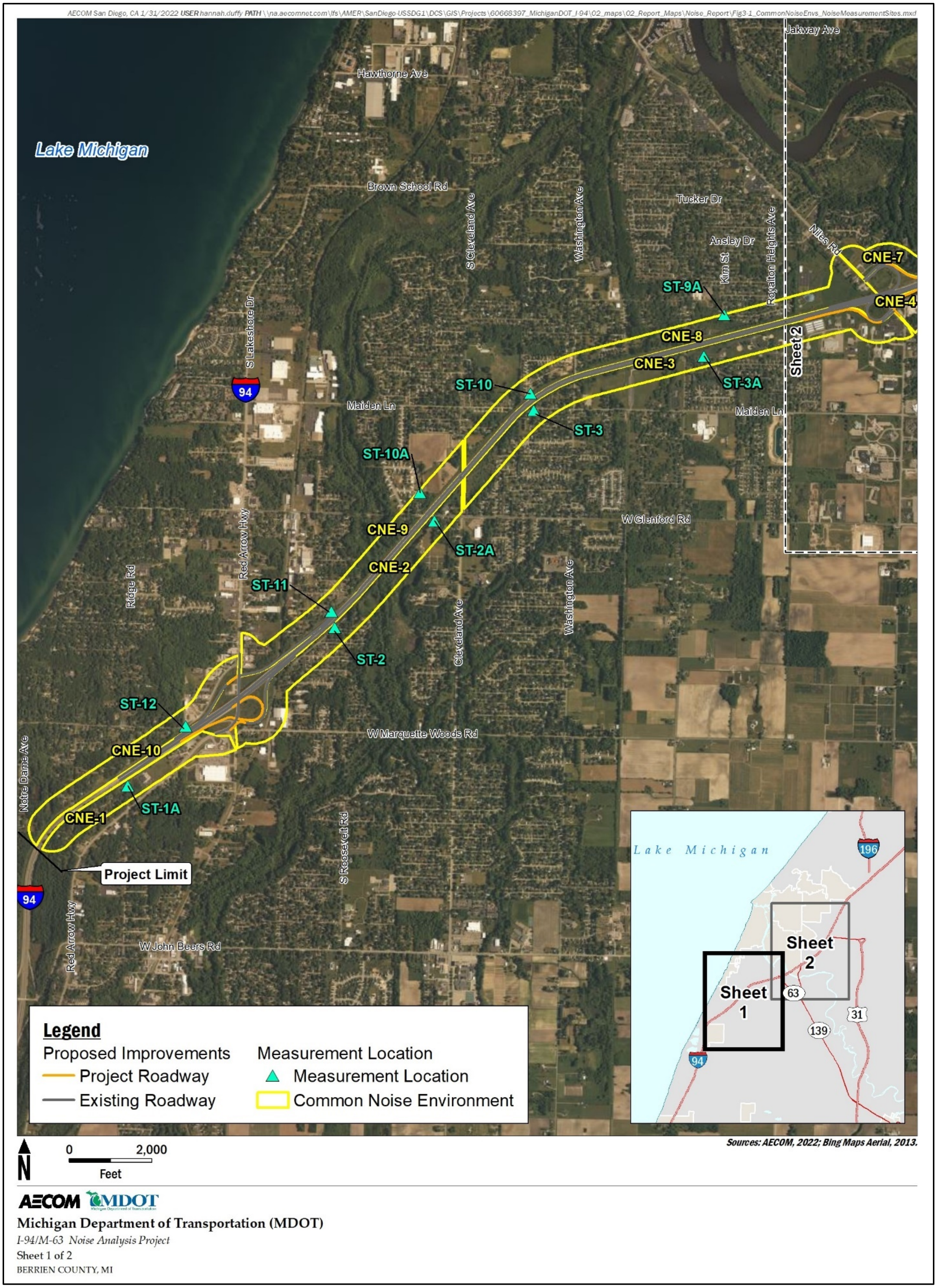
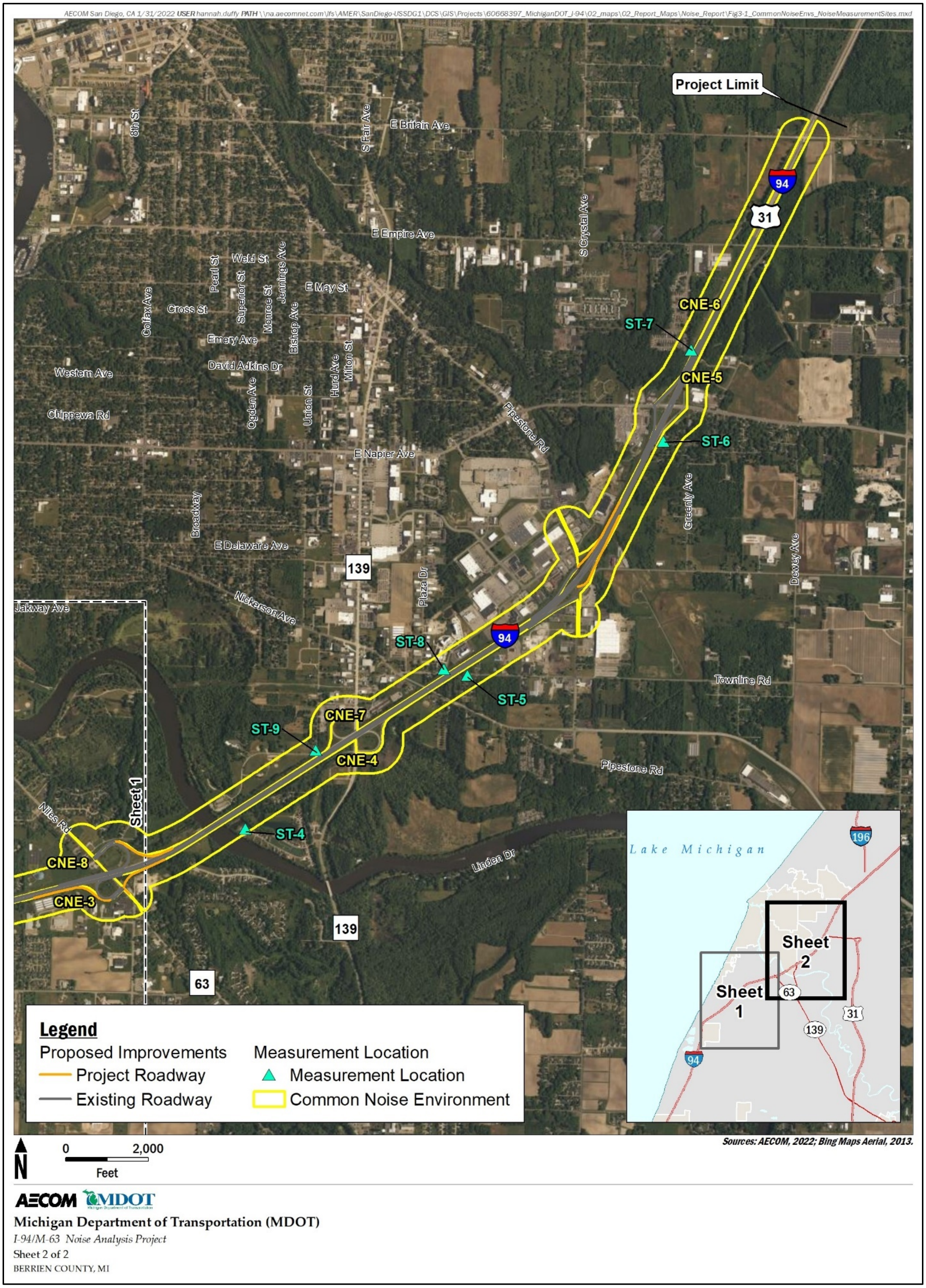


Figure 3-1B Common Noise Environments and Noise Measurement Sites (Sheet 2)



3.9.3 Existing Noise Environment

3.9.3.1 Field Noise Measurements

Noise measurements were conducted for this project between October 25 and October 28, 2021. Noise measurements were conducted to provide information for noise model validation (short-term measurements with accompanying classified traffic counts). Noise measurements were conducted as described in Section 3.2. Appendix A includes measurement-related materials.

A total of 16 ST noise measurements were conducted as summarized in Table 3-3. Figures 3-1A and 3-1B contain an aerial figure of the Project area showing each measurement location.

3.9.3.2 Noise Model Validation and Results

The FHWA TNM Version 2.5 was used to predict noise levels for both the existing condition and future build alternative at receptor locations where noise levels are dominated by traffic noise on project roadways. To demonstrate that the noise model is predicting traffic noise levels within a reasonable margin of error, the noise model runs were validated by comparing predicted noise levels to measured noise levels for similar traffic conditions. However, since the TNM only predicts noise levels associated with traffic noise, the model runs can only be validated at measurement locations where noise levels were dominated by project roadways. For this project, noise model validation was possible for all twelve ST noise measurement locations. Noise models are considered to be validated if the difference between measured and modeled noise levels for comparable conditions is 3 dBA or less. The successful results of the noise validation effort are presented in Table 3-3.

Table 3-3 TNM Validation Summary

Measurement ID and Location	Observed Traffic Count			Measured Leq, dBA	Modeled Leq, dBA	Difference
ST-1A, 5418 Ridge Road	**Type**	**I-94 EB**	**I-94 WB**	70.7	70.3	-0.4
	Autos	600	592			
	Medium Trucks	68	36			
	Heavy Trucks	376	420			
	Busses	0	4			
	Motorcycles	0	0			
ST-2, 2125 Oaklawn Drive	**Type**	**I-94 EB**	**I-94 WB**	72.7	73.8	1.1
	Autos	712	492			
	Medium Trucks	32	28			
	Heavy Trucks	368	300			
	Busses	8	0			
	Motorcycles	4	0			
ST-2A, 1792 W. Glenlord Road	**Type**	**I-94 EB**	**I-94 WB**	68.3	68.0	-0.3
	Autos	828	692			
	Medium Trucks	84	112			
	Heavy Trucks	356	424			
	Busses	4	0			
	Motorcycles	0	0			
ST-3, 1442 Maiden Lane	**Type**	**I-94 EB**	**I-94 WB**	74.7	72.1	-2.6
	Autos	856	704			
	Medium Trucks	72	48			
	Heavy Trucks	464	308			
	Busses	8	0			
	Motorcycles	0	0			
ST-3A, 3516 Pine Court	**Type**	**I-94 EB**	**I-94 WB**	74.4	70.6	-3.8
	Autos	1044	988			

Measurement ID and Location	Observed Traffic Count			Measured Leq, dBA	Modeled Leq, dBA	Difference
	Medium Trucks	40	40			
	Heavy Trucks	576	388			
	Busses	16	0			
	Motorcycles	0	4			
ST-4, 530 Swan River Drive	**Type**	**I-94 EB**	**I-94 WB**	66.7	66.2	-0.5
	Autos	1264	1192			
	Medium Trucks	52	20			
	Heavy Trucks	296	544			
	Busses	4	4			
	Motorcycles	0	0			
ST-5, 2520 Woodley Drive	**Type**	**I-94 EB**	**I-94 WB**	72.2	69.9	-2.3
	Autos	820	856			
	Medium Trucks	88	88			
	Heavy Trucks	356	328			
	Busses	0	4			
	Motorcycles	0	0			
ST-6, 2015 Gaines Drive	**Type**	**I-94 EB**	**I-94 WB**	69.6	72.3	2.7
	Autos	906	708			
	Medium Trucks	126	102			
	Heavy Trucks	402	402			
	Busses	0	0			
	Motorcycles	0	0			
ST-7, Sierra Boulevard	**Type**	**I-94 EB**	**I-94 WB**	74.8	74.4	-0.4
	Autos	906	708			
	Medium Trucks	126	102			
	Heavy Trucks	402	402			
	Busses	0	0			
	Motorcycles	0	0			
ST-8, 1201 Nickerson Court	**Type**	**I-94 EB**	**I-94 WB**	73.1	73.2	0.1
	Autos	820	856			
	Medium Trucks	88	88			
	Heavy Trucks	356	328			
	Busses	0	4			
	Motorcycles	0	0			
ST-9, 280 Somerlayton Road	**Type**	**I-94 EB**	**I-94 WB**	68.4	71.0	2.6
	Autos	1264	1192			
	Medium Trucks	52	20			
	Heavy Trucks	296	544			
	Busses	4	4			
	Motorcycles	0	0			
ST-9A, 753 Manitou Road	**Type**	**I-94 EB**	**I-94 WB**	61.4	64.2	2.8
	Autos	1044	988			
	Medium Trucks	40	40			

Measurement ID and Location	Observed Traffic Count			Measured Leq, dBA	Modeled Leq, dBA	Difference
	Heavy Trucks	576	388			
	Busses	16	0			
	Motorcycles	0	4			
ST-10, 3605 Terese Path	**Type**	**I-94 EB**	**I-94 WB**	74.3	74.7	0.4
	Autos	856	704			
	Medium Trucks	72	48			
	Heavy Trucks	464	308			
	Busses	8	0			
	Motorcycles	0	0			
ST-10A, Fox Park	**Type**	**I-94 EB**	**I-94 WB**	60.3	61.8	1.5
	Autos	828	692			
	Medium Trucks	84	112			
	Heavy Trucks	356	424			
	Busses	4	0			
	Motorcycles	0	0			
ST-11, 2179 Welch Drive	**Type**	**I-94 EB**	**I-94 WB**	72.7	74.4	1.7
	Autos	712	492			
	Medium Trucks	32	28			
	Heavy Trucks	368	300			
	Busses	8	0			
	Motorcycles	4	0			
ST-12, 2755 W. Marquette Woods Road	**Type**	**I-94 EB**	**I-94 WB**	74.8	73.5	-1.3
	Autos	600	592			
	Medium Trucks	68	36			
	Heavy Trucks	376	420			
	Busses	0	4			
	Motorcycles	0	0			

As shown in Table 3-3, all calculated differences between modeled and measured noise levels are less than 3.0 dBA, except for location 3A. At this location it was noted that poor pavement conditions resulted in an audible “slab slap” resulting in slightly higher than typical tire/pavement noise at this location (and a measured versus measured difference of 3.8 dBA), which would explain the difference. Therefore, the noise model predictions are considered to be valid.

TNM validation runs developed for this Project are digitally archived and will be made available upon request.

4. Noise Impact Analysis

4.1 Future Noise Levels and Impacts

This section presents predicted noise levels and noise impacts (or noise impact distances for identified CNE areas and general undeveloped areas).

4.1.1 Predicted Noise Levels and Noise Impacts

Traffic noise impacts, as defined in 23 CFR 772.5, occur when the design year condition noise levels approach or exceed the noise abatement criteria (NAC) specified in 23 CFR 772, or design year condition noise levels create a substantial noise increase over existing noise levels. 23 CFR 772 does not specifically define the terms “substantial increase” or “approach”; these criteria are defined in the MDOT Noise Analysis and Abatement Guidelines (July 13, 2011), as described in the following section. Table 2-3 summarizes the FHWA NAC corresponding to various defined land use activity categories.

MDOT noise handbook defines that a noise impact occurs when the sound level approaches or exceeds the NAC level, which is defined as an Leq(h) sound level 1 dBA less than the NAC identified in 23 CFR 772. This means that a loudest-hour noise level of 66 dBA is considered to approach the NAC for Category B of 67 dBA and is identified as an impact. The MDOT noise handbook defines a noise increase as substantial when the predicted traffic noise levels with project implementation exceed existing noise levels by 10 dBA. All conventional modeling techniques and recommendations for TNM by both FHWA and MDOT were implemented, as described in Section 3.7.

Table 4-1 below contains a summary of the predicted noise levels and noise impacts at all modeled CNE locations in the Project. Figures 5-1 (CNE-1 and CNE-10), 5-2 (CNE-3 and CNE-9), 5-3 (CNE-3, and CNE-8), 5-4 (CNE-4 and CNE-7), and 5-5 (CNE-5 and CNE-6), contain detailed aerial imagery of the Project area showing all modeled receptor locations and predicted future build impacts. Due to the large number of modeled receptors and CNEs within the Project area, prediction information for individual receptors is presented in detail in Appendix C.

Table 4-1 Summary of Predicted Noise Levels by CNE

CNE	**No. of Modeled Receivers**	**Total Dwelling Units**	**Predicted Noise Level (Range), Leq (1h)**		**Total Number of Noise Impacted Units**		
			Existing	Future Build	Approach or Exceed NAC	Significant Increase	Total Impacted DU
CNE-1	20	20	61 - 75	62 - 75	13	0	13
CNE-2	57	57	58 - 76	58 - 77	39	0	39
CNE-3	76	76	62 - 75	63 - 76	60	0	60
CNE-4	22	22	62 - 76	62 - 77	19	0	19
CNE-5	17	17	62 - 74	63 - 75	12	0	12
CNE-6	45	45	58 - 74	59 - 75	32	0	32
CNE-7	50	50	52 - 76	53 - 76	35	0	35
CNE-8	115	121	54 - 76	54 - 76	90	0	90
CNE-9	49	95	58 - 78	58 - 79	48	0	48
CNE-10	19	19	64 - 77	64 - 78	16	0	16

Figures showing all receiver locations along with evaluated noise abatement elements are included in Section 5.

5. Noise Abatement Evaluation

5.1 Noise Abatement Measures

According to FHWA and MDOT policies, when noise impacts are identified, noise barriers (at a minimum) must be considered as noise abatement. Other potential noise abatement measures might include heavy truck or speed restrictions, alignment changes, and depressed roadways. Of these alternatives, the Project alignment was evaluated and compared for noise impacts (as presented in Section 4), but truck restrictions and speed restrictions below proposed speed limits would significantly reduce the value of the roadway. Noise barriers were evaluated for each CNE with noise impacts for feasibility and reasonableness. The following section describes the results of the barrier assessments for each evaluated CNE.

5.2 Feasible and Reasonable Criteria and Requirements

For abatement to be recommended, the barrier must meet certain feasibility and reasonableness requirements established by MDOT in the Noise Analysis and Abatement Guidelines.

When noise barriers are considered, a preliminary noise barrier design analysis must show that the barrier is feasible. According to the MDOT noise handbook, feasible noise barriers must provide at least 5 dBA of noise reduction to 75% of the impacted receptors. In addition to meeting minimum noise reduction requirements, noise barriers must also meet engineering and constructability feasibility requirements in terms of safety, property and emergency access, drainage control, overhead and underground utility clearance, and other issues.

Noise barrier reasonableness is generally related to cost-effectiveness and benefitted receptors, where a benefitted receptor receives at least 5 dBA of noise reduction (NR), and cost-effectiveness is driven by CPBU value. The handbook identifies a CPBU of ~~\$49,907~~ which is a final quotient resulting from dividing the total cost of abatement (at a rate of \$45.00 ft^{2}) by the total number of benefitted receptors. Additionally, The MDOT design year attenuation requirement requires that a minimum of one benefitted receptor achieve at least a 10 dBA noise reduction and that at least 50% of benefitted receptors achieve a 7dBA reduction for noise abatement to be reasonable.

To summarize, for a barrier to be considered feasible and reasonable, it must have:

- A noise reduction of at least 5 dBA must be achieved at 75% of impacted receptors
- A noise reduction of 10 dBA must be achieved for at least one receptor
- A noise reduction of 7 dBA must be achieved at 50% of benefitted receptors

For a noise barrier to be considered reasonable in addition to the requirements listed above, the viewpoints of benefitted property owners and residents must be taken into consideration. Greater than 50% in favor of all responding benefitted owners and residents is needed to construct noise abatement. Public viewpoints and votes of benefitted receptors are not part of this noise analysis but are collected during the Preliminary Engineering Phase and are recorded in the environmental documentation.

5.3 Findings and Recommendations for Noise Abatement

Noise abatement was considered for each CNE with identified noise impacts. Initially, noise abatement was checked for feasibility (5 dBA reduction and at least 75% of impacted receptors and access restrictions). If abatement was determined to be feasible, the abatement was analyzed for cost-effectiveness and other reasonableness factors. For all impacted receptors meeting feasibility requirements, preliminary barrier designs were evaluated using TNM. If the abatement was found to be both reasonable and feasible, it would be recommended for inclusion in the project pending a polling of viewpoints from benefitted receptors. A summary of the barrier locations and resulting sound levels are provided in Table 5-1. The details of the barrier analysis including determinations of feasibility and reasonableness are included in Table 5-2. The narrative results of abatement evaluations for each impacted CNE are summarized in subsequent sub-sections.

Table D-1 in Appendix D lists the predicted existing, future build, and future build with barrier noise levels per modeled receptor location. The table also includes the information regarding benefitted receptors and barrier design goal achievement.

Table 5-1 Evaluated Barrier Descriptions

Barrier ID	Location	Existing Leq (dBA)	Future Leq Range (dBA)		Barrier Noise Reduction (dBA)	Barrier Geometries (feet)	
			No Barrier	With Barrier		Length	Avg. Height
Wall 1	CNE-1, I-94 EB, between Puetz Rd. and Ridge Rd.	61 - 75	62 - 75	57 - 68	3 - 10	3372	16
Wall 2	CNE-2, I-94 EB, between St. Joseph Ave. and Chestnut Path	58 - 76	64 - 77	57 - 66	3 - 11	2649	15.62
Wall 3a	CNE-3, I-94 EB, between Cleveland Ave and Washington Ave	63 - 75	63 - 76	57 - 68	3 - 12	3400*	14.5
Wall 3b	CNE-3, I-94 EB, Between Washington Ave. and M-63	62 - 70	63 - 76	59 - 68	4 - 11	5100	15.27
Wall 4a	CNE-4, I-94 EB, between St. Joseph River and M-139	62 - 73	66 - 75	60 - 65	4 - 10	2899	18
Wall 4b	CNE-4, I-94 EB, between Nickerson Ave and Pipestone Rd.	64 - 75	66 - 77	62 - 67	4 - 10	1251	13
Wall 5	CNE-5 I-94 EB, between Meadowbrook Rd and Napier Ave.	62 - 74	63 - 75	59 - 65	4 - 10	2500	16
Wall 6	CNE-6, I-94 WB, between Empire Ave. and Napier Ave.	58 - 74	58 - 75	55 - 66	2 - 11	1700	17.21
Wall 7a	CNE-7, I-94 WB, between Pipestone Rd and Nickerson Ave.	52 - 76	63 - 76	59 - 67	4 – 12	800	13
Wall 7b	CNE-7, I-94 WB between M-139 and St. Joseph River	55 - 71	63 - 74	60 - 69	0 – 10	1825	15.07
Wall 8a	CNE-8, I-94 WB, Between M-63 and Lincoln Ave	54 - 74	59-76	57 - 67	1 – 11	3700	14.54
Wall 8b	CNE-8, I-94 WB between Lincoln Ave, and Washington Ave.	59 - 76	65 - 76	61 - 68	2 – 9	1750	17.32
Wall 8c	CNE-8, I-94 WB, between Washington Ave and Cleveland Ave.	59 - 76	63 - 76	58 - 68	2 - 15	3150	13.68
Wall 9a	CNE-9, I-94 WB, between Cleveland Ave and Glenlord Rd.	61 - 72	64 - 73	58 - 64	6 - 10	750	18.4
Wall 9b	CNE-9, I-94 WB, between Glenlord Rd. and Hickory Creek.	58 - 78	69 - 78	62 - 69	5 - 10	550	19.09
Wall 9c	CNE-9, I-94 WB, between Hickory Creek and Red Arrow Hwy.	58 - 78	61 - 79	56 - 75	0 - 17	2252	18.18
Wall 10a	CNE-10, I-94 WB, between Red Arrow Hwy and Ridge Rd.	64 - 77	67 - 79	61 - 72	2 - 10	2300	15.78
Wall 10b	CNE-10, I-91 WB, between Ridge Rd and Puetz Rd.	65 - 71	66-74	58 - 63	5 - 11	1800	16

Table 5-2 Barrier Analysis Results

Barrier ID	Number of Attenuated Locations[1]					Cost[2]	Cost Per Benefitted Unit	Feasible?	Reasonable?	Recommended?
	≥ 10 dBA	≥ 7 dBA		≥ 5 dBA (Benefitted Units)						
		#	% of Benefit	#	% of Impacts					
Wall-1	2	9	56%	16	83%	$2,427,840	$151,740	Yes	No	No
Wall-2	4	34	81%	42	100%	$1,861,982	$44,333	Yes	Yes	Yes
Wall-3a	2	12	36%	33	90%	$2,218,500	$67,227	Yes	No	No
Wall-3b	5	20	51%	39	94%	$3,504,465	$89,858	Yes	No	No
Wall-4a	2	7	100%	7	100%	$2,348,190	$335,456	Yes	No	No
Wall 4b	2	4	57%	7	100%	$731,835	$104,548	Yes	No	No
Wall 5	1	7	54%	13	91%	$1,800,000	$138,462	Yes	No	No
Wall 6	4	15	52%	29	90%	$1,316,565	$45,399	Yes	Yes	Yes
Wall 7a	2	5	83%	6	100%	$468,000	$78,000	Yes	No	No
Wall 7b	4	13	54%	24	91%	$1,237,624	$51,568	Yes	No	No
Wall 8a	11	29	57%	51	95%	$2,420,910	$47,469	Yes	Yes	Yes
Wall 8b	0	7	78%	9	100%	$1,363,950	$151,550	Yes	No	No
Wall 8c	11	21	51%	41	93%	$1,939,140	$47,296	Yes	Yes	Yes
Wall 9a	1	7	50%	18	100%	$621,100	$34,500	Yes	Yes	Yes
Wall 9b	1	2	67%	3	100%	$472,478	$157,493	Yes	No	No
Wall 9c	6	15	48%	31	95%	$1,842,361	$59,431	Yes	No	No
Wall 10a	1	5	63%	8	90%	$1,633,230	$204,154	Yes	No	No
Wall 10b	1	6	86%	7	100%	$1,296,000	$185,143	Yes	No	No

Note:
1) MDOT policy requires that reasonable and feasible noise walls must be constructable, provide at least 10 dBA noise reduction at one impacted receptor, at least 7 dBA noise reduction for at-least 50% of benefitted receptors, at least 5 dBA noise reduction for at least 75% of impacted receptors, and be constructed at an estimated cost of no more than $49,907 per benefitted receptor.
2) Wall costs reported here are based on wall area in square feet as calculated by TNM times MDOT unit cost of $45.00/square foot.
* Preliminary Estimates to be updated in next version of report

5.3.1 CNE-1 Noise Abatement Analysis

CNE-1, south of I-94 between Puetz Rd. and St. Joseph Ave, contains 20 modeled receiver locations representing a total of 20 single family homes, each representing one dwelling unit. Of these, 13 receptors were determined to be impacted under the future build condition. One noise wall was analyzed, Wall 1, between approximately Puetz Rd. and Ridge Rd. Wall 1 was determined to not meet MDOT reasonableness standards. Wall 1 would cost $151,740 per benefitted unit, exceeding the allowable CPBU. Thus, abatement is not recommended for this CNE. The analyzed wall is shown in Figure 5-1.

5.3.2 CNE-2 Noise Abatement Analysis

CNE-2, south of I-94 between St. Joseph Ave./Red Arrow Hwy. and Cleveland Ave. contains 57 modeled receiver locations representing a total of 56 single family homes and one cemetery (Hickory Bluff Cemetery). Of the 56 single family homes, 38 were determined to be impacted. One noise wall was analyzed, Wall 2, between approximately St. Joseph Ave. and Hickory Creek. Wall 2 was analyzed located at the shoulder as well as separately analyzed located at the ROW. Wall 2 was determined to meet MDOT reasonableness and feasibility standards with cost of $44,333 per benefitted unit, below the maximum allowable CPBU, when located at the shoulder. Wall 2 did not meet MDOT reasonableness and feasibility standards when located at the ROW. Thus, abatement at the shoulder is recommended for this CNE. The analyzed wall is shown in Figure 5-2.

5.3.3 CNE-3 Noise Abatement Analysis

CNE-3, south of I-94 between Cleveland Ave. and M-63, contains 76 modeled receptor locations, representing single family residences and two public parks. Of these 60 residences and representative park receptors were determined to be impacted under the future build condition. Two walls were analyzed, Walls 3a and 3b. Wall 3a would stretch from Cleveland Ave. to Washington Ave and would cost $67,227 per benefitted unit, exceeding the allowable CPBU. Wall 3b was analyzed, stretching from Washington Ave. to M-63. with a cost of $89,858 per benefitted unit, exceeding the maximum allowable CPBU. This wall was also tested as two separate walls to determine if either the western half or eastern have would be determined to be reasonable and feasible on their own, but the CPBU for both portions still exceeded the maximum allowable value. As both walls would exceed the maximum allowable CPBU, abatement is not recommended for this CNE. The analyzed walls are shown in Figure 5-3 (Sheets A-B).

5.3.4 CNE-4 Noise Abatement Analysis

CNE-4, south of I-94 between M-63 and Pipestone Rd., contains 22 modeled receptor locations representing single family residences, of which 19 were determined to be impacted under the future build condition. Two walls were analyzed, Walls 4a and 4b. Wall 4a would stretch from the St. Joseph River to M-139 and would cost $335,456 per benefitted unit, exceeding the maximum allowable CPBU. Wall 4b would stretch from Nickerson Ave. to Pipestone Road and would cost of $104,548 per benefitted unit, exceeding the maximum allowable CPBU. As both walls would exceed the maximum allowable CPBU, abatement is not recommended for this CNE. The analyzed walls are shown in Figure 5-4.

5.3.5 CNE-5 Noise Abatement Analysis

CNE-5, south of I-94 between Pipestone Rd. and Britain Ave. contains 17 modeled receiver locations representing a total of 17 single family homes. Of the 17 single family homes, 12 were determined to be impacted. One noise wall was analyzed, Wall 5, between approximately Meadowbrook Rd. and Napier Ave. Wall-5 would cost $138,462 per benefitted unit, exceeding the maximum allowable CPBU. As the wall would exceed the allowable CPBU abatement is not recommended for this CNE. The analyzed wall is shown in Figure 5-5.

5.3.6 CNE-6 Noise Abatement Analysis

CNE-6, north of I-94 between Britain Ave and Pipestone Rd. contains 45 modeled receiver locations representing a total of 45 single family homes. Of the 45 single family homes, 32 were determined to be impacted. One noise wall was analyzed, Wall 6, between approximately Britain Ave. and Napier Ave. Wall 6 was analyzed located at the shoulder as well as separately analyzed located at the ROW. Wall 6 was determined to meet MDOT reasonableness and feasibility standards at both locations, with a CPBU of $38,000 at the shoulder and a CPBU of $45,399 at the ROW. Due to safety concerns when placing barriers near or at the shoulder, The noise wall located at the ROW is recommended for this CNE. The analyzed wall is shown in Figure 5-5.

5.3.7 CNE-7 Noise Abatement Analysis

CNE-7, north of I-94 between Pipestone Ave and M-63, contains 50 modeled receptor locations representing mostly single-family home and a large multi-use park, for a total of 50 equivalent dwelling units. Of these 50 dwelling units 35 equivalent dwelling units are impacted in the Future Build condition. Two noise walls were analyzed for this CNE, Wall 7a between Pipestone Road and Nickerson Ave., and Wall 7b between M-139 and the St Joseph River. Wall 7b was analyzed located at the shoulder as well as at the ROW. Wall 7a would cost $78,000 per benefitted unit. Wall 7b would cost $51,568 per benefitted unit at the shoulder, and $60,897 at the ROW. Neither of these two walls would cost less than the maximum allowable cost of $49,907 per unit and be considered reasonable and feasible, and therefore no abatement is recommended in this CNE. The analyzed walls are shown in Figure 5-4.

5.3.8 CNE-8 Noise Abatement Analysis

CNE-8, north of I-94 between M-63 and Cleveland Ave, contains 115 modeled receptor locations representing mostly single-family homes and one church with exterior use areas, for a total of 121 equivalent dwelling units. Of these 121 dwelling units 90 dwelling units are impacted for Future Build condition. Three noise walls were analyzed for this CNE, Wall 8a between M-63 and Lincoln Ave., Wall 8b between Lincoln Ave. and Washington Ave., and Wall 8c between Washington Ave. and Cleveland Ave. Wall 8a and 8c were both analyzed located at the shoulder as well as separately analyzed located at the ROW. Wall 8a would cost $47,469 per benefitted unit when located at the shoulder, and $52,380 when located at the ROW, Wall 8b would cost $151,550 per benefitted unit, and Wall 8c would cost $48,973 per benefited unit when located at the shoulder, and $47,296 when located at the ROW. Of these three walls, Wall 8a (shoulder) and Wall 8c (shoulder and ROW) would cost less than the maximum allowable cost of $49,907 per benefitted unit and are considered reasonable and feasible, and therefore would be the only walls recommended in this CNE. Wall 8c is recommended to be placed at the ROW, due to safety concerns when when placing barriers near or at the ROW. It is noted here that Wall 8a protects a group of single-family homes and also outdoor use areas associated with the Blueroof Church. If the church were to opt out of receiving a noise reduction benefit from the wall (in order to preserve its view from the highway), the wall could be shortened by approximately 300 feet on the eastern end, and still provide adequate noise reduction for the single-family homes west of the church. The analyzed walls are shown in Figure 5-3.

5.3.9 CNE-9 Noise Abatement Analysis

CNE-9, north of I-94 between Cleveland Ave. and Red Arrow Highway/St. Joseph Avenue, contains 49 modeled receptor locations representing a total of mostly single-family home and one assisted living facility with 18 residents, for a total of 95 dwelling units. Of these 95 dwelling units 48 dwelling units are impacted in Future Build condition. Three noise walls were analyzed for this CNE, Wall 9a between Cleveland Ave. and Glenlord Rd., analyzed located at the shoulder as well as separately analyzed located at the ROW, Wall 9b between Glenlord Rd. and Hickory Creek, and Wall 9c between Hickory Creek and Red Arrow Highway. Wall 9a would cost $75,000 per benefitted unit when located at the shoulder, and $37,740 per benefitted unit when located at the ROW, Wall 9b would cost $157,493 per benefitted unit, and Wall 9c would cost $59,431 per benefited unit. Of these three walls only Wall 9a located at the ROW would cost less than the maximum allowable cost of $49,907 per unit and be considered reasonable and feasible, and therefore would be the only wall recommended in this CNE. The analyzed walls are shown in Figure 5-2.

5.3.10 CNE-10 Noise Abatement Analysis

CNE-10, north of I-94 between Puetrz Road. and Red Arrow Highway/St. Joseph Avenue, contains 19 modeled receiver locations representing a total of 19 single family homes, each representing one dwelling unit. There are also three budget hotels near the eastern end of this CNE but these had no apparent exterior use areas. Of the 19 single family homes,16 were determined to be impacted under the Future Build condition. Two noise walls were analyzed for this CNE, Wall 10a between approximately, between approximately Red Arrow Highway and Ridge Road, and Wall 10b between approximately Ridge Road and Puetz Road. Wall 10a would cost at least $204,154 per benefitted unit, and Wall 10b would cost at least $185,143 per benefitted unit, both exceeding the allowable CPBU of $49,907. Thus, abatement is not recommended for this CNE. The analyzed walls are shown in Figure 5-1.

Figure 5-1 Acoustical Analysis for CNE-1 and CNE-10

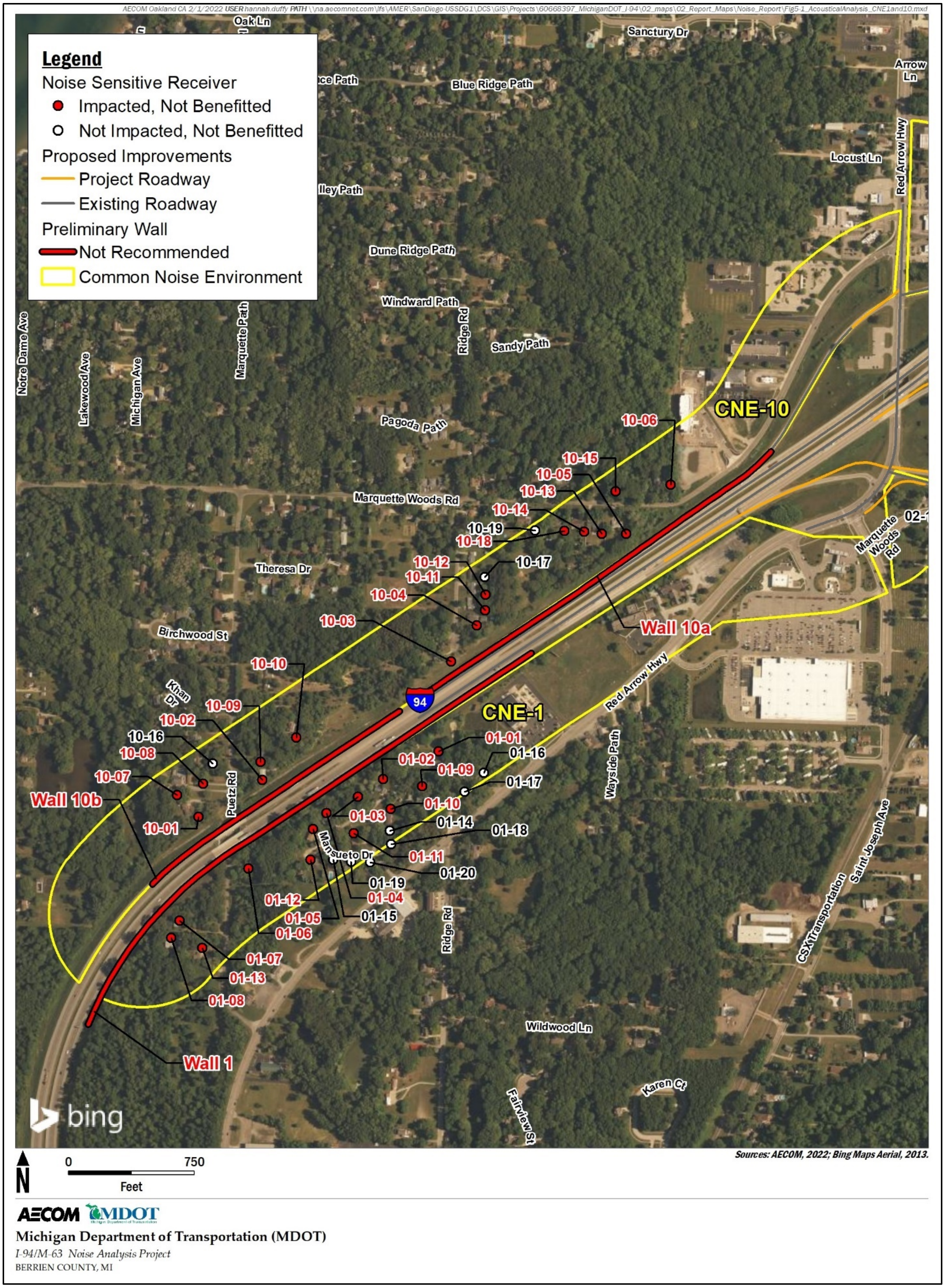


Figure 5-2 Acoustical Analysis for CNE-2 and CNE-9

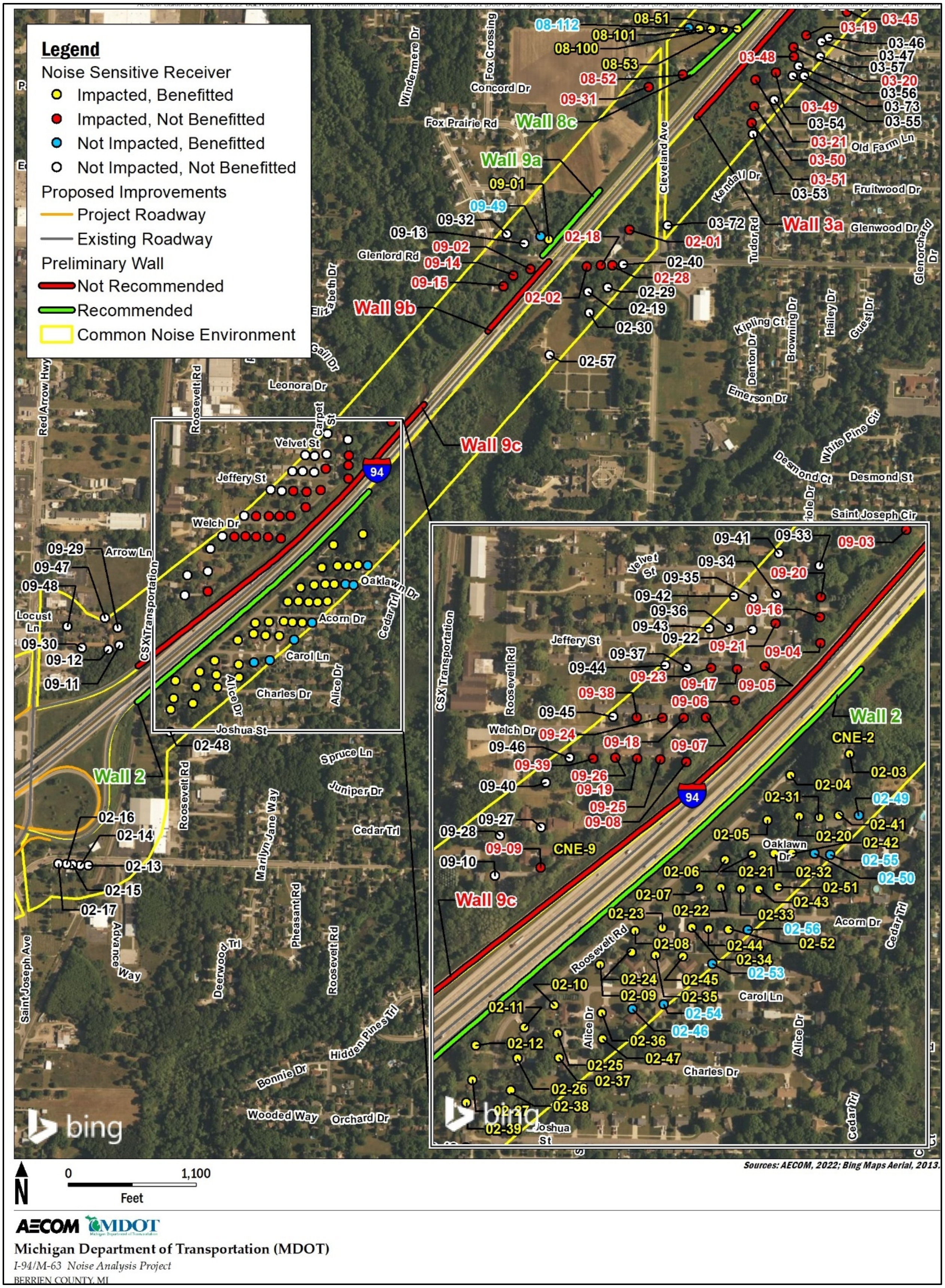


Figure 5-3 Acoustical Analysis for CNE-3, and CNE-8 (Overview)-

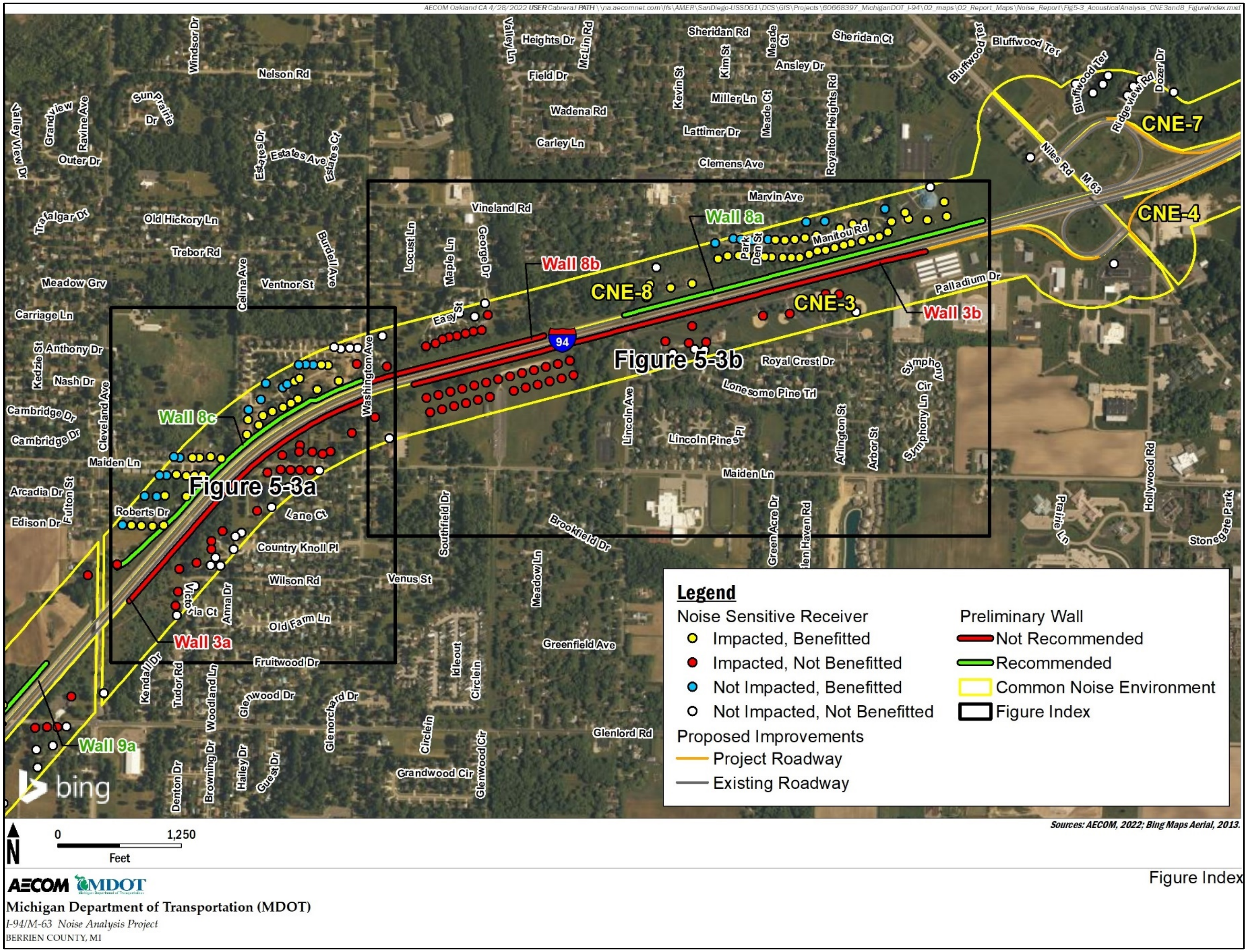


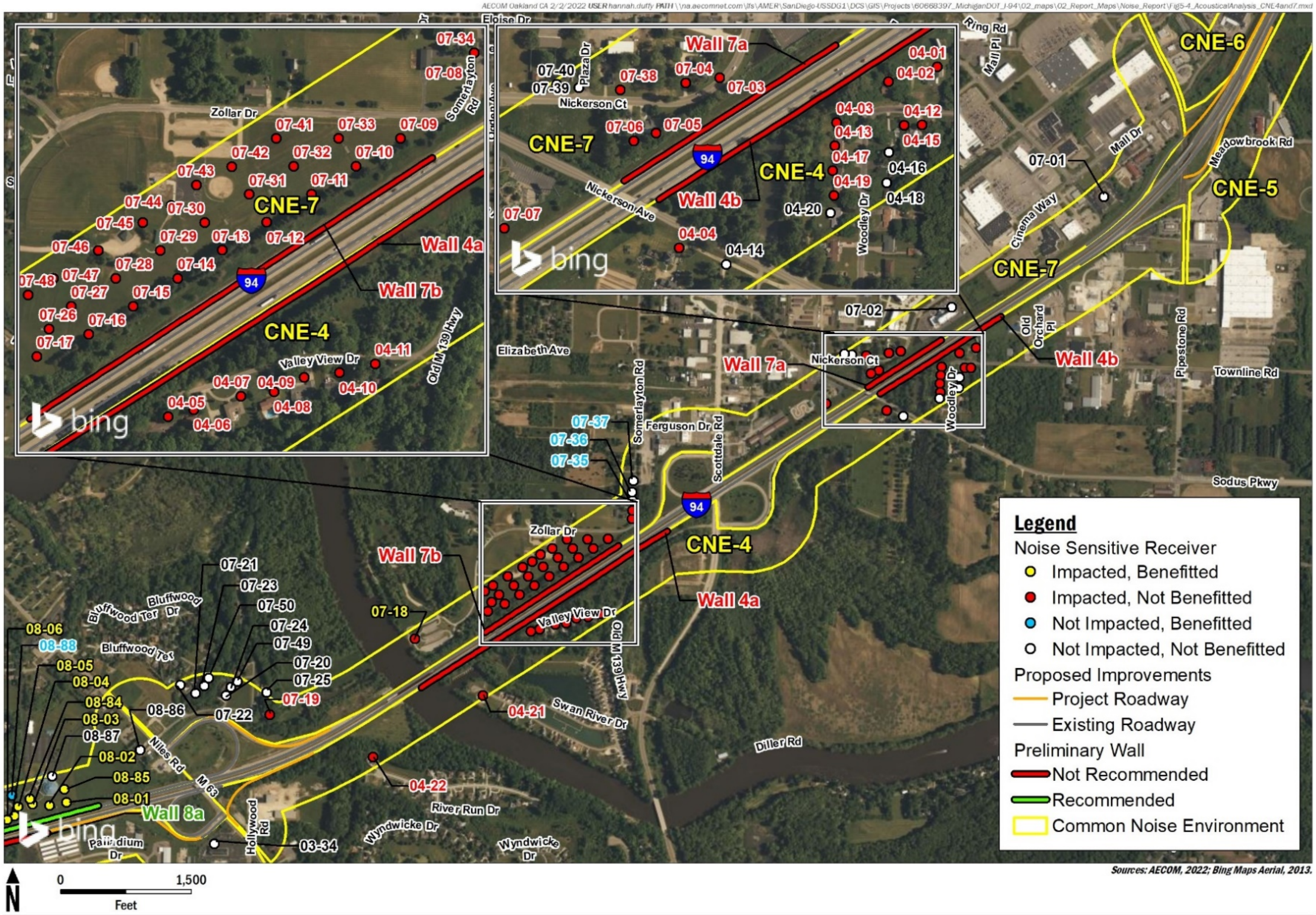
Figure 5-3A Acoustical Analysis for CNE-3, and CNE-8 (Detail Sheet 1 of 2)

Sources: AECOM, 2022; Bing Maps Aerial, 2013.

Figure 5-3B Acoustical Analysis for CNE-3 and CNE-8 (Detail Sheet 2 of 2)

Sources: AECOM, 2022; Bing Maps Aerial, 2013.

Figure 5-4 Acoustical Analysis for CNE-4 and CNE-7



Sources: AECOM, 2022; Bing Maps Aerial, 2013.

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Michigan Department of Transportation (MDOT)

I-94/M-63 Noise Analysis Project

BERRIEN COUNTY, MI

Figure 5-5 Acoustical Analysis for CNE-5 and CNE-6

6. Construction Noise Analysis

FHWA policy requires that construction noise be considered in a Type 1 highway noise analysis. This analysis would generally include the following:

1. Identification of land uses that may be affected by construction noise,
2. Determination of the measures needed in the plans and specifications to minimize or eliminate construction noise impacts; and,
3. Incorporate needed abatement into the plans and specifications.

Neither FHWA nor MDOT identify specific construction noise impact criteria. In addition, the detailed information necessary to predict actual construction noise levels (construction schedules, phasing, equipment lists, laydown areas, etc.) has not yet been determined. However, for this project, it is anticipated that pile driving, and some nighttime construction work will be required.

It is recognized that areas adjacent to the highway right of way and other construction areas (such as staging areas and laydown sites) can temporarily be exposed to high levels of noise during peak construction periods. It is reasonable to assume that the same CNEs identified for potential traffic noise impacts could also be exposed to construction noise. The effect of the noise on the local area can be reduced if the hours and days of construction activity are limited to less sensitive time periods. The project construction standard noise specifications help minimize the effects of construction noise.

The following special provisions may be incorporated into the construction contract:

- Inform the local public in advance of construction activities that may generate particularly high noise levels (such as pile drivers) or periods of nighttime construction activity.
- Noise barriers approved for incorporation into the project should be constructed as close to the beginning of the project's construction timeline as practical.
- Noise created by truck movement shall not exceed 88 dBA at 50 feet.
- When working between 7:00 P.M. and 10:00 P.M., use “smart alarms” instead of standard reverse signal alarms or use spotters. When working between 10:00 P.M. and 7:00 A.M. use spotters instead of auditory alarms.
- Have portable noise meters on the job at all times for noise level spot checks on specific operations. Employ an individual trained in the use of noise meters, with working knowledge of sound measurements and their meaning and use as applied to these abatement/abatement measures.

6.1 Typical Construction Noise Levels

Table 6-1 contains a list of commonly used construction equipment and noise levels associated with using that equipment.

Table 6-1 Typical Construction Equipment Noise Levels

Equivalent Type	Lmax Ref dBA (50 feet)	AUF %
Auger Drill	84	20
Backhoe	78	40
Boring Jack Power Unit	83	50
Chain Saw	84	20
Compactor (ground)	83	20
Compressor (air)	78	40
Concrete Mixer Truck	79	40
Concrete Pump Truck	81	20
Concrete Saw	90	20
Crane	81	16
Dozer	82	40
Drill Rig Truck	79	20
Drum Mixer	80	50
Dump Truck	76	40
Excavator	81	40
Flat Bed Truck	74	40
Front End Loader	79	40
Generator (>25KVA)	81	50
Generator (<25KVA)	73	50
Gradall	83	40
Grader	85	40
Horizontal Boring Jack	82	25
Hoe Ram	90	20
Jackhammer	89	20
Man Lift	75	20
Pavement Scarafier	90	20
Paver	77	50
Pickup Truck	75	40
Pneumatic Tools	85	50
Pumps	81	50
Roller	80	20
Scraper	84	40
Shears (on backhoe)	96	40
Tractor	84	40
Vacuum Excavator	85	40
Vacuum Street Sweeper	82	10
Ventilating Fan	79	100
Vibrating Hopper	87	50
Vibratory Concrete Mixer	80	20
Warning Horn	83	5
Welder/Torch	74	40

Source: FHWA Roadway Construction Noise Model (RCNM) User Guide, Table 1 (actual measured Lmax)
Table 1 (actual measured Lmax; AUF = Acoustic Use factor

6.2 Construction Noise Abatement Measures

Although MDOT does not identify any specific abatement measures related to construction noise, the following list could be considered best practices for the avoidance of any potential problems related to construction noise impacts:

- No construction shall be performed within 1,000 feet of an occupied dwelling unit on Sundays, legal holidays, or between the hours of 10 p.m. and 6 a.m. on other days without the approval of the MDOT construction project manager.
- All equipment used shall have sound-control devices no less effective than those provided on the original equipment. No equipment shall have unmuffled exhaust.

- All equipment shall comply with pertinent equipment noise standards of the U.S. Environmental Protection Agency.
- No pile driving or blasting operations shall be performed within 3,000 feet of an occupied dwelling unit on Sundays, legal holidays, or between the hours of 8 p.m. and 8 a.m. on other days without the approval of the MDOT construction project manager.
- The noise from rock crushing or screening operations performed within 3,000 feet of any occupied dwelling shall be mitigated by strategic placement of material stockpiles between the operation and the affected dwelling or by other means approved by the MDOT construction project manager.

If a specific noise impact complaint is received during construction of the project, the contractor may be required to implement one or more of the following noise abatement measures at the contractor’s expense, as directed by the construction project manager:

- Locate stationary construction equipment as far from nearby noise-sensitive properties as feasible.
- Shut off idling equipment.
- Reschedule construction operations to avoid periods of noise annoyance identified in the complaint.
- Notify nearby residents whenever extremely noisy work will be occurring.
- Install temporary or portable acoustic barriers around stationary construction noise sources.
- Operate electrically powered equipment using line voltage power or solar power.

7. Information for Local Government Officials

FHWA and MDOT policy specify that local officials should be provided appropriate information to assist with future compatible land use planning, especially regarding the planning and development of undeveloped lands near the proposed project right-of-way.

Table 7-1 shows noise impact distance for the 66 dBA and 71 dBA levels for NAC categories B/C (residential, parks, churches. schools, etc.) and E (restaurants and hotels with outdoor use areas), respectively, from major roads in the project area. Future developments should not place applicable noise-sensitive land uses within the distances listed from edge of pavement.

Table 7-1 Noise Impact Distances for Undeveloped Lands

	Distance from the Edge of Pavement (Feet)	
Project Roadway	**71 dBA**	**66 dBA**
I-94	223	406

8. Conclusions and Recommendations

The noise analysis for the proposed project included a total of 16 measurement locations and 249 predicted representative noise levels for noise-sensitive land uses in the project area. The project was split into ten separate CNEs for noise impact analysis within the study area.

All the ten CNEs contained receptors with predicted future noise levels approaching or exceeding the NAC. Noise abatement was considered in the form of noise walls at 18 locations. Five of these walls were found to be feasible and reasonable while the remainder were disqualified for failing to meet some or all feasibility and reasonableness requirements as defined by MDOT. The recommended noise walls should be advanced to the public participation phase to determine viewpoints of benefitted receptors for final determination of reasonableness and inclusion in the project.

9. Statement of Likelihood

Based on the studies thus far accomplished, MDOT intends to install highway traffic noise abatement in the form of barriers presented in Table 5-1 in this document. The preliminary indications of likely abatement measures are based on preliminary design for barrier cost(s) and noise abatement as illustrated in Table 5-2 in this document. If it subsequently develops during final design that these conditions have substantially changed, the abatement measures might not be provided. A final decision of the installation and aesthetics of the abatement measures(s) will be made upon completion of the project’s final design and the Context Sensitive Design process.

10. References

Federal Highway Administration, 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, July 2010. https://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0772.htm

Federal Highway Administration (FHWA). 2011. Highway Traffic Noise: Analysis and Abatement Guidance. U.S. Department of Transportation, Federal Highway Administration, Washington, DC. . https://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/revguidance.pdf

Michigan Department of Transportation, Highway Noise Analysis and Abatement Handbook. July 13, 2011. https://www.michigan.gov/documents/mdot/MDOT_HighwayNoiseAnalysis_and_AbatementHandbook_358156_7.pdf

Appendix A Noise Measurement Data and Documentation

Appendix A contains the following noise measurement data and documentation:

- Short-term Noise Measurement Summary Table
- Noise Measurement Photo Log
- Noise Measurement Field Data Sheets
- Noise Measurement Equipment Calibration Certificates

Short Term Measurement Summary

ID	Location	Average Leq (dBA)	Leq Range (dBA)	Start (hh:mm)	Stop (hh:mm)	Duration (hh:mm)
ST-1A	5148 Ridge Road	70.7	69.0 - 72.3	9:21	9:34	0:14
ST-2	4545 Roosevelt Street	72.7	69.7 - 74.5	9:50	10:04	0:15
ST-2A	Cemetery	68.3	66.8 - 69.5	12:16	12:31	0:16
ST-3	1442 Maiden Lane	74.7	72.8 – 77.0	10:47	11:01	0:15
ST-3A	Eaton Park	74.4	72.3 - 75.9	11:29	11:44	0:16
ST-4	534 Swan River Dr. Trumpeter Bay	66.7	64.2 - 68.8	12:40	12:54	0:15
ST-5	2524 Woodley	72.2	70.4 - 73.5	9:06	9:19	0:14
ST-6	2015 Gaines	69.6	68.3 - 70.8	10:41	10:54	0:14
ST-7	Sierra Boulevard	74.8	73.1 - 76.2	10:39	10:56	0:18
ST-8	1201 Nickerson Court	73.1	71.2 - 75.1	9:07	9:20	0:14
ST-9	280 Somerlayton Road	68.4	65.9 - 70.2	12:40	12:55	0:16
ST-9A	753 Manitou Road	61.4	59.5 - 63.4	11:30	11:47	0:18
ST-10	3605 Terese Path	74.3	72.3 - 75.8	10:48	11:02	0:15
ST-10A	Fox Park	60.3	58.3 - 61.3	12:17	12:30	0:14
ST-11	2179 Welch Drive	72.7	71.3 - 74.8	9:52	10:06	0:15
ST-12	2755 W. Marquette Woods Road	74.8	71.6 - 76.6	9:21	9:36	0:16

Note: All measurement data collected on October 26 and 27, 2021

Noise Measurement Photo Log

ST-01A, 5148 Ridge Road.

	
ST-01 Facing North	ST-01 Facing South

ST-02, 4545 Roosevelt Street

	
ST-02 Facing North	ST-02 Facing South

ST-02a Hickory Bluff Cemetery, 4290 Cleveland Ave.

ST-02a Facing North

ST-02a Facing South

ST-03 1442 Maiden Lane

ST-03 Facing East

ST-03 Facing West

ST-03A Eaton Park

ST-03A Facing North

ST-03A Facing South

ST-04, 534 Swan River Dr. Trumpeter Bayshore

ST-04 Facing North

ST-04 Facing South

ST-05, 2524 Woodley

ST-05 Facing West

ST-05 Facing East

ST-06, 2015. Gaines

-06 Facing West

LT-06 Facing South

ST-07, Sierra Blvd.

	
ST-07 Facing East	ST-07 Facing North

ST-08, 1201 Nickerson Court

	
ST-08 Facing Southeast	ST-08 Facing North

ST-09, 280 Somerlayton Road

	
ST-09 Facing Southeast	ST-09 Facing Northwest

ST-10, 3605 Terese Path

	
ST-10 Facing Southeast	ST-10 Facing North

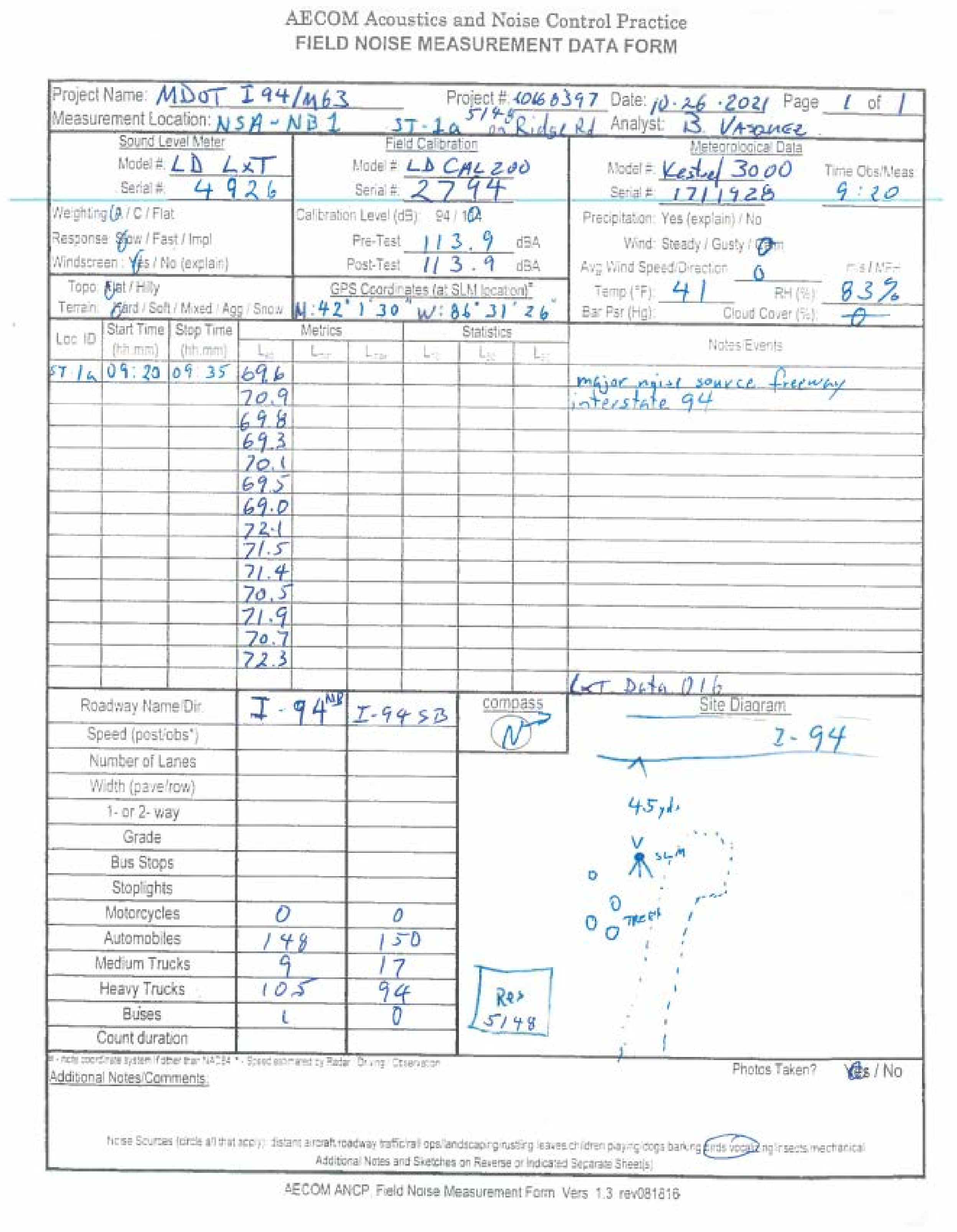
ST-11, 2179 Welch Drive

	
LT-11 Facing North	LT-11 Facing South

ST-12, 2755 W. Maquette Woods Road

	
LT-12 Facing North	LT-12 Facing South

Field Data Sheets



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63
Project #: 60660397
Date: 10-26-2021
Page 1 of 1
Measurement Location: NSA-NB1 ST-1a 5148 on Ridge Rd
Analyst: B. Vasquez

Sound Level Meter Model #: LD LxT Serial #: 4926	**Field Calibration** Model #: LD CAL200 Serial #: 2794	**Meteorological Data** Model #: Kestrel 3000 Serial #: 1711928 Time Obs/Meas: 9:20
Weighting: [✓ A] / C / Flat Response: [✓ Slow] / Fast / Impl Windscreen: [✓ Yes] / No (explain)	Calibration Level (dB): 94 / [✓ 114] Pre-Test 113.9 dBA Post-Test 113.9 dBA	Precipitation: Yes (explain) / No Wind: Steady / Gusty / [✓ Calm] Avg Wind Speed/Direction 0 m/s / MPH
Topo: [✓ Flat] / Hilly Terrain: [✓ Hard] / Soft / Mixed / Agg / Snow	GPS Coordinates (at SLM location)* N:42°1'30" W:86°31'26"	Temp (°F): 41 RH (%): 83% Bar Psr (Hg): Cloud Cover (%): 0

Loc ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
ST-1a	09:20	09:35	69.6						major noise source freeway
			70.9						interstate 94
			69.8						
			69.3						
			70.1						
			69.5						
			69.0						
			72.1						
			71.5						
			71.4						
			70.5						
			71.9						
			70.7						
			72.3						
									LxT Data 016

Roadway Name/Dir.	I-94 NB	I-94 SB
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	0	0
Automobiles	148	150
Medium Trucks	9	17
Heavy Trucks	105	94
Buses	1	0
Count duration		

compass
N

Site Diagram

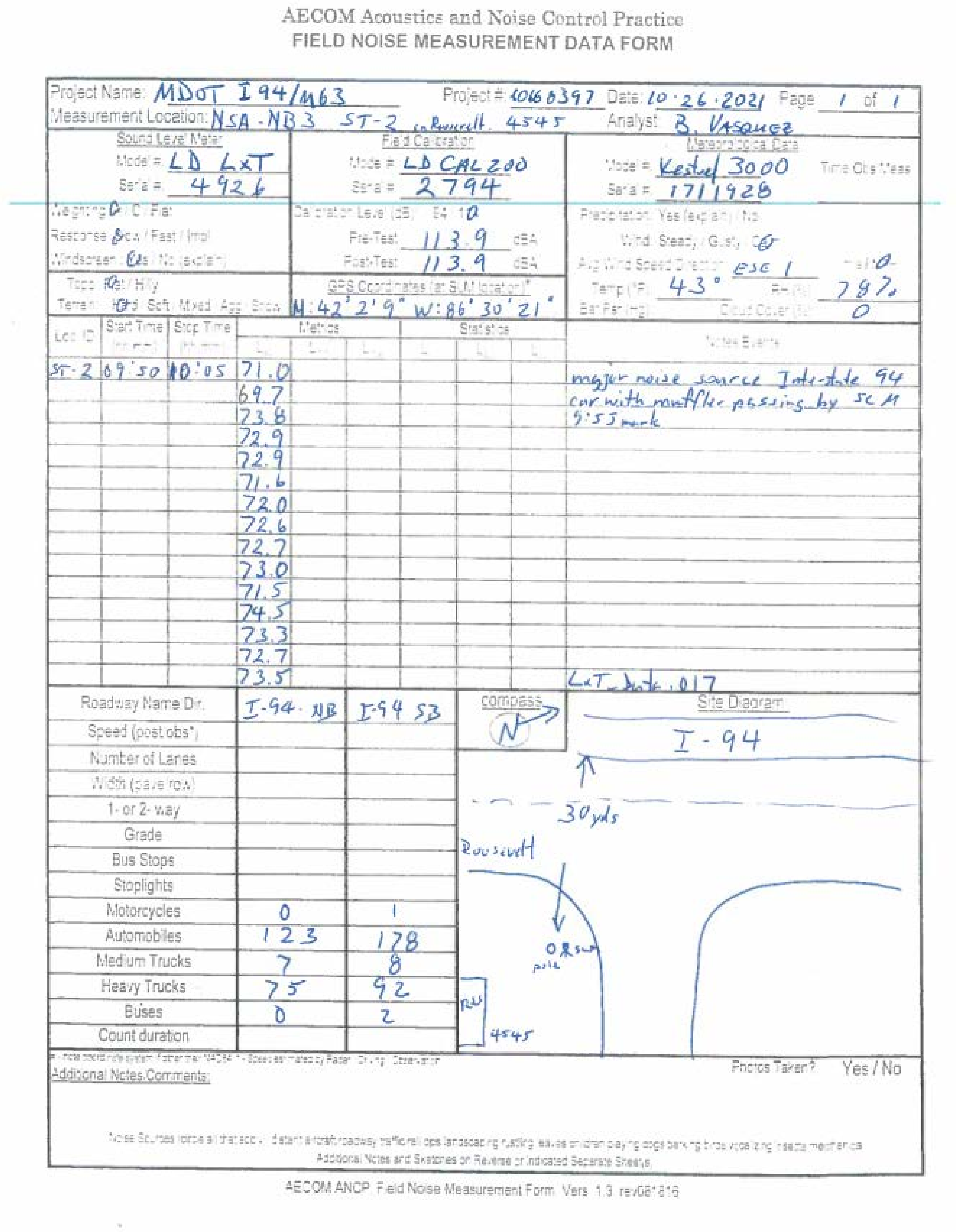
- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

Additional Notes/Comments:

Photos Taken? [✓ Yes] / No

Noise Sources (circle all that apply): distant aircraft/roadway traffic/rail ops/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081816



AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I 94/M63 Project #: 40660397 Date: 10·26·2021 Page 1 of 1

Measurement Location: NSA-NB3 ST-2 on Roosevelt. 4545 Analyst: B. Vasquez

Sound Level Meter	Field Calibrator	Meteorological Data
Model #: LD LxT	Model #: LD CAL200	Model #: Kestrel 3000 Time Obs/Meas
Serial #: 4926	Serial #: 2794	Serial #: 1711928
Weighting: [✓ A] / C / Flat	Calibration Level (dB): 94 / 1[illegible]	Precipitation: Yes (explain) / No
Response: [✓ Slow] / Fast / Impl	Pre-Test: 113.9 dBA	Wind: Steady / Gusty / [✓ Calm]
Windscreen: [✓ Yes] / No (explain)	Post-Test: 113.9 dBA	Avg Wind Speed/Direction: ESE 1 Peak: 0
Topo: [✓ Flat] / Hilly	GPS Coordinates (at SLM location)*	Temp (°F): 43° RH (%): 78%
Terrain: [✓ Hard] / Soft / Mixed / Agg / Snow	N: 42° 2' 9" W: 86° 30' 21"	Bar Press (inHg): Cloud Cover (%): 0

Loc ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes Events
			L_{eq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}	
ST-2	09:50	10:05	71.0						major noise source Inter-state 94
			69.7						car with muffler passing by 5C M
			73.8						9:53 mark
			72.9						
			72.9						
			71.6						
			72.0						
			72.6						
			72.7						
			73.0						
			71.5						
			74.5						
			73.3						
			72.7						
			73.5						LxT_data.017

Roadway Name Dir.	I-94 NB	I-94 SB
Speed (post obs**)		
Number of Lanes		
Width (pave row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	0	1
Automobiles	123	178
Medium Trucks	7	8
Heavy Trucks	75	92
Buses	0	2
Count duration		

compass

Site Diagram

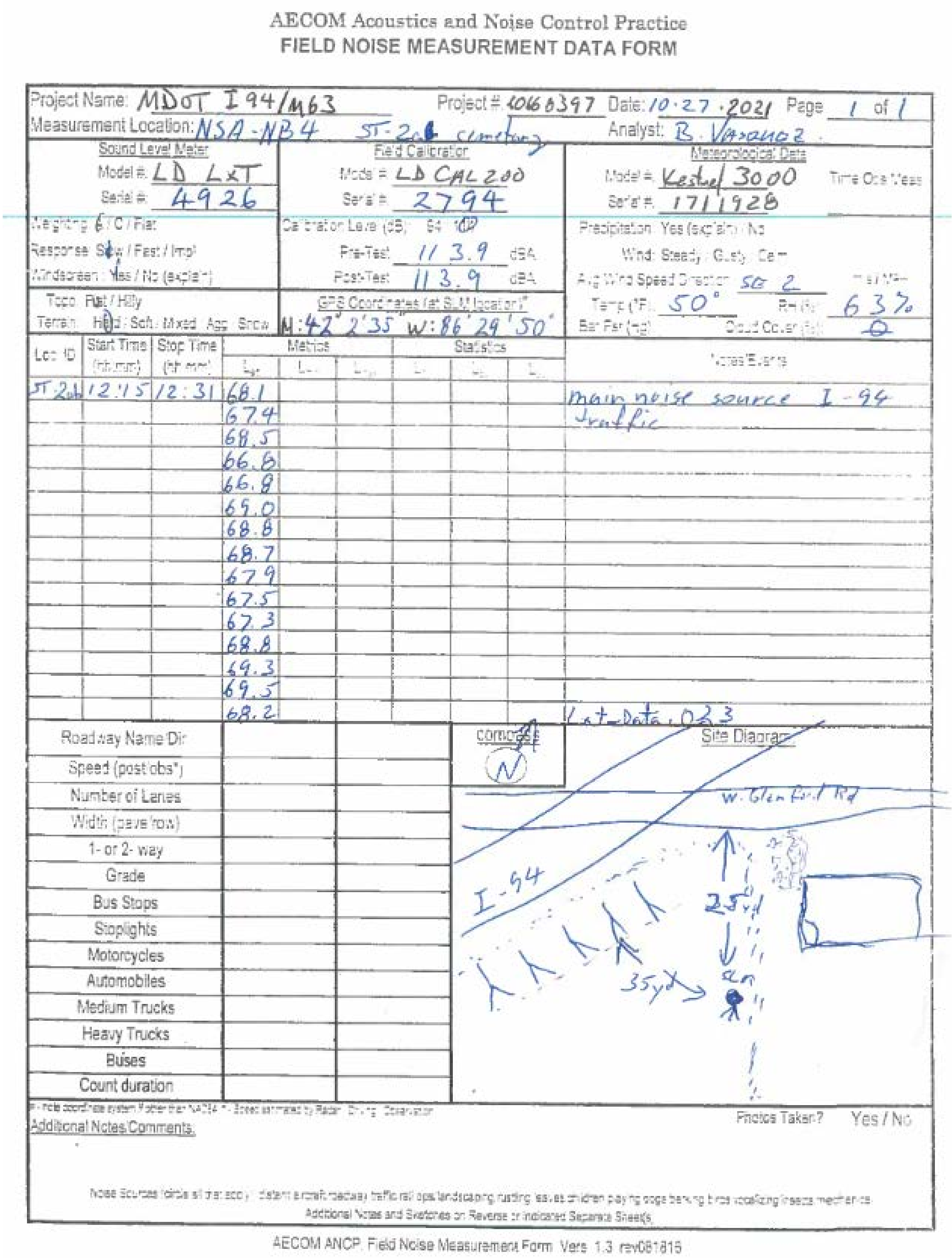
* - note coordinate system if other than NAD83 ** - Speed estimated by Radar / Driving / Observation

Additional Notes/Comments: Photos Taken? Yes / No

Noise Sources (circle all that apply): distant aircraft/roadway traffic/rail ops/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects/mechanicals

Additional Notes and Sketches on Reverse or Indicated Separate Sheets

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081815



AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I 94/M63 Project #: 60668397 Date: 10·27·2021 Page 1 of 1

Measurement Location: NSA-NB4 ST-2b cemetery

Analyst: B. Vazquez

Sound Level Meter	Field Calibrator	Meteorological Data
Model #: LD LxT	Model #: LD CAL 200	Model #: Kestrel 3000
Serial #: 4926	Serial #: 2794	Serial #: 1711928
		Time Obs Meas
Weighting: [✓ A] / C / Flat	Calibration Level (dB): 94 [✓ 114]	Precipitation: Yes (explain) / No
Response: [✓ Slow] / Fast / Impl	Pre-Test: 113.9 dBA	Wind: Steady / Gusty / Calm
Windscreen: [✓ Yes] / No (explain)	Post-Test: 113.9 dBA	Avg Wind Speed Direction: SE 2 Max MPH
Topo: [✓ Flat] / Hilly	GPS Coordinates (at SLM location)*	Temp (°F): 50° RH (%): 63%
Terrain: [✓ Hard] / Soft / Mixed / Agg / Snow	N: 42° 2' 35" W: 86° 29' 50"	Bar Pér (inHg) Cloud Cover (%): 0

Loc ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			Leq	Lmax	Lmin	L	L	L	
ST-2b	12:15	12:31	68.1						main noise source I-94
			67.4						traffic
			68.5						
			66.8						
			66.8						
			69.0						
			68.8						
			68.7						
			67.9						
			67.5						
			67.3						
			68.8						
			69.3						
			69.5						
			68.2						Lxt_Data.023

Roadway Name/Dir		
Speed (post/obs**)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

Compass

Site Diagram

* - note coordinate system if other than NAD84 ** - Speed estimated by Radar, Driving, Observation

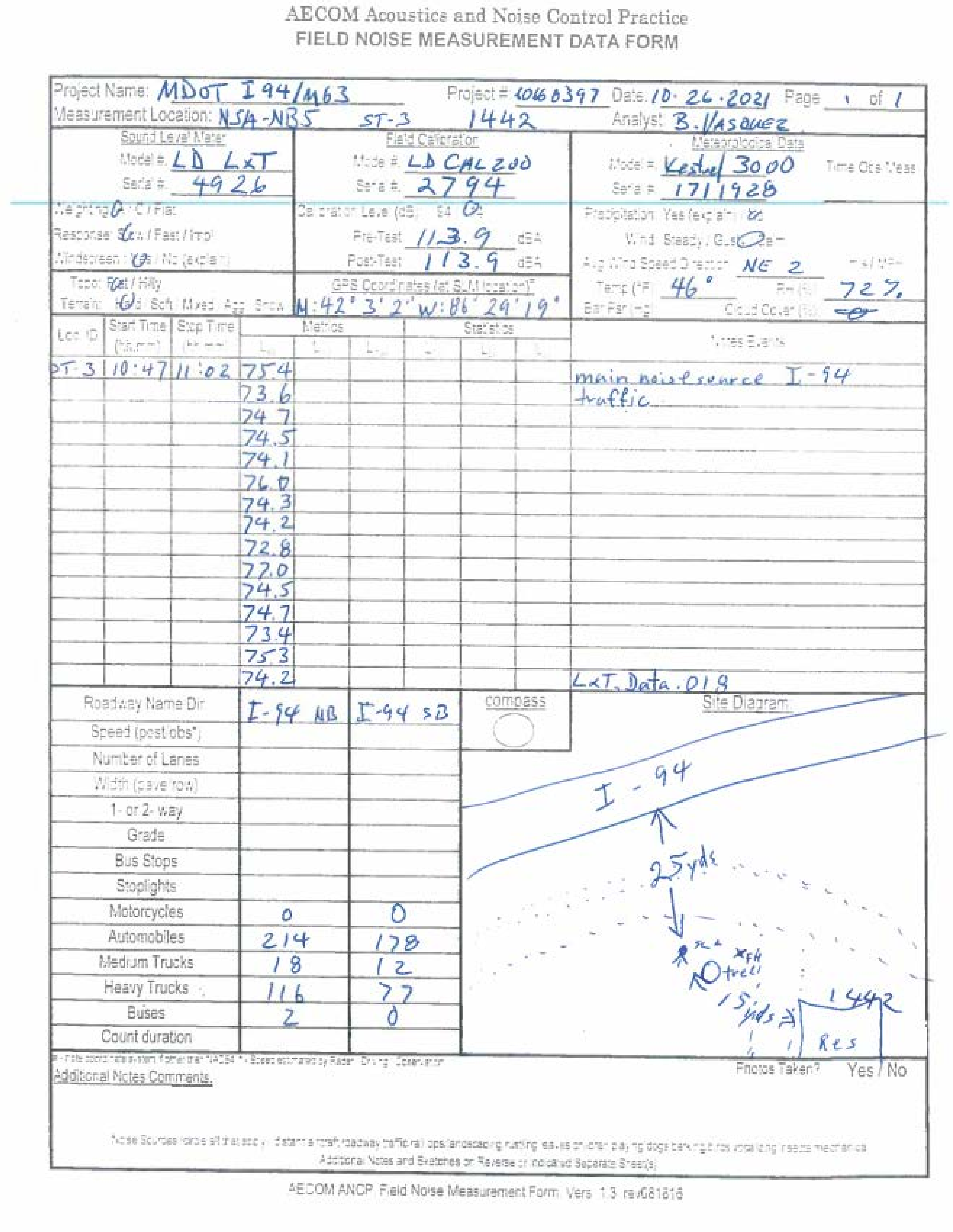
Additional Notes/Comments:

Photos Taken? Yes / No

Noise Sources (circle all that apply): distant aircraft, roadway traffic, rail ops, landscaping, rustling leaves, children playing, dogs barking, birds vocalizing, insects, mechanics

Additional Notes and Sketches on Reverse or indicated Separate Sheet(s)

AECOM ANCP: Field Noise Measurement Form Vers 1.3 rev081815



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project # 60660397 Date: 10·26·2021 Page 1 of 1
Measurement Location: NSA-NB5 ST-3 1442 Analyst: B. Vasquez

Sound Level Meter
Model #: LD LxT
Serial #: 4926

Field Calibrator
Model #: LD CAL200
Serial #: 2794

Meteorological Data
Model #: Kestrel 3000
Serial #: 1711928
Time Obs/Meas

Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Calibration Level (dB): 94 0
Pre-Test 113.9 dBA
Post-Test 113.9 dBA

Precipitation: Yes (explain) / [✓ No]
Wind: Steady / Gusty / [✓ Calm]
Avg Wind Speed Direction NE 2 mph / MPH

Topo: [✓ Flat] / Hilly
Terrain: [✓ Hard] / Soft / Mixed / Agg / Snow

GPS Coordinates (at SLM location)#
N: 42° 3' 2" W: 86° 29' 19"

Temp (°F) 46°
RH (%) 72%
Bar Press (Hg)
Cloud Cover (%) -0-

Loc ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes Events
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
ST-3	10:47	11:02	75.4						main noise source I-94
			73.6						traffic
			74.7						
			74.5						
			74.1						
			76.0						
			74.3						
			74.2						
			72.8						
			72.0						
			74.5						
			74.7						
			73.4						
			75.3						
			74.2						LxT_Data.018

Roadway Name Dir	I-94 NB	I-94 SB
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	0	0
Automobiles	214	178
Medium Trucks	18	12
Heavy Trucks	116	77
Buses	2	0
Count duration		

compass

Site Diagram

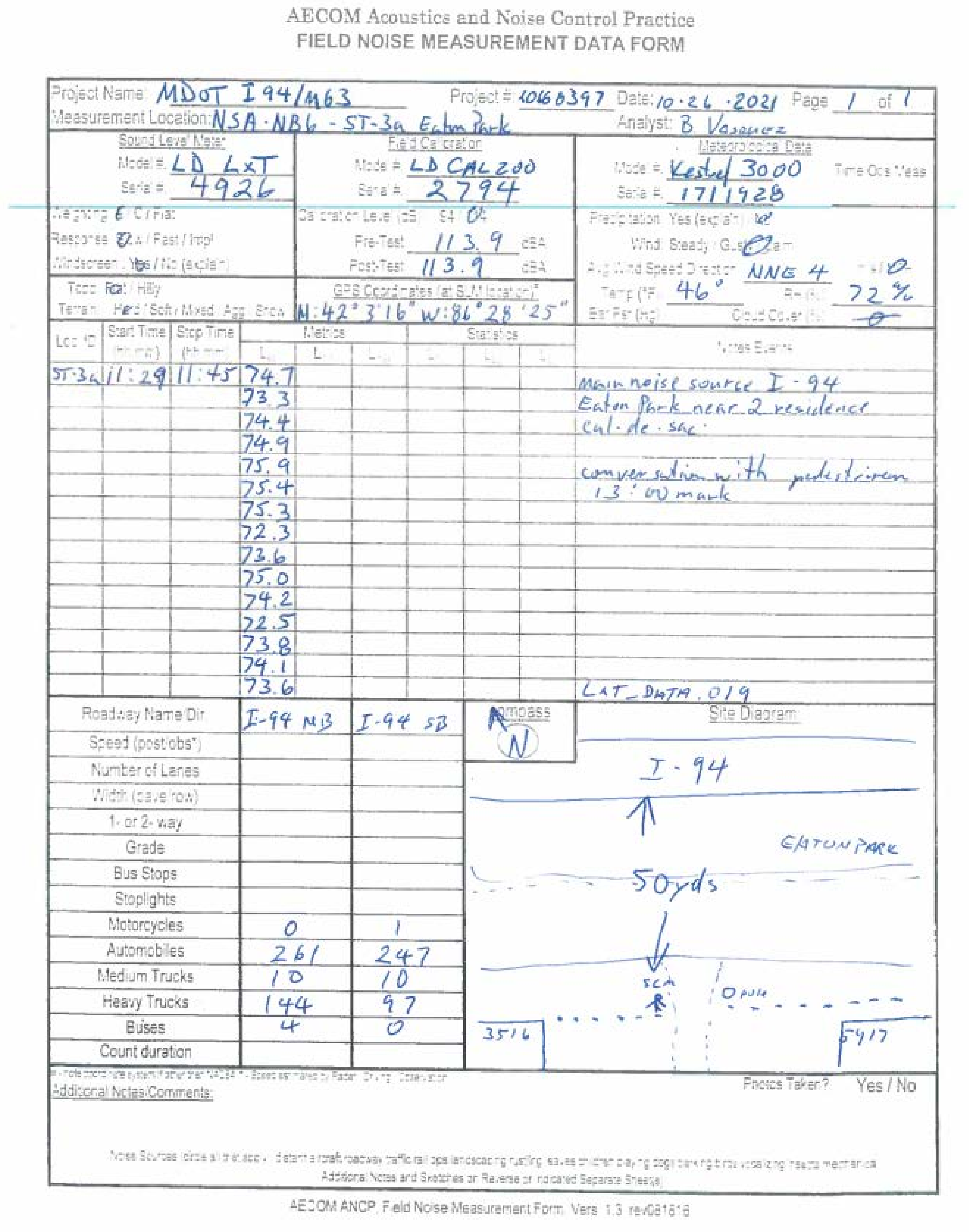
- note coordinate system if other than NAD83 * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes / No

Additional Notes Comments:

Noise Sources (circle all that apply): distant aircraft / roadway traffic / rail ops / landscaping / rustling leaves / children playing / dogs barking / birds vocalizing / insects / mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081816



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I 94/M63
Project #: 10660397
Date: 10 · 26 · 2021
Page 1 of 1
Measurement Location: NSA · NB6 - ST-3a Eaton Park
Analyst: B Vasquez

Sound Level Meter
Model #: LD LxT
Serial #: 4926
Weighting [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: LD CAL200
Serial #: 2794
Calibration Level (dB): 94 / 0
Pre-Test: 113.9 dBA
Post-Test: 113.9 dBA

Meteorological Data
Model #: Kestrel 3000
Serial #: 1711928
Precipitation: Yes (explain) / No
Wind: Steady / Gusty / Calm 0
Avg Wind Speed Direction: NNE 4
Temp (°F): 46°
RH (%): 72 %
Bar Pr (Hg):
Cloud Cover (%): 0

Topo: [✓ Flat] / Hilly
Terrain: Hard / Soft / Mixed / Agg / Snow
GPS Coordinates (at SLM location): N:42° 3' 16" W:86° 28' 25"

Loc ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L	L	L	L	L	L	
ST-3a	11:29	11:45	74.7						
			73.3						main noise source I - 94
			74.4						Eaton Park near 2 residence
			74.9						cul · de · sac
			75.9						
			75.4						conversation with pedestrian
			75.3						13 : 00 mark
			72.3						
			73.6						
			75.0						
			74.2						
			72.5						
			73.8						
			74.1						
			73.6						LAT_DATA . 019

Roadway Name/Dir	I-94 NB	I-94 SB
Speed (post/obs*)		
Number of Lanes		
Width (pave row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	0	1
Automobiles	261	247
Medium Trucks	10	10
Heavy Trucks	144	97
Buses	4	0
Count duration		

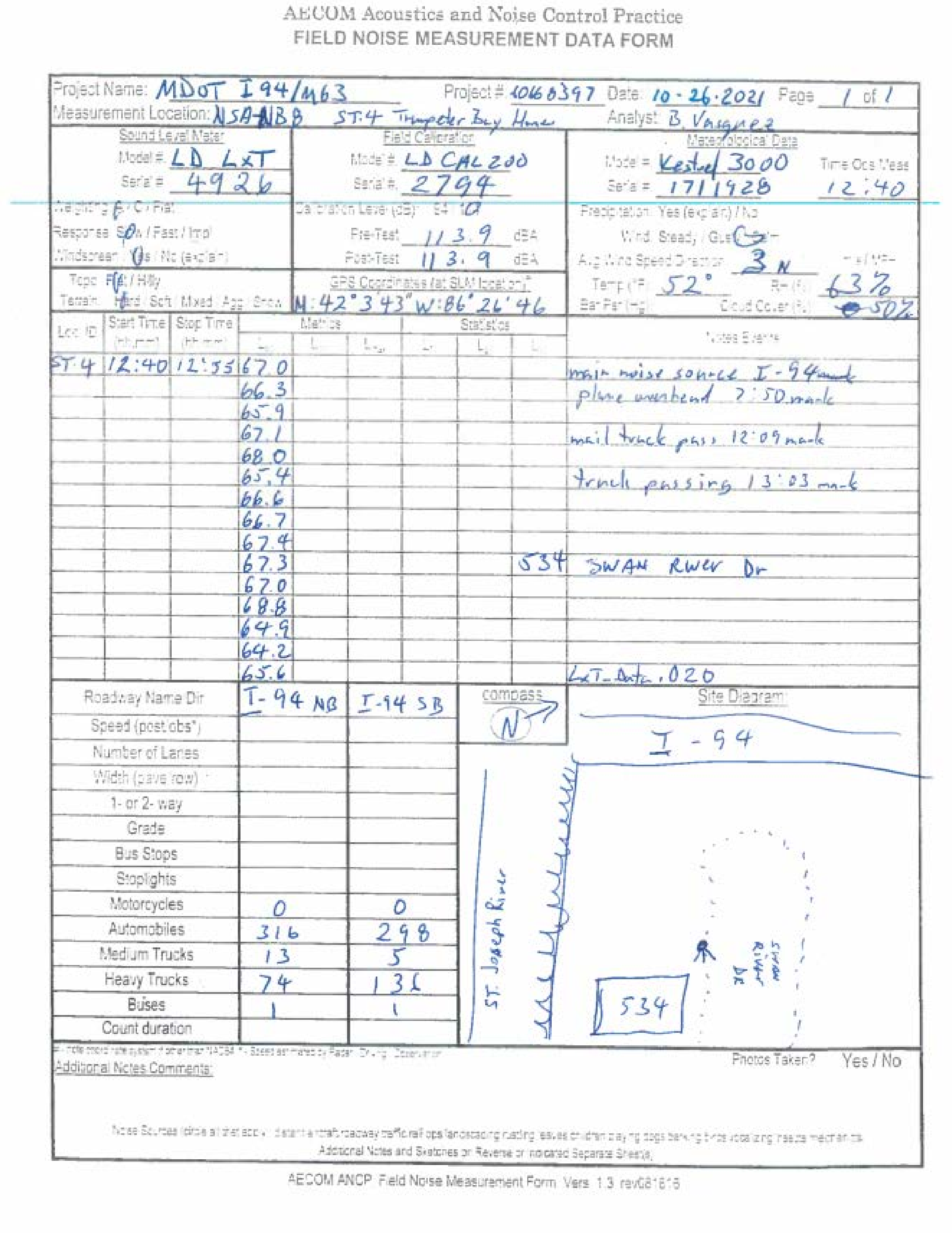
Compass

Site Diagram

Additional Notes/Comments:

Photos Taken? Yes / No

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081618



AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63
Project #: 60668397
Date: 10-26-2021
Page 1 of 1
Measurement Location: ~~NSA~~ NBB ST.4 Trumpeter Bay Home
Analyst: B. Vasquez

Sound Level Meter
Model #: LD LxT
Serial #: 4926
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: LD CAL200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test 113.9 dBA
Post-Test 113.9 dBA

Meteorological Data
Model #: Kestrel 3000
Serial #: 1711928
Time Obs Meas 12:40
Precipitation: Yes (explain) / No
Wind: Steady / [✓ Gusty] / Calm
Avg Wind Speed Direction 3 N mps / MPH
Temp (°F) 52°
RH (%) 63%
Bar Pres (inHg)
Cloud Cover (%) 50%

Topo: [✓ Flat] / Hilly
Terrain: [✓ Hard] / Soft / Mixed / Agg / Snow

GPS Coordinates (at SLM location)*: N:42°3'43" W:86°26'46

Loc ID (hh:mm)	Start Time (hh:mm)	Stop Time	Metrics L	L	L	Statistics L	L	L	Notes Events
ST.4	12:40	12:55	67.0						main noise source I-94 and
			66.3						plane overhead 2:50 mark
			65.9						
			67.1						mail truck pass 12:09 mark
			68.0						
			65.4						truck passing 13:03 mark
			66.6						
			66.7						
			67.4						
			67.3					534	SWAN RIVER Dr
			67.0						
			68.8						
			64.9						
			64.2						
			65.6						LxT_Data.020

Roadway Name Dir	I-94 NB	I-94 SB
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles	0	0
Automobiles	316	298
Medium Trucks	13	5
Heavy Trucks	74	131
Buses	1	1
Count duration		

compass

Site Diagram:

* - note coordinate system if other than NAD83 * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes / No

Additional Notes Comments:

Noise Sources (circle all that apply): distant aircraft, roadway traffic, rail ops, landscaping, rustling leaves, children playing, dogs barking, birds vocalizing, hvac/mechanicals

Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081616

AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project #: 60608397 Date: 10.27.2021 Page 1 of 1

Measurement Location: NSA-NB9 ST-5 2524 Woodley Analyst: B Vasquez

Sound Level Meter

Model = LD LxT

Serial = 4926

Weighting: A / C / Flat

Response: Slow / Fast / Impulse

Windscreen: Yes / No (explain)

Topo: Flat / Hilly

Terrain: Hard / Soft / Mixed / Other

Field Calibrator

Model = LD CAL200

Serial = 2794

Calibration Level (dB): 94 0

Pre-Test 113.9 dBA

Post-Test 113.9 dBA

GPS Coordinates (at SLM location)*

N:42° 4'21" W:86°25'36"

Meteorological Data

Model = Kestrel 3000

Serial = 1711928

Time Obs Meas 09:05

Precipitation: Yes (explain) / No

Wind: Steady / Gusty / Calm

Avg Wind Speed/Direction 0 mi/MPH

Temp (F) 34° RH (%) 90%

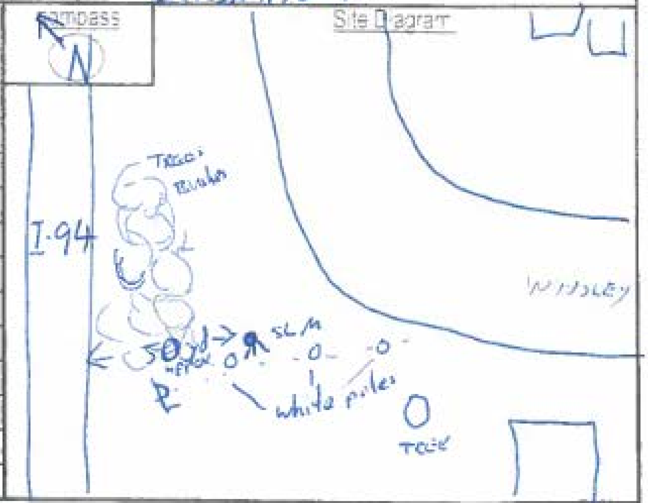
Baro (inHg) Cloud Cover (%) 0

Loc ID	Start Time	Stop Time	Metrics			Statistics			Notes/Events
ST-5	09:05	09:20	71.3						main noise source I-94
			72.1						TRAFFIC
			72.4						
			71.3						
			72.9						
			72.2						
			70.4						
			73.5						
			73.0						
			71.3						
			72.4						
			72.0						
			72.9						
			71.7						
			73.4						LxT DATA.021

Roadway Name Dir		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

Compass

Site Diagram



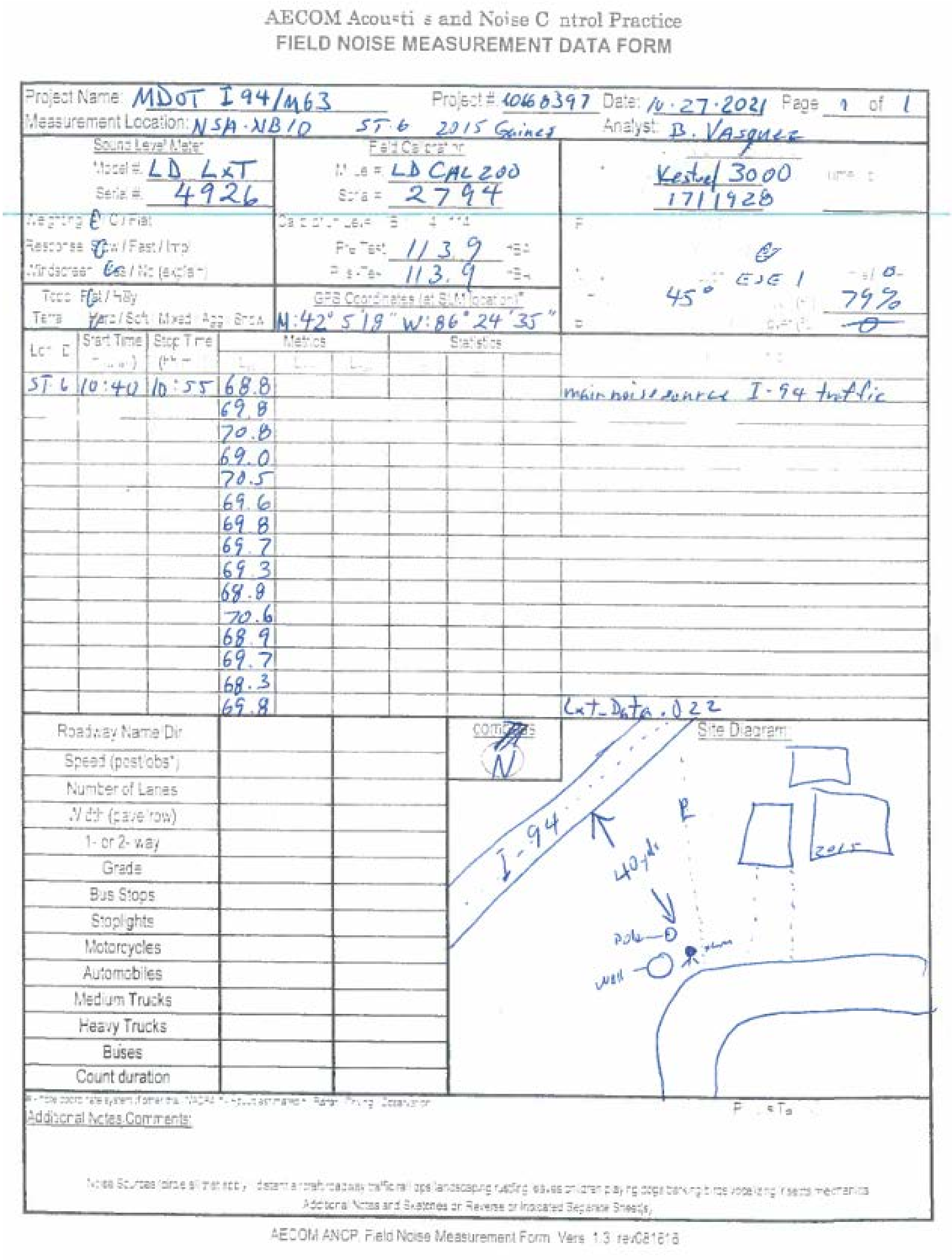
Photos Taken? Yes / No

Additional Notes/Comments

Noise Sources (circle all that apply): distant aircraft roadway traffic rail ops landscaping rustling leaves children playing dogs barking birds vocalizing insects mechanical

Additional Notes and Sketches on Reverse or Indicated Separate Sheets

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081816



AECOM Acousti s and Noise C ntrol Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I 94/M63 Project #: 60668397 Date: 10·27·2021 Page 1 of 1
Measurement Location: NSA·NB10 ST·6 2015 Gaines Analyst: B. Vasquez

Sound Level Meter
Model #: LD LxT
Serial #: 4926

Field Calibrator
Model #: LD CAL200
Serial #: 2794

Kestrel 3000
171928

Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Imp
Windscreen: [✓ Yes] / No (explain)

Pre-Test: 113.9 dBA
Post-Test: 113.9 dBA

45° ENE 1 0-
79%
-0-

Topo: [✓ Flat] / Hilly
Terrain: [✓ Hard] / Soft / Mixed / Agg / Brick

GPS Coordinates (at SLM location)*
N:42° 5'18" W:86° 24'35"

Loc ID	Start Time	Stop Time	Metrics			Statistics			
ST·6	10:40	10:55	68.8						main noise source I-94 traffic
			69.8						
			70.8						
			69.0						
			70.5						
			69.6						
			69.8						
			69.7						
			69.3						
			68.8						
			70.6						
			68.9						
			69.7						
			68.3						
			69.8						Lxt_Data.022

Roadway Name/Dir		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

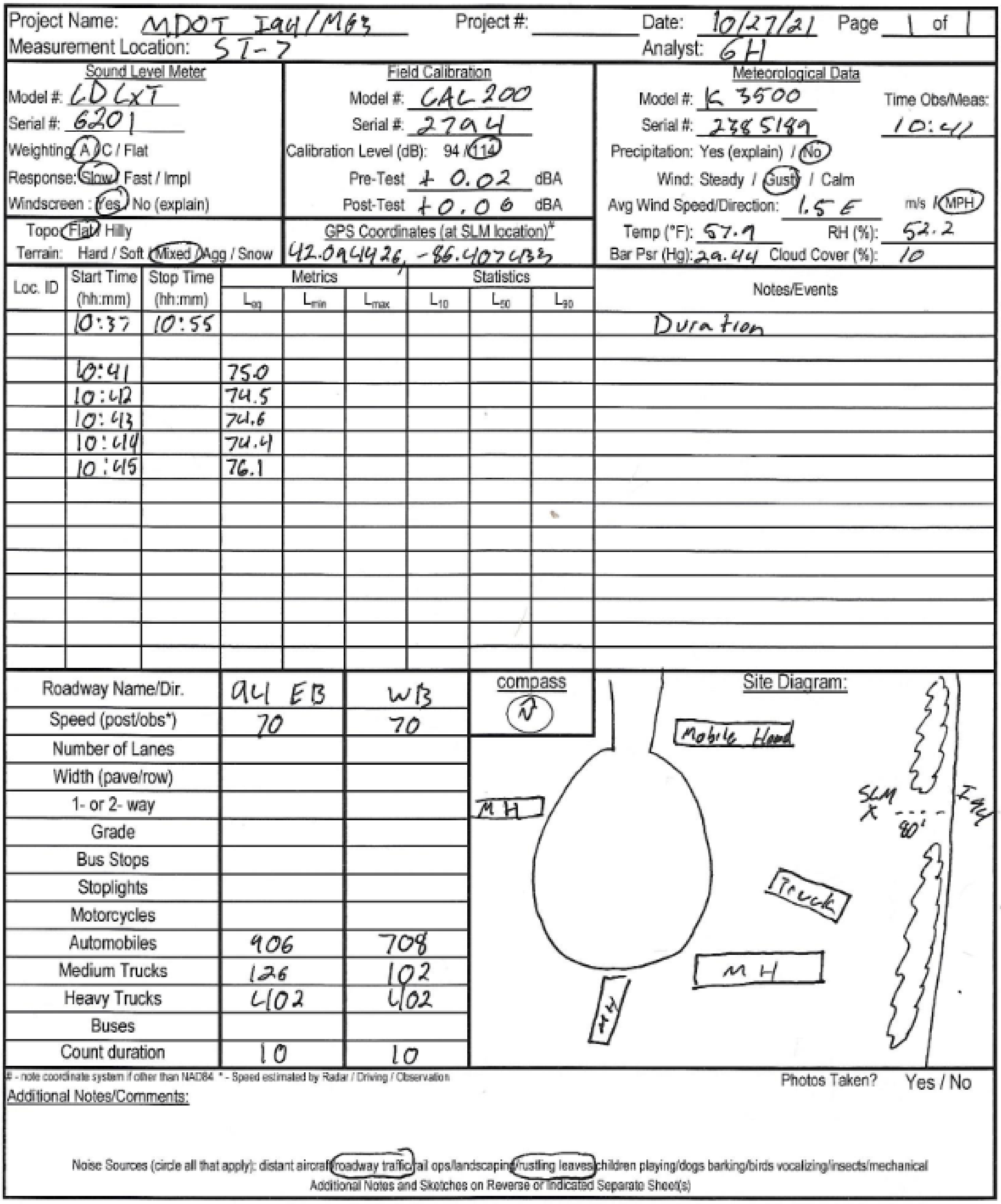
Compass

Site Diagram:

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft roadway traffic rail ops landscaping rustling leaves children playing dogs barking birds vocalizing insects mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheets

AECOM ANCP Field Noise Measurement Form Vers 1.3 rev081618



Project Name: MDOT I94/M63 Project #: ____ Date: 10/27/21 Page 1 of 1
Measurement Location: ST-7 Analyst: GH

Sound Level Meter
Model #: LD LxT
Serial #: 6201
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: CAL200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test + 0.02 dBA
Post-Test +0.06 dBA

Meteorological Data
Model #: K 3500
Serial #: 2385189
Time Obs/Meas: 10:41
Precipitation: Yes (explain) / [✓ No]
Wind: Steady / [✓ Gusty] / Calm
Avg Wind Speed/Direction: 1.5 E m/s / [✓ MPH]
Temp (°F): 57.9 RH (%): 52.2
Bar Psr (Hg): 29.44 Cloud Cover (%): 10

Topo: [✓ Flat] / Hilly
Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

GPS Coordinates (at SLM location)#
42.094426, -86.407433

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
	10:37	10:55							Duration
	10:41		75.0						
	10:42		74.5						
	10:43		74.6						
	10:44		74.4						
	10:45		76.1						

Roadway Name/Dir.	94 EB	WB
Speed (post/obs*)	70	70
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles	406	708
Medium Trucks	126	102
Heavy Trucks	402	402
Buses		
Count duration	10	10

compass
N

Site Diagram:

Mobile Home
MH
SLM
80'
I-94
Truck
MH
MH

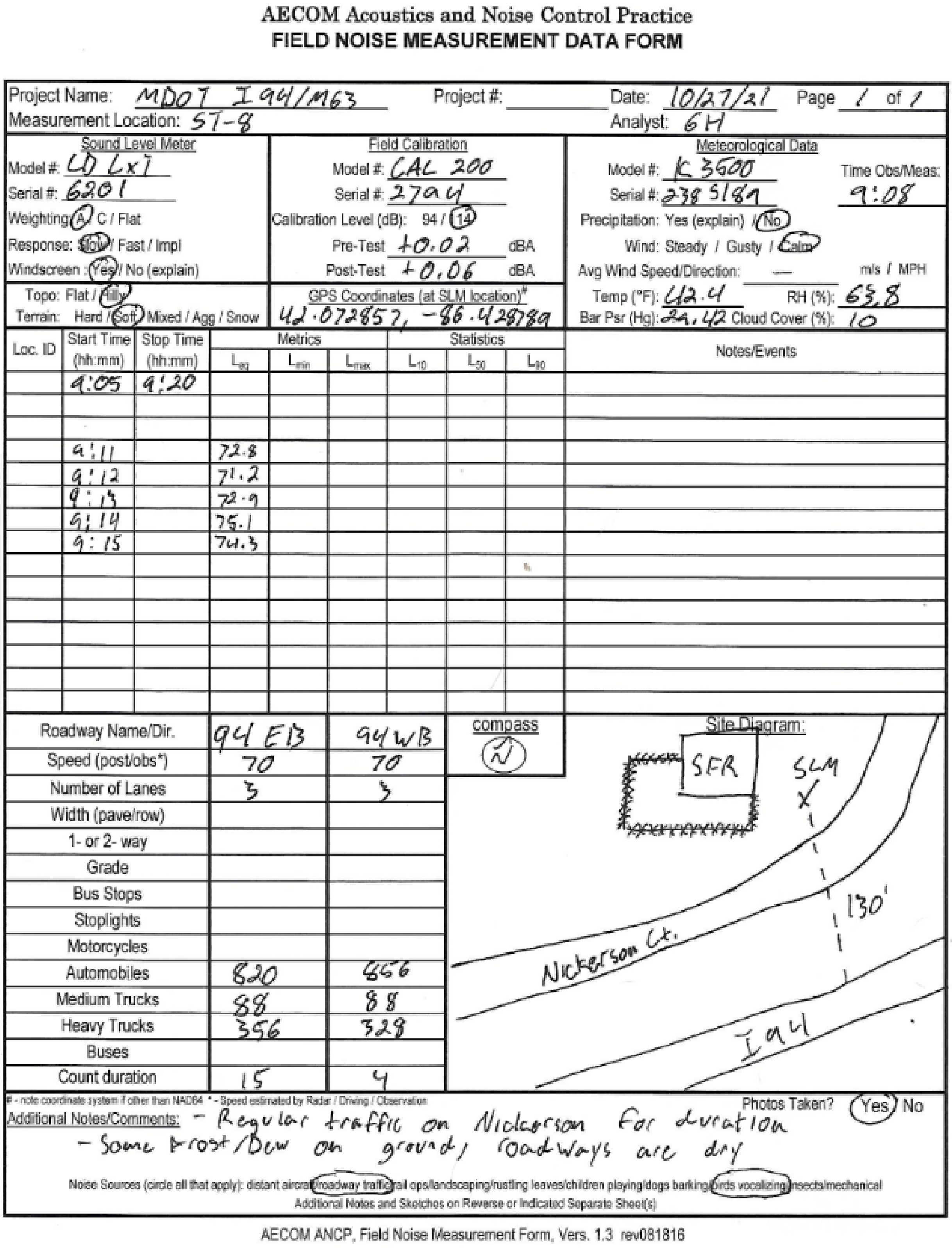
- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

Photos Taken? Yes / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/[✓ rustling leaves]/children playing/dogs barking/birds vocalizing/insects/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project #: ______ Date: 10/27/21 Page 1 of 1
Measurement Location: ST-8 Analyst: GH

Sound Level Meter
Model #: LD LxT
Serial #: 6201
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: CAL 200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test +0.02 dBA
Post-Test +0.06 dBA

Meteorological Data
Model #: K 3500
Serial #: 2385189
Time Obs/Meas: 9:08
Precipitation: Yes (explain) / [✓ No]
Wind: Steady / Gusty / [✓ Calm]
Avg Wind Speed/Direction: — m/s / MPH
Temp (°F): 42.4 RH (%): 63.8
Bar Psr (Hg): 29.42 Cloud Cover (%): 10

Topo: Flat / [✓ Hilly]
Terrain: Hard / [✓ Soft] / Mixed / Agg / Snow

GPS Coordinates (at SLM location)#
42.072857, -86.428789

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
	9:05	9:20							
	9:11		72.8						
	9:12		71.2						
	9:13		72.9						
	9:14		75.1						
	9:15		74.3						

Roadway Name/Dir.	94 EB	94 WB
Speed (post/obs*)	70	70
Number of Lanes	3	3
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles	820	856
Medium Trucks	88	88
Heavy Trucks	356	329
Buses		
Count duration	15	4

compass

Site Diagram:

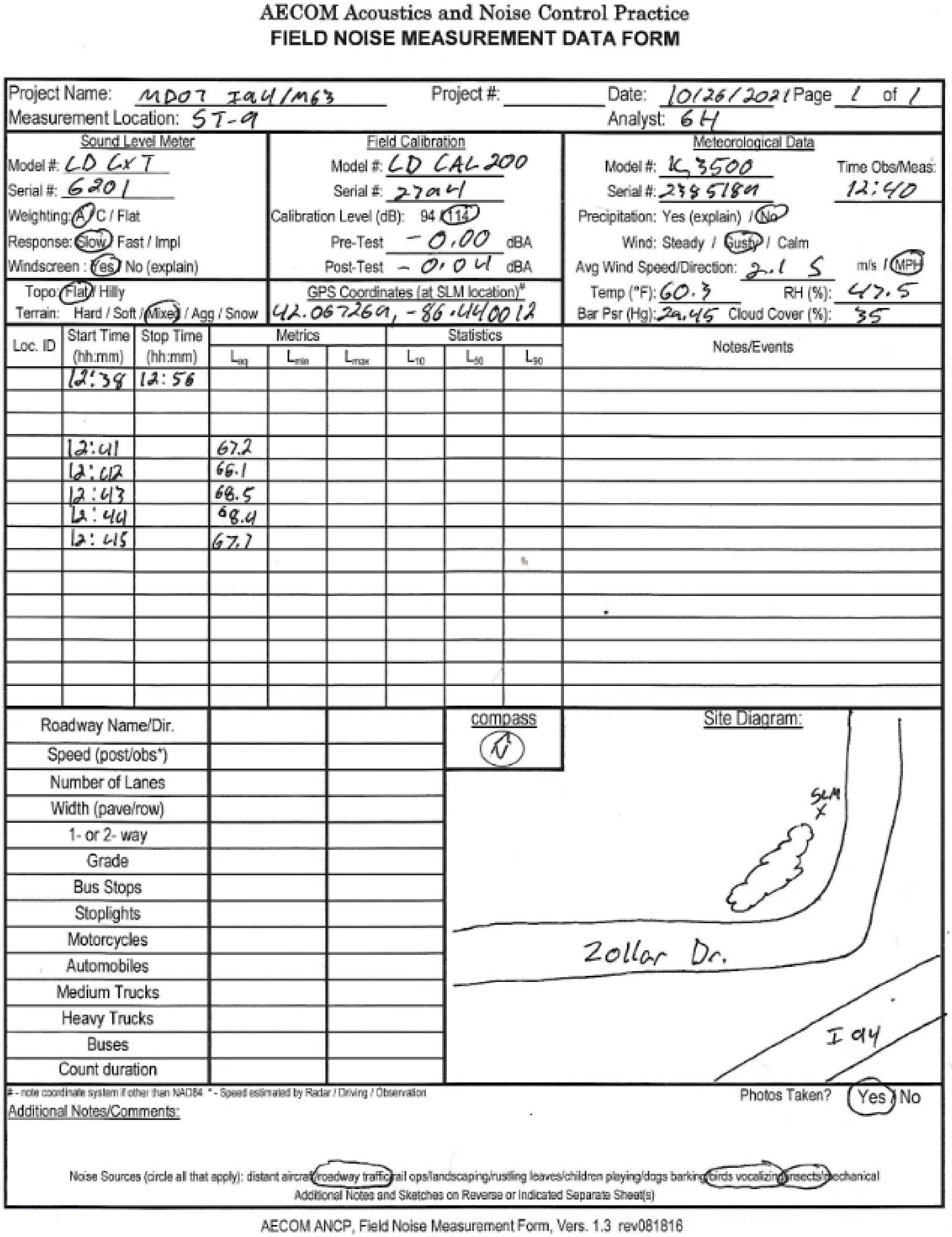
- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

Photos Taken? [✓ Yes] No

Additional Notes/Comments: - Regular traffic on Nickerson for duration
- Some Frost/Dew on ground, roadways are dry

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project #: ______ Date: 10/26/2021 Page 1 of 1
Measurement Location: ST-9 Analyst: GH

Sound Level Meter

Model #: LD CxT
Serial #: 6201
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen : [✓ Yes] / No (explain)

Field Calibration

Model #: LD CAL200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test -0.00 dBA
Post-Test -0.04 dBA

Meteorological Data

Model #: K3500
Serial #: 2385189
Time Obs/Meas: 12:40
Precipitation: Yes (explain) / [✓ No]
Wind: Steady / [✓ Gusty] / Calm
Avg Wind Speed/Direction: 2.1 S m/s / [✓ MPH]
Temp (°F): 60.3 RH (%): 47.5
Bar Psr (Hg): 29.45 Cloud Cover (%): 35

Topo: [✓ Flat] / Hilly
Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

GPS Coordinates (at SLM location)#
42.067269, -86.440012

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
	12:38	12:56							
	12:41		67.2						
	12:42		66.1						
	12:43		68.5						
	12:44		68.4						
	12:45		67.7						

Roadway Name/Dir.		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

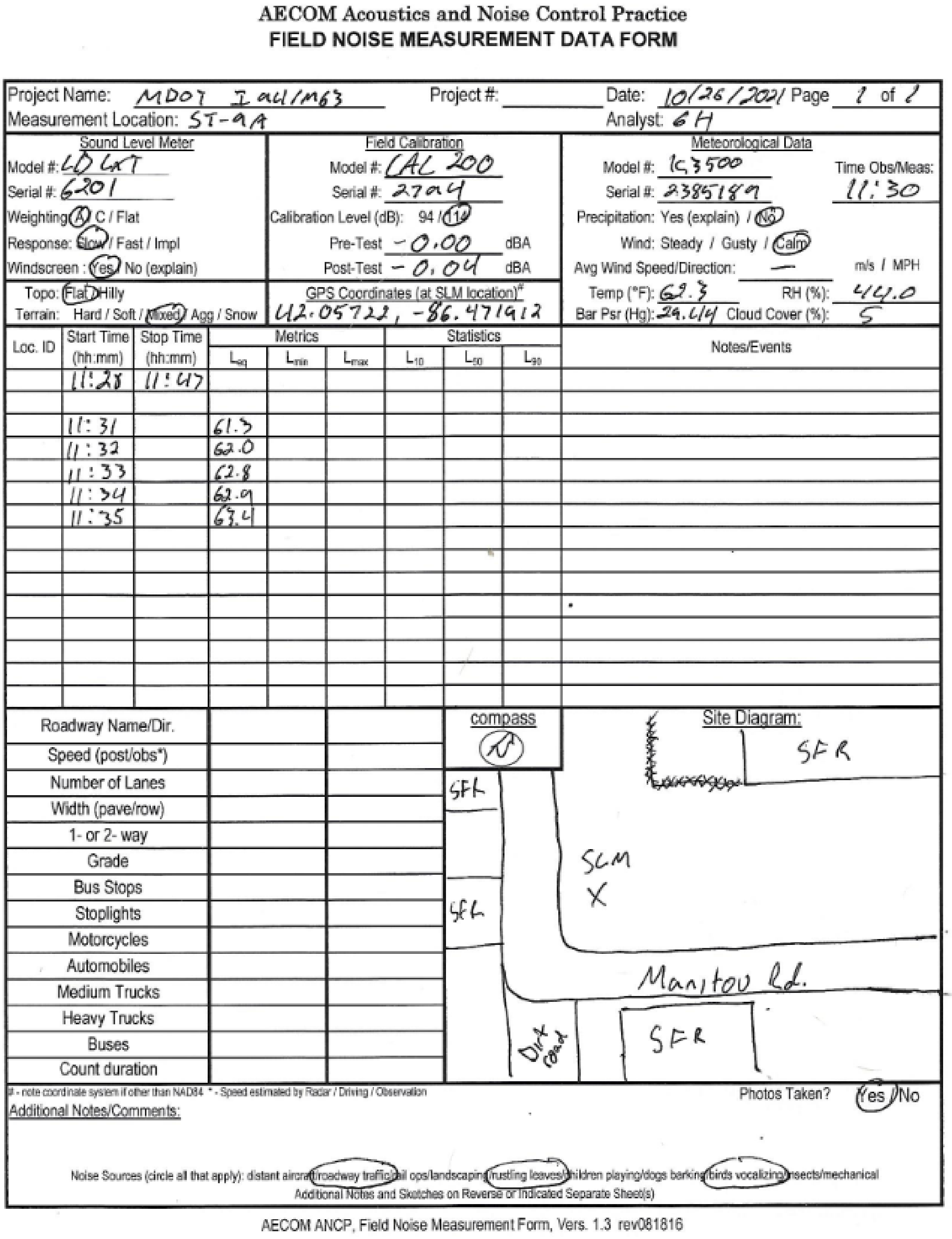
- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

Photos Taken? [✓ Yes] / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/[✓ insects]/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I 94/M63 Project #: ____ Date: 10/26/2021 Page 1 of 1
Measurement Location: ST-9A Analyst: GH

Sound Level Meter
Model #: LD LxT
Serial #: 6201
Weighting [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen : [✓ Yes] / No (explain)

Field Calibration
Model #: CAL 200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test -0.00 dBA
Post-Test -0.04 dBA

Meteorological Data
Model #: Kestrel 3500
Serial #: 2385189
Time Obs/Meas: 11:30
Precipitation: Yes (explain) / [✓ No]
Wind: Steady / Gusty / [✓ Calm]
Avg Wind Speed/Direction: — m/s / MPH
Temp (°F): 62.3 RH (%): 44.0
Bar Psr (Hg): 29.44 Cloud Cover (%): 5

Topo: [✓ Flat] / Hilly
Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

GPS Coordinates (at SLM location)#
42.05722, -86.471912

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics L_{eq}	Metrics L_{min}	Metrics L_{max}	Statistics L_{10}	Statistics L_{50}	Statistics L_{90}	Notes/Events
	11:28	11:47							
	11:31		61.3						
	11:32		62.0						
	11:33		62.8						
	11:34		62.9						
	11:35		63.4						

Roadway Name/Dir.		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

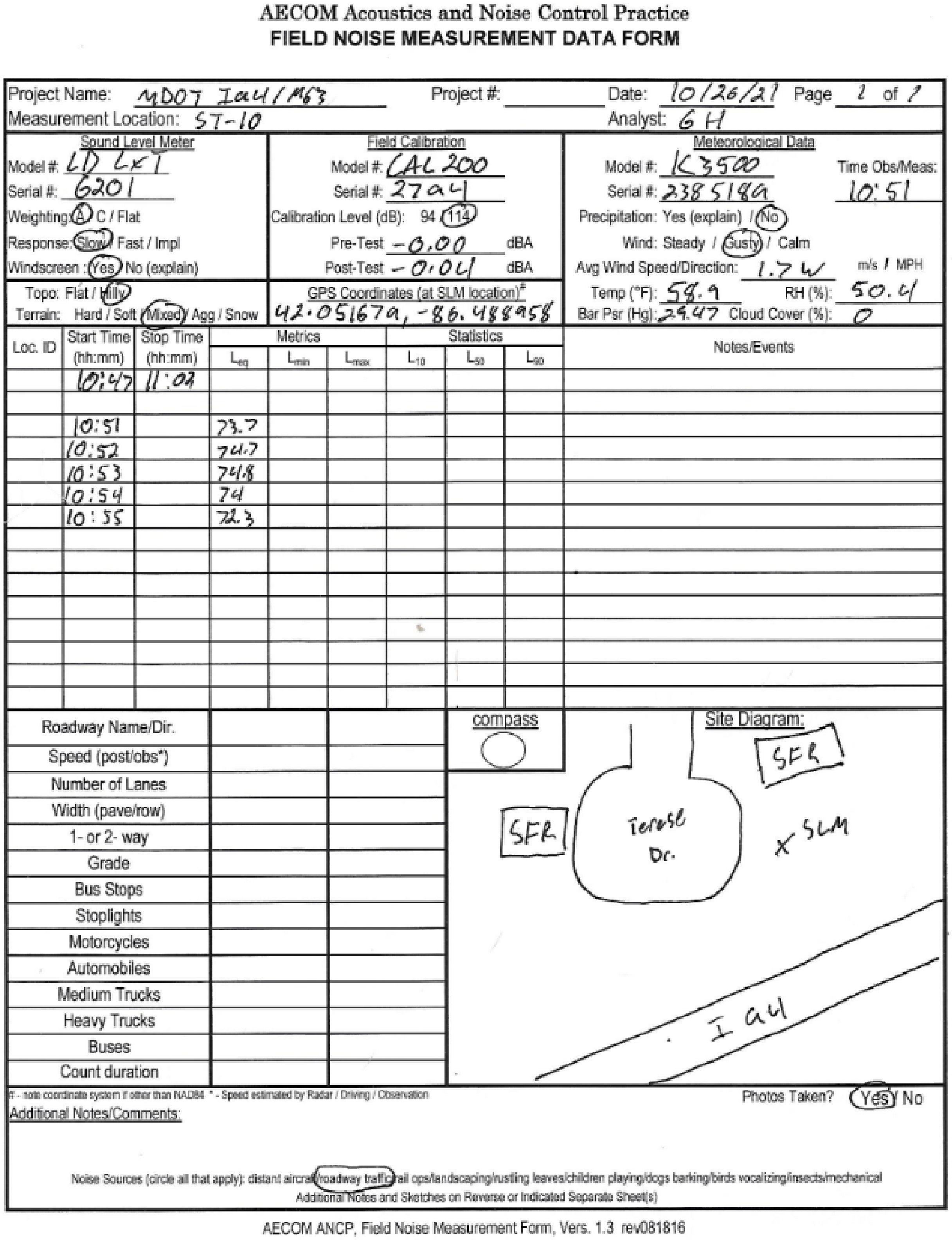
- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

Photos Taken? [✓ Yes] / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/[✓ rustling leaves]/children playing/dogs barking/[✓ birds vocalizing]/insects/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project #: ______ Date: 10/26/21 Page 1 of 1

Measurement Location: ST-10 Analyst: GH

Sound Level Meter

Model #: LD LXT

Serial #: 6201

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Topo: Flat / [✓ Hilly]

Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

Field Calibration

Model #: CAL200

Serial #: 2794

Calibration Level (dB): 94 / [✓ 114]

Pre-Test -0.00 dBA

Post-Test -0.04 dBA

GPS Coordinates (at SLM location)#

42.051679, -86.488958

Meteorological Data

Model #: K3500

Serial #: 2385189

Time Obs/Meas: 10:51

Precipitation: Yes (explain) / [✓ No]

Wind: Steady / [✓ Gusty] / Calm

Avg Wind Speed/Direction: 1.7 W m/s / MPH

Temp (°F): 58.9 RH (%): 50.4

Bar Psr (Hg): 29.47 Cloud Cover (%): 0

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
	10:47	11:02							
	10:51		73.7						
	10:52		74.7						
	10:53		74.8						
	10:54		74						
	10:55		72.3						

Roadway Name/Dir.		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

SFR

SFR

Terese Dr.

x SLM

I 94

- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

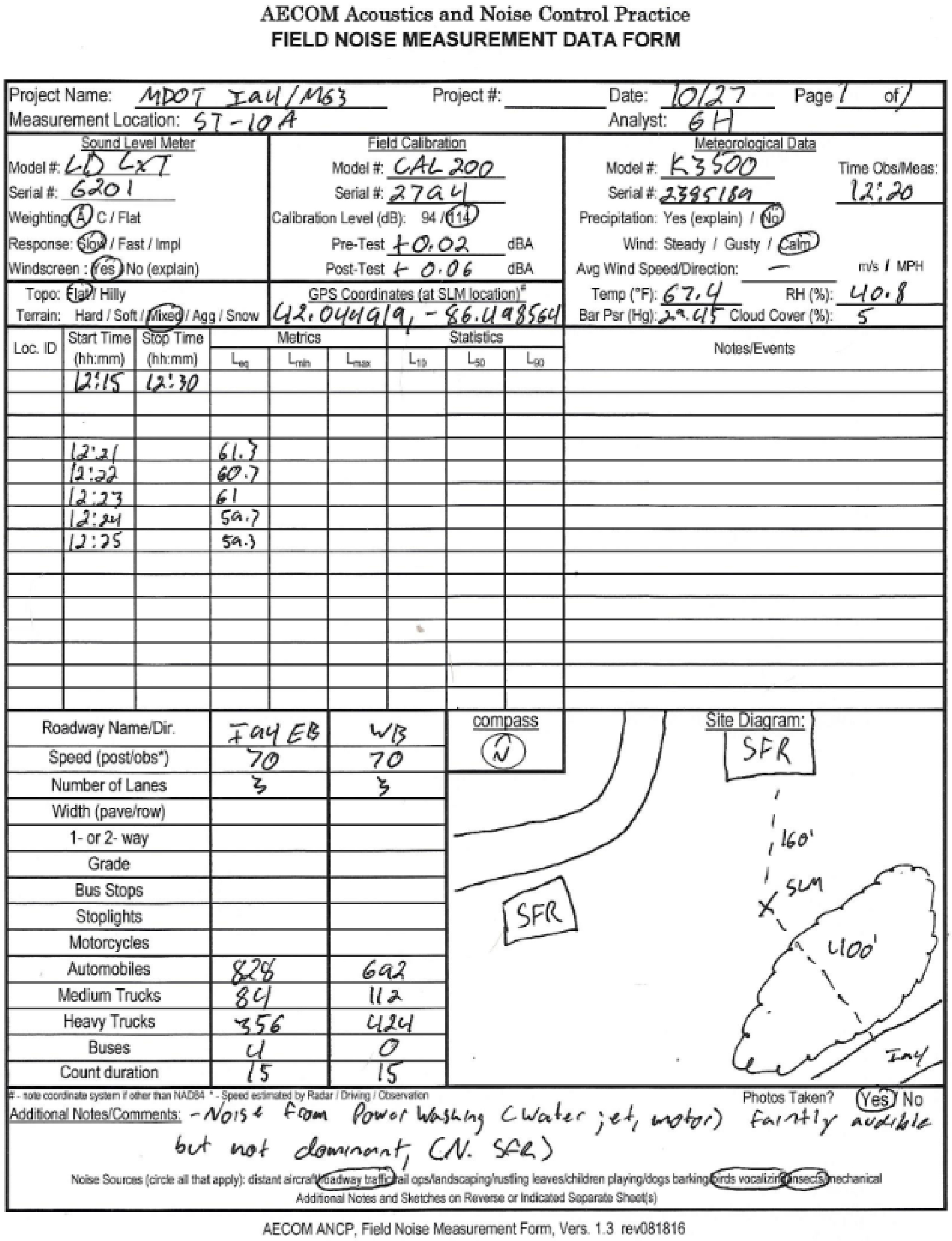
Photos Taken? [✓ Yes] / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects/mechanical

Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project #: ______ Date: 10/27 Page 1 of 1

Measurement Location: ST-10A Analyst: GH

Sound Level Meter

Model #: LD LxT

Serial #: 6201

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Field Calibration

Model #: CAL 200

Serial #: 2794

Calibration Level (dB): 94 / [✓ 114]

Pre-Test +0.02 dBA

Post-Test + 0.06 dBA

Meteorological Data

Model #: K3500

Serial #: 2395189

Time Obs/Meas: 12:20

Precipitation: Yes (explain) / [✓ No]

Wind: Steady / Gusty / [✓ Calm]

Avg Wind Speed/Direction: — m/s / MPH

Temp (°F): 67.4 RH (%): 40.8

Bar Psr (Hg): 29.45 Cloud Cover (%): 5

Topo: [✓ Flat] / Hilly

Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

GPS Coordinates (at SLM location)#: 42.044919, -86.498564

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
	12:15	12:30							
	12:21		61.3						
	12:22		60.7						
	12:23		61						
	12:24		59.7						
	12:25		59.3						

Roadway Name/Dir.	I94 EB	WB
Speed (post/obs*)	70	70
Number of Lanes	3	3
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles	828	692
Medium Trucks	84	112
Heavy Trucks	356	424
Buses	4	0
Count duration	15	15

compass

Site Diagram:

- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

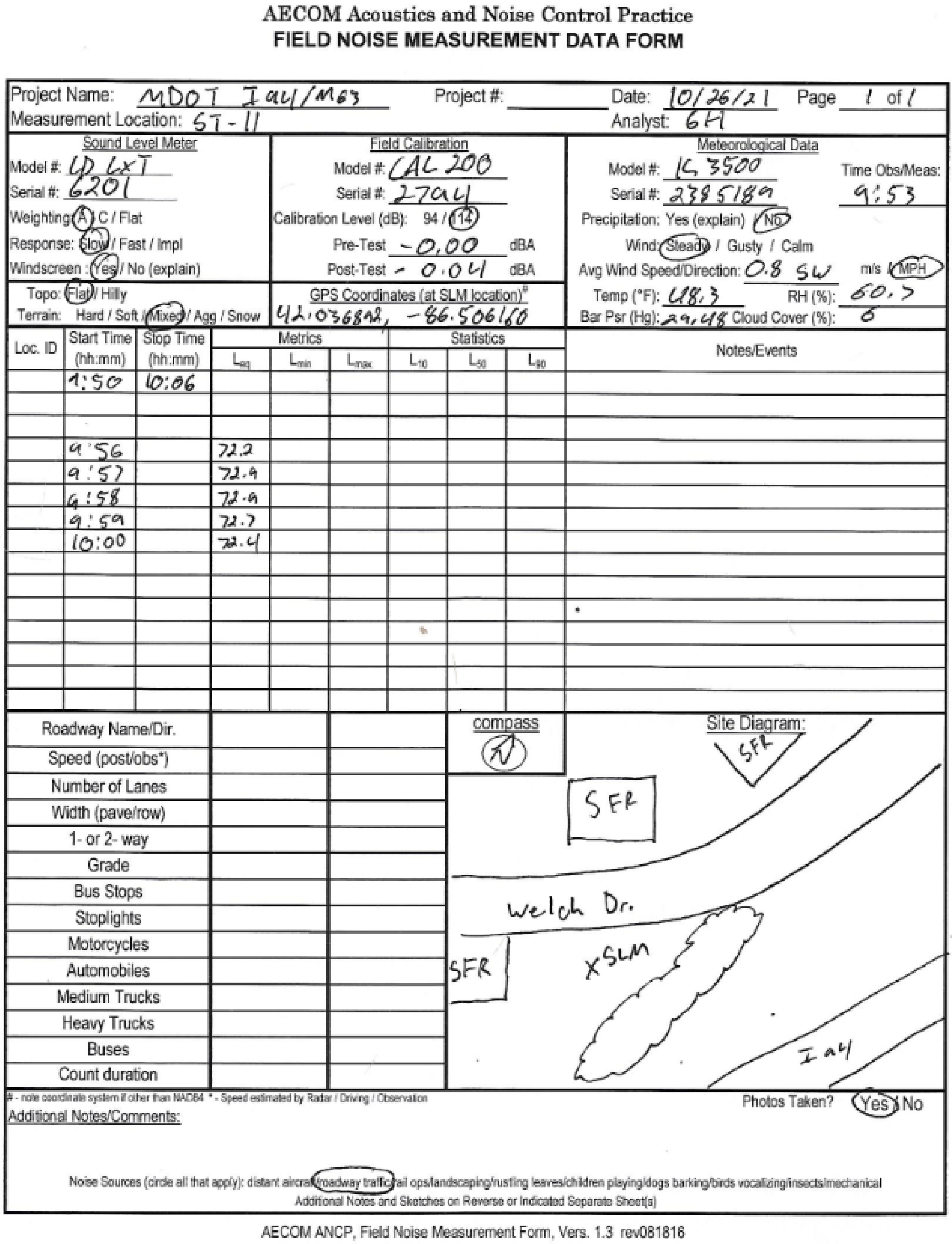
Photos Taken? [✓ Yes] / No

Additional Notes/Comments: -Noise from Power Washing (Water jet, motor) faintly audible but not dominant, (N. SFR)

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/[✓ insects]/mechanical

Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I94/M63 Project #: ______ Date: 10/26/21 Page 1 of 1
Measurement Location: ST-11 Analyst: GH

Sound Level Meter
Model #: LD LxT
Serial #: 6201
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: CAL 200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test -0.00 dBA
Post-Test - 0.04 dBA

Meteorological Data
Model #: K 3500
Serial #: 2385189
Time Obs/Meas: 9:53
Precipitation: Yes (explain) / [✓ No]
Wind: [✓ Steady] / Gusty / Calm
Avg Wind Speed/Direction: 0.8 SW m/s / [✓ MPH]
Temp (°F): 48.3 RH (%): 60.7
Bar Psr (Hg): 29.48 Cloud Cover (%): 0

Topo: [✓ Flat] / Hilly
Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

GPS Coordinates (at SLM location)#
42.036842, -86.506160

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics			Statistics			Notes/Events
			L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	
	9:50	10:06							
	9:56		72.2						
	9:57		72.9						
	9:58		72.9						
	9:59		72.7						
	10:00		72.4						

Roadway Name/Dir.		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

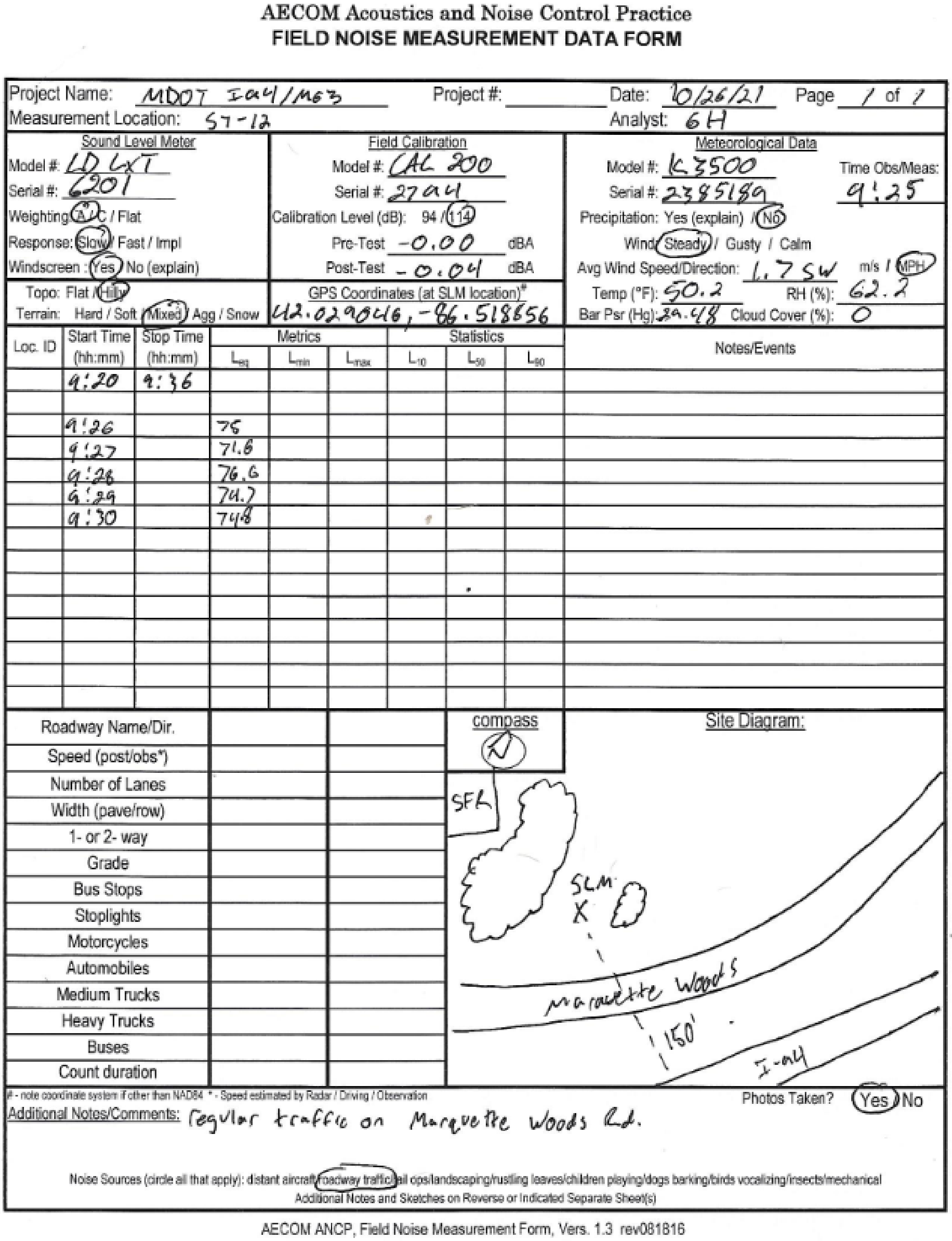
- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

Photos Taken? [✓ Yes] / No

Additional Notes/Comments:

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816



AECOM Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: MDOT I-94/M63 Project #: ______ Date: 10/26/21 Page 1 of 1
Measurement Location: ST-12 Analyst: GH

Sound Level Meter
Model #: LD LxT
Serial #: 6201
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: CAL 200
Serial #: 2794
Calibration Level (dB): 94 / [✓ 114]
Pre-Test -0.00 dBA
Post-Test -0.04 dBA

Meteorological Data
Model #: K3500
Serial #: 2385189
Time Obs/Meas: 9:25
Precipitation: Yes (explain) / [✓ No]
Wind: [✓ Steady] / Gusty / Calm
Avg Wind Speed/Direction: 1.7 SW m/s / [✓ MPH]
Temp (°F): 50.2 RH (%): 62.2
Bar Psr (Hg): 29.48 Cloud Cover (%): 0

Topo: Flat / [✓ Hilly]
Terrain: Hard / Soft / [✓ Mixed] / Agg / Snow

GPS Coordinates (at SLM location)#
42.029046, -86.518656

Loc. ID	Start Time (hh:mm)	Stop Time (hh:mm)	Metrics L_{eq}	Metrics L_{min}	Metrics L_{max}	Statistics L_{10}	Statistics L_{50}	Statistics L_{90}	Notes/Events
	9:20	9:36							
	9:26		75						
	9:27		71.6						
	9:28		76.6						
	9:29		74.7						
	9:30		74.8						

Roadway Name/Dir.		
Speed (post/obs*)		
Number of Lanes		
Width (pave/row)		
1- or 2- way		
Grade		
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

- note coordinate system if other than NAD84 * - Speed estimated by Radar / Driving / Observation

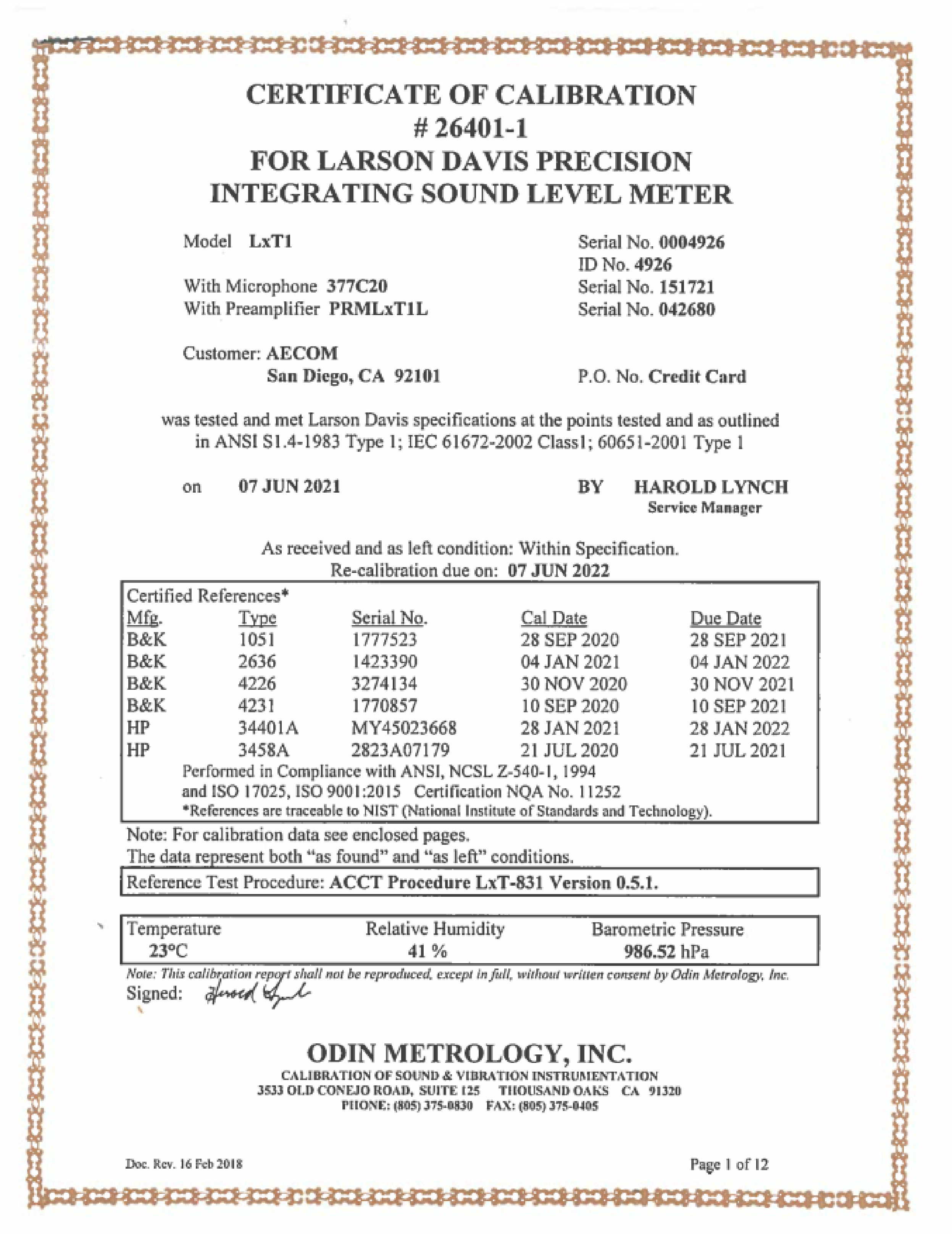
Photos Taken? [✓ Yes] / No

Additional Notes/Comments: regular traffic on Marquette Woods Rd.

Noise Sources (circle all that apply): distant aircraft/[✓ roadway traffic]/rail ops/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/insects/mechanical
Additional Notes and Sketches on Reverse or Indicated Separate Sheet(s)

AECOM ANCP, Field Noise Measurement Form, Vers. 1.3 rev081816

Calibration Certificates for Equipment Used



CERTIFICATE OF CALIBRATION
26401-1
FOR LARSON DAVIS PRECISION INTEGRATING SOUND LEVEL METER

Model **LxT1**
Serial No. **0004926**
ID No. **4926**
With Microphone **377C20**
Serial No. **151721**
With Preamplifier **PRMLxT1L**
Serial No. **042680**

Customer: **AECOM**
San Diego, CA 92101
P.O. No. **Credit Card**

was tested and met Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 1; IEC 61672-2002 Class1; 60651-2001 Type 1

on **07 JUN 2021**
BY **HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specification.
Re-calibration due on: **07 JUN 2022**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	1051	1777523	28 SEP 2020	28 SEP 2021
B&K	2636	1423390	04 JAN 2021	04 JAN 2022
B&K	4226	3274134	30 NOV 2020	30 NOV 2021
B&K	4231	1770857	10 SEP 2020	10 SEP 2021
HP	34401A	MY45023668	28 JAN 2021	28 JAN 2022
HP	3458A	2823A07179	21 JUL 2020	21 JUL 2021

Performed in Compliance with ANSI, NCSL Z-540-1, 1994 and ISO 17025, ISO 9001:2015 Certification NQA No. 11252

*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" conditions.

Reference Test Procedure: **ACCT Procedure LxT-831 Version 0.5.1.**

Temperature	Relative Humidity	Barometric Pressure
23°C	**41 %**	**986.52** hPa

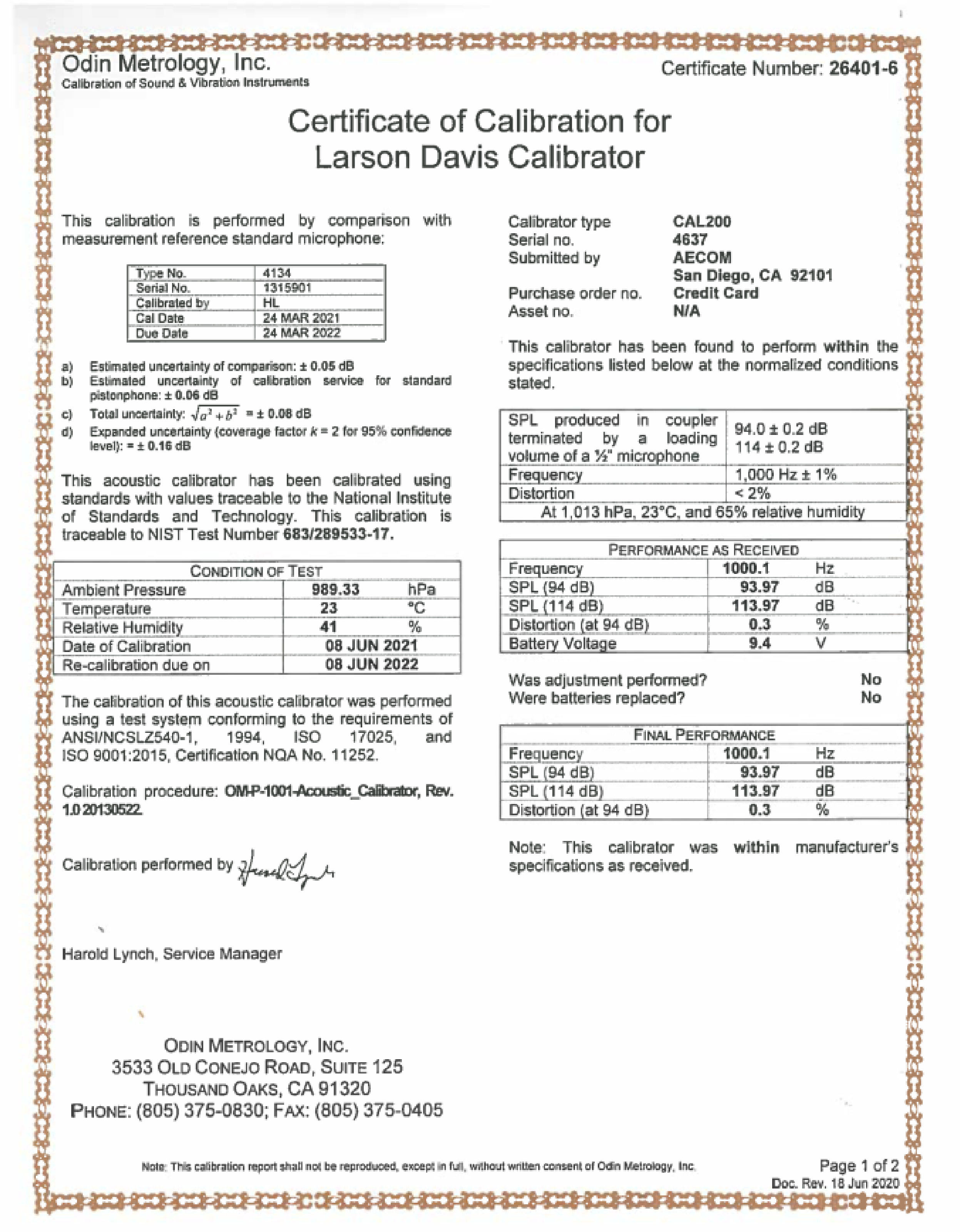
Note: This calibration report shall not be reproduced, except in full, without written consent by Odin Metrology, Inc.

Signed:

ODIN METROLOGY, INC.
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

Doc. Rev. 16 Feb 2018

Page 1 of 12



Odin Metrology, Inc.
Calibration of Sound & Vibration Instruments

Certificate Number: **26401-6**

Certificate of Calibration for Larson Davis Calibrator

This calibration is performed by comparison with measurement reference standard microphone:

Type No.	4134
Serial No.	1315901
Calibrated by	HL
Cal Date	24 MAR 2021
Due Date	24 MAR 2022

a) Estimated uncertainty of comparison: ± 0.05 dB
b) Estimated uncertainty of calibration service for standard pistonphone: ± 0.06 dB
c) Total uncertainty: $\sqrt{a^2+b^2}$ = ± 0.08 dB
d) Expanded uncertainty (coverage factor k = 2 for 95% confidence level): = ± 0.16 dB

This acoustic calibrator has been calibrated using standards with values traceable to the National Institute of Standards and Technology. This calibration is traceable to NIST Test Number **683/289533-17.**

CONDITION OF TEST		
Ambient Pressure	**989.33**	hPa
Temperature	**23**	°C
Relative Humidity	**41**	%
Date of Calibration	**08 JUN 2021**	
Re-calibration due on	**08 JUN 2022**	

The calibration of this acoustic calibrator was performed using a test system conforming to the requirements of ANSI/NCSLZ540-1, 1994, ISO 17025, and ISO 9001:2015, Certification NQA No. 11252.

Calibration procedure: **OM-P-1001-Acoustic_Calibrator, Rev. 1.0 20130522.**

Calibration performed by

Harold Lynch, Service Manager

Calibrator type	**CAL200**
Serial no.	**4637**
Submitted by	**AECOM** **San Diego, CA 92101**
Purchase order no.	**Credit Card**
Asset no.	**N/A**

This calibrator has been found to perform within the specifications listed below at the normalized conditions stated.

SPL produced in coupler terminated by a loading volume of a ½" microphone	94.0 ± 0.2 dB 114 ± 0.2 dB
Frequency	1,000 Hz ± 1%
Distortion	< 2%
At 1,013 hPa, 23°C, and 65% relative humidity	

PERFORMANCE AS RECEIVED		
Frequency	**1000.1**	Hz
SPL (94 dB)	**93.97**	dB
SPL (114 dB)	**113.97**	dB
Distortion (at 94 dB)	**0.3**	%
Battery Voltage	**9.4**	V

Was adjustment performed?	**No**
Were batteries replaced?	**No**

FINAL PERFORMANCE		
Frequency	**1000.1**	Hz
SPL (94 dB)	**93.97**	dB
SPL (114 dB)	**113.97**	dB
Distortion (at 94 dB)	**0.3**	%

Note: This calibrator was within manufacturer's specifications as received.

ODIN METROLOGY, INC.
3533 OLD CONEJO ROAD, SUITE 125
THOUSAND OAKS, CA 91320
PHONE: (805) 375-0830; FAX: (805) 375-0405

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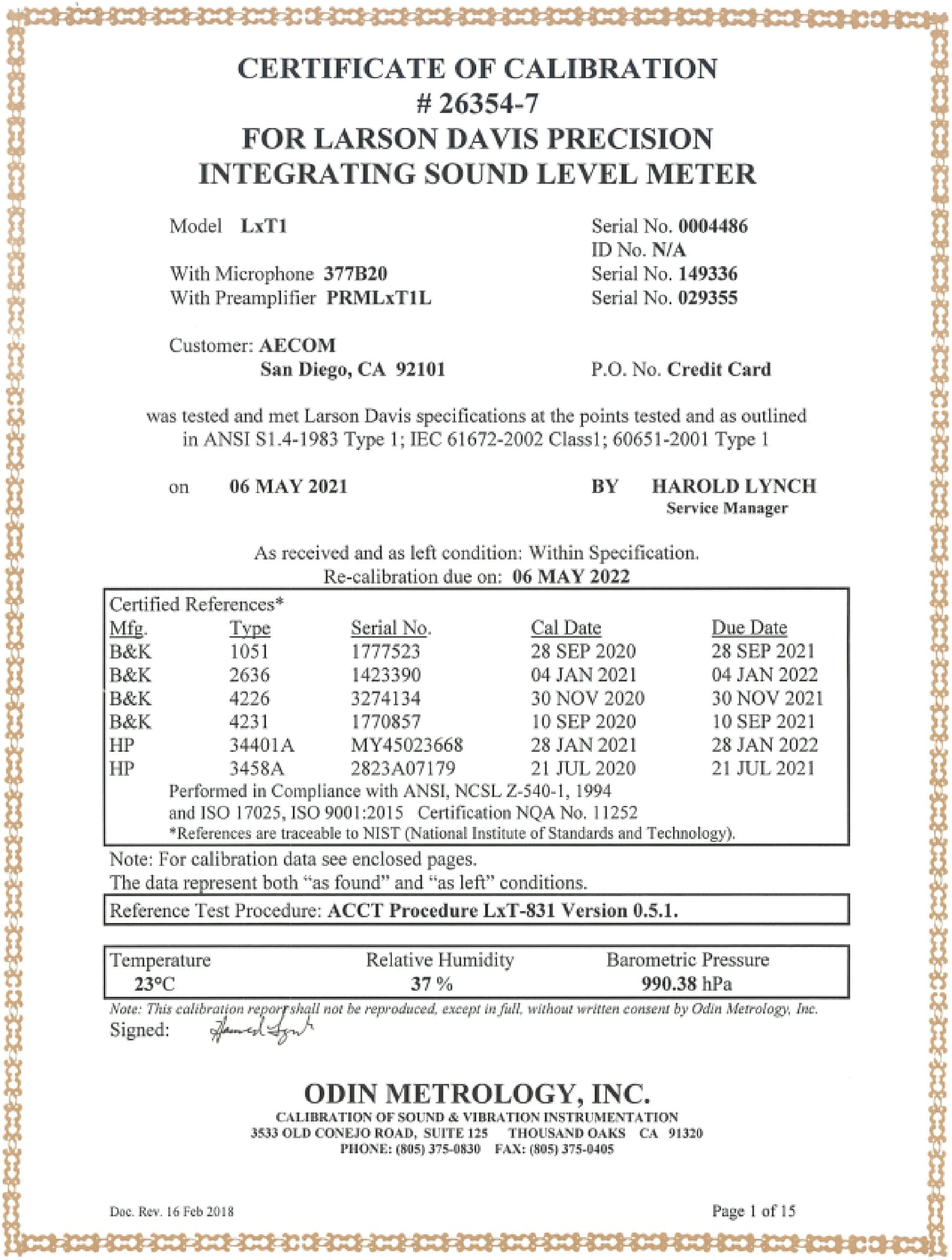
Page 1 of 2
Doc. Rev. 18 Jun 2020



CERTIFICATE OF CALIBRATION
26354-7
FOR LARSON DAVIS PRECISION INTEGRATING SOUND LEVEL METER

Model **LxT1** Serial No. **0004486**
ID No. **N/A**
With Microphone **377B20** Serial No. **149336**
With Preamplifier **PRMLxT1L** Serial No. **029355**

Customer: **AECOM**
San Diego, CA 92101 P.O. No. **Credit Card**

was tested and met Larson Davis specifications at the points tested and as outlined in ANSI S1.4-1983 Type 1; IEC 61672-2002 Class1; 60651-2001 Type 1

on **06 MAY 2021** **BY** **HAROLD LYNCH**
Service Manager

As received and as left condition: Within Specification.
Re-calibration due on: **06 MAY 2022**

Certified References*

Mfg.	Type	Serial No.	Cal Date	Due Date
B&K	1051	1777523	28 SEP 2020	28 SEP 2021
B&K	2636	1423390	04 JAN 2021	04 JAN 2022
B&K	4226	3274134	30 NOV 2020	30 NOV 2021
B&K	4231	1770857	10 SEP 2020	10 SEP 2021
HP	34401A	MY45023668	28 JAN 2021	28 JAN 2022
HP	3458A	2823A07179	21 JUL 2020	21 JUL 2021

Performed in Compliance with ANSI, NCSL Z-540-1, 1994
and ISO 17025, ISO 9001:2015 Certification NQA No. 11252
*References are traceable to NIST (National Institute of Standards and Technology).

Note: For calibration data see enclosed pages.
The data represent both "as found" and "as left" conditions.

Reference Test Procedure: **ACCT Procedure LxT-831 Version 0.5.1.**

Temperature	Relative Humidity	Barometric Pressure
23°C	**37** %	**990.38** hPa

Note: This calibration report shall not be reproduced, except in full, without written consent by Odin Metrology, Inc.

Signed:

ODIN METROLOGY, INC.

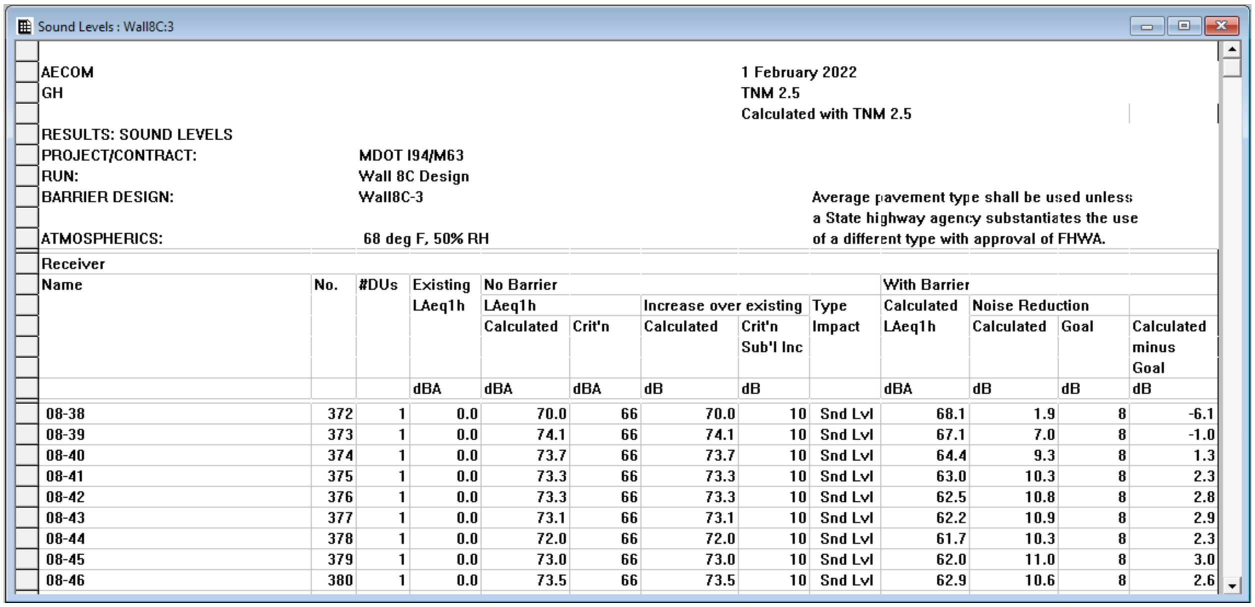
CALIBRATION OF SOUND & VIBRATION INSTRUMENTATION
3533 OLD CONEJO ROAD, SUITE 125 THOUSAND OAKS CA 91320
PHONE: (805) 375-0830 FAX: (805) 375-0405

Doc. Rev. 16 Feb 2018 Page 1 of 15

Appendix B Sample TNM Input/Output Files

Sample TNM output tables are provided for CNE 4 Abatement analysis. Additional input and output files are available upon request.

CNE 4 TNM Sound Level Prediction Output Table



AECOM
GH

1 February 2022
TNM 2.5
Calculated with TNM 2.5

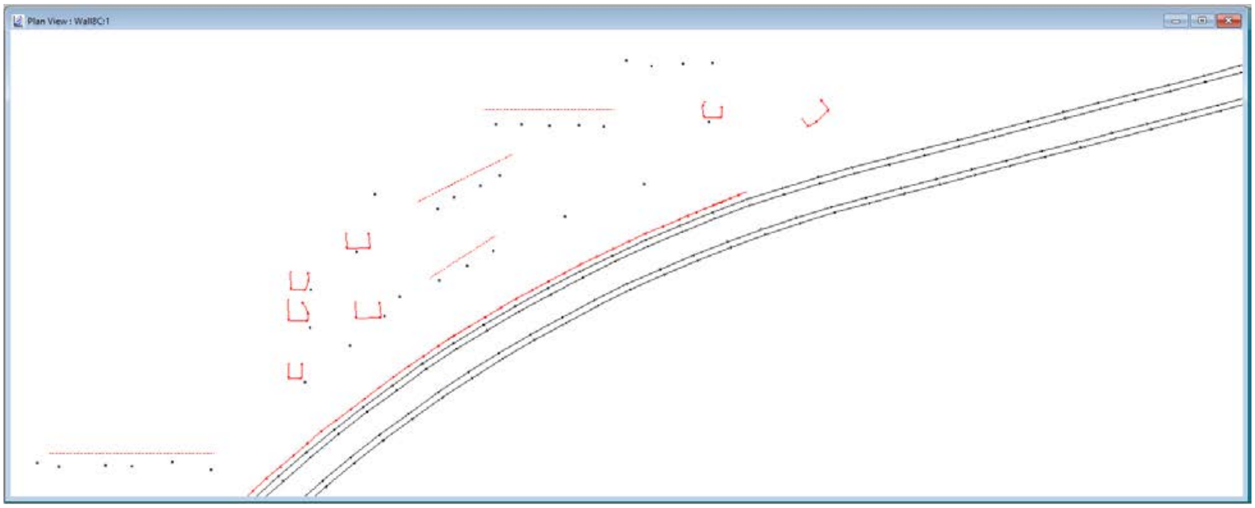
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: MDOT I94/M63
RUN: Wall 8C Design
BARRIER DESIGN: Wall8C-3

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

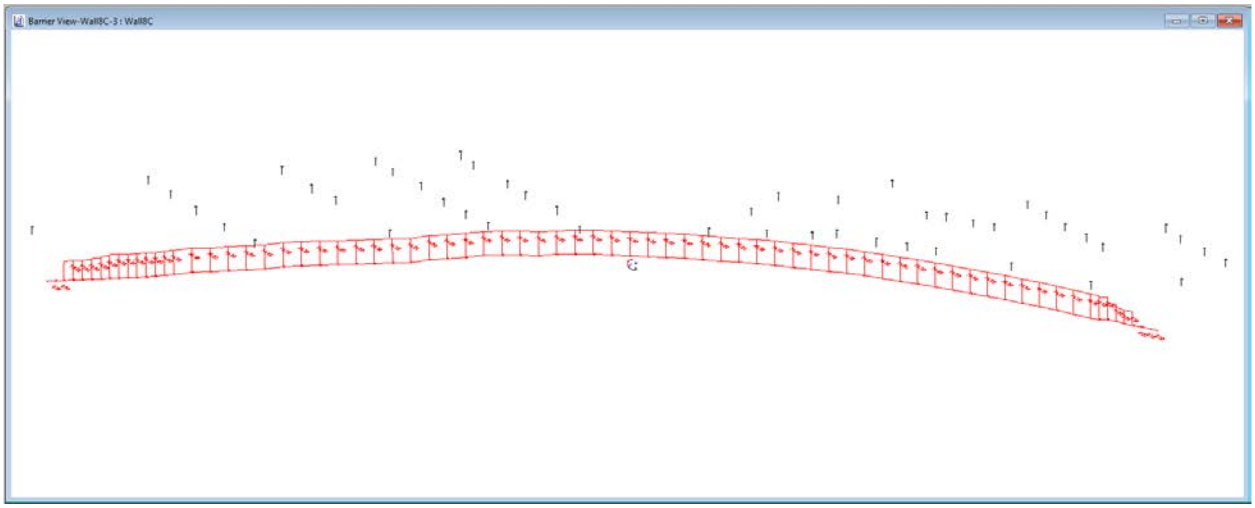
ATMOSPHERICS: 68 deg F, 50% RH

Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	Impact	LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
08-38	372	1	0.0	70.0	66	70.0	10	Snd Lvl	68.1	1.9	8	-6.1
08-39	373	1	0.0	74.1	66	74.1	10	Snd Lvl	67.1	7.0	8	-1.0
08-40	374	1	0.0	73.7	66	73.7	10	Snd Lvl	64.4	9.3	8	1.3
08-41	375	1	0.0	73.3	66	73.3	10	Snd Lvl	63.0	10.3	8	2.3
08-42	376	1	0.0	73.3	66	73.3	10	Snd Lvl	62.5	10.8	8	2.8
08-43	377	1	0.0	73.1	66	73.1	10	Snd Lvl	62.2	10.9	8	2.9
08-44	378	1	0.0	72.0	66	72.0	10	Snd Lvl	61.7	10.3	8	2.3
08-45	379	1	0.0	73.0	66	73.0	10	Snd Lvl	62.0	11.0	8	3.0
08-46	380	1	0.0	73.5	66	73.5	10	Snd Lvl	62.9	10.6	8	2.6

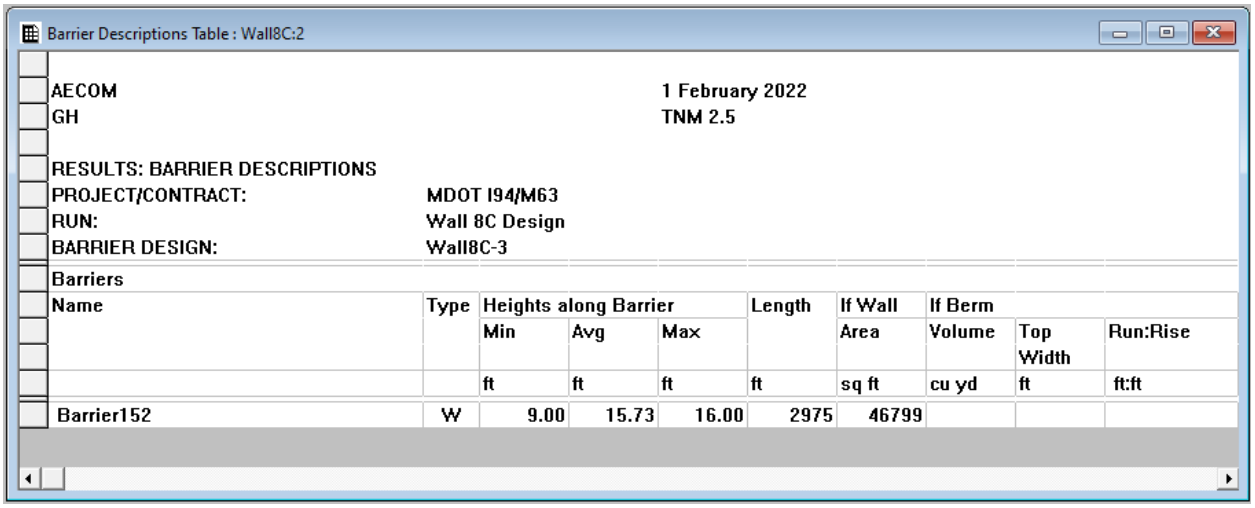
Plan View



Barrier Analysis Screenshot



Barrier Description Table



Barrier Descriptions Table : Wall8C:2

AECOM 1 February 2022
GH TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: MDOT I94/M63
RUN: Wall 8C Design
BARRIER DESIGN: Wall8C-3

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm		
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft
Barrier152	W	9.00	15.73	16.00	2975	46799			

Appendix C Predicted Noise Levels and Impacts

Table C-1 Loudest Hour Noise Levels, Leq(1h), dBA

Receptor Number	**Land Use**	**Activity Category**	**Units**	**FHWA/MDOT NAC**	**Existing**	**Build**	**Change**
CNE 1							
01-01	Residential	B	1	66	**71**	**71.5**	0.5
01-02	Residential	B	1	66	**73.9**	**74.4**	0.5
01-03	Residential	B	1	66	**72.9**	**73.4**	0.5
01-04	Residential	B	1	66	**74.7**	**75.2**	0.5
01-05	Residential	B	1	66	**72.9**	**73.4**	0.5
01-06	Residential	B	1	66	**71**	**71.5**	0.5
01-07	Residential	B	1	66	**74.5**	**75**	0.5
01-08	Residential	B	1	66	**72.7**	**73.2**	0.5
01-09	Residential	B	1	66	**67.8**	**68.3**	0.5
01-10	Residential	B	1	66	**65.7**	**66.1**	0.4
01-11	Residential	B	1	66	65.2	**65.7**	0.5
01-12	Residential	B	1	66	**67.1**	**67.6**	0.5
01-13	Residential	B	1	66	**66.2**	**66.7**	0.5
01-14	Residential	B	1	66	62.4	62.8	0.4
01-15	Residential	B	1	66	63.4	63.9	0.5
01-16	Residential	B	1	66	65	65.4	0.4
01-17	Residential	B	1	66	64	64.4	0.4
01-18	Residential	B	1	66	62.3	62.8	0.5
01-19	Residential	B	1	66	61.8	62.3	0.5
01-20	Residential	B	1	66	61.2	61.6	0.4
CNE 2							
02-01	Church	C	1	66	**69.7**	**70.2**	0.5
02-02	Residential	B	1	66	**71**	**71.5**	0.5
02-03	Residential	B	1	66	**70.4**	**70.9**	0.5
02-04	Residential	B	1	66	**76.1**	**76.6**	0.5
02-05	Residential	B	1	66	**72**	**72.5**	0.5
02-06	Residential	B	1	66	**71.9**	**72.4**	0.5
02-07	Residential	B	1	66	**71.1**	**71.6**	0.5
02-08	Residential	B	1	66	**70.4**	**70.9**	0.5
02-09	Residential	B	1	66	**69.7**	**70.2**	0.5
02-10	Residential	B	1	66	**68.9**	**69.4**	0.5
02-11	Residential	B	1	66	**68.7**	**69.2**	0.5
02-12	Residential	B	1	66	**69.3**	**69.8**	0.5
02-13	Residential	B	1	66	60.7	60.8	0.1
02-14	Residential	B	1	66	61.6	61.3	-0.3
02-15	Residential	B	1	66	62.3	61.9	-0.4
02-16	Residential	B	1	66	62.7	62.2	-0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
02-17	Residential	B	1	66	63.2	62.7	-0.5
02-18	Residential	B	1	66	**66.3**	**66.8**	0.5
02-19	Residential	B	1	66	60.7	61.2	0.5
02-20	Residential	B	1	66	**68.3**	**68.8**	0.5
02-21	Residential	B	1	66	**69.4**	**69.9**	0.5
02-22	Residential	B	1	66	**69**	**69.5**	0.5
02-23	Residential	B	1	66	**69.7**	**70.2**	0.5
02-24	Residential	B	1	66	**69.3**	**69.8**	0.5
02-25	Residential	B	1	66	**66.8**	**67.3**	0.5
02-26	Residential	B	1	66	**67.4**	**67.9**	0.5
02-27	Residential	B	1	66	**68**	**68.5**	0.5
02-28	Residential	B	1	66	**65.5**	**65.9**	0.4
02-29	Residential	B	1	66	58.9	59.4	0.5
02-30	Residential	B	1	66	57.5	58	0.5
02-31	Residential	B	1	66	**66.5**	**67**	0.5
02-32	Residential	B	1	66	**67.4**	**67.9**	0.5
02-33	Residential	B	1	66	**67.5**	**68**	0.5
02-34	Residential	B	1	66	**67.6**	**68.1**	0.5
02-35	Residential	B	1	66	**67.6**	**68.1**	0.5
02-36	Residential	B	1	66	**66.4**	**66.9**	0.5
02-37	Residential	B	1	66	65	**65.5**	0.5
02-38	Residential	B	1	66	**65.9**	**66.4**	0.5
02-39	Residential	B	1	66	**67.1**	**67.6**	0.5
02-40	Residential	B	1	66	64.6	65.1	0.5
02-41	Residential	B	1	66	65.4	**65.9**	0.5
02-42	Residential	B	1	66	**66.1**	**66.6**	0.5
02-43	Residential	B	1	66	**66.3**	**66.8**	0.5
02-44	Residential	B	1	66	**66.7**	**67.2**	0.5
02-45	Residential	B	1	66	**66.2**	**66.7**	0.5
02-46	Residential	B	1	66	64.9	65.4	0.5
02-47	Residential	B	1	66	65	**65.5**	0.5
02-48	Residential	B	1	66	64.2	64.7	0.5
02-49	Residential	B	1	66	64.4	64.9	0.5
02-50	Residential	B	1	66	64.8	65.3	0.5
02-51	Residential	B	1	66	65.1	**65.6**	0.5
02-52	Residential	B	1	66	65.2	**65.7**	0.5
02-53	Residential	B	1	66	64.2	64.7	0.5
02-54	Residential	B	1	66	63.8	64.3	0.5
02-55	Residential	B	1	66	64	64.5	0.5
02-56	Residential	B	1	66	64.2	64.7	0.5
02-57	Cemetery	C	1	66	60.7	61.2	0.5
CNE 3							

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
03-01	Park	C	1	66	**69.4**	**69.9**	0.5
03-02	Park	C	1	66	**71.7**	**72.2**	0.5
03-03	Park	C	1	66	**71.7**	**72.2**	0.5
03-04	Park	C	1	66	**71.7**	**72.2**	0.5
03-05	Park	C	1	66	**71.8**	**72.3**	0.5
03-06	Park	C	1	66	**71.8**	**72.3**	0.5
03-07	Park	C	1	66	**71.9**	**72.4**	0.5
03-08	Park	C	1	66	**71.9**	**72.4**	0.5
03-09	Park	C	1	66	**71.9**	**72.4**	0.5
03-10	Park	C	1	66	**71.9**	**72.4**	0.5
03-11	Park	C	1	66	**72**	**72.5**	0.5
03-12	Park	C	1	66	**72**	**72.5**	0.5
03-13	Park	C	1	66	**72**	**72.5**	0.5
03-14	Park	C	1	66	**72**	**72.5**	0.5
03-15	Park	C	1	66	**72.1**	**72.6**	0.5
03-16	Park	C	1	66	**74.1**	**74.6**	0.5
03-17	Park	C	1	66	**75.3**	**75.8**	0.5
03-18	Park	C	1	66	**72.6**	**73.1**	0.5
03-19	Park	C	1	66	**68.8**	**69.2**	0.4
03-20	Park	C	1	66	**69.3**	**69.8**	0.5
03-21	Park	C	1	66	**71.9**	**72.4**	0.5
03-22	Park	C	1	66	62.2	62.6	0.4
03-23	Park	C	1	66	**70**	**70.4**	0.4
03-24	Park	C	1	66	**71.5**	**71.9**	0.4
03-25	Park	C	1	66	**67.8**	**68.3**	0.5
03-26	Park	C	1	66	**69.6**	**70.1**	0.5
03-27	Park	C	1	66	**67.4**	**67.9**	0.5
03-28	Residential	B	1	66	**67.1**	**67.6**	0.5
03-29	Residential	B	1	66	**66.7**	**67.1**	0.4
03-30	Residential	B	1	66	**66.7**	**67.2**	0.5
03-31	Residential	B	1	66	**66.7**	**67.2**	0.5
03-32	Residential	B	1	66	**66.7**	**67.2**	0.5
03-33	Residential	B	1	66	**66.8**	**67.2**	0.4
03-34	Restaurant	E	1	66	66.9	67.4	0.5
03-35	Park	C	1	66	**67**	**67.5**	0.5
03-36	Park	C	1	66	**67**	**67.5**	0.5
03-37	Park	C	1	66	**67.1**	**67.6**	0.5
03-38	Park	C	1	66	**67.1**	**67.6**	0.5
03-39	Park	C	1	66	**67**	**67.5**	0.5
03-40	Park	C	1	66	**70.3**	**70.8**	0.5
03-41	Park	C	1	66	**68.2**	**68.7**	0.5
03-42	Park	C	1	66	**71.1**	**71.6**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
03-43	Park	C	1	66	**70.1**	**70.6**	0.5
03-44	Park	C	1	66	**69.5**	**70**	0.5
03-45	Park	C	1	66	65.4	**65.9**	0.5
03-46	Park	C	1	66	64.4	64.9	0.5
03-47	Park	C	1	66	63.5	64	0.5
03-48	Park	C	1	66	**67.4**	**67.9**	0.5
03-49	Park	C	1	66	**68**	**68.5**	0.5
03-50	Park	C	1	66	**66.7**	**67.2**	0.5
03-51	Park	C	1	66	65.1	**65.6**	0.5
03-52	Park	C	1	66	62.5	63	0.5
03-53	Park	C	1	66	63.9	64.4	0.5
03-54	Park	C	1	66	64.3	64.8	0.5
03-55	Park	C	1	66	64.4	64.9	0.5
03-56	Park	C	1	66	64.9	65.4	0.5
03-57	Park	C	1	66	62.9	63.4	0.5
03-58	Park	C	1	66	63.2	63.7	0.5
03-59	Park	C	1	66	65.4	**65.9**	0.5
03-60	Residential	B	1	66	**67.9**	**68.4**	0.5
03-61	Residential	B	1	66	**67.6**	**68.1**	0.5
03-62	Residential	B	1	66	64.1	64.6	0.5
03-63	Residential	B	1	66	**65.7**	**66.2**	0.5
03-64	Residential	B	1	66	**68.3**	**68.8**	0.5
03-65	Residential	B	1	66	**67.6**	**68.1**	0.5
03-66	Residential	B	1	66	64.9	65.3	0.4
03-67	Residential	B	1	66	65.4	**65.9**	0.5
03-68	Residential	B	1	66	65.3	**65.8**	0.5
03-69	Residential	B	1	66	65.4	**65.9**	0.5
03-70	Residential	B	1	66	**66**	**66.5**	0.5
03-71	Residential	B	1	66	**66.5**	**67**	0.5
03-72	Residential	B	1	66	64	64.5	0.5
03-73	Residential	B	1	66	62.7	63.2	0.5
03-74	Residential	B	1	66	65.1	**65.6**	0.5
03-75	Residential	B	1	66	63.8	64.3	0.5
03-76	Residential	B	1	66	63.5	64	0.5
CNE 4							
04-01	Residential	B	1	66	**72.8**	**73.3**	0.5
04-02	Residential	B	1	66	**76.1**	**76.6**	0.5
04-03	Residential	B	1	66	**74.4**	**74.9**	0.5
04-04	Residential	B	1	66	**68.1**	**68.6**	0.5
04-05	Residential	B	1	66	**73.8**	**74.3**	0.5
04-06	Residential	B	1	66	**72.4**	**72.9**	0.5
04-07	Residential	B	1	66	**70.5**	**71**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
04-08	Residential	B	1	66	**68.6**	**69.1**	0.5
04-09	Residential	B	1	66	**68**	**68.5**	0.5
04-10	Residential	B	1	66	**66.5**	**67**	0.5
04-11	Residential	B	1	66	**65.6**	**66.1**	0.5
04-12	Residential	B	1	66	**67**	**67.5**	0.5
04-13	Residential	B	1	66	**70.1**	**70.5**	0.4
04-14	Residential	B	1	66	63.7	64.2	0.5
04-15	Residential	B	1	66	**65.9**	**66.4**	0.5
04-16	Residential	B	1	66	65	**65.5**	0.5
04-17	Residential	B	1	66	**67.2**	**67.7**	0.5
04-18	Residential	B	1	66	61.9	62.4	0.5
04-19	Residential	B	1	66	65.1	**65.6**	0.5
04-20	Residential	B	1	66	64.2	64.7	0.5
04-21	Residential	B	1	66	**65.8**	**66.4**	0.6
04-22	Residential	B	1	66	**66.8**	**67.6**	0.8
CNE 5							
05-01	Residential	B	1	66	**73.2**	**73.7**	0.5
05-02	Residential	B	1	66	**74**	**74.5**	0.5
05-03	Residential	B	1	66	**68.1**	**68.6**	0.5
05-04	Residential	B	1	66	**70.1**	**70.6**	0.5
05-05	Residential	B	1	66	**69.6**	**70.2**	0.6
05-06	Residential	B	1	66	**71.4**	**72**	0.6
05-07	Residential	B	1	66	**70.3**	**70.9**	0.6
05-08	Residential	B	1	66	64.6	65.1	0.5
05-09	Residential	B	1	66	**66.1**	**66.7**	0.6
05-10	Residential	B	1	66	**65.8**	**66.3**	0.5
05-11	Residential	B	1	66	**67.9**	**68.5**	0.6
05-12	Residential	B	1	66	**65.6**	**66.1**	0.5
05-13	Residential	B	1	66	62.7	63.2	0.5
05-14	Residential	B	1	66	63.8	64.3	0.5
05-15	Residential	B	1	66	65.3	**65.8**	0.5
05-16	Residential	B	1	66	62	62.5	0.5
05-17	Residential	B	1	66	62.6	63.1	0.5
CNE 6							
06-01	Residential	B	1	66	**73.9**	**74.4**	0.5
06-02	Residential	B	1	66	**74**	**74.5**	0.5
06-03	Residential	B	1	66	**73.9**	**74.4**	0.5
06-04	Residential	B	1	66	**73**	**73.5**	0.5
06-05	Residential	B	1	66	**72.5**	**73**	0.5
06-06	Residential	B	1	66	**71.9**	**72.4**	0.5
06-07	Residential	B	1	66	**71.6**	**72.1**	0.5
06-08	Residential	B	1	66	**71.2**	**71.7**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
06-09	Residential	B	1	66	**70.6**	**71.1**	0.5
06-10	Residential	B	1	66	**70**	**70.5**	0.5
06-11	Residential	B	1	66	**69.7**	**70.2**	0.5
06-12	Residential	B	1	66	**69**	**69.5**	0.5
06-13	Residential	B	1	66	**68.5**	**69**	0.5
06-14	Residential	B	1	66	**68**	**68.5**	0.5
06-15	Residential	B	1	66	**67.6**	**68.1**	0.5
06-16	Residential	B	1	66	**67.6**	**68.1**	0.5
06-17	Residential	B	1	66	**66.8**	**67.3**	0.5
06-18	Residential	B	1	66	**66.5**	**67**	0.5
06-19	Residential	B	1	66	**66.1**	**66.6**	0.5
06-20	Residential	B	1	66	**65.6**	**66.1**	0.5
06-21	Residential	B	1	66	**65.2**	**65.7**	0.5
06-22	Residential	B	1	66	**65**	**65.5**	0.5
06-23	Residential	B	1	66	**67.7**	**68.2**	0.5
06-24	Residential	B	1	66	**69.9**	**70.4**	0.5
06-25	Residential	B	1	66	**69.3**	**69.8**	0.5
06-26	Residential	B	1	66	**69.2**	**69.6**	0.4
06-27	Residential	B	1	66	**68.7**	**69.2**	0.5
06-28	Residential	B	1	66	**67.9**	**68.4**	0.5
06-29	Residential	B	1	66	**67.5**	**68**	0.5
06-30	Residential	B	1	66	**67.1**	**67.6**	0.5
06-31	Residential	B	1	66	**66.4**	**66.9**	0.5
06-32	Residential	B	1	66	63.7	64.2	0.5
06-33	Residential	B	1	66	65.3	**65.8**	0.5
06-34	Residential	B	1	66	63.3	63.8	0.5
06-35	Residential	B	1	66	62.6	63.1	0.5
06-36	Residential	B	1	66	61.3	61.8	0.5
06-37	Residential	B	1	66	58.1	58.6	0.5
06-38	Residential	B	1	66	63	63.5	0.5
06-39	Residential	B	1	66	60.9	61.4	0.5
06-40	Residential	B	1	66	60.6	61.1	0.5
06-41	Residential	B	1	66	60.7	61.2	0.5
06-42	Residential	B	1	66	59	59.5	0.5
06-43	Residential	B	1	66	58.2	58.7	0.5
06-44	Residential	B	1	66	62	62.5	0.5
06-45	Residential	B	1	66	64.7	65.2	0.5
CNE 7							
07-01	Hotel	E	1	72	59.6	60.1	0.5
07-02	Hotel/Restaurant	E	1	72	61.4	61.9	0.5
07-03	Residential	B	1	66	**73**	**73.5**	0.5
07-04	Residential	B	1	66	**70**	**70.5**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
07-05	Residential	B	1	66	**75.7**	**76.2**	0.5
07-06	Residential	B	1	66	**74.2**	**74.7**	0.5
07-07	Park	C	1	66	**75.6**	**76.1**	0.5
07-08	Residential	B	1	66	**68.7**	**69.2**	0.5
07-09	Park	C	1	66	**71.1**	**71.6**	0.5
07-10	Park	C	1	66	**73.1**	**73.6**	0.5
07-11	Park	C	1	66	**73.5**	**74**	0.5
07-12	Park	C	1	66	**73.7**	**74.2**	0.5
07-13	Park	C	1	66	**73.7**	**74.2**	0.5
07-14	Park	C	1	66	**73.7**	**74.2**	0.5
07-15	Park	C	1	66	**73.7**	**74.2**	0.5
07-16	Park	C	1	66	**73.3**	**73.8**	0.5
07-17	Park	C	1	66	**71.5**	**72**	0.5
07-18	Park	C	1	66	65.4	**65.9**	0.5
07-19	Residential	B	1	66	**65.9**	**66.9**	1
07-20	Residential	B	1	66	58.1	59.2	1.1
07-21	Residential	B	1	66	51.7	52.9	1.2
07-22	Residential	B	1	66	53.7	54.8	1.1
07-23	Residential	B	1	66	54.4	56.3	1.9
07-24	Residential	B	1	66	57.5	58.8	1.3
07-25	Residential	B	1	66	62.4	63	0.6
07-26	Park	C	1	66	**69.3**	**69.8**	0.5
07-27	Park	C	1	66	**68.5**	**69**	0.5
07-28	Park	C	1	66	**68.8**	**69.3**	0.5
07-29	Park	C	1	66	**69**	**69.5**	0.5
07-30	Park	C	1	66	**68.9**	**69.4**	0.5
07-31	Park	C	1	66	**69**	**69.5**	0.5
07-32	Park	C	1	66	**68.8**	**69.3**	0.5
07-33	Park	C	1	66	**68.4**	**68.9**	0.5
07-34	Residential	B	1	66	**66.2**	**66.7**	0.5
07-35	Residential	B	1	66	64.2	64.7	0.5
07-36	Residential	B	1	66	63.1	63.6	0.5
07-37	Residential	B	1	66	62.3	62.8	0.5
07-38	Residential	B	1	66	65.5	66	0.5
07-39	Residential	B	1	66	63.5	64	0.5
07-40	Residential	B	1	66	62.6	63.1	0.5
07-41	Park	C	1	66	**65.5**	66	0.5
07-42	Park	C	1	66	**65.6**	**66.1**	0.5
07-43	Park	C	1	66	65.3	**65.8**	0.5
07-44	Park	C	1	66	**65.7**	**66.2**	0.5
07-45	Park	C	1	66	**65.6**	**66.1**	0.5
07-46	Park	C	1	66	**65.5**	**66**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
07-47	Park	C	1	66	65.4	**65.9**	0.5
07-48	Park	C	1	66	65.3	**65.8**	0.5
07-49	Residential	B	1	66	57.5	58.4	0.9
07-50	Residential	B	1	66	51.8	52.8	1
CNE 8							
08-01	Church	C	2	66	**72.8**	**73.3**	0.5
08-02	Church	C	2	66	**72.1**	**72.6**	0.5
08-03	Playground	C	2	66	**69.4**	**69.9**	0.5
08-04	Residential	B	1	66	**68.9**	**69.4**	0.5
08-05	Residential	B	1	66	**72.9**	**73.4**	0.5
08-06	Residential	B	1	66	**74.2**	**74.7**	0.5
08-07	Residential	B	1	66	**74.1**	**74.6**	0.5
08-08	Residential	B	1	66	**74.2**	**74.7**	0.5
08-09	Residential	B	1	66	**73.7**	**74.2**	0.5
08-10	Residential	B	1	66	**73.8**	**74.3**	0.5
08-11	Residential	B	1	66	**73.9**	**74.4**	0.5
08-12	Residential	B	1	66	**74**	**74.5**	0.5
08-13	Residential	B	1	66	**73.4**	**73.9**	0.5
08-14	Residential	B	1	66	**73.9**	**74.4**	0.5
08-15	Residential	B	1	66	**74.5**	**75**	0.5
08-16	Residential	B	1	66	**73.2**	**73.7**	0.5
08-17	Residential	B	1	66	**72**	**72.5**	0.5
08-18	Residential	B	1	66	**70.6**	**71.1**	0.5
08-19	Residential	B	1	66	**69.7**	**70.2**	0.5
08-20	Residential	B	1	66	**68.8**	**69.3**	0.5
08-21	Residential	B	1	66	**67.8**	**68.3**	0.5
08-22	Residential	B	1	66	**67.3**	**67.8**	0.5
08-23	Residential	B	1	66	**66.5**	**67**	0.5
08-24	Residential	B	1	66	**66.7**	**67.2**	0.5
08-25	Residential	B	1	66	**72.8**	**73.3**	0.5
08-26	Residential	B	1	66	**71.8**	**72.2**	0.4
08-27	Residential	B	1	66	**71.5**	**72**	0.5
08-28	Residential	B	1	66	**69.1**	**69.6**	0.5
08-29	Residential	B	1	66	**69.6**	**70.1**	0.5
08-30	Residential	B	1	66	**69.3**	**69.8**	0.5
08-31	Residential	B	1	66	**69.4**	**69.9**	0.5
08-32	Residential	B	1	66	**69.5**	**70**	0.5
08-33	Residential	B	1	66	**69.2**	**69.7**	0.5
08-34	Residential	B	1	66	**69.4**	**69.9**	0.5
08-35	Residential	B	1	66	**70.2**	**70.7**	0.5
08-36	Residential	B	1	66	**70.3**	**70.8**	0.5
08-37	Residential	B	1	66	**75.6**	**76.1**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
08-38	Residential	B	1	66	**69.6**	**70.1**	0.5
08-39	Residential	B	1	66	**73.8**	**74.3**	0.5
08-40	Residential	B	1	66	**73.2**	**73.7**	0.5
08-41	Residential	B	1	66	**72.7**	**73.2**	0.5
08-42	Residential	B	1	66	**72.7**	**73.2**	0.5
08-43	Residential	B	1	66	**72.5**	**73**	0.5
08-44	Residential	B	1	66	**71.4**	**71.9**	0.5
08-45	Residential	B	1	66	**73.2**	**72.3**	-0.9
08-46	Residential	B	1	66	**72.9**	**73.4**	0.5
08-47	Residential	B	1	66	**73**	**73.5**	0.5
08-48	Residential	B	1	66	**73.7**	**74.2**	0.5
08-49	Residential	B	1	66	**72.8**	**73.3**	0.5
08-50	Residential	B	1	66	**73.3**	**73.8**	0.5
08-51	Residential	B	1	66	**75.2**	**75.7**	0.5
08-52	Residential	B	1	66	**70.4**	**70.9**	0.5
08-53	Residential	B	1	66	**70.9**	**71.4**	0.5
08-54	Residential	B	1	66	**70.3**	**70.8**	0.5
08-55	Residential	B	1	66	**69.7**	**70.2**	0.5
08-56	Residential	B	1	66	**67.5**	**68**	0.5
08-57	Residential	B	1	66	64.5	65	0.5
08-58	Residential	B	1	66	64.8	65.3	0.5
08-59	Residential	B	1	66	65.1	**65.6**	0.5
08-60	Residential	B	1	66	65.2	**65.7**	0.5
08-61	Residential	B	1	66	**65.9**	**66.4**	0.5
08-62	Residential	B	1	66	**66.3**	**66.8**	0.5
08-63	Residential	B	1	66	**66.6**	**67.1**	0.5
08-64	Residential	B	1	66	64.4	64.9	0.5
08-65	Residential	B	1	66	64	64.5	0.5
08-66	Residential	B	1	66	64.4	64.9	0.5
08-67	Residential	B	1	66	64.1	64.6	0.5
08-68	Residential	B	1	66	64.5	65	0.5
08-69	Residential	B	1	66	**65.8**	66.3	0.5
08-70	Residential	B	1	66	**67.6**	68.1	0.5
08-71	Residential	B	1	66	64.1	64.6	0.5
08-72	Residential	B	1	66	64.1	64.5	0.4
08-73	Residential	B	1	66	64.3	64.8	0.5
08-74	Residential	B	1	66	64.7	65.2	0.5
08-75	Residential	B	1	66	65.3	65.8	0.5
08-76	Residential	B	1	66	**65.7**	**66.2**	0.5
08-77	Residential	B	1	66	**66.3**	**66.8**	0.5
08-78	Residential	B	1	66	**66.9**	**67.4**	0.5
08-79	Residential	B	1	66	**67.2**	**67.7**	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
08-80	Residential	B	1	66	**67.3**	**67.8**	0.5
08-81	Residential	B	1	66	**66.8**	**67.3**	0.5
08-82	Residential	B	1	66	**66.7**	**67.2**	0.5
08-83	Residential	B	1	66	**67.2**	**67.7**	0.5
08-84	Picnic Area	C	2	66	**67.4**	**67.9**	0.5
08-85	Church	C	2	66	**66.9**	**67.4**	0.5
08-86	Residential	B	1	66	63.6	64.1	0.5
08-87	Church	C	2	66	58.1	58.5	4.7
08-88	Residential	B	1	66	65.3	**65.8**	0.5
08-89	Residential	B	1	66	64.9	65.4	0.5
08-90	Residential	B	1	66	63.4	63.9	0.5
08-91	Residential	B	1	66	65.2	**65.7**	0.5
08-92	Residential	B	1	66	63.1	63.6	0.5
08-93	Residential	B	1	66	64.2	64.7	0.5
08-94	Residential	B	1	66	64.1	64.6	0.5
08-95	Residential	B	1	66	**65.8**	**66.3**	0.5
08-96	Residential	B	1	66	65.2	**65.7**	0.5
08-97	Residential	B	1	66	**67.6**	**68.1**	0.5
08-98	Residential	B	1	66	**68.3**	**68.8**	0.5
08-99	Residential	B	1	66	**66.3**	**66.8**	0.5
08-100	Residential	B	1	66	**67.9**	**68.4**	0.5
08-101	Residential	B	1	66	**65.7**	**66.2**	0.5
08-102	Residential	B	1	66	64.7	65.2	0.5
08-103	Residential	B	1	66	**66.2**	**66.7**	0.5
08-104	Residential	B	1	66	**66.2**	**66.7**	0.5
08-105	Residential	B	1	66	64	64.5	0.5
08-106	Residential	B	1	66	63.5	64	0.5
08-107	Residential	B	1	66	62.7	63.2	0.5
08-108	Residential	B	1	66	62.7	63.2	0.5
08-109	Residential	B	1	66	64.4	64.9	0.5
08-110	Residential	B	1	66	64.8	65.3	0.5
08-111	Residential	B	1	66	63.1	63.6	0.5
08-112	Residential	B	1	66	64.5	65	0.5
08-113	Residential	B	1	66	64	64.5	0.5
08-114	Residential	B	1	66	63.4	63.9	0.5
CNE 9							
09-01	Residential/Nursing Home	B	18	66	**73**	**78.2**	5.2
09-02	Residential	B	1	66	**77.7**	**76.2**	-1.5
09-03	Residential	B	1	66	**75.7**	**78.9**	3.2
09-04	Residential	B	1	66	**78.4**	**73**	-5.4
09-05	Residential	B	1	66	**72.5**	**73.7**	1.2
09-06	Residential	B	1	66	**73.2**	**72.3**	-0.9

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
09-07	Residential	B	1	66	**71.8**	**75.8**	4
09-08	Residential	B	1	66	**75.3**	**68.7**	-6.6
09-09	Residential	B	1	66	**68.2**	**65.9**	-2.3
09-10	Residential	B	1	66	**65.4**	**65**	-0.4
09-11	Residential	B	6	66	**64.5**	**64.8**	0.3
09-12	Residential	B	6	66	**64.3**	**63.7**	-0.6
09-13	Residential	B	1	66	**63.2**	**68.3**	5.1
09-14	Residential	B	1	66	**67.8**	**68.3**	0.5
09-15	Residential	B	1	66	**67.8**	**75.4**	7.6
09-16	Residential	B	1	66	**74.9**	**69.9**	-5
09-17	Residential	B	1	66	**69.4**	**70**	0.6
09-18	Residential	B	1	66	**69.5**	**72.1**	2.6
09-19	Residential	B	1	66	**71.6**	**72.5**	0.9
09-20	Residential	B	1	66	**72**	**67.7**	-4.3
09-21	Residential	B	1	66	**67.2**	**66.4**	-0.8
09-22	Residential	B	1	66	**65.9**	**67.3**	1.4
09-23	Residential	B	1	66	**66.8**	**68**	1.2
09-24	Residential	B	1	66	**67.5**	**69.5**	2
09-25	Residential	B	1	66	**69**	**67.8**	-1.2
09-26	Residential	B	1	66	**67.3**	**65.9**	-1.4
09-27	Residential	B	1	66	65.4	65	-0.4
09-28	Residential	B	1	66	64.5	63.2	-1.3
09-29	Residential	B	6	66	62.7	63.7	1
09-30	Residential	B	6	66	63.2	**66.2**	3
09-31	Residential	B	1	66	**65.7**	**58.4**	-7.3
09-32	Residential	B	1	66	57.9	**68.3**	10.4
09-33	Residential	B	1	66	**67.8**	64.7	-3.1
09-34	Residential	B	1	66	64.2	62.6	-1.6
09-35	Residential	B	1	66	62.1	64.6	2.5
09-36	Residential	B	1	66	64.1	**65.6**	1.5
09-37	Residential	B	1	66	65.1	**66.3**	1.2
09-38	Residential	B	1	66	**65.8**	**66.6**	0.8
09-39	Residential	B	1	66	**66.1**	**66**	-0.1
09-40	Residential	B	1	66	**65.5**	62.4	-3.1
09-41	Residential	B	1	66	61.9	61.2	-0.7
09-42	Residential	B	1	66	60.7	63.6	2.9
09-43	Residential	B	1	66	63.1	64.4	1.3
09-44	Residential	B	1	66	63.9	65.2	1.3
09-45	Residential	B	1	66	64.7	**65.5**	0.8
09-46	Residential	B	1	66	65	61.6	-3.4
09-47	Residential	B	6	66	61.1	62.3	1.2
09-48	Residential	B	6	66	61.8	62.3	0.5

Receptor Number	Land Use	Activity Category	Units	FHWA/MDOT NAC	Existing	Build	Change
09-49	Residential	B	6	67	63.8	64.3	0.5
CNE 10							
10-01	Residential	B	1	66	**72.4**	**72.9**	0.5
10-02	Residential	B	1	66	**68.9**	**69.4**	0.5
10-03	Residential	B	1	66	**77**	**77.5**	0.5
10-04	Residential	B	1	66	**72.3**	**72.8**	0.5
10-05	Residential	B	1	66	**75.1**	**75.6**	0.5
10-06	Residential	B	1	66	**71**	**71.5**	0.5
10-07	Residential	B	1	66	65.1	**65.6**	0.5
10-08	Residential	B	1	66	**66.2**	**66.7**	0.5
10-09	Residential	B	1	66	**66.6**	**67.1**	0.5
10-10	Residential	B	1	66	**70.1**	**70.6**	0.5
10-11	Residential	B	1	66	**67.5**	**68**	0.5
10-12	Residential	B	1	66	**66.5**	**67**	0.5
10-13	Residential	B	1	66	**71.4**	**71.8**	0.4
10-14	Residential	B	1	66	**68.5**	**69**	0.5
10-15	Residential	B	1	66	**67.3**	**67.7**	0.4
10-16	Residential	B	1	66	64.9	65.4	0.5
10-17	Residential	B	1	66	64.8	65.3	0.5
10-18	Residential	B	1	66	**66.3**	**66.8**	0.5
10-19	Residential	B	1	66	63.8	64.3	0.5

Appendix D Noise Barrier Analysis Detail

Table D-1 Noise Barrier Analysis, Receiver Level Detail

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
Wall 1								
01-01	Residential	B	1	66	**72**	62	9	Y
01-02	Residential	B	1	66	**75**	67	8	Y
01-03	Residential	B	1	66	**74**	63	10	Y
01-04	Residential	B	1	66	**76**	66	10	Y
01-05	Residential	B	1	66	**74**	68	7	Y
01-06	Residential	B	1	66	**70**	61	9	Y
01-07	Residential	B	1	66	**76**	67	9	Y
01-08	Residential	B	1	66	**74**	68	6	Y
01-09	Residential	B	1	66	**68**	61	8	Y
01-10	Residential	B	1	66	**66**	59	7	Y
01-11	Residential	B	1	66	**66**	60	6	Y
01-12	Residential	B	1	66	**69**	65	3	N
01-13	Residential	B	1	66	**67**	64	4	N
01-14	Residential	B	1	66	63	57	6	Y
01-15	Residential	B	1	66	65	61	4	N
01-16	Residential	B	1	66	65	59	6	Y
01-17	Residential	B	1	66	64	59	6	Y
01-18	Residential	B	1	66	63	58	5	Y
01-19	Residential	B	1	66	63	58	5	Y
01-20	Residential	B	1	66	62	58	4	N
Wall 2								
02-03	Residential	B	1	66	**71**	66	5	Y
02-04	Residential	B	1	66	**77**	66	11	Y
02-05	Residential	B	1	66	**73**	63	10	Y
02-06	Residential	B	1	66	**72**	63	10	Y
02-07	Residential	B	1	66	**72**	62	10	Y
02-08	Residential	B	1	66	**71**	62	9	Y
02-09	Residential	B	1	66	**70**	61	9	Y
02-10	Residential	B	1	66	**69**	61	9	Y
02-11	Residential	B	1	66	**69**	61	8	Y
02-12	Residential	B	1	66	**69**	60	9	Y
02-20	Residential	B	1	66	**69**	62	7	Y
02-21	Residential	B	1	66	**70**	61	9	Y
02-22	Residential	B	1	66	**70**	62	8	Y
02-23	Residential	B	1	66	**70**	61	8	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
02-24	Residential	B	1	66	**69**	61	8	Y
02-25	Residential	B	1	66	**67**	60	7	Y
02-26	Residential	B	1	66	**67**	60	8	Y
02-27	Residential	B	1	66	**68**	61	7	Y
02-31	Residential	B	1	66	**67**	61	6	Y
02-32	Residential	B	1	66	**68**	60	8	Y
02-33	Residential	B	1	66	**68**	60	8	Y
02-34	Residential	B	1	66	**68**	60	8	Y
02-35	Residential	B	1	66	**68**	60	7	Y
02-36	Residential	B	1	66	**67**	59	7	Y
02-37	Residential	B	1	66	65	58	7	Y
02-38	Residential	B	1	66	**66**	60	5	Y
02-39	Residential	B	1	66	**67**	62	5	Y
02-41	Residential	B	1	66	**66**	61	6	Y
02-42	Residential	B	1	66	**67**	60	7	Y
02-43	Residential	B	1	66	**67**	59	8	Y
02-44	Residential	B	1	66	**67**	59	8	Y
02-45	Residential	B	1	66	**66**	59	8	Y
02-46	Residential	B	1	66	65	58	7	Y
02-47	Residential	B	1	66	65	58	7	Y
02-48	Residential	B	1	66	64	61	3	N
02-49	Residential	B	1	66	65	60	5	Y
02-50	Residential	B	1	66	65	59	6	Y
02-51	Residential	B	1	66	**66**	58	7	Y
02-52	Residential	B	1	66	**66**	58	7	Y
02-53	Residential	B	1	66	65	57	7	Y
02-54	Residential	B	1	66	64	57	7	Y
02-55	Residential	B	1	66	64	59	6	Y
02-56	Residential	B	1	66	65	58	7	Y
Wall 3A								
03-16	Residential	B	1	66	**75**	64	10	Y
03-17	Residential	B	1	66	**76**	64	12	Y
03-18	Residential	B	1	66	**73**	64	9	Y
03-19	Residential	B	1	66	**69**	62	7	Y
03-20	Residential	B	1	66	**70**	62	8	Y
03-21	Residential	B	1	66	**72**	64	9	Y
03-40	Residential	B	1	66	**71**	68	3	N
03-41	Residential	B	1	66	**69**	63	6	Y
03-42	Residential	B	1	66	**72**	63	8	Y
03-43	Residential	B	1	66	**71**	63	7	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
03-44	Residential	B	1	66	**70**	63	7	Y
03-45	Residential	B	1	66	**66**	61	5	Y
03-46	Residential	B	1	66	65	59	6	Y
03-47	Residential	B	1	66	64	58	6	Y
03-48	Residential	B	1	66	**68**	62	6	Y
03-49	Residential	B	1	66	**69**	61	7	Y
03-50	Residential	B	1	66	**67**	61	6	Y
03-51	Residential	B	1	66	**66**	60	6	Y
03-53	Residential	B	1	66	64	59	6	Y
03-54	Residential	B	1	66	65	59	6	Y
03-55	Residential	B	1	66	65	59	6	Y
03-56	Residential	B	1	66	65	59	6	Y
03-57	Residential	B	1	66	63	58	6	Y
03-58	Residential	B	1	66	64	59	5	Y
03-59	Residential	B	1	66	**66**	60	6	Y
03-60	Residential	B	1	66	**68**	62	7	Y
03-61	Residential	B	1	66	**68**	62	6	Y
03-69	Residential	B	1	66	**66**	60	6	Y
03-70	Residential	B	1	66	**67**	61	6	Y
03-71	Residential	B	1	66	**67**	61	7	Y
03-72	Residential	B	1	66	65	59	5	Y
03-73	Residential	B	1	66	63	57	6	Y
03-74	Residential	B	1	66	**66**	59	6	Y
03-75	Residential	B	1	66	64	59	6	Y
03-76	Residential	B	1	66	64	61	3	N
Wall 3B								
03-01	Park	C	1	66	**70**	65	5	Y
03-02	Park	C	1	66	**71**	64	7	Y
03-03	Park	C	1	66	**72**	64	9	Y
03-04	Park	C	1	66	**72**	64	9	Y
03-05	Park	C	1	66	**73**	64	9	Y
03-06	Park	C	1	66	**73**	64	9	Y
03-07	Park	C	1	66	**73**	63	9	Y
03-08	Park	C	1	66	**73**	63	10	Y
03-09	Park	C	1	66	**73**	63	10	Y
03-10	Park	C	1	66	**73**	62	11	Y
03-11	Park	C	1	66	**73**	62	10	Y
03-12	Park	C	2	66	**73**	63	10	Y
03-13	Park	C	1	66	**73**	64	9	Y
03-14	Park	C	1	66	**73**	65	7	Y
03-15	Park	C	1	66	**73**	68	5	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
03-23	Park	C	1	66	**70**	63	8	Y
03-24	Park	C	1	66	**72**	63	9	Y
03-25	Park	C	1	66	**68**	**63**	5	Y
03-26	Park	C	1	66	**69**	62	7	Y
03-27	Park	C	1	66	**67**	61	7	Y
03-28	Residential	B	1	66	**68**	61	6	Y
03-29	Residential	B	1	66	**67**	61	6	Y
03-30	Residential	B	1	66	**67**	61	6	Y
03-31	Residential	B	1	66	**67**	61	6	Y
03-32	Residential	B	1	66	**67**	61	7	Y
03-33	Residential	B	1	66	**68**	61	7	Y
03-34	Residential	B	1	66	**67**	60	8	Y
03-35	Park	C	1	66	**68**	60	7	Y
03-36	Park	C	1	66	**68**	61	7	Y
03-37	Park	C	1	66	**68**	62	6	Y
03-38	Park	C	1	66	**68**	63	5	Y
03-39	Park	C	1	66	**68**	64	4	N
03-62	Residential	B	1	66	64	59	6	Y
03-63	Residential	B	1	66	65	59	6	Y
03-64	Residential	B	1	66	**67**	61	6	Y
03-65	Residential	B	1	66	**67**	61	6	Y
03-66	Residential	B	1	66	65	60	5	Y
03-67	Residential	B	1	66	65	59	6	Y
03-68	Residential	B	1	66	65	59	6	Y
Wall 4A								
04-05	Residential	B	1	66	**75**	65	10	Y
04-06	Residential	B	1	66	**74**	64	10	Y
04-07	Residential	B	1	66	**72**	63	9	Y
04-08	Residential	B	1	66	**70**	62	8	Y
04-09	Residential	B	1	66	**69**	61	8	Y
04-10	Residential	B	1	66	**67**	60	7	Y
04-11	Residential	B	1	66	**66**	59	7	Y
04-21	Residential	B	1	66	**67**	63	4	N
Wall 4B								
04-01	Residential	B	1	66	**74**	66	8	Y
04-02	Residential	B	1	66	**77**	67	10	Y
04-12	Residential	B	1	66	**68**	62	6	Y
04-15	Residential	B	1	66	**67**	62	5	Y
04-03	Residential	B	1	66	**75**	66	10	Y
04-13	Residential	B	1	66	**71**	64	7	Y
04-17	Residential	B	1	66	**68**	63	5	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
04-19	Residential	B	1	66	**66**	62	4	N
Wall 5								
05-01	Residential	B	1	66	**74**	64	10	Y
05-02	Residential	B	1	66	**75**	65	9	Y
05-03	Residential	B	1	66	**69**	62	7	Y
05-04	Residential	B	1	66	**71**	63	8	Y
05-05	Residential	B	1	66	**70**	63	7	Y
05-06	Residential	B	1	66	**72**	65	8	Y
05-07	Residential	B	1	66	**71**	65	6	Y
05-08	Residential	B	1	66	65	61	5	Y
05-09	Residential	B	1	66	**67**	61	5	Y
05-10	Residential	B	1	66	**66**	60	7	Y
05-11	Residential	B	1	66	**69**	63	6	Y
05-12	Residential	B	1	66	**66**	62	4	N
05-13	Residential	B	1	66	63	59	4	N
05-14	Residential	B	1	66	64	59	5	Y
05-15	Residential	B	1	66	**66**	60	6	Y
Wall 6								
06-01	Residential	B	1	66	**75**	64	11	Y
06-02	Residential	B	1	66	**75**	64	11	Y
06-03	Residential	B	1	66	**75**	64	10	Y
06-04	Residential	B	1	66	**74**	64	10	Y
06-05	Residential	B	1	66	**73**	64	9	Y
06-06	Residential	B	1	66	**73**	64	9	Y
06-07	Residential	B	1	66	**72**	64	9	Y
06-08	Residential	B	1	66	**72**	63	8	Y
06-09	Residential	B	1	66	**71**	63	8	Y
06-10	Residential	B	1	66	**71**	63	8	Y
06-11	Residential	B	1	66	**70**	63	7	Y
06-12	Residential	B	1	66	**70**	62	7	Y
06-13	Residential	B	1	66	**69**	62	7	Y
06-14	Residential	B	1	66	**68**	62	7	Y
06-15	Residential	B	1	66	**68**	62	6	Y
06-16	Residential	B	1	66	**68**	62	6	Y
06-17	Residential	B	1	66	**67**	61	6	Y
06-18	Residential	B	1	66	**67**	61	6	Y
06-19	Residential	B	1	66	**66**	61	5	Y
06-20	Residential	B	1	66	**66**	61	5	Y
06-21	Residential	B	1	66	**66**	61	5	Y
06-22	Residential	B	1	66	**66**	61	5	Y
06-24	Residential	B	1	66	**71**	64	7	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
06-25	Residential	B	1	66	**70**	65	5	Y
06-26	Residential	B	1	66	**70**	66	4	N
06-27	Residential	B	1	66	**70**	66	3	N
06-28	Residential	B	1	66	**69**	64	5	Y
06-29	Residential	B	1	66	**68**	63	5	Y
06-30	Residential	B	1	66	**67**	63	5	Y
06-31	Residential	B	1	66	**67**	61	5	Y
06-32	Residential	B	1	66	65	60	5	Y
06-33	Residential	B	1	66	**66**	62	4	N
06-34	Residential	B	1	66	64	62	2	N
06-35	Residential	B	1	66	64	60	3	N
06-36	Residential	B	1	66	62	58	4	N
06-37	Residential	B	1	66	58	56	2	N
06-38	Residential	B	1	66	64	62	2	N
06-39	Residential	B	1	66	62	59	2	N
06-40	Residential	B	1	66	61	59	2	N
06-41	Residential	B	1	66	61	58	4	N
06-42	Residential	B	1	66	60	56	4	N
06-43	Residential	B	1	66	59	55	4	N
06-44	Residential	B	1	66	62	58	4	N
Wall 7A								
07-03	Residential	B	1	66	**74**	67	7	Y
07-04	Residential	B	1	66	**71**	62	8	Y
07-05	Residential	B	1	66	**76**	64	12	Y
07-06	Residential	B	1	66	**75**	64	11	Y
07-38	Residential	B	1	66	**66**	60	7	Y
07-39	Residential	B	1	66	64	59	5	Y
07-40	Residential	B	1	66	63	59	4	N
Wall 7B								
07-08	Residential	B	1	66	**69**	**69**	0	
07-09	Residential	B	1	66	**72**	**67**	5	Y
07-10	Residential	B	1	66	**74**	64	9	Y
07-11	Residential	B	1	66	**74**	64	10	Y
07-12	Residential	B	1	66	**74**	64	10	Y
07-13	Residential	B	1	66	**74**	64	10	Y
07-14	Residential	B	1	66	**74**	65	10	Y
07-15	Residential	B	1	66	**74**	65	9	Y
07-16	Residential	B	1	66	**74**	**66**	8	Y
07-17	Residential	B	1	66	**72**	**68**	5	Y
07-18	Residential	B	1	66	**66**	**66**	0	N
07-26	Residential	B	1	66	**70**	65	5	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
07-27	Residential	B	1	66	**69**	63	6	Y
07-28	Residential	B	1	66	**69**	63	7	Y
07-29	Residential	B	1	66	**70**	62	8	Y
07-30	Residential	B	1	66	**70**	62	8	Y
07-31	Residential	B	1	66	**70**	62	8	Y
07-32	Residential	B	1	66	**69**	62	8	Y
07-33	Residential	B	1	66	**69**	62	7	Y
07-34	Residential	B	1	66	**67**	**67**	0	N
07-35	Residential	B	1	66	65	65	0	N
07-36	Residential	B	1	66	64	64	0	N
07-37	Residential	B	1	66	63	63	0	N
07-41	Residential	B	1	66	**66**	60	6	Y
07-42	Residential	B	1	66	**66**	60	6	Y
07-43	Residential	B	1	66	**66**	60	6	Y
07-44	Residential	B	1	66	**66**	60	6	Y
07-45	Residential	B	1	66	**66**	60	6	Y
07-46	Residential	B	1	66	**66**	60	6	Y
07-47	Residential	B	1	66	**66**	61	5	Y
07-48	Residential	B	1	66	**66**	62	4	N
Wall 8A								
08-01	Church	C	2	66	**73**	65	9	Y
08-02	Church	C	2	67	**73**	64	9	Y
08-03	Playground	C	2	66	**70**	63	7	Y
08-04	Residential	B	1	66	**70**	62	8	Y
08-05	Residential	B	1	66	**74**	63	10	Y
08-06	Residential	B	1	66	**75**	64	11	Y
08-07	Residential	B	1	66	**75**	63	11	Y
08-08	Residential	B	1	66	**75**	63	11	Y
08-09	Residential	B	1	66	**74**	63	11	Y
08-10	Residential	B	1	66	**74**	63	11	Y
08-11	Residential	B	1	66	**74**	63	11	Y
08-12	Residential	B	1	66	**75**	64	11	Y
08-13	Residential	B	1	66	**74**	64	10	Y
08-14	Residential	B	1	66	**75**	64	10	Y
08-15	Residential	B	1	66	**75**	65	10	Y
08-16	Residential	B	1	66	**74**	65	9	Y
08-17	Residential	B	1	66	**73**	65	8	Y
08-18	Residential	B	1	66	**71**	64	7	Y
08-19	Residential	B	1	66	**70**	64	7	Y
08-20	Residential	B	1	66	**70**	63	7	Y
08-21	Residential	B	1	66	**68**	62	6	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
08-22	Residential	B	1	66	**68**	62	6	Y
08-23	Residential	B	1	66	**67**	61	6	Y
08-24	Residential	B	1	66	**67**	61	6	Y
08-25	Residential	B	1	66	**72**	64	8	Y
08-26	Residential	B	1	66	**71**	64	7	Y
08-27	Residential	B	1	66	**71**	65	6	Y
08-28	Residential	B	1	66	**69**	67	1	N
08-70	Residential	B	1	66	**67**	62	5	Y
08-71	Residential	B	1	66	65	60	5	Y
08-72	Residential	B	1	66	65	59	5	Y
08-73	Residential	B	1	66	65	59	6	Y
08-74	Residential	B	1	66	65	60	5	Y
08-75	Residential	B	1	66	**66**	60	6	Y
08-76	Residential	B	1	66	**66**	60	6	Y
08-77	Residential	B	1	66	**67**	61	6	Y
08-78	Residential	B	1	66	**68**	61	7	Y
08-79	Residential	B	1	66	**68**	61	7	Y
08-80	Residential	B	1	66	**68**	61	7	Y
08-81	Residential	B	1	66	**67**	61	7	Y
08-82	Residential	B	1	66	**67**	60	7	Y
08-83	Residential	B	1	66	**68**	60	8	Y
08-84	Residential	B	2	66	**68**	62	6	Y
08-85	Residential	B	2	66	**68**	63	5	Y
08-87	Residential	B	2	66	59	57	2	N
08-88	Residential	B	1	66	**66**	59	7	Y
08-89	Residential	B	1	66	65	59	7	Y
08-90	Residential	B	1	66	64	58	6	Y
08-91	Residential	B	1	66	65	61	4	N
Wall 8B								
08-29	Residential	B	1	66	**70**	62	9	Y
08-30	Residential	B	1	66	**70**	61	9	Y
08-31	Residential	B	1	66	**70**	61	9	Y
08-32	Residential	B	1	66	**70**	61	9	Y
08-33	Residential	B	1	66	**70**	62	8	Y
08-34	Residential	B	1	66	**70**	61	9	Y
08-35	Residential	B	1	66	**71**	62	9	Y
08-36	Residential	B	1	66	**71**	62	9	Y
08-37	Residential	B	1	66	**76**	68	8	Y
08-64	Residential	B	1	66	65	63	2	N
08-65	Residential	B	1	66	65	61	4	N
08-66	Residential	B	1	66	65	64	2	N

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
Wall 8C								
08-38	Residential	B	1	66	**70**	68	2	N
08-39	Residential	B	1	66	**74**	66	8	Y
08-40	Residential	B	1	66	**74**	64	10	Y
08-41	Residential	B	1	66	**73**	64	10	Y
08-42	Residential	B	1	66	**73**	64	10	Y
08-43	Residential	B	1	66	**73**	63	10	Y
08-44	Residential	B	1	66	**72**	63	9	Y
08-45	Residential	B	1	66	**73**	64	10	Y
08-46	Residential	B	1	66	**74**	64	10	Y
08-47	Residential	B	1	66	**74**	64	10	Y
08-48	Residential	B	1	66	**74**	64	11	Y
08-49	Residential	B	1	66	**73**	64	10	Y
08-50	Residential	B	1	66	**74**	64	10	Y
08-51	Residential	B	1	66	**76**	61	15	Y
08-52	Residential	B	1	66	**71**	64	7	Y
08-53	Residential	B	1	66	**72**	63	9	Y
08-54	Residential	B	1	66	**71**	63	8	Y
08-55	Residential	B	1	66	**70**	63	7	Y
08-56	Residential	B	1	66	**68**	61	7	Y
08-57	Residential	B	1	66	65	60	5	Y
08-58	Residential	B	1	66	65	61	5	Y
08-59	Residential	B	1	66	**66**	62	4	N
08-60	Residential	B	1	66	**66**	62	4	N
08-61	Residential	B	1	66	**66**	61	5	Y
08-62	Residential	B	1	66	**67**	61	6	Y
08-63	Residential	B	1	66	**67**	63	4	N
08-64	Residential	B	2	66	65	63	2	N
08-93	Residential	B	2	66	65	62	3	N
08-94	Residential	B	2	66	65	61	3	N
08-95	Residential	B	1	66	**66**	62	5	Y
08-96	Residential	B	1	66	**66**	61	5	Y
08-97	Residential	B	1	66	**68**	61	7	Y
08-98	Residential	B	1	66	**69**	62	7	Y
08-99	Residential	B	1	66	**67**	62	5	Y
08-100	Residential	B	1	66	**69**	62	7	Y
08-101	Residential	B	1	66	**67**	61	5	Y
08-102	Residential	B	1	66	65	60	5	Y
08-103	Residential	B	1	66	**67**	61	5	Y
08-104	Residential	B	1	66	**67**	61	6	Y
08-105	Residential	B	1	66	65	60	5	Y

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
08-106	Residential	B	1	66	64	60	4	N
08-107	Residential	B	1	66	63	58	5	Y
08-108	Residential	B	1	66	63	58	5	Y
08-109	Residential	B	1	66	65	60	6	Y
08-110	Residential	B	1	66	65	60	5	Y
08-111	Residential	B	1	66	64	59	5	Y
08-112	Residential	B	1	66	65	60	5	Y
08-113	Residential	B	1	66	65	60	5	Y
08-114	Residential	B	1	66	64	59	5	Y
Wall 9A								
09-01	Residential	B	9	66	**73**	64	10	Y
09-49	Residential	B	9	66	64	58	6	Y
Wall 9B								
09-02	Residential	B	1	66	**78**	69	10	Y
09-14	Residential	B	1	66	**69**	62	7	Y
09-15	Residential	B	1	66	**69**	64	5	Y
Wall 9C								
09-03	Residential	B	1	66	**75**	75	1	N
09-04	Residential	B	1	66	**79**	62	17	Y
09-05	Residential	B	1	66	**72**	62	11	Y
09-06	Residential	B	1	66	**73**	63	11	Y
09-07	Residential	B	1	66	**72**	62	10	Y
09-08	Residential	B	1	66	**76**	64	12	Y
09-09	Residential	B	1	66	**69**	63	6	Y
09-10	Residential	B	1	66	**66**	64	2	N
09-11	Residential	B	1	66	64	64	0	N
09-12	Residential	B	1	66	64	64	0	N
09-16	Residential	B	1	66	**72**	62	10	Y
09-17	Residential	B	1	66	**69**	61	9	Y
09-18	Residential	B	1	66	**70**	62	9	Y
09-19	Residential	B	1	66	**73**	63	9	Y
09-20	Residential	B	1	66	**69**	61	8	Y
09-21	Residential	B	1	66	**67**	60	7	Y
09-22	Residential	B	1	66	**66**	59	7	Y
09-23	Residential	B	1	66	**67**	60	7	Y
09-24	Residential	B	1	66	**68**	61	7	Y
09-25	Residential	B	1	66	**70**	63	8	Y
09-26	Residential	B	1	66	**68**	62	6	Y
09-27	Residential	B	1	66	**66**	61	5	Y
09-28	Residential	B	1	66	65	62	3	N
09-29	Residential	B	1	66	63	62	0	N

Receptor Number	Land Use	Category	Units	FHWA/MDOT NAC	Build	Noise Level w/Barr	Noise Reduction	Benefit?
09-33	Residential	B	1	66	65	60	5	Y
09-34	Residential	B	1	66	64	58	5	Y
09-35	Residential	B	1	66	62	57	5	Y
09-36	Residential	B	1	66	64	58	6	Y
09-37	Residential	B	1	66	65	59	6	Y
09-38	Residential	B	1	66	**66**	60	6	Y
09-39	Residential	B	1	66	**67**	62	5	Y
09-40	Residential	B	1	66	**66**	61	5	Y
09-41	Residential	B	1	66	61	58	3	N
09-42	Residential	B	1	66	61	56	5	Y
09-43	Residential	B	1	66	63	57	6	Y
09-44	Residential	B	1	66	64	58	5	Y
09-45	Residential	B	1	66	65	60	5	Y
09-46	Residential	B	1	66	**66**	61	5	Y
09-47	Residential	B	1	66	62	61	0	N
09-48	Residential	B	1	66	62	62	0	N
Wall 10A								
10-03	Residential	B	1	66	**78**	68	10	Y
10-04	Residential	B	1	66	**73**	65	8	Y
10-05	Residential	B	1	66	**76**	72	5	Y
10-06	Residential	B	1	66	**72**	65	7	Y
10-11	Residential	B	1	66	**69**	63	6	Y
10-12	Residential	B	1	66	**68**	62	5	Y
10-13	Residential	B	1	66	**72**	66	7	Y
10-14	Residential	B	1	66	**70**	62	7	Y
10-15	Residential	B	1	66	**68**	66	2	N
10-18	Residential	B	1	66	**67**	61	6	Y
Wall 10 b								
10-01	Residential	B	1	66	**74**	63	11	Y
10-02	Residential	B	1	66	**69**	61	9	Y
10-07	Residential	B	1	66	**66**	61	5	Y
10-08	Residential	B	1	66	**67**	59	8	Y
10-09	Residential	B	1	66	**67**	59	8	Y
10-10	Residential	B	1	66	**71**	63	8	Y
10-16	Residential	B	1	66	**66**	58	7	Y