DRAFT REPORT

TRAFFIC NOISE TECHNICAL REPORT FULL DEPTH ROADWAY RECONSTRUCTION AND WIDENING OF THE PENNSYLVANIA TURNPIKE (I-76) FROM MILEPOST 312 TO 319.

Prepared for

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ANSI	American National Standards Institute
BR	Benefited Receptors
CE	Categorical Exclusion
dB	Decibel (measure of sound pressure level on a logarithmic scale)
dBA	A-weighted decibel (sound pressure level)
DU	Dwelling Unit
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
Hz	Hertz
IL	Insertion Loss
Lx	Measured noise level exceeded x percent of the measurement period
Leq	Equivalent sound level (energy averaged sound level)
Leq(1h)	A-weighted, energy average sound level during a 1-hour period
Lmax	Maximum measured noise level
LT	Long Term
Max SF/BR	Maximum Square Foot per Benefited Receptor
MP	Mile Post
NAC	Noise Abatement Criteria
NSA	Noise Sensitive Area
PennDOT	Pennsylvania Department of Transportation
PTC	Pennsylvania Turnpike Commission
ROD	Record of Decision
ROW	Right of Way
SF/BR	Square Foot per Benefited Receptor
SLM	Sound Level Meter
ST	Short Term
SR	State Route
TNM	Traffic Noise Model
v/c	Volume to capacity ratio
vph	Vehicles per hour

ES.1 PROJECT DESCRIPTION SUMMARY

The Project under analysis entails the proposed widening and reconstruction of the existing Pennsylvania Turnpike (I-76) from four lanes to six lanes between MP 311.4 and MP 319.39, including the Downingtown Interchange ramps up to the toll booth area. Preliminary plans indicate the existing 82-foot pavement will be widened to approximately 122 feet. Three bridge replacements are proposed as part of the project: PA Turnpike over Ramp CD at MP 312.03; PA Turnpike over Pine Creek Road at MP 314.19; and PA Turnpike over SR 0401 at MP 314.95. In addition, two superstructure replacements will take place at PA Turnpike over SR 1003 and Conrail at MP 319.19 and PA Turnpike over North Morehall Road/SR 29 at MP 319.33. Figure 1 contains an overview of the Project location.

ES.2 NOISE LEVELS AND NOISE IMPACTS

The Pennsylvania Turnpike Commission follows Pennsylvania Department of Transportation (PennDOT) noise guidelines as stated in "*Pennsylvania Department of Transportation, Project Level Highway Traffic Noise Handbook, Publication No. 24, dated July 2011*". The noise analysis included a total of 260 measurement/modeled prediction locations (receivers) representing 471 individual noise sensitive dwelling units (receptors). In order to simplify the reporting of noise levels, noise impacts, noise mitigation, and in adherence with preferred PennDOT analysis methodology, these receptors were organized in 26 defined Noise Sensitive Areas (NSAs) within the general project area. The NSAs are shown in Figures 3-1 through 3-7.

Existing noise levels were predicted to determine the extent of the noise impact relative to the Project edge of pavement (PennDOT requires analysis out to 500 feet unless impacts are determined beyond that limit). Existing condition noise models were successfully validated at twenty-nine (29) short-term measurement locations, with predicted and measured noise levels differing by less than 3.0 dBA at each location, in keeping with PennDOT policy. Existing and future (Year 2038) noise levels were determined and modeled using standard Federal Highway Administration (FHWA) and PennDOT methodologies. These predicted levels were compared to the existing noise conditions and evaluated for potential impacts as defined by FHWA and PennDOT criteria.

Table ES-1 presents a summary of each of the identified NSAs in the project area along with its associated FHWA/PennDOT noise impact, Land Use, Activity Category, Noise Abatement Criteria (NAC), number of modeled receptor locations, number of representative equivalent units (dwelling units), predicted existing noise level, future noise level and type of impact.

Table ES-1
Summary of Identified Noise Sensitive Areas (NSAs)

NSA ID	Land Use	Activity Category	Noise Abatement Criteria	# of Modeled Receivers	# of Receptors/ Equivalent Residential Units	Predicted Existing Noise Level. Range of Leq(1h), dBA	Predicted Future Noise Level Range of Leq(1h), dBA	Type of Impact NAC/ Increase/ None or Both
1	Residential/ Commercial	B, E	66, 71	7	6	64 - 71	67 - 72	NAC
2	Residential/ Commercial	B, E	66, 71	4	4	61 - 69	62 - 73	NAC
3	Commercial	E	71	13	0	55 - 76	58 - 79	NAC
4	Residential	B	66	55	153	52 - 74	54 – 80	NAC
5	Residential	B	66	38	95	59 - 82	61 – 80	NAC
6	Residential	B	66	1	1	64 - 64	67 – 67	NAC
7	Residential	B	66	3	4	62 - 66	64 – 69	NAC
8	Residential	B	66	20	20	57 - 75	61 – 76	NAC
9	Residential	B	66	6	8	58 - 69	60 – 71	NAC
10	Residential	B	66	4	4	62 - 66	64 – 68	NAC
11	Residential	B	66	2	2	60 - 72	62 – 75	NAC
12	Residential	B	66	1	1	66 - 66	69 – 69	NAC
13	Residential	B	66	3	3	66 - 71	70 – 74	NAC
14	Residential	B	66	1	1	66 - 66	69 – 69	NAC
15	Residential	B	66	13	13	59 - 74	63 – 77	NAC
16	Residential	B	66	6	6	59 - 68	61 – 70	NAC
17	Residential	B	66	4	4	56 - 64	59 – 67	NAC
18	Residential	B	66	4	4	61 - 73	62 – 75	NAC
19	Residential	B	66	14	14	54 - 61	59 – 65	None
20	Residential	B	66	15	44	55 - 66	59 – 70	NAC
21	Residential	B	66	29	29	44 - 74	46 – 76	NAC
22	Residential	B	66	4	4	51 - 62	54 – 65	None
23	Residential	B	66	3	3	57 - 62	60 – 65	None
24	Church	C	66	2	1	64 - 71	66 – 73	NAC
25	School/Future Residential	B	66	18	42	50 - 70	52 – 72	NAC
26	Residential	B	66	5	5	65 - 70	67 - 72	NAC
TOTAL				274	471			

Noise levels were predicted for all receptor locations for the Existing and Future Build alternative using the FHWA Traffic Noise Model (TNM), Version 2.5, the most recent version available. Predictions assumed worst case hourly equivalent noise levels (1-hour Leq, dBA) using projected peak-hour design year traffic volumes and speeds. The highest predicted future noise levels for each NSA (among the range of noise levels for all modeled receptors within the NSA), are summarized in Table ES-1. Figures 4-1 through 4-7 show the modeling results graphically.

The PennDOT noise manual defines a traffic noise impact under two separate conditions: 1) when the future predicted traffic noise level is equal to or exceeds the PennDOT NAC, or 2) when the future predicted traffic noise level creates a substantial increase of 10 dBA over existing noise levels. NAC values vary depending on land use, but are generally either 66 dBA (1-hr Leq, exterior) for residential, institutional, and outdoor active use areas; or 71 dBA (1-hr Leq, exterior) for noise sensitive commercial areas, (including hotels and offices). NAC values for each NSA are indicated in Table ES-1. A summary of all predicted noise impacts for each of the identified NSAs is presented in Table ES-2. It should be noted that no receptors expected to experience substantial increase over existing noise levels.

Table ES-2
Recommend Noise Abatement, by NSA

	Highest Predicted Noise Level by Alternative Leq (1h), dBA	Number of Impacted Receptors	
NSA ID	Future 2038 Build	Future 2038 Build	Impact Type
4	80	77	NAC
5	80	70	NAC
20	70	15	NAC
Total		162	-

ES.3 NOISE ABATEMENT CONSIDERATIONS AND COMMITMENTS

FHWA and PennDOT policy require that when noise impacts are identified, noise abatement must be evaluated; and if noise abatement is found to be feasible and reasonable, it must be incorporated into the project. PennDOT noise manual specifies that for noise abatement to be feasible it must be capable of providing a 5 dBA insertion loss (the net noise reduction provided by the barrier) for the majority (50% or greater) of impacted receptors, and that it must meet safety, constructability, and access requirements. For an abatement measure to be reasonable it must meet a maximum square foot per benefited receptor (Max SF/BR) criterion. PennDOT noise barrier cost reasonableness value is based on a Max SF/BR value of 2,000 square feet. The square footage of a barrier is based on its length multiplied by its height above the finished ground at its base to the top elevation. The benefited receptor values are determined by counting all receptors receiving a 5 dBA or greater insertion loss (IL). Although at least a 5 dBA IL for the majority of receptors is required to meet the feasibility criterion, the proposed barrier must reduce noise level by at least 7 dBA for at least one benefited receptor. It is desirable to provide this IL for additional impacted receptors while confirming to the Max SF/BR criteria and if justified by a “point of diminishing returns" evaluation. While optimizing a proposed noise barrier, the desired abatement goals should be evaluated in terms of establishing insertion loss for impacted receptors only.

The final factor of reasonableness is determined by the benefited receptors. The benefited receptors must be surveyed to get their input on whether or not they would approve the barrier. If a majority of the benefited receptors approve of the barrier (greater than 50%), then the barrier is deemed as reasonable.

Each impacted NSA was evaluated to determine if noise abatement, typically in the form of noise walls, was feasible and reasonable. The analyses for each NSA are presented in Section 5. A summary of recommended noise abatement are presented in Table ES-3. Figures 5-1 and 5-2 show the proposed placement of the barrier walls. Final wall design and placement is pending approval from PTC. Noise walls were used in the analysis; however, final design might include berms as well as walls.

Table ES-3
Proposed Noise Abatement Recommendation Summary

Descriptions	NSA4	NSA5	NSA20
Number of Impacted Receptors	77	70	15
Number of Benefited Receptors	95	67	34
Barrier Evaluation Method	TNM	TNM	TNM
Length (ft)	2570	1925	1966
Average Height (ft)	12.45	13.71	10.41
Minimum Height (ft)	8.00	12.00	8.00
Maximum Height (ft)	20.00	20.00	16.00
Area (ft^2)	31,985	26,394	20,457
Calculated SF/ BR	337	394	602
Number of Receptors meeting Design Goal (7 dBA)	56	57	11
Design Goal Met?	Yes	Yes	Yes
Feasible?	Yes	Yes	Yes
Reasonable?	Yes	Yes	Yes

ES.4 CONSTRUCTION NOISE

This work consists of making every effort to minimize the effect of noise on the surrounding community, and conducting an initial community meeting or distributing a Construction Notice to adjacent property owners prior to commencing construction, and at other times prior to critical phases of the project.

ES.5 INFORMATION FOR LOCAL OFFICIALS

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

This technical noise report will serve as the primary information source to help local officials avoid future incompatible land use planning with regard to noise generated by this project. In particular, refer to Table 4-2 for noise impact contour distances for various regions of the project. Two representative undeveloped lands were used as references for the entire project site; one of the undeveloped land contours represent topographically flat areas (line-of-sight (LOS) between receptor and sources) and the other represents a 'cut' section (no LOS). The shorter distance represents a typical 'cut' section, the longer distance represents a typical flat section. For convenience this table is presented below as Table ES-4.

Table ES-4
Noise Impact Distances for Undeveloped Lands

Representative Undeveloped Land	Estimated Impact Distance (feet)	
	66 dBA (Categories B and C)	71 dBA (Category E)
Typical Unobstructed Areas (line of sight to the roadway)	425	200
Typical Obstructed Areas (no line of sight to roadway)	220	100

Notes:
1: The impact distances are from the edge of I-76.

ES.6 ADDENDUM 1 NOVEMBER 2016

During October 2016 it was determined that a home within NSA-21 (3195 Blackberry Lane, which received its building permit on 11/26/12 and was not included in the original project drawings or aerial mapping) was inadvertently omitted from the analysis. Thus, the NSA-21 analysis was revised to include the missing home and concluded that a noise barrier is still determined to be not reasonable under FHWA/PTC/PennDOT policy and is therefore not recommended for inclusion in the project (see Appendix F for details of the analysis).

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SECTION 1 INTRODUCTION AND PROJECT DESCRIPTION

PROJECT DESCRIPTION

The Project entails the proposed widening and reconstruction of the existing Pennsylvania Turnpike (I-76) from four lanes to six lanes between MP 311.4 and MP 319.39, including the Downingtown Interchange ramps up to the toll booth area. Preliminary plans indicate the existing 82-foot pavement will be widened to approximately 122 feet. Three bridge replacements are proposed as part of the project: PA Turnpike over Ramp CD at MP 312.03; PA Turnpike over Pine Creek Road at MP 314.19; and PA Turnpike over SR 0401 at MP 314.95. In addition, two superstructure replacements will take place at PA Turnpike over SR 1003 and Conrail at MP 319.19 and PA Turnpike over North Morehall Road/SR 29 at MP 319.33.

Figure 1 contains an overview of the Project location.

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SECTION 2 NOISE ANALYSIS OVERVIEW

This section identifies and reviews the methodology and policy for the technical tasks and analyses used in this report. The actual results of these tasks and analyses are presented in subsequent sections of this report.

2.1 REGULATORY OVERVIEW

2.1.1 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, or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment, or increases the number of through-traffic lanes.

Type I projects include those that create a completely new noise source, as well as those that increase the volume or speed of traffic or move the traffic closer to a receptor. Type I projects include the addition of through traffic lanes, 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.

Due to the addition of through traffic lanes throughout the project area, the proposed project would be considered Type I.

2.1.2 FHWA Noise Abatement Criteria (NAC)

Under 23 CFR 772.13, noise abatement must be considered for Type I projects if the project is predicted to result in traffic noise impacts. In such cases, 23 CFR 772 requires that the project sponsor “consider” noise abatement before adoption of the final PTC 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 PennDOT *Publication No. 24 (May 2011),* as described in the following section.

Table 2-1 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 a given area. Background information on noise levels and noise metrics can be found in Appendix A.

In identifying noise impacts, primary consideration is given to exterior areas of frequent human use. In situations where there are no exterior activities, or where the exterior activities are far from the roadway or physically shielded in a manner that prevents an impact on exterior activities, the interior criterion (Activity Category D) may be used as the basis for determining a noise impact.

Table 2-1
FHWA Noise Abatement Criteria[1]

Activity Category	Activity Criteria[2]		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[3]	67	70	Exterior	Residential.
C[3]	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 studios, recording studios, schools, and television studios.
E[3]	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

The federal regulation also covers such topics as traffic noise prediction, analysis of traffic noise impacts, analysis of noise abatement, information for public officials, and construction noise issues, all of which have been incorporated into the current PennDOT noise manual, as discussed in the next section.

2.1.3 State Regulations and Policies

The Pennsylvania Turnpike Commission follows Pennsylvania Department of Transportation (PennDOT) noise guidelines. PennDOT's noise policy provides guidance in the analysis of highway traffic noise and the evaluation of noise mitigation measures. The noise guidelines are entitled "*Pennsylvania Department of Transportation, Project Level Highway Traffic Noise Handbook, Publication No. 24, dated July 2011*". (hereafter referred to as "noise manual"). It 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 NAC specified in the noise manual are the same as those specified in the most recent version of 23 CFR 772. The PennDOT noise manual states that a sound level is considered to approach the NAC level when the Leq(h) sound level is 1 dBA less than the NAC identified in 23 CFR 772. This means that a peak hour noise level of 66 dBA is considered to approach the NAC of 67 dBA, but 65 dBA does not. The PennDOT noise manual defines a noise increase as substantial when the predicted traffic noise levels with project implementation exceed existing noise levels by 10 dBA. The PennDOT noise manual provides detailed technical guidance for the evaluation of highway traffic noise. This includes field measurement methods, noise modeling methods, and report preparation guidance.

In addition to the NAC criteria above, the PennDOT noise manual also specifies the following definitions and policies:

A **Benefited Receptor** is a receptor predicted to receive at least 5 dBA net noise reduction, also referred to as insertion loss (IL), from the proposed mitigation and inclusive of all such residences, not limited to those receptors in the first row.

A **Feasible Noise Abatement Measure** is a mitigation measure that is acoustically feasible and meets engineering requirements for constructability. A feasible noise barrier must provide a minimum of 5 dBA IL for a majority (50% or greater) of the impacted receptors.

The **Insertion loss Design Goal** is the optimum desired dBA noise reduction determined from calculating the difference between future build noise levels with abatement, to future build noise levels without abatement. The PENNDOT design goal is a 7 dBA IL for at least one benefited receptor.

A **Reasonable Noise Abatement Measure** is defined by PennDOT as a Maximum Square Footage of Abatement Per Benefited Receptor (MaxSF/BR) value of 2,000. In determining the MaxSF value, the square footage of the barrier shall be based upon its length and its height from the finished ground elevation at the base of the barrier to its top elevation. In determining the Benefited Receptor (BR) value, count any receptor receiving 5 dBA IL or greater as being benefited.

Consideration of Viewpoints of benefited property owners and residence is ultimately required for noise abatement to be considered Reasonable.

2.2 DEFINING AREA OF POTENTIAL IMPACT

PennDOT noise manual references the FHWA “Highway Traffic Noise: Analysis and Abatement Guideline”, FHWA-HEP-10-025HP dated December 2011. 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 400 to 500 feet from the roadway. It is also established that the FHWA Traffic Noise Model is less reliable at predicting noise levels beyond this range, so a 500 foot screening distance from the edge of the proposed highway is established as a default value for the area of potential impact. However, in some areas with low existing noise levels (say below 55 dBA during the loudest hour), substantial increase in noise impacts could exist without the predicted project noise level approaching or exceeding the NAC, so in these areas a more extensive analysis area may be required.

2.3 NOISE MEASUREMENT PROCEDURES

A variety of 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 PennDOT noise manual. Specifically, the following practices and procedures were used.

- Both long- and short-term noise measurements were conducted. (Appendix B)

- The long-term measurements (typically 24 hours) were used primarily to document the daily variation in existing traffic noise levels and to identify the worst case noise hour, if there was one. Long-term measurements were generally conducted at or near the highway right-of-way (ROW) line in order to best document hourly variation in traffic noise level with minimal influence from non-highway noise sources.

- The short-term noise measurements (typically 15-30 minutes) were conducted at actual noise sensitive receptor locations and were used primarily to validate noise models (at locations where traffic noise was dominant).

- Short-term noise measurements were generally conducted at areas of frequent exterior 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).

- Only ANSI (American National Standards Institute) Rated Type 1 or Type 2 sound levels meters were used (Type 1 for short-term and Type 2 for long-term). The meters were subjected to a field calibration check before and after each measurement. Calibration certificates and raw data for each meter used in the Project can be found in Appendix B.

- Concurrent classified (auto, medium and heavy trucks, buses, and motorcycles) traffic counts for the acoustically dominant road were conducted for each short-term measurement (either via live count, or by videotape). Observed traffic counts can be found in Appendix B, official traffic counts used in the TNM modeling can be found in Appendix C.

- All field data was recorded on field data sheets, which included the time, name and location of the measurement, instrumentation data, 5-minute Leq noise levels, observed meteorological data, field calibration data, a measurement site diagram, GIS coordinates, and notes as to the dominant noise sources and any other observed acoustically relevant events (such as aircraft over-flights, emergency vehicle pass bys, etc.). Field sheets used in this project can be found in Appendix B.

- Photographs were taken for each measurement location showing the location relative to the dwelling and the noise source. Photographs of the measurement locations, along with a general description of the location, can be found in Appendix B.

2.4 ANALYSIS OBJECTIVES

The purpose of this draft noise analysis report is to identify and document potential noise impacts associated with the future alternative of the proposed 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 and state regulations. This information is presented in Section 2.1 of this report.
3. **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 and background information can be found in Appendix B.
4. **Predict Future Noise Levels:** Future noise levels at noise sensitive land uses for the future Project alternative are predicted using the FHWA Traffic Noise Model (TNM) Version 2.5. This information is presented in Section 4 of this report and a summary of the TNM modeling can be found in Appendix D.
5. **Assess Future Noise Impacts:** For each alternative/design option, compare future noise levels (as well as increases in future noise levels over existing noise levels) to appropriate identified noise impact criteria and quantify resulting noise impacts. This information is presented in Section 4 of this report and a summary of the TNM modeling can be found in Appendix D.
6. **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 PENNDOT standards. This information is presented in Section 5 of this report and a summary of the TNM modeling can be found in Appendix D. Worksheets from

PennDOT Pub. #24 Appendix A ""Warranted, Reasonable and Feasible Worksheets" are located in Appendix E.

7. **Consider Construction Noise Impacts:** Analyze potential construction noise impacts, and discuss available mitigation options. This information is presented in Section 6 of this report.
8. **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.

2.5 SELECTION OF NOISE SENSITIVE RECEPTORS

In general, noise-sensitive receptors are selected to represent potentially impacted land uses within the Project area. Initially, the entire Project area was reviewed and noise sensitive areas were identified. A noise sensitive area, or NSA, is generally defined as a geographical area covering multiple properties with similar land uses and noise environments and that might benefit from a single noise abatement measure, such as a noise wall. An NSA might represent a single isolated property or an entire neighborhood. The delineated NSAs for this Project are described in Section 3 of this report. Within each NSA, several representative noise measurement and noise prediction locations may be identified. Typically, each NSA would have one measurement location and multiple noise prediction locations, although some smaller adjacent NSAs may share a single measurement location. The number and locations of the receptors (measurement and modeling locations) within each NSA are selected to adequately represent all of the noise-sensitive property units (dwellings) within that NSA, and these properties may include Activity Categories A through E in Table 2-1 (including residential, noise sensitive commercial, parks, schools, hotels, etc.). Activity Categories F and G (agriculture, retail, industrial, transportation, utilities, and undeveloped land), typically would not have associated NSAs or receptor locations. For residential properties in particular, more isolated residences would generally be modeled as individual receptors, while residences in multi-family buildings and densely populated neighborhoods may be modeled with one modeled receptor location representing multiple dwelling units or homes (receptors).

All receptor locations (short-term measurement locations and all modeled locations) are located to represent an area of frequent exterior human use. For residential properties, this would normally be an exterior activity area between the structure and the proposed project roadway. If no specific outdoor activity area is identified, a position at approximately 10 to 20 feet from the building façade exposed to the project roadway would be used. For commercial and other non-residential properties, some other area of frequent exterior human use would be selected.

2.6 WORST-CASE NOISE CONDITIONS

When determining noise impacts, traffic noise predictions must be made for the worst case 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 worst case noise hour is typically either the peak vehicular truck hour or the peak vehicular volume hour (with LOS A through D conditions). Long-term noise measurements were used to evaluate peak traffic noise hours at four locations within the Project area.

2.7 NOISE ABATEMENT REQUIREMENTS

According to the PennDOT noise manual, once a noise impact has been identified, feasible and reasonable noise abatement measures must be considered. For noise abatement, primary consideration is given to exterior areas of frequent human use. When traffic noise impacts are identified, noise barrier walls, at a minimum, are required to be considered.

When noise barriers are considered, a preliminary noise barrier design analysis must show that the barrier is feasible and reasonable. This typically requires that the barrier provides a minimum level of insertion loss. According to the PennDOT noise manual, feasible noise barriers must provide at least 5 dBA of insertion loss for the majority (50% or greater) of impacted receptors. In addition to meeting minimum insertion loss requirements, noise barriers must also meet engineering and constructability feasibility requirements in terms of safety, property and emergency access, drainage control, overhead and underground utilities clearance, and other issues.

For an abatement measure to be reasonable it must meet a maximum square foot per benefited receptor (Max SF/BR) criterion. PennDOT noise barrier cost reasonableness value is based on a Max SF/BR value of 2,000 square feet. The square footage of a barrier is based on its length multiplied by its height above the finished ground at its base to the top elevation. The benefited receptor values are determined by counting all receptors receiving a 5 dBA or greater insertion loss (IL). Although at least a 5 dBA IL for the majority of receptors is required to meet the feasibility criterion, the proposed barrier must reduce noise level by at least 7 dBA for at least one benefited receptor.

If noise barriers are determined to be reasonable and feasible then the viewpoints of property owners and residences should be taken into consideration. Half (50%) of all responding benefited owners and residences must be in favor of implementing noise abatement. The polling is typically conducted after the Draft Noise Analysis is prepared and approved.

2.8 NOISE MODELING METHODOLOGY

Future build noise levels, along with existing noise levels, were predicted using the 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 PennDOT were implemented by highly experienced TNM modelers. These included the following modeling procedures and conventions:

- 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 provided by the project engineers and are listed in Appendix C.
- Existing terrain lines (topography), buildings, ground zones and tree zones were modeled.
- All TNM model runs were detail checked for accuracy by an independent noise analyst.

2.9 PROJECT TRAFFIC DATA

Existing traffic data and traffic mix (autos, medium trucks, and heavy trucks) was provided by the Pennsylvania Turnpike Commission (PTC) and PennDOT. Project engineers generated the traffic projections for future years based on the existing traffic data and an estimated growth percentage. Traffic data used in this analysis can be found in Appendix C.

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SECTION 3 EXISTING NOISE ENVIRONMENT AND NOISE SENSITIVE AREAS

3.1 EXISTING LAND USE AND ZONING

3.1.1 Existing Land Uses

The vicinity of the Project area consists of land uses, such as residential, industrial, commercial, public, and vacant, agricultural or open space. The areas at the western and eastern ends of the project (along SR100 and SR29, respectively) contain a majority of industrial and commercial businesses with a few residential homes interspersed. In the middle of the project area, the area mostly contains single-family and multi-family residences, and open space. Figure 2 shows the land use division within the project area.

3.1.2 Noise Sensitive Areas

In order to better categorize the potential noise impacts and evaluate noise abatement for the various project alternatives, all of the potentially impacted, noise-sensitive receptors have been organized into Noise Sensitive Areas, or NSAs. An NSA is defined as a geographical area that includes a variety of individual noise-sensitive receptor units (individual homes, apartment units, institutional properties, etc.) which have a similar land use and noise environment, and if impacted, would likely be protected by a single noise abatement element, such as a noise barrier. Descriptions of delineated NSAs, including geographic area, primary land use, and type of noise-sensitive receptors are listed in Table 3-1. Figures 3-1 through 3-7 show all of the defined NSAs and their associated noise measurement locations.

Table 3-1
Noise Sensitive Areas (NSAs)

NSA	Description	Long-term Measurement ID	Short-term Measurement ID
1	South of I-76, East and West of State Route 100 Single-Family Residences and Proposed Hotel with no outdoor use		ST-01
2	North of I-76, East of East Township Line Road Single-Family Residence and Commercial Businesses		ST-02
3	South of I-76, North of Sheree Boulevard, in parking lot of office development. Commercial Businesses		ST-03
4	North of I-76, East of Uwchlan Avenue Multi-Family Residences	LT-01	ST-04, ST-26
5	North of I-76, South of Davis Road Multi-Family and Single-Family Residences		ST-05
6	South of I-76, West of Pine Creek Road Single-Family Residence		ST-06
7	South of I-76, North of Worthington Road Single-Family Residences and Church		ST-07

NSA	Description	Long-term Measurement ID	Short-term Measurement ID
8	South of I-76, East and West of Conestoga Road Single-Family Residences	LT-02	ST-08
9	North of I-76, East and West of Conestoga Road, South of Seven Oaks Road. Single-Family Residences		ST-09
10	North of I-76, East and West of Seven Oaks Road Single-Family Residences		ST-29
11	South of I-76, North of Conestoga Road, East of Newcomen Road. Single-Family Residence		ST-11
12	North of I-76, West of Bodine Road Single-Family Residence		ST-12
13	South of I-76, West of Bodine Road Single-Family Residences		ST-13
14	North of I-76, East of Bodine Road Single-Family Residence, Commercial Business		ST-14
15	South of I-76, End of Shamrock Hill Lane Single-Family Residences		ST-15
16	North of I-76, South of Wood Valley Lane Single-Family Residences		ST-16
17	South of I-76, East of Valley Hill Road Single-Family Residence		ST-17
18	North of I-76, East of Valley Hill Road Single-Family Residence		ST-18
19	North of I-76, South of Hollow Drive Single-Family Residences	LT03	ST-19
20	South of I-76, at intersection of Yellow Springs Road and Brandywine Road Single-Family and Multi-Family Residences	LT04	ST-20
21	North of I-76, east of Yellow Springs Road (homes on Blackberry Lane) Single-Family Residences		ST-21, ST-27
22	South of I-76, North of Phoenxiville Pike (Rt 29) Single-Family Residence		ST-22
23	South of I-76, North of Phoenixville Pike (Rt 29) Single-Family Residence		ST-23
24	South of I-76, North of Phoenixville Pike (Rt 29) Church		ST-24
25	North of I-76, West of Phoenixville Pike (Rt 29), North of Charlestown Road School, Future Housing Development		ST-25
26	South of I-76, east of Charlestown Road and north of Yellow Springs Road Single Family Homes		ST-28

3.2 EXISTING NOISE LEVELS

3.2.1 Noise Measurements

Multiple noise measurements were conducted for this project on November 26-30, 2012 and October 27-28, 2013 including long-term (24-hour) and short-term (10 to 30 minutes) measurements. Noise measurements were conducted for several reasons, including:

1. To empirically determine the peak noise hour, if one exists, in different areas of the project (long-term measurement). Leq values reported in Tables 3-2 and 3-5 and subsequently used for model validation were a result of an energy average of the individual interval values recorded on the data sheets.
2. To provide information for noise model validation (short-term measurements with accompanying classified traffic counts).

A total of twenty-nine (29) short-term (ST) noise measurements were conducted as summarized in Table 3-2. Figures 3-1 through 3-7 show an overview of the Project area with each measurement location.

Table 3-2
Short-Term Measurement Summary

Receptor[1]	Location	Date	Start Time	End Time	Measured Leq, dBA
ST-01	30 Pennsylvania Rd.	11/28/2012	09:35	09:55	67
ST-02	82 E. Township Line Rd.	11/28/2012	10:05	10:20	65
ST-03	180 Sheree Blvd., Suite #2100	10/29/2013	10:50	11:15	61
ST-04	Pickering Point Complex, 1202 Ambrosa Dr.	11/28/2012	11:20	11:35	67
ST-05	Holly Tree Ct. Playground	11/28/2012	11:45	12:00	69
ST-06	200 Upper Pine Creek Rd.	10/29/2013	13:20	13:45	60
ST-07	511 Worthington Rd.	10/29/2013	13:55	14:20	59
ST-08	1148 Conestoga Rd. CRT 401	11/28/2012	13:45	14:00	68
ST-09	906 Seven Oaks Rd.	10/29/2013	14:00	14:35	66
ST-11	Horse farm, 69 Hillsover Rd.	11/29/2012	11:00	11:20	67
ST-12	2151 Bodine Rd.	10/29/2013	08:15	08:35	66
ST-13	#2 Bodine Rd.	11/29/2012	11:30	11:50	66
ST-14	2148 Bodine Rd.	10/29/2013	15:55	16:20	66
ST-15	26 Shamrock Hill Ln.	11/30/2012	08:55	09:10	66
ST-16	10 Wood Valley Ln.	11/29/2012	14:25	14:40	66
ST-17	2198 Valley Hill Rd.	11/30/2012	09:25	09:40	62
ST-18	2236 Valley Hill Rd.	11/30/2012	09:50	10:05	66
ST-19	29 Hollow Dr.	10/28/2013	16:25	17:10	61
ST-20	2062 Yellow Springs Rd.	10/28/2013	16:35	16:55	64
ST-21	181 Blackberry Ln.	11/29/2012	15:55	16:10	69

Receptor[1]	Location	Date	Start Time	End Time	Measured Leq, dBA
ST-22	3149 Phoenixville Pike	10/28/2013	15:45	16:10	62
ST-23	3199 Phoenixville Pike	10/28/2013	15:30	16:05	60
ST-24	3281 Phoenixville Pike	11/30/2012	12:25	12:45	59
ST-25	Near 2060 Clarkstown Rd.	11/30/2012	12:55	13:15	62
ST-26	3501 Eaton Ct.	10/29/2013	10:05	10:30	66
ST-27	31210 Blackberry Ln.	10/29/2013	15:10	15:30	68
ST-28	1022 Yellow Springs Rd.	10/28/2013	14:50	15:15	60
ST-29	2068 Seven Oaks Rd.	10/29/2013	17:25	17:45	62

[1] Measurement ST-10 was discarded and replaced by ST-29 for NSA10.

A total of four (4) long-term (LT) noise measurements were conducted as summarized in Table 3-4 and Figures 3-1 through 3-7 show an overview of the Project area with each measurement location. Appendix B contains a graphical presentation of the long-term data collected.

Table 3-3
Long-Term Measurement Summary

Receptor	Location	Start Date	Start Time	End Date	End Time	Minimum and Maximum Measured Leq, dBA
LT1	Liongate Community, Eaton Court, near basketball court	11/28/12	08:34	11/29/12	2:40	67 - 73
LT2	931 Newcomen Road	11/28/12	09:15	11/29/12	08:45	71 - 80
LT3	57 Deerfield Drive	11/29/12	10:15	11/30/12	10:00	66 - 72
LT4	Across street from 2111 Yellow Springs Road	10/28/13	17:15	10/29/13	17:00	64 - 75

Long-term noise measurements were conducted at fence-line locations in order to identify general trends in noise variation over the course of the day. These were used to determine if or when noise levels peaked during the day, or if noise levels were reduced at peak traffic hours due to traffic congestion. In general the measurement data showed that while traffic noise levels fluctuated somewhat over the course of the day there was generally no identified discrete "worst hour", with noise levels loudest between about 6:00 AM and 6:00 PM. The data also provided no indication that noise levels were substantially reduced due to congestion at any time during the day.

3.2.2 Noise Monitoring Equipment and Atmospheric Conditions

Only ANSI (American National Standards Institute) Rated Type 1 or Type 2 Sound Levels Meters were used (Type 1 for short-term and Type 2 for long-term). Meters were subjected to a field calibration check before and after each measurement. Current annual factory calibration certificates for the meters used on this project can be found in Appendix B.

Weather conditions in the Project area were recorded using hand-held anemometers. Table 3-4 contains the weather data recorded at each measurement position. This data can also be found on the noise measurement field sheets in Appendix B. Meteorological conditions were noted for all short-term noise measurements to document that conditions were appropriate. All measurements were conducted during appropriate and acceptable meteorological weather conditions with dry roadways (i.e., acceptable temperature and humidity ranges, wind less than 12 mph).

All field data was recorded on field data sheets, which included the time, name and location of the measurement, instrumentation data, 5-minute Leq noise levels (for short-term readings), meteorological data, field calibration data, a measurement site diagram, GIS coordinates, and notes as to the dominant noise sources and any other observed acoustically relevant events (such as aircraft over-flights, emergency vehicle pass-bys, etc.). Classified traffic counts were generally taken from video shot during the noise measurements. Speeds used for validation runs were values indicated on the field data sheets as “Observed” speeds. Existing speeds were estimated by driving through the project roadway during periods with similar traffic conditions and noting vehicle speed. For this project, the observed speeds during noise measurement activities were approximately the same as posted speeds. Field sheets used for this project can be found in Appendix B.

Table 3-4
Measurement Weather Data

	Atmospheric Conditions						
Receptor[1]	Temperature (°F)	Wind Descriptor	Avg. Wind Speed (mph)[2]	Wind Direction	Relative Humidity (%)	Barometric Pressure (Hg)	Cloud Cover (%)
ST-01	36.0	Calm, occasional light gusts	0 - 2	-	73.0	1004.7	20
ST-02	35.0	gusty	5	-	59.0	1004.7	20
ST-03	49.0	calm	-	-	65.0	-	0
ST-04	37.0	Calm, occasional light gusts	0 - 2	-	70.0	1004.7	50
ST-05	39.0	Calm, occasional light gusts	0 - 2	-	67.0	1007.0	50
ST-06	55.0	Calm, occasional light gusts	0 - 2	-	64.7	1011.7	0
ST-07	60.0	calm	-	-	61.6	1010.4	0
ST-08	41.0	Calm, occasional light gusts	0 - 2	-	70.0	1005.0	20
ST-09	60.0	calm	-	-	62.0	1009.0	0
ST-11	38.0	gusty	0 - 8	variable	56.0	1010.0	100
ST-12	41.5	calm	-	-	77.7	1009.1	0
ST-13	38.0	Calm, occasional light gusts	0 - 2	-	67.0	1008.0	50

ST-14	60.0	calm	-	-	52.5	1007.0	0
ST-15	31.0	calm	-	-	69.4	1005.1	80
ST-16	45.0	steady	0 - 8	variable	53.3	1004.1	0
ST-17	32.0	calm	-	-	62.1	1004.0	90
ST-18	32	calm	-	-	59.1	1004.8	60
ST-19	62.0	Calm, occasional light gusts	0 - 3	-	54.1	1000	10
ST-20	60.0	calm	-	-	53.2	1002.6	10
ST-21	43.0	calm	-	-	53.0	1003.4	0
ST-22	64.1	Calm, occasional light gusts	1 - 3	-	52.4	1005.0	10
ST-23	64.1	Calm, occasional light gusts	0 - 3	-	54.5	1008.0	10
ST-24	43.0	steady	0 - 8	east	55.2	1010.5	100
ST-25	44.0	steady	2	east	59.6	1009.6	90
ST-26	42.0	calm	-	-	75.0	1011.6	0
ST-27	60.0	calm	-	-	62.0	1009.0	0
ST-28	65.3	Calm, occasional light gusts	0 - 3	-	54.3	1008.4	10
ST-29	48.0	calm	-	-	65.6	1009.7	0

[1] Measurement ST-10 was discarded and replaced by ST-29 for NSA10.

[2] Measurements were not conducted if wind speeds exceeded 12mph

3.2.3 Noise Model Validation and Results

The FHWA TNM Version 2.5 was used to predict noise levels for the future build alternative as well as existing noise levels at receptor locations where noise levels are dominated by traffic noise on project roadways. To demonstrate that the noise model is predicting noise levels within a reasonable margin of error, the noise model runs are validated by comparing predicted noise levels to measured noise levels for similar traffic conditions. Acoustical measurements were only taken when traffic was free-flowing. However, since the TNM only predicts noise levels associated with traffic noise, the model runs can only be validated at measurement locations where current noise levels are dominated by project roadways. For this project, noise model validation was possible for all noise measurement locations. Noise models are considered to be validated according to the PennDOT noise manual if the difference between measured and modeled noise levels for comparable conditions is 3 dBA or less. The results of the noise validation effort are presented in Table 3-5.

While it is usually preferred to conduct model validation measurements without snow cover that is not always possible given field conditions and project deadlines. Due to a recent snowfall preceding the November 12 measurement trip there was a light snow cover for some of the validation site measurements (generally less than a few inches), as shown in some of the noise measurement location photographs. In this case the snow cover was apparently light enough that validation models did not require any special modeling or adjustments to account for the snow and all measurement location were validated within an acceptable margin of error (+/- 3 dBA).

Table 3-5
TNM Validation Summary Table

Receptor	Location	Date	NSA	Measured Leq, dBA	Modeled Leq, dBA	Delta
ST-01	30 Pennsylvania Rd.	11/28/2012	01	66.6	65.4	1.2
ST-02	82 E. Township Line Rd.	11/28/2012	02	64.7	66.5	-1.8
ST-03	180 Sheree Blvd., Suite #2100	10/29/2013	03	61.0	58.1	2.9
ST-04	Pickering Point Complex, 1202 Ambrosa Dr.	11/28/2012	04	67.0	64.8	2.2
ST-05	Holly Tree Ct. Playground	11/28/2012	05	68.9	71.7	-2.8
ST-06	200 Upper Pine Creek Rd.	10/29/2013	06	60.0	61.5	-1.5
ST-07	511 Worthington Rd.	10/29/2013	07	59.2	60.1	-0.9
ST-08	1148 Conestoga Rd. CRT 401	11/28/2012	08	68.5	71.2	-2.7
ST-09	906 Seven Oaks Rd.	10/29/2013	09	65.9	66.2	-0.3
ST-11	Horse farm, 69 Hillsover Rd.	11/29/2012	11	66.6	69.4	-2.8
ST-12	2151 Bodine Rd.	10/29/2013	12	66.4	63.8	2.6
ST-13	#2 Bodine Rd.	11/29/2012	13	66.1	65.4	0.7
ST-14	2148 Bodine Rd.	10/29/2013	14	66.1	64.8	1.3
ST-15	26 Shamrock Hill Ln.	11/30/2012	15	66.4	67.7	-1.3
ST-16	10 Wood Valley Ln.	11/29/2012	16	66.3	66.3	0.0

ST-17	2198 Valley Hill Rd.	11/30/2012	17	61.9	63.3	-1.4
ST-18	2236 Valley Hill Rd.	11/30/2012	18	66.5	64.9	1.6
ST-19	29 Hollow Dr.	10/28/2013	19	61.5	58.7	2.8
ST-20	2062 Yellow Springs Rd.	10/28/2013	20	64.1	63.6	0.5
ST-21	181 Blackberry Ln.	11/29/2012	21	68.7	71.3	-2.6
ST-22	3149 Phoenixville Pike	10/28/2013	22	62.3	59.5	2.8
ST-23	3199 Phoenixville Pike	10/28/2013	23	60.4	58.2	2.2
ST-24	3281 Phoenixville Pike	11/30/2012	24	59.5	61.8	-2.3
ST-25	Near 2060 Clarkstown Rd.	11/30/2012	25	62.4	62.4	0.0
ST-26	3501 Eaton Ct.	10/29/2013	04	65.8	64.8	1.0
ST-27	31210 Blackberry Ln.	10/29/2013	21	67.9	68.9	-1.0
ST-28	1022 Yellow Springs Rd.	10/28/2013	26	60.3	62.4	-2.1
ST-29	2068 Seven Oaks Rd.	10/29/2013	10	62.2	64.6	-2.4

[1] Measurement ST-10 was discarded and replaced by ST-29 for NSA10.

As shown in Table 3-5, all calculated differences between modeled and measured noise levels are less than 3.0 dBA. Therefore the noise models in those locations are considered validated.

3.2.4 Observed Traffic Counts

The observed traffic counts are used for validating the TNM models. The field-observed values are compared to the predicted values. If the difference between the two values is less than ±3 decibels, then the model is considered to be within an acceptable level of accuracy. All NSAs were within ±3 decibels. The observed traffic data videotaped or hand-counted during the noise measurements and used in the validation process can be found in Appendix B. TNM validation runs developed for this Project are available on request.

3.2.5 Existing Noise Levels

Existing noise levels for NSAs were predicted by modeling the receptor locations using the FHWA TNM. Table 3-6 presents a summary of existing noise levels for all modeled receptors in the Project area. Existing levels range from 44 to 77 dBA. Figures 3-1 through 3-7 contains an overview of the Project area showing measured receptor locations within each NSA, represented by a green circle. Figures 4-1 through 4-7 show the modeling results for the measurement location.

Table 3-6
Predicted Existing Noise Levels

NSA	NSA Description	# of Modeled Receivers	# of Receptors/ Equivalent Residential Units	Predicted Existing Noise Level, Range of Leq (1h) dBA
1	South of I-76, East and West of State Route 100 Single-Family Residences and Proposed Hotel with no outdoor use	7	6	64 - 71
2	North of I-76, East of East Township Line Road Single-Family Residence and Commercial	4	4	61 - 69
3	South of I-76, North of Sheree Boulevard, in parking lot of office development Office development outdoor area for employees	13	0	55 - 76
4	North of I-76, East of Uwchlan Avenue Multi-Family Residences	55	153	52 - 74
5	North of I-76, South of Davis Road Multi-Family, Single-Family Residences and undeveloped land	38	95	59 - 82
6	South of I-76, West of Pine Creek Road Single-Family Residence and undeveloped land	1	1	64 - 64
7	South of I-76, North of Worthington Road Single-Family Residence (abandoned) and Church	3	4	62 - 66
8	South of I-76, West of Conestoga Road Single-Family Residences	20	20	57 - 75
9	North of I-76, East of Conestoga Road, South of Seven Oaks Road Single-Family Residences	6	8	58 - 69
10	North of I-76, East of Seven Oaks Road Single-Family Residences[1]	4	4	62 - 66
11	South of I-76, North of Conestoga Road, East of Newcomen Road Single-Family Residence	2	2	60 - 72
12	North of I-76, West of Bodine Road Single-Family Residence	1	1	66 - 66
13	South of I-76, West of Bodine Road Single-Family Residences	3	3	66 - 71
14	North of I-76, East of Bodine Road Single-Family Residence, Commercial Business	1	1	66 - 66
15	South of I-76, End of Shamrock Hill Lane Single-Family Residences	13	13	59 - 74
16	North of I-76, South of Wood Valley Lane Single-Family Residences	6	6	59 - 68
17	South of I-76, East of Valley Hill Road Single-Family Residence	4	4	56 - 64

NSA	NSA Description	# of Modeled Receivers	# of Receptors/ Equivalent Residential Units	Predicted Existing Noise Level, Range of Leq (1h) dBA
18	North of I-76, East of Valley Hill Road Single-Family Residence	4	4	61 - 73
19	North of I-76, South of Hollow Drive Single-Family Residences	14	14	54 - 61
20	South of I-76, Northside of Yellow Springs Road Single-Family and Multi-Family Residences	15	44	55 - 66
21	North of I-76, End of Blackberry Lane Single-Family Residences	29	29	44 - 74
22	South of I-76, North of Phoenxiville Pike (Rt 29) Single-Family Residence	4	4	51 - 62
23	South of I-76, North of Phoenixville Pike (Rt 29) Single-Family Residence	3	3	57 - 62
24	South of I-76, North of Phoenixville Pike (Rt 29) Church	2	1	64 - 71
25	North of I-76, West of Phoenixville Pike (Rt 29), North of Charlestown Road School, Future Housing Development	18	42	50 - 70
26	South of I-76 and east of Charlestown Rd.	5	5	65 - 70

[1] Access to ST-10 was granted by owner during the November 2012 acoustical survey. The property had been sold to a new owner when URS returned in October 2013 to collect additional survey data. Repeated attempts to contact the new owner were made, but no contact was established. Therefore, a new receptor was selected adjacent to the initial property with similar distance to the PA Turnpike. The new measurement receptor representing NSA10 is noted as ST-29.

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SECTION 4 FUTURE NOISE LEVELS AND IMPACTS

This section presents predicted noise levels and noise impacts (or noise impact distances for both identified NSA areas and general undeveloped areas

4.1 PREDICTED NOISE LEVELS AND NOISE IMPACTS

Future build alternative noise levels, along with existing noise levels, were predicted using the 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 PennDOT were implemented by highly experienced TNM modelers. These included the following modeling procedures and conventions:

- 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 provided by the project engineers and are listed in Appendix C. Modeled vehicle-type traffic data (i.e., car, medium truck, heavy truck, bus, motorcycle) is located in Appendix C.
- All TNM runs were detail checked for accuracy by an independent noise analyst.

An “Approach or Exceed” noise impact occurs when the predicted future noise level at an identified noise receptor location approaches or exceeds the FHWA NAC within 1 dBA. Table 4-1 below summarizes the number of absolute or “Approach or Exceed” noise impacts for the Future Build alternative.

A “Substantial Increase” noise impact occurs when the predicted future noise level at an identified noise receptor location exceeds the existing condition noise level by 10 dBA or more. No substantial increase impacts have been identified for the Project area.

Table 4-1 below contains a summary of the predicted noise levels and noise impacts at all NSA locations in the Project area for the existing condition, the future Build alternative, and the future no-build alternative. Additional predicted noise levels and noise impacts for each individual modeled receptor location are provided in Appendix D

Figures 4-1 through 4-7 contain an overview of the Project area showing all Future Build modeled receptor locations.

Table 4-1
Predicted Noise Levels and Impact Summary

NSA ID	Dwelling Units	Predicted Noise Levels (range) Leq (1H), dBA		Impacted Receptors	
		Existing	Future Build	Number	Type
1	6[a]	64 - 71	67 - 72	6	NAC
2	4	61 - 69	62 - 73	1	NAC
3	2	55 - 76	58 - 79	0	NAC
4	153	52 - 74	54 - 80	77	NAC
5	95	59 - 82	61 - 80	70	NAC
6	2	64 - 64	67 - 67	1	NAC
7	3	62 - 66	64 - 69	2	NAC
8	20	57 - 75	61 - 76	7	NAC
9	8	58 - 69	60 - 71	2	NAC
10	4	62 - 66	64 - 68	3	NAC
11	2	60 - 72	62 - 75	1	NAC
12	1	66 - 66	69 - 69	1	NAC
13	3	66 - 71	70 - 74	3	NAC
14	1	66 - 66	69 - 69	1	NAC
15	13	59 - 74	63 - 77	8	NAC
16	6	59 - 68	61 - 70	2	NAC
17	4	56 - 64	59 - 67	2	NAC
18	4	61 - 73	62 - 75	2	NAC
19	14	54 - 61	59 - 65	0	None
20	44	55 - 66	59 - 70	15	NAC
21	20	44 - 74	46 - 76	20	NAC
22	4	51 - 62	54 - 65	0	None
23	3	57 - 62	60 - 65	0	None
24	1	64 - 71	66 - 73	1	NAC
25	42	50 - 70	52 - 72	27	NAC
26	5	65 - 70	67 - 72	5	NAC

[a] A seventh receptor is shown within the NSA. The seventh receptor is a hotel with no planned outdoor activities for their guests (i.e., no pool, no picnic area, etc.), therefore, it is not considered as an impacted receptor.

4.2 PREDICTED IMPACT DISTANCE FOR UNDEVELOPED LANDS

For use in Land Use Planning, distances to potential noise impact contours have been calculated for generalized regions within the project corridor, as presented in Table 4-2 below. Two representative undeveloped lands were used as references for the entire project site; one of the undeveloped land contours represent topographically flat areas (line-of-sight (LOS) between receptor and sources) and the other represents a 'cut' section (no LOS). The shorter distance represents a typical 'cut' section, the longer distance represents a typical flat section. The distances are measured from the outside edge of the Pennsylvania Turnpike shoulder in each direction.

Table 4-2
Noise Impact Distances for Undeveloped Land

Representative Undeveloped Land	Estimated Impact Distance (feet)	
	66 dBA (Categories B and C)	71 dBA (Category E)
Typical Unobstructed Areas (line of sight to the roadway)	425	200
Typical Obstructed Areas (no line of sight to roadway)	220	100

Notes:
1: The impact distances are from the edge of I-76.

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SECTION 5 NOISE ABATEMENT EVALUATION

5.1 NOISE ABATEMENT MEASURES

According to FHWA and PennDOT policies, when noise impacts are identified, noise barriers (at a minimum) must be considered as noise abatement. Noise barriers were evaluated for twenty two of the twenty six NSAs for feasibility and reasonableness. Four NSAs (03, 19, 22 and 23) were acoustically modeled and the results showed that they do not have any receptors that approached or exceed the NAC criteria. The following sections describe results of barrier assessment.

5.2 FEASIBLE AND REASONABLE CRITERIA AND REQUIREMENTS

In order for mitigation to be recommended, the barrier must meet certain feasibility and reasonability requirements established by PennDOT in the noise manual.

When noise barriers are considered, a preliminary noise barrier design analysis must show that the barrier is feasible. This typically requires that the barrier provides a minimum level of insertion loss (IL). According to PennDOT policy, feasible noise barriers must provide at least 5 dBA of IL for a majority (50% or greater) of impacted receptors. In addition to meeting minimum IL requirements, noise barriers must also meet engineering and constructability feasibility requirements in terms of safety, property and emergency access, drainage control, overhead and underground utilities clearance, and other issues.

Noise barrier reasonableness generally is related to cost effectiveness. PennDOT noise barrier cost reasonableness value is based on a Maximum Square Foot per Benefited Residence (Max SF/BR) value of 2,000 square feet. The square footage of a barrier is based on its length multiplied by its height above the finished ground at its base to the top elevation. The benefited receptor values are determined by counting all receptors receiving a 5 dBA or greater IL. Although at least a 5 dBA IL for the majority of receptors is required to meet the feasibility criterion, the proposed barrier must reduce noise level by at least 7 dBA for at least one benefited receptor.

If noise barriers are determined to be reasonable and feasible then the viewpoints of property owners and residents should be taken into consideration. Agreement of half (50%) of all responding benefited owners and residences is needed to implement noise abatement. Polling for the viewpoints of benefited receptors typically occurs after the Draft Noise Analysis is prepared and approved.

5.3 DESIGN GOAL REQUIREMENTS

PennDOT defines its IL design goal as 7 dBA. The IL design goal is not to be confused with the 5 dBA feasibility criterion (see section 3.3.3.2 *"Noise Reduction Design Criteria and Goals"* of the PennDOT noise manual). It is PennDOT policy that at least one benefited property must receive at least a 7 dBA reduction in noise levels with the proposed abatement measure. The IL design goal results in the construction of more effective barriers.

5.4 FINDINGS AND RECOMMENDATIONS FOR NOISE ABATEMENT

Noise abatement was considered for each NSA with noise impacted receptors. Initially, noise abatement was checked for feasibility (5 dBA reduction at a minimum of half of impacted receptors and access restrictions). If abatement was feasible, the abatement was analyzed for reasonableness factors. For all impacted receptors meeting feasibility requirements, preliminary barrier designs were evaluated using TNM. For some NSAs with only one or two isolated impacted receptors, a simplified "rule of thumb" barrier length estimation calculation was used, rather than TNM modeling. In this estimation calculation it was assumed that a barrier would need to be at least 4 time as long as the distance from the roadway in each direction from the end receptor and at least 8 feet tall.

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 benefited receptors per PennDOT Pub. #24, Section 6.4 "Voting Procedures". The narrative results of abatement evaluations for each impacted NSA are summarized below. Table 5-1 summarizes the barrier analysis for each NSA location. Figures 5-1 and 5-2 illustrate the three NSA locations that barrier walls are recommended for and the location of the barrier wall. Appendix D contains a summary of the TNM modeling results. Appendix E presents PennDOT Pub. #24's Appendix A "Warranted, Reasonable and Feasible Worksheets".

Table 5-1
Summary of Barrier Analysis for Each NSA Location

NSA	Description	Number of Impacted Receptors	Method[1]	Feasible?[2]	Reasonable?[3]	Proposed Barrier Length, in feet	Average Height, in feet	Barrier Total Sq. Ft.	Number of Benefited Receptors	Sq. Ft. / BDU[3]	Recommend?
1	South of I-76 east and west of Pottstown Pike (SR-100)	6	TNM	Yes	No	1300	9.85	12801	4	3200	No
2	North of I-76, between E. Township Line Rd. and the curve at Haywood Dr.	1	TNM	Yes	No	500	12.4	6199	1	6199	No
3	South of I-76 and west of Uwchlan Ave.	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
4	North of I-76 and east of Uwchlan Ave.	77	TNM	Yes	Yes	2570	12.45[4]	31985	95	337	Yes
5	North of I-76, east of Uwchlan Ave. at Pickering Station Dr.	70	TNM	Yes	Yes	1925	13.71[5]	26394	67	394	Yes
6	South of I-76 and west of Pine Creek Rd.	1	Screening Analysis	Yes	No	1660	8	13280	1	13280	No
7	South of I-76 and east of Pine Creek Rd.	2	Screening Analysis	Yes	No	1320	8	10560	2	5280	No
8	South of I-76 at Conestoga Rd. (SR-401)	7	TNM	Yes	No	1538	12.96	19934	8	2942	No
9	North of I-76 at Conestoga Rd. (SR-401)	2	TNM	Yes	No	785	8.47	6650	2	3325	No
10	North of I-76 at 7 Oaks Rd.	3	TNM	Yes	No	1101	8.00	8810	3	2937	No

NSA	Description	Number of Impacted Receptors	Method[1]	Feasible?[2]	Reasonable?[3]	Proposed Barrier Length, in feet	Average Height, in feet	Barrier Total Sq. Ft.	Number of Benefited Receptors	Sq. Ft. / BDU[3]	Recommend?
11	South of I-76 between Conestoga Rd. and Bodine Rd.	1	TNM	Yes	No	470	11.72	5508	1	5508	No
12	North of I-76 and west of Bodine Rd.	1	Screening Analysis	Yes	No	900	8.00	7200	1	7200	No
13	South of I-76 and west of Bodine Rd.	3	TNM	Yes	No	400	16.50	6600	3	2200	No
14	North of I-76 and east of Bodine Rd.	1	Screening Analysis	Yes	No	700	8.00	5600	1	5600	No
15	South of I-76 and west of Valley Hill Rd.	8	TNM	Yes	No	2250	14.40	32500	7	4643	No
16	North of I-76 and west of Valley Hill Rd.	2	TNM	Yes	No	1000	12.80	12800	2	6400	No
17	South of I-76 and east of Valley Hill Rd.	2	TNM	Yes	No	1235	14.00	22900	1	22900	No
18	North of I-76 and east of Valley Hill Rd.	2	TNM	Yes	No	1042	8.19	8532	2	4266	No
19	North of I-76 and west of Yellow Springs Rd.	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
20	South of I-76 at the intersection of Yellow Springs Rd. and Brandywine Rd.	15	TNM	Yes	Yes	1966	10.41[6]	20457	34	602	Yes
21	North of I-76 and east of Yellow Springs Rd. (homes on Blackberry Ln.)	20	TNM	Yes	No	4162	13.20	54919	21	2615	No
22	South of I-76 and north of Phoenixville Pike	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
23	South of I-76 and north of Phoenixville Pike, near Spring Mill Rd.	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
24	South of I-76 and north of Phoenixville Pike, near Spring Mill Rd.	1	Screening Analysis	Yes	No	576	8.00	4608	1	4608	No
25	North of I-76 and Charlestown Rd., west of Phoenixville Pike[7]	27	TNM	No[2]	No	2699	20	53972	4	13493	No
26	South of I-76 and east of Charlestown Rd.	5	TNM	Yes	No	2000	20	40000	5	8000	No

1 Screening Analysis consisted of an estimation calculation. The calculation assumed that a barrier would need to be at least 4 times as long as the distance from the roadway in each direction from the end receptor and at least 8 feet tall, TNM indicates the use of the Traffic Noise Model to establish barrier dimensions.

2 Noise abatement considered feasible if a minimum of 5 dBA Insertion Loss (IL) for a majority (50% or greater) of the impacted receptors.

3 Noise abatement considered reasonable if the Maximum Square Footage per Benefited Receptor (MaxSF/BR) has a value of 2000 or less. One benefited receptor must have an IL of 7 dBA.

4 Barrier minimum Height is 8.00 feet, maximum Height is 20.00 feet

5 Barrier minimum height is 12.00 feet, maximum height is 20.00 feet

6 Barrier minimum height is 8.00 feet, maximum height is 16.00 feet

7 Not applicable since not feasible. Barrier at turnpike ROW/shoulder is not feasible; no barriers on arterial roadways

Tables 5-2 through 5-23 summarizes the narrative results for abatement evaluations for each of the twenty two (22) NSAs that were determined to have impacted receptors. Table 5-24 presents the summary of recommended noise abatement.

NSA1 Residential/Commercial

NSA1 contains six (6) identified receptors with NAC impacts associated with the proposed alternative. These receptors are representative of a single-family residential land use south of I-76 and east of Route 100 (Pottstown Pike). Noise abatement was evaluated at six receptors within the NSA. A seventh receptor is shown in the figure representing a future hotel with no planned outdoor activities (i.e., no pool, picnic area, etc.). Because no outdoor activities are associated with the hotel, it is not considered a benefited receptor. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 3200 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-2 summarizes the barrier analysis for this NSA location.

Table 5-2
Barrier Analysis Summary – NSA1

Descriptions	Results
Number of Impacted Receptors	6
Number of Benefited Receptors	4
Barrier Evaluation Method	TNM
Length (ft)	1300
Average Height (ft)	9.85
Minimum Height (ft)	8.00
Maximum Height (ft)	14.00
Area (ft^2)	12801
Calculated SF/BR	3200
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA2 Residential/Commercial

NSA2 contains one residential receptor with NAC impacts associated with the proposed alternative. This receptor is located north of I-76, east of East Township Road and at the curve of Haywood Drive. Noise abatement was evaluated for the single-family residence. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 6200 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-3 summarizes the barrier analysis for this NSA location.

Table 5-3
Barrier Analysis Summary – NSA2

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefited Receptors	1
Barrier Evaluation Method	TNM
Length (ft)	500
Average Height (ft)	12.4
Minimum Height (ft)	8.0
Maximum Height (ft)	18.0
Area (ft^2)	6199
Calculated SF/BR	6199
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA4 Residential

NSA4 contains seventy-seven (77) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family and multi-family residences north of I-76 and east of Uwchlan Avenue. Noise abatement was evaluated and is considered feasible and reasonable. Table 5-4 summarizes the barrier analysis for this NSA location.

Table 5-4
Barrier Analysis Summary – NSA4

Descriptions	Results
Number of Impacted Receptors	77
Number of Benefited Receptors	95
Barrier Evaluation Method	TNM
Length (ft)	2570
Average Height (ft)	12.45
Minimum Height (ft)	8.00
Maximum Height (ft)	20.00
Area (ft^2)	31985
Calculated SF/BR	337
Number of Receptors meeting Design Goal (7 dBA)	56
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	Yes
Recommended?	Yes

NSA5 Residential

NSA5 contains seventy (70) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family and multi-family residential land uses located north of I-76, east of Uwchlan Avenue along Pickering Station Drive, Holly Tree Court and Davis Road. Noise abatement was evaluated and is considered feasible and reasonable. Table 5-5 summarizes the barrier analysis for this NSA location.

Table 5-5
Barrier Analysis Summary – NSA5

Descriptions	Results
Number of Impacted Receptors	70
Number of Benefited Receptors	67
Barrier Evaluation Method	TNM
Length (ft)	1925
Average Height (ft)	13.71
Minimum Height (ft)	12.00
Maximum Height (ft)	20.00
Area (ft^2)	26394
Calculated SF/BR	394
Number of Receptors Meeting Design Goal (7 dBA)	57
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	Yes
Recommended?	Yes

NSA6 Residential

NSA6 contains one (1) receptor with NAC impacts associated with the proposed alternative. This receptor is representative of a single-family residential land use located south of I-76 and west of Pine Creek Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 13280 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. This receptor was evaluated on Screening Analysis and the analysis results are shown below.

Table 5-6
Barrier Analysis Summary – NSA6

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefited Receptors	1
Barrier Evaluation Method	Screening Analysis
Length (ft)	1660
Average Height (ft)	8
Minimum Height (ft)	8
Maximum Height (ft)	8
Area (ft^2)	13280
Calculated SF/BR	13280
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA7 Residential

NSA7 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of a single-family residential land use and a church located south of I-76 and north of Worthington Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 5280 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. This receptor was evaluated on Screening Analysis and the analysis results are shown below.

Table 5-7
Barrier Analysis Summary – NSA7

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	2
Barrier Evaluation Method	Screening Analysis
Length (ft)	1320
Average Height (ft)	8
Minimum Height (ft)	8
Maximum Height (ft)	8
Area (ft^2)	10560
Calculated SF/BR	5280
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA8 Residential

NSA8 contains seven (7) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76 and straddling east and west of Conestoga Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 2850 square feet per benefited receptor) to provide the minimum required noise reduction exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-8 summarizes the barrier analysis for this NSA location.

Table 5-8
Barrier Analysis Summary – NSA8

Descriptions	NSA 8 Results
Number of Impacted Receptors	7
Number of Benefited Receptors	8
Barrier Evaluation Method	TNM
Length (ft)	1538
Average Height (ft)	12.96
Minimum Height (ft)	8.00
Maximum Height (ft)	20.00
Area (ft^2)	19934
Calculated SF/BR	2492
Number of Receptors meeting Design Goal (7 dBA)	2
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA9 Residential

NSA9 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, straddling east and west Conestoga Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 3325 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-9 summarizes the barrier analysis for this NSA location.

Table 5-9
Barrier Analysis Summary – NSA9

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	2
Barrier Evaluation Method	TNM
Length (ft)	785
Average Height (ft)	8.47
Minimum Height (ft)	8.00
Maximum Height (ft)	10.00
Area (ft^2)	6650
Calculated SF/BR	3325
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA10 Residential

NSA10 contains three (3) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, east and west of Seven Oaks Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 2940 square feet per benefited receptor) to provide the minimum required noise reduction exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-10 summarizes the barrier analysis for this NSA location.

Table 5-10
Barrier Analysis Summary – NSA10

Descriptions	Results
Number of Impacted Receptors	3
Number of Benefited Receptors	3
Barrier Evaluation Method	TNM
Length (ft)	1101
Average Height (ft)	8.00
Minimum Height (ft)	8.00
Maximum Height (ft)	8.00
Area (ft^2)	8810
Calculated SF/BR	2937
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA11 Residential

NSA11 contains one (1) receptor with NAC impacts associated with the proposed alternative. This receptor is representative of single-family residence located south of I-76, north of Conestoga Road and east of Newcomen Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 5500 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-11 summarizes the barrier analysis for this NSA location.

Table 5-11
Barrier Analysis Summary – NSA11

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefited Receptors	1
Barrier Evaluation Method	TNM
Length (ft)	470
Average Height (ft)	11.72
Minimum Height (ft)	10.00
Maximum Height (ft)	12.00
Area (ft^2)	5508
Calculated SF/BR	5508
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA12 Residential

NSA12 contains one (1) receptor with NAC impacts associated with the proposed alternative. This receptor is representative of single-family residence located north of I-76, and west of Bodine Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 7200 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. This receptor was evaluated on Screening Analysis and the results are shown below.

Table 5-12
Barrier Analysis Summary – NSA12

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefited Receptors	1
Barrier Evaluation Method	Screening Analysis
Length (ft)	900
Average Height (ft)	8
Minimum Height (ft)	8
Maximum Height (ft)	8
Area (ft^2)	7200
Calculated SF/BR	7200
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA13 Residential

NSA13 contains three (3) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76, west of Bodine Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 5280 square feet per benefited receptor) to provide the minimum required noise reduction exceeded the maximum allowable amount of 2200 square feet per benefited receptor. Table 5-13 summarizes the barrier analysis for this NSA location.

Table 5-13
Barrier Analysis Summary – NSA13

Descriptions	Results
Number of Impacted Receptors	3
Number of Benefited Receptors	3
Barrier Evaluation Method	TNM
Length (ft)	400
Average Height (ft)	16.50
Minimum Height (ft)	14.00
Maximum Height (ft)	18.00
Area (ft^2)	6600
Calculated SF/BR	2200
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA14 Residential

NSA14 contains one (1) receptor with NAC impacts associated with the proposed alternative. This receptor is representative of a single-family residence located north of I-76, and east of Bodine Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 5600 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. This receptor was evaluated on Screening Analysis and the analysis results are shown below.

Table 5-14
Barrier Analysis Summary – NSA14

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefitted Receptors	1
Barrier Evaluation Method	Screening Analysis
Length (ft)	700
Average Height (ft)	8
Minimum Height (ft)	8
Maximum Height (ft)	8
Area (ft^2)	5600
Calculated SF/BR	5600
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA15 Residential

NSA15 contains eight (8) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76, and west of Valley Hill Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 4640 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-15 summarizes the barrier analysis for this NSA location.

Table 5-15
Barrier Analysis Summary – NSA15

Descriptions	Results
Number of Impacted Receptors	8
Number of Benefited Receptors	7
Barrier Evaluation Method	TNM
Length (ft)	2250
Average Height (ft)	14.40
Minimum Height (ft)	8.00
Maximum Height (ft)	20.00
Area (ft^2)	32500
Calculated SF/BR	4643
Number of Receptors meeting Design Goal (7 dBA)	5
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA16 Residential

NSA16 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, and west of Valley Hill Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 6400 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-16 summarizes the barrier analysis for this NSA location.

Table 5-16
Barrier Analysis Summary – NSA16

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	2
Barrier Evaluation Method	TNM
Length (ft)	1000
Average Height (ft)	12.80
Minimum Height (ft)	8.00
Maximum Height (ft)	14.00
Area (ft^2)	12800
Calculated SF/BR	6400
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA17 Residential

NSA17 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76, and east of Valley Hill Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 22900 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-17 summarizes the barrier analysis for this NSA location.

Table 5-17
Barrier Analysis Summary – NSA17

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	1
Barrier Evaluation Method	TNM
Length (ft)	1235
Average Height (ft)	14.00
Minimum Height (ft)	10.00
Maximum Height (ft)	20.00
Area (ft^2)	17290
Calculated SF/BR	17290
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA18 Residential

NSA18 contains two (2) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, and east of Valley Hill Road. Noise abatement was evaluated at one location along the alignment and is considered feasible. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 4270 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-18 summarizes the barrier analysis for this NSA location.

Table 5-18
Barrier Analysis Summary – NSA18

Descriptions	Results
Number of Impacted Receptors	2
Number of Benefited Receptors	2
Barrier Evaluation Method	TNM
Length (ft)	1042
Average Height (ft)	8.19
Minimum Height (ft)	8.00
Maximum Height (ft)	10.00
Area (ft^2)	8532
Calculated SF/BR	4266
Number of Receptors meeting Design Goal (7 dBA)	1
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA20 Residential

NSA20 contains fifteen (15) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family and multi-family residences located south of I-76, and the intersection of Yellow Springs and Brandywine Roads. Noise abatement was evaluated and is considered feasible and reasonable. Table 5-19 summarizes the barrier analysis for this NSA location.

Table 5-19
Barrier Analysis Summary – NSA20

Descriptions	Results
Number of Impacted Receptors	15
Number of Benefited Receptors	34
Barrier Evaluation Method	TNM
Length (ft)	1966
Average Height (ft)	10.41
Minimum Height (ft)	8.00
Maximum Height (ft)	16.00
Area (ft^2)	20457
Calculated SF/BR	602
Number of Receptors meeting Design Goal (7 dBA)	11
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	Yes
Recommended?	Yes

NSA21 Residential

NSA21 contains twenty (20) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located north of I-76, and east of Yellow Springs Road, along Blackberry Lane. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 2615 square feet per benefited receptor) to provide the minimum required noise reduction exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-20 summarizes the barrier analysis for this NSA location.

Table 5-20
Barrier Analysis Summary – NSA21

Descriptions	Results
Number of Impacted Receptors	20
Number of Benefited Receptors	21
Barrier Evaluation Method	TNM
Length (ft)	4162
Average Height (ft)	13.20
Minimum Height (ft)	8.00
Maximum Height (ft)	18.00
Area (ft^2)	54919
Calculated SF/BR	2615
Number of Receptors meeting Design Goal (7 dBA)	10
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA24 Church

NSA24 contains one (1) receptor with NAC impacts associated with the proposed alternative. This receptor is representative of a church located south of I-76, and north of Phoenixville Pike. Noise abatement was evaluated and is considered feasible but not reasonable. The sensitive receptor in this NSA is a church, not a single- or multi-family residence. Because the receptor is a church, Equivalent Residential Unit (ERU) calculation was used to determine the number of receptors at this location. The ERU calculation was based on PennDOT Pub. #24, Section 3.3.1.2 and Appendix E.

A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 4600 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-21 summarizes the barrier analysis for this NSA location.

Table 5-21
Barrier Analysis Summary – NSA24

Descriptions	Results
Number of Impacted Receptors	1
Number of Benefited Receptors	1
Barrier Evaluation Method	Screening Analysis
Length (ft)	576
Average Height (ft)	8
Minimum Height (ft)	8
Maximum Height (ft)	8
Area (ft^2)	4608
Calculated SF/BR	4608
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	Yes
Reasonable?	No
Recommended?	No

NSA25 School/Future Residential

NSA25 contains Twenty-Seven (27) receptors with NAC impacts associated with the proposed alternative. These receptor represent a school (Charlestown Elementary School) and a future residential development currently planned and programmed east of the school,. They are both located north of I-76 and Charlestown Road, and west of Phoenixville Pike. A noise barrier for this NSA was determined to be not feasible and reasonable because a barrier within the Highway Right-of-way line could not provide sufficient noise reduction to meet the noise barrier design goal at the impacted receptors. This was primarily due to significant noise contributions from the local arterial roadways between the Highway and impacted receptors (Charlestown Road and Phoenixville Pike). Table 5-22 summarizes the barrier analysis for this NSA location.

Table 5-22
Barrier Analysis Summary – NSA25

Descriptions	Results
Number of Impacted Receptors	27
Number of Benefited Receptors	4
Barrier Evaluation Method	TNM
Length (ft)	2699
Average Height (ft)	20
Minimum Height (ft)	20
Maximum Height (ft)	20
Area (ft^2)	53972
Calculated SF/BR	13493
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	No
Reasonable?	No
Recommended?	No

NSA26 Residential

NSA26 contains five (5) receptors with NAC impacts associated with the proposed alternative. These receptors are representative of single-family residences located south of I-76, east of Morehall Road and north of Yellow Springs Road. Noise abatement was evaluated and is considered feasible but not reasonable. A barrier in this location was determined to not be reasonable because the size of the barrier required (approximately 8000 square feet per benefited receptor) to provide the minimum required noise reduction far exceeded the maximum allowable amount of 2000 square feet per benefited receptor. Table 5-23 summarizes the barrier analysis for this NSA location.

Table 5-23
Barrier Analysis Summary – NSA26

Descriptions	Results
Number of Impacted Receptors	5
Number of Benefited Receptors	5
Barrier Evaluation Method	TNM
Length (ft)	2000
Average Height (ft)	20
Minimum Height (ft)	20
Maximum Height (ft)	20
Area (ft^2)	40000
Calculated SF/BR	8000
Number of Receptors meeting Design Goal (7 dBA)	0
Design Goal Met?	No
Feasible?	No
Reasonable?	No
Recommended?	No

Table 5-24
Recommended Noise Abatement Summary

Descriptions	NSA4	NSA5	NSA20
Number of Impacted Receptors	77	70	15
Number of Benefited Receptors	95	67	34
Barrier Evaluation Method	TNM	TNM	TNM
Length (ft)	2570	1925	1966
Average Height (ft)	12.45	13.71	10.41
Minimum Height (ft)	8.00	12.00	8.00
Maximum Height (ft)	20.00	20.00	16.00
Area (ft^2)	31,985	26,394	20,457
Calculated SF/BR	337	394	602
Number of Receptors meeting Design Goal (7 dBA)	56	57	11
Design Goal Met?	Yes	Yes	Yes
Feasible?	Yes	Yes	Yes
Reasonable?	Yes	Yes	Yes

5.5 VIEWPOINTS OF BENEFITTED RECEPTORS

When proposed noise abatement is found to be reasonable and feasible in accordance with PennDOT policy, benefited residents and owners are polled to determine if they are in favor of having the noise abatement constructed. When noise abatement is recommended, a “Statement of Likelihood” is required that states that the recommended abatement is based upon preliminary design data, and that the abatement might not be provided if the final design changes significantly.

Polling for the viewpoints of benefited receptors will be conducted by the PTC Engineer’s office and typically occurs after the Draft Noise Analysis is prepared and approved.

SECTION 6 CONSTRUCTION NOISE CONTROL & COMMUNITY COORDINATION

The Commission is committed to minimizing disruption to local residents, business owners, and the traveling public while also providing for the efficient construction of the proposed improvements. To this end, it is anticipated that a specification will be included in the construction contract(s) detailing responsibilities and actions relative to pending disruptions and noise levels (a sample of which is included below):

SAMPLE CONSTRUCTION NOISE SPECIFICATION

The Commission is committed to minimizing disruption to local residents, business owners, and the traveling public. The Commission will assign an individual to support this commitment. Indicate at the pre-construction conference the individual assigned this responsibility.

Coordinate activities with the Commission's Manager of Public Information & Involvement. Refer media contacts to the Commission's Manager of Public Information & Involvement.

At least two (2) weeks in advance of the start of construction activity affecting the local residents, business owners, and traveling public, make arrangements with the local municipality to conduct an initial community meeting or distribute a Construction Notice to adjacent property owners. For this meeting, have appropriate company personnel attend and be prepared to inform the public of the planned construction activities and their impacts. At other times as necessary, attend municipal meetings to inform the public of anticipated major changes to construction activities. If distribution of a Construction Notice is chosen, the contractor must have personnel distribute a handout to adjacent property owners stating:

(a) *that the contractor is performing work for the Commission*
(b) *the type of work to be performed*
(c) *the specific nights of the week , with dates, and the hours of work*
(d) *the contractor's Name and Phone Number to provide further information*

Coordinate with local municipalities and schedule short-term road closures so as not to impact civic or sport events.

Throughout the project duration, provide notifications to local residents, business owners, and the traveling public for any temporary inconveniences such as utility service interruptions, driveway construction, traffic interruptions, temporary and permanent road closures, detours, and other construction coordination as required.

COMMUNITY AWARENESS - Keep the Representative aware of all planned activities and specifically identify those that could have significant noise impact on the community due to close proximity of work to receptors.

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SECTION 7 INFORMATION FOR LOCAL GOVERNMENT OFFICIALS

To minimize future traffic noise impacts on currently undeveloped lands of Type I projects, PennDOT is required to inform local jurisdictions (where the proposed highway project is located) of the following:

1. Noise compatible planning concepts.
2. The best estimation of the future design year noise levels at various distances from the edge of the nearest travel lane of the highway, where the future noise levels meet PennDOT's definition of "approach" for undeveloped lands or properties within the project limits. At a minimum, the distance to PennDOT's exterior NAC from Table 2-1 must be identified (this information is provided in Table 4-2).

To fulfill these two requirements, at a minimum, PTC must send a cover letter to local jurisdictions, along with copies of the noise study, explaining noise compatible planning concepts. A face-to-face meeting between PTC and the local jurisdiction(s) will likely better convey information than only sending a letter with attachments. The letter must also include a table of future noise levels at specific locations or a figure showing the distances to typical noise levels along the roadway for unpermitted, undeveloped lands in the project area. The letter should encourage local officials to make this information available for disclosure in real estate transactions. Local officials should be made aware that funds for traffic noise abatement are not available for development that occurs after the date of public knowledge of the project as explained in the letter.

The letter and copies of the noise technical report must be provided to and reviewed by City and/or County planning departments. The letter and the report should be distributed with the environmental document. The distribution information, including names and date distributed, and any follow-up contact with local agencies must be documented in the project files.

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SECTION 8 CONCLUSIONS AND RECOMMENDATIONS

The noise analysis included a total of 274 measurement/prediction locations (receivers) representing 471 individual noise sensitive dwelling units (receptors). In order to simplify the reporting of noise levels, noise impacts, and noise mitigation, and in adherence with preferred PennDOT analysis methodology, these receptors were organized in 26 NSAs within the general project area.

Of the twenty-six (26) NSAs evaluated, twenty-two (22) NSAs contained receptors with predicted future noise levels approaching or exceeding the NAC. The twenty-two NSAs were evaluated for noise abatement by modeling with TNM or screening evaluation. Noise barriers for three NSAs were found to be both feasible and reasonable following PennDOT's noise manual. Therefore, noise abatement is recommended for NSAs 4, 5, and 20.

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SECTION 9 REFERENCES

Pennsylvania Department of Transportation, Publication #24, Revision 2 "*Project Level Highway Traffic Noise Handbook*", 12-12-13.

Federal Highway Administration, 23 CFR 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise, July 2010.

Federal Highway Administration (FHWA). 2011. Highway Traffic Noise: Analysis and Abatement Guidance. U.S. Department of Transportation, Federal Highway Administration, Washington, DC.

Lee, C.S.Y. and G.G. Fleming. 1996. Measurement of Highway Related Noise, Federal Highway Administration Report FHWA-PD-96-046. U.S. Department of Transportation, Research and Special Programs Administration, John A. Volpe National Transportation Systems Center, Cambridge, MA.

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All Figures for this document are located in this section.

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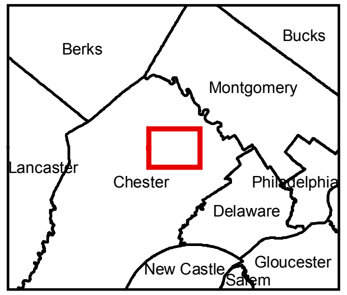
Legend

- ● Interchange
- ⬭ Buffer: 500 Feet (either side)
- ▭ Municipal Boundary



Key Map
Not to Scale

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

Reference:
Toll Plazas and Municipalities
provided by PennDOT

0 0.35 0.7 1.4 Miles

1 inch = 0.7 miles

URS

Figure 1
Project Overview Map

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 2/19/2014

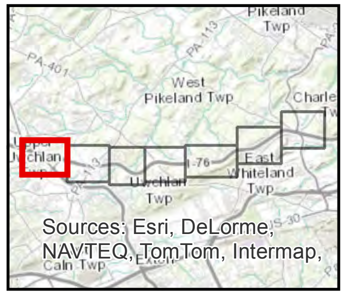
Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 1 PTC Project Overview Map.mxd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

Noise Sensitive Area (NSA)
Buffer: 500 Feet (either side)
Municipal Boundary

🟥	Commercial	🟧	Residential
🟪	County/State/Nat'l Land	▨	Transitional (in construction)
🟪	Education/Church Facility	⬛	Utilities/Roads
🟨	Farm/Agricultural	🟦	Water Feature/Basin
🟩	Forested	⬜	Vacant Land
🟩	Forested Wetland		



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided
by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 550 feet

DRAFT

URS

Figure 2 -1
Land Use Map
Noise Sensitve Areas 01 and 02

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

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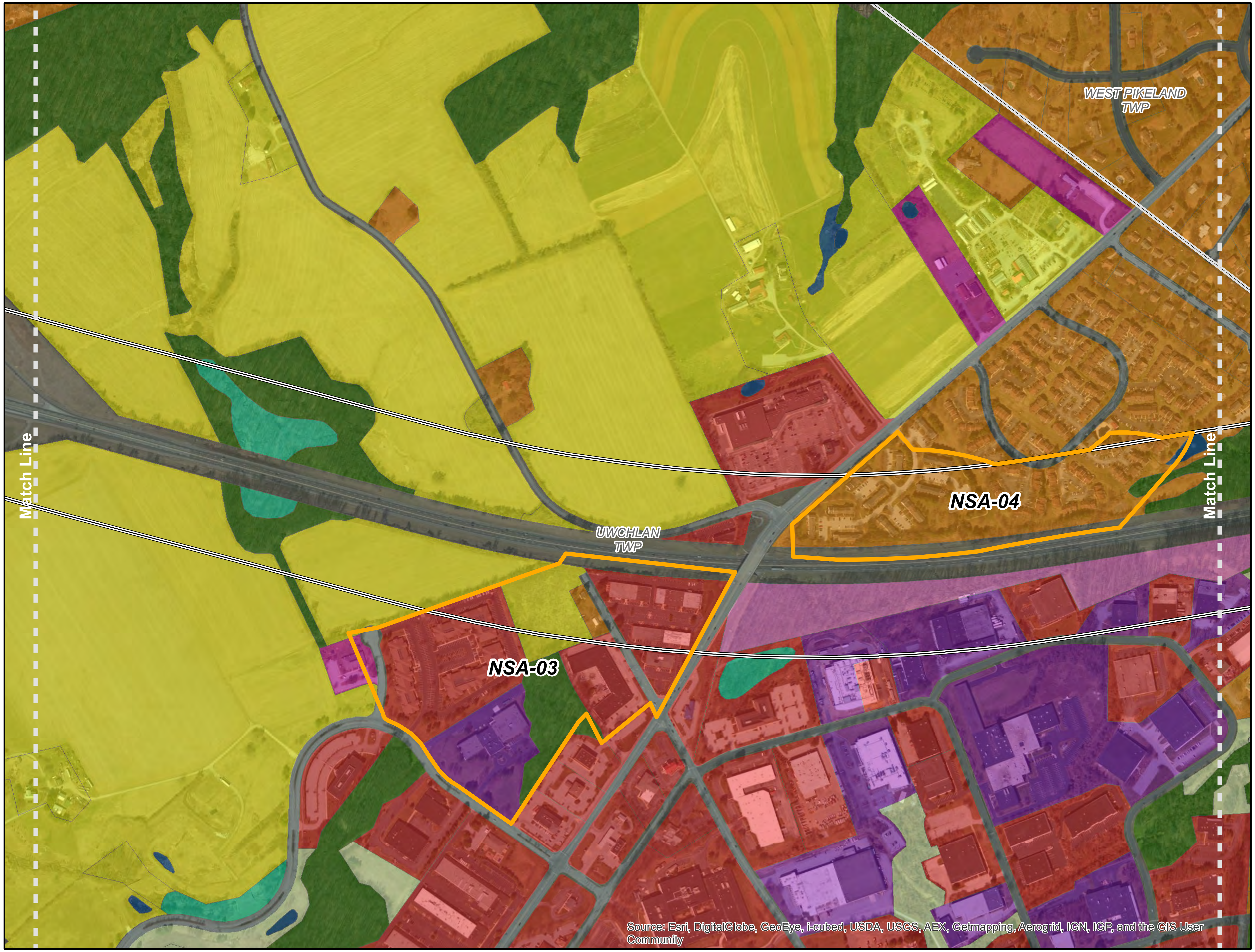
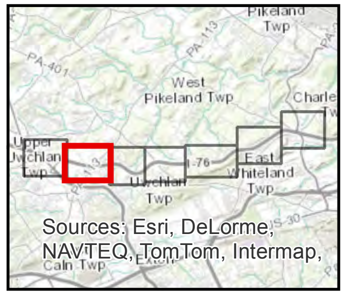


Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

🟥	Commercial	🟪	Industrial
🟪	County/State/Nat'l Land	🟩	Forested Wetland
🟪	Education/Church Facility	🟧	Residential
🟨	Farm/Agricultural	⬛	Utilities/Roads
🟩	Forested	🟦	Water Feature/Basin
☐	Homeowner Association Open Space	🟩	Vacant Land



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 550 feet

DRAFT

Figure 2 -2
Land Use Map
Noise Sensitve Areas 03 and 04

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

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Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

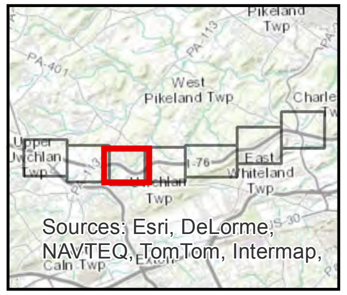
Legend

Noise Sensitive Area (NSA)

Buffer: 500 Feet (either side)

Municipal Boundary

- 🟥 Commercial
- ■ County/State/Nat'l Land
- ■ Education/Church Facility
- 🟨 Farm/Agricultural
- 🟩 Forested
- ☐ Homeowner Association Open Space
- 🟪 Industrial
- ■ Forested Wetland
- ▨ Open Space
- 🟧 Residential
- 🟩 Scrub/Shrub Wetland
- ■ Utilities/Roads
- 🟦 Water Feature/Basin
- ■ Vacant Land



Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

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NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 550 feet

DRAFT

URS

Figure 2 -3
Land Use Map
Noise Sensitve Areas 05 to 07

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

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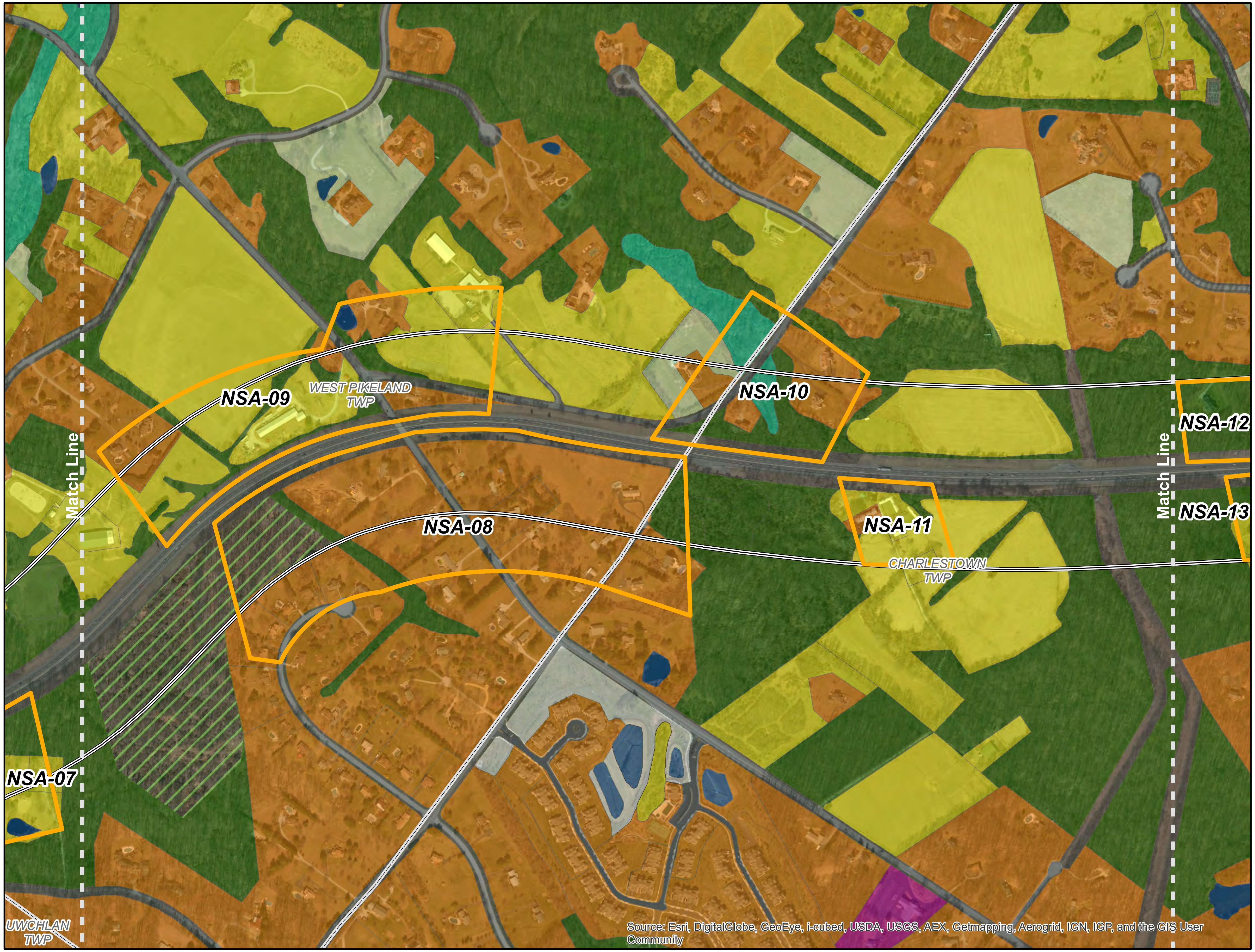
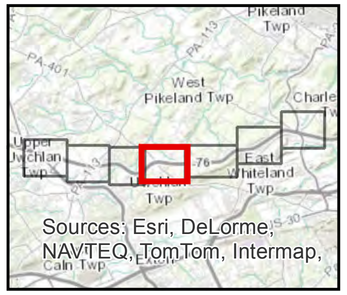


Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

🟪	Education/Church Facility	▨	Open Space
🟨	Farm/Agricultural	🟧	Residential
🟩	Forested	⬛	Utilities/Roads
☐	Homeowner Association Open Space	🟦	Water Feature/Basin
🟩	Forested Wetland	🟨	Vacant Land



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided
by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 550 feet

DRAFT

URS

Figure 2 -4
Land Use Map
Noise Sensitve Areas 08 to 11

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

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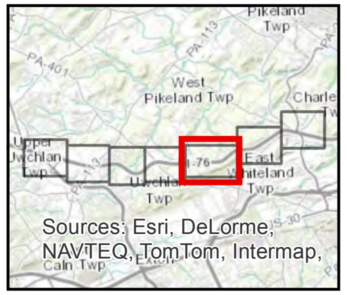
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

- 🟪 County/State/Nat'l Land
- 🟨 Farm/Agricultural
- 🟩 Forested
- 🟩 Forested Wetland
- ▨ Open Space
- ▭ Parcels with Land Trust Easements
- 🟧 Residential
- ▨ Transitional (in construction)
- ⬛ Utilities/Roads
- 🟦 Water Feature/Basin
- 🟩 Vacant Land



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 700 feet

DRAFT

URS

Figure 2 -5
Land Use Map
Noise Sensitve Areas 12 to 19

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

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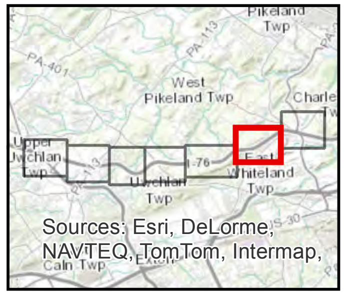
Legend

- Noise Sensitive Area (NSA)
- Buffer: 500 Feet (either side)
- Municipal Boundary

🟥	Commercial	▤	Parcels with Land Trust Easements
🟨	Farm/Agricultural	🟧	Residential
🟩	Forested	⬛	Utilities/Roads
🟪	Industrial	🟦	Water Feature/Basin
▨	Open Space	▢	Vacant Land



Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 550 feet

DRAFT

URS

Figure 2 -6
Land Use Map
Noise Sensitve Areas 20 to 23

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

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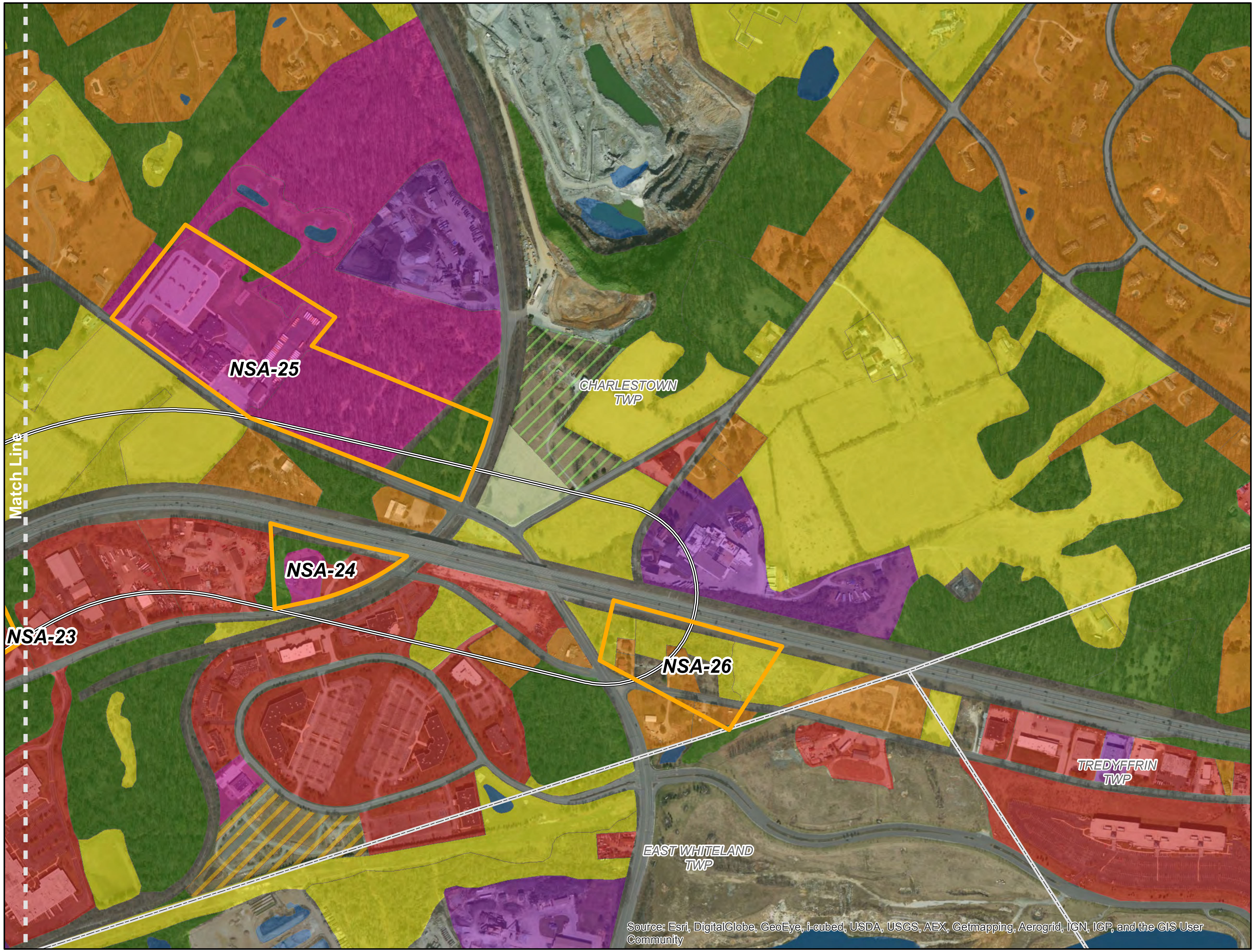
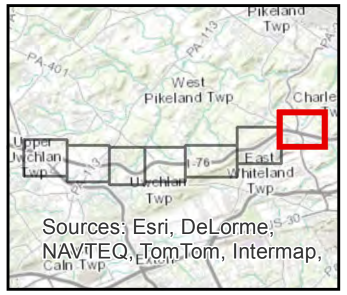


Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- 🟧 Noise Sensitive Area (NSA)
- ⬭ Buffer: 500 Feet (either side)
- ⬚ Municipal Boundary

- 🟥 Commercial
- 🟪 Education/Church Facility
- 🟨 Farm/Agricultural
- 🟩 Forested
- 🟪 Industrial
- ▨ Open Space
- 🟧 Residential
- ▨ Transitional (in construction)
- ⬛ Utilities/Roads
- 🟦 Water Feature/Basin
- ⬜ Vacant Land



Key Map
Not to Scale

Note:
Undeveloped lands data unavailable in the Chester County Land Use GIS Dataset.

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Municipal Boundaries provided by PennDOT
Land Use Data (Chester County, 2005)
URS Custom Data

0 300 600 1,200 Feet

1 inch = 550 feet

DRAFT

URS

Figure 2 -7
Land Use Map
Noise Sensitve Areas 24 to 26

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

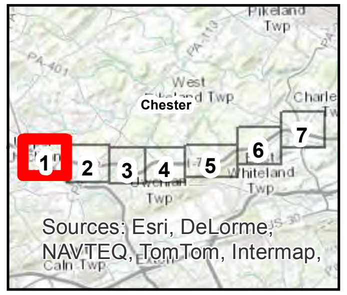
Prepared By: PLJ/RRM	Checked By: SRS
Job: 21387581.00029	Date: 5/6/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 2 PTC Land Use.mxd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

●	Noise Receiver
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
⬭	Buffer: 500 Feet (either side)
▭	Noise Sensitive Area (NSA)
▭	Municipal Boundary
🟨	Area of Future Development



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

ST-01 66.6	Receiver ID Measured Noise Level in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100 Feet

DRAFT

URS

Figure 3 - 1
Measured Noise Levels
Noise Sensitve Areas 01 and 02

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

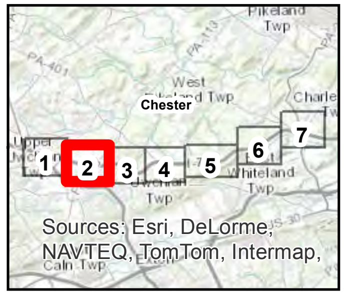
Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

●	Noise Receiver
○	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
⬭	Buffer: 500 Feet (either side)
▢	Noise Sensitive Area (NSA)
▢	Municipal Boundary
🟨	Area of Future Development



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

ST-01
66.6

Receiver ID
Measured Noise Level
in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

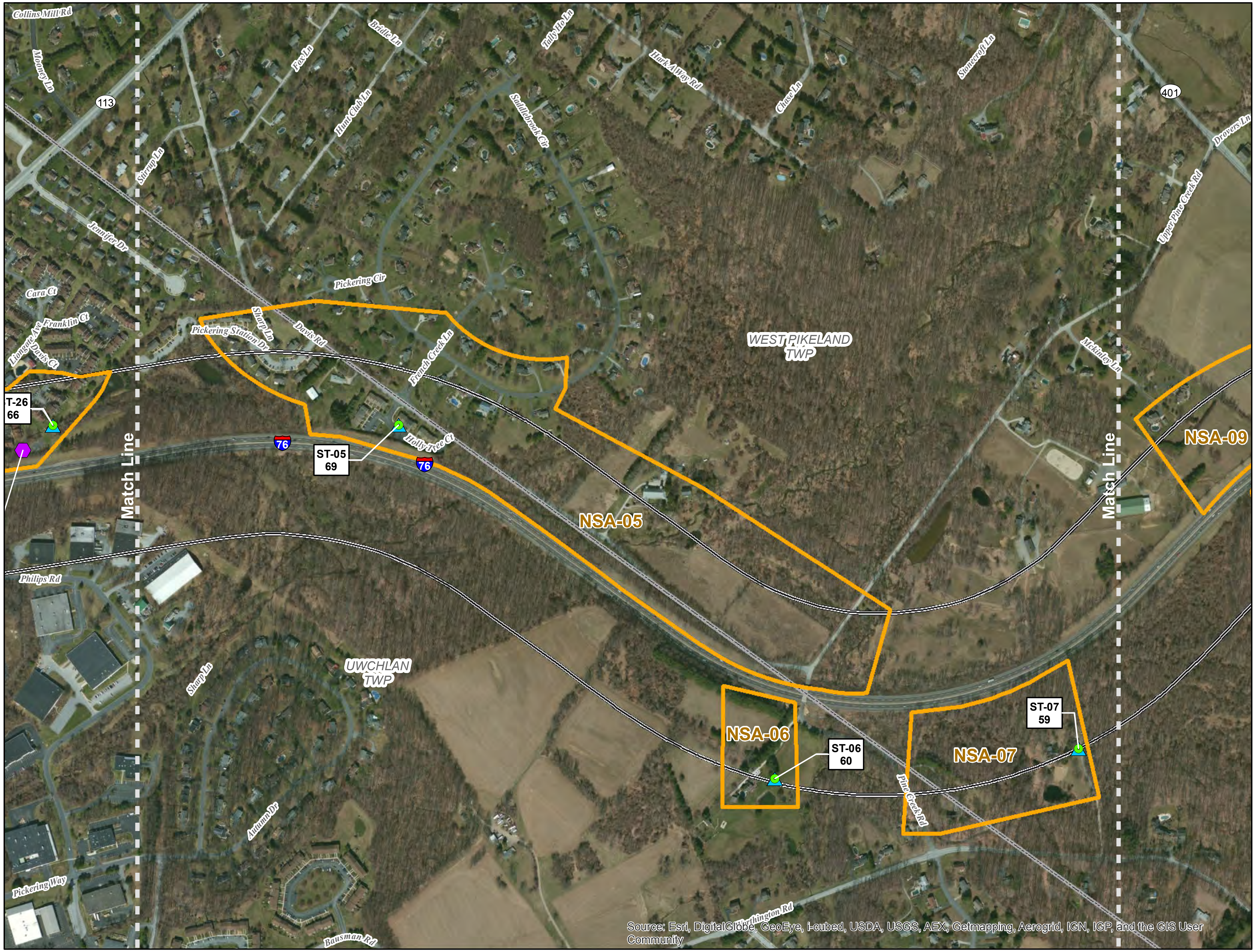
URS

Figure 3 - 2
Measured Noise Levels
Noise Sensitve Areas 03 and 04

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

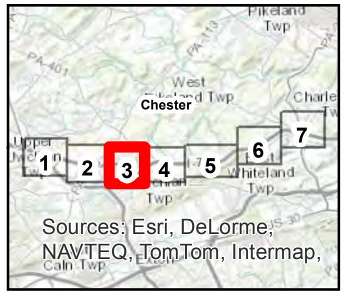
Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- ● Noise Receiver
- ● PA Turnpike Toll Plaza
- ▲ Short-Term Measurement Location
- ⬢ Long-Term Measurement Location
- ◯ Buffer: 500 Feet (either side)
- ▭ Noise Sensitive Area (NSA)
- ▭ Municipal Boundary
- ▭ Area of Future Development



Key Map
Not to Scale

ST-01 66.6	Receiver ID Measured Noise Level in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

N

0 550 1,100 Feet

DRAFT

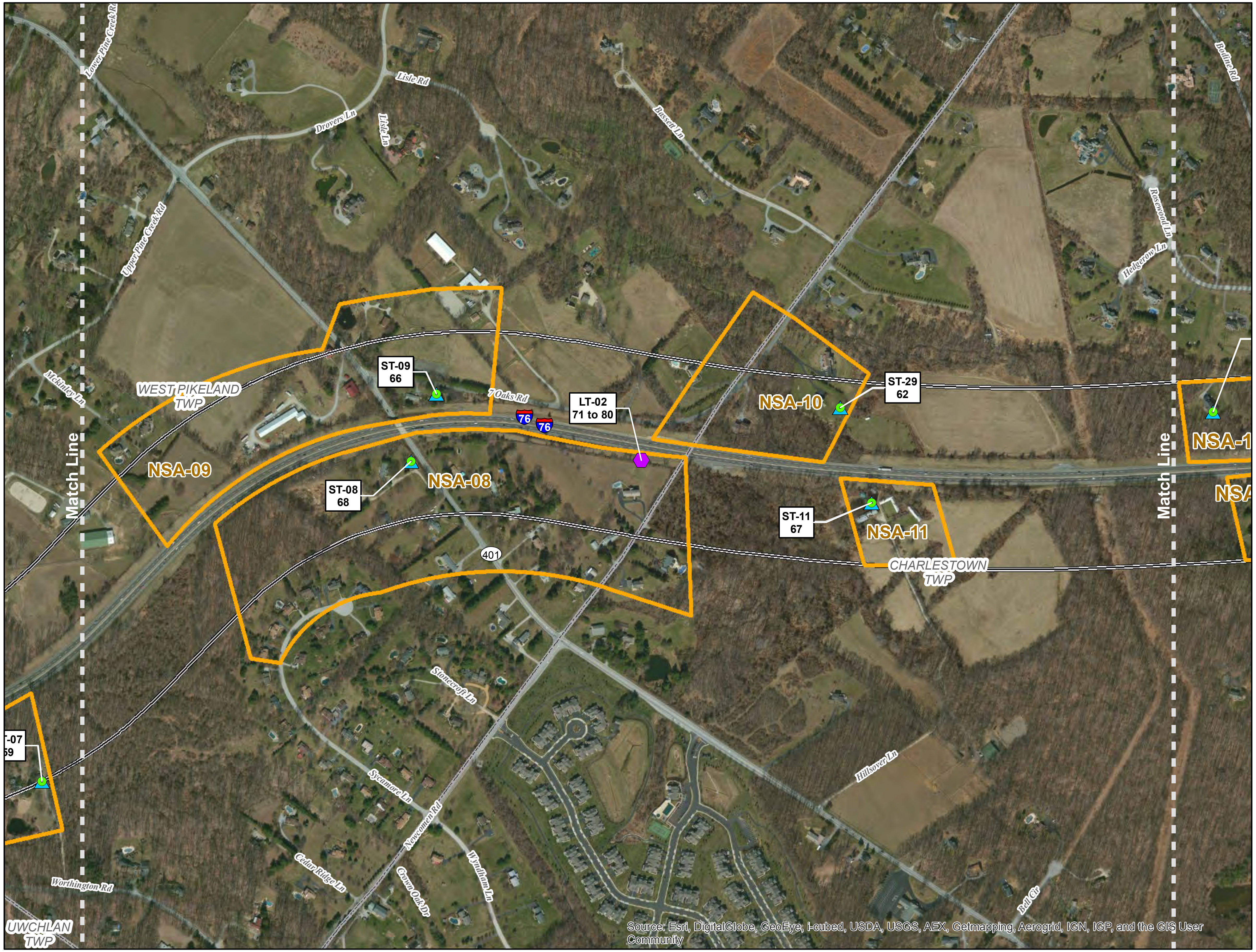
URS

Figure 3 - 3
Measured Noise Levels
Noise Sensitve Areas 05 to 07

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

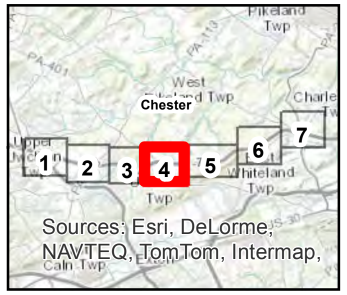
Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

●	Noise Receiver
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
⬭	Buffer: 500 Feet (either side)
▭	Noise Sensitive Area (NSA)
▭	Municipal Boundary
🟨	Area of Future Development



Key Map
Not to Scale

ST-01 66.6	Receiver ID Measured Noise Level in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

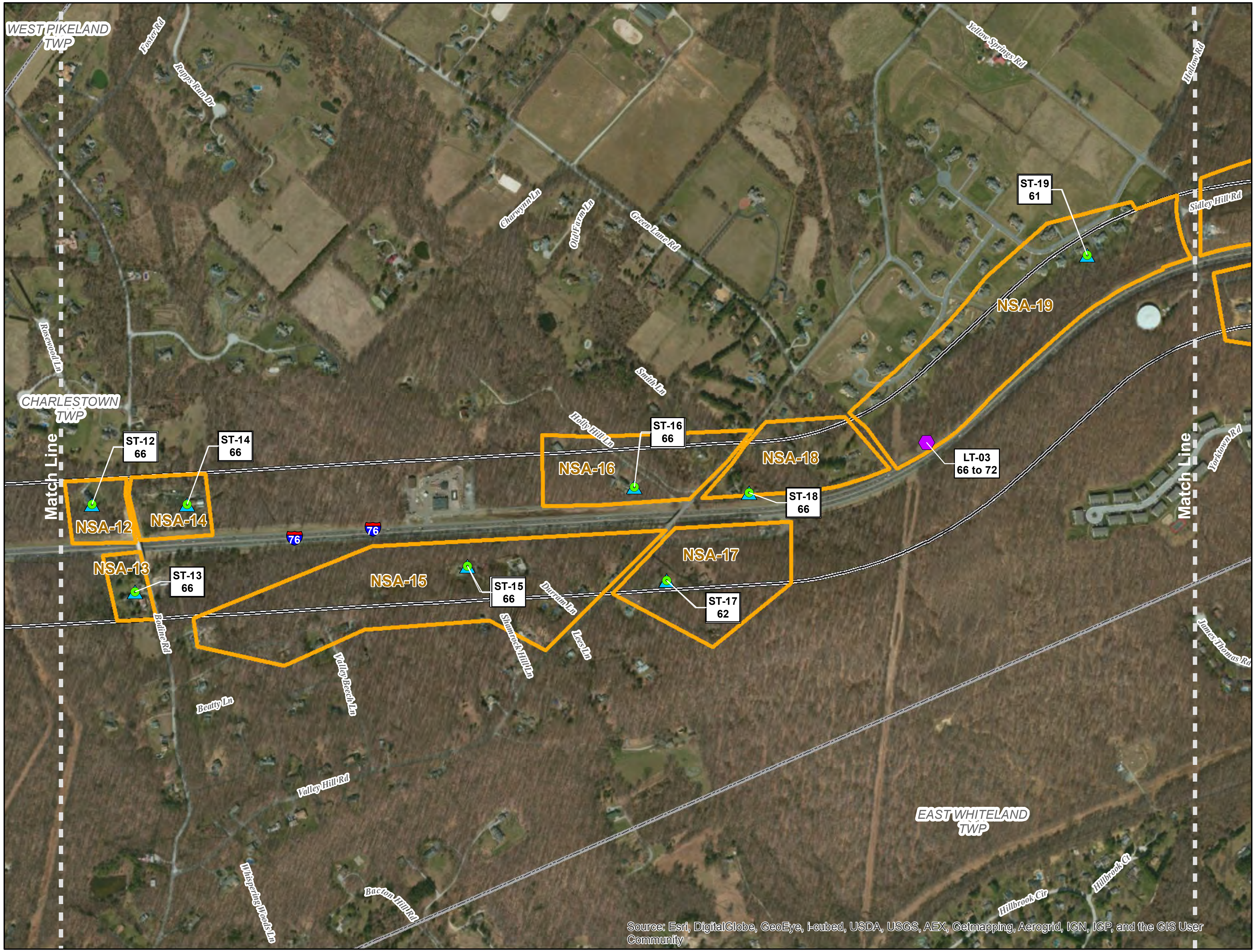
URS

Figure 3 - 4
Measured Noise Levels
Noise Sensitve Areas 08 to 11

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

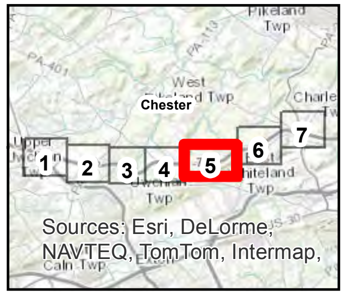
Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- ● Noise Receiver
- ● PA Turnpike Toll Plaza
- ▲ Short-Term Measurement Location
- ⬢ Long-Term Measurement Location
- ⬭ Buffer: 500 Feet (either side)
- ▭ Noise Sensitive Area (NSA)
- ▭ Municipal Boundary
- 🟨 Area of Future Development



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

ST-01 66.6	Receiver ID Measured Noise Level in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 700 1,400
Feet

DRAFT

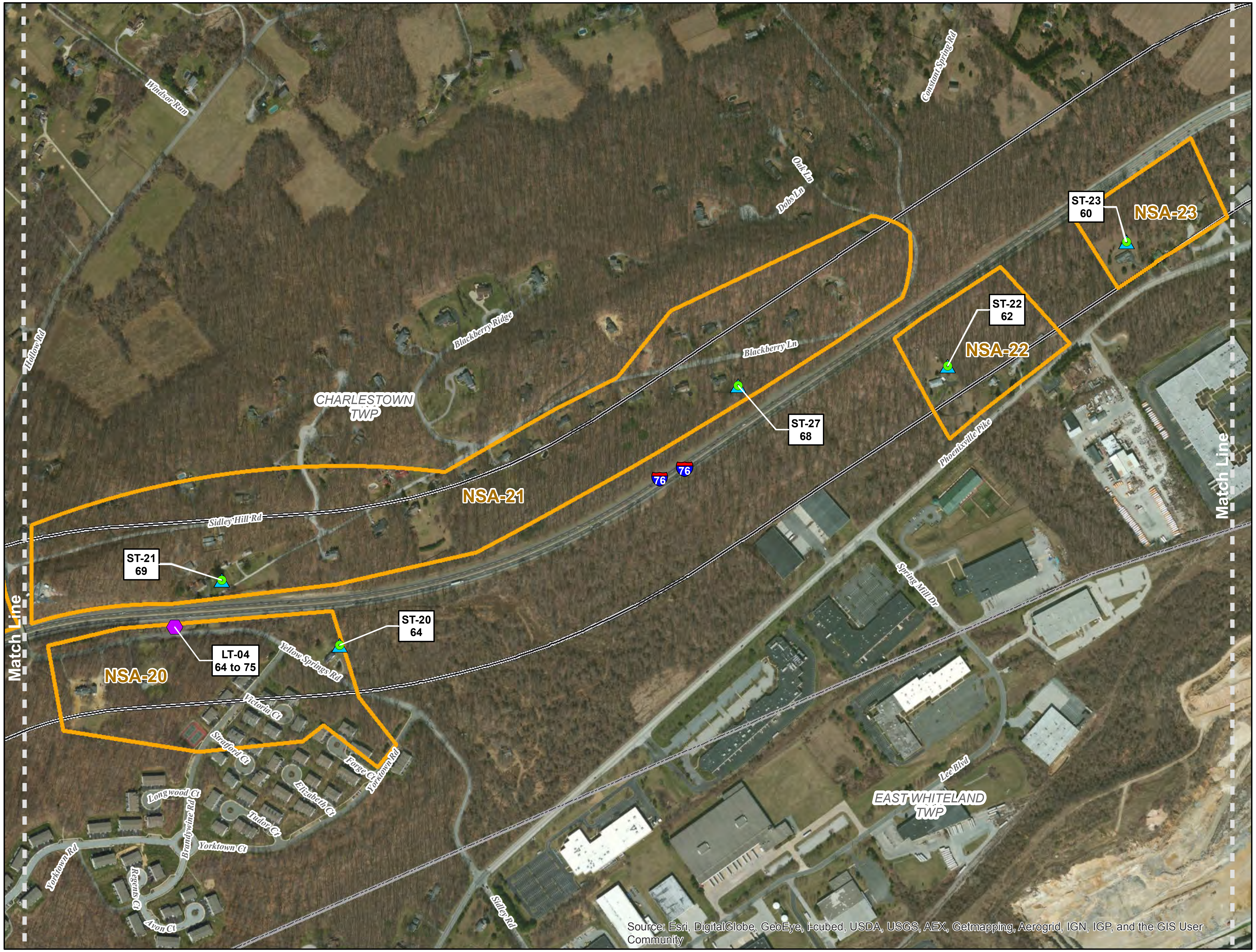
URS

Figure 3 - 5
Measured Noise Levels
Noise Sensitve Areas 12 to 19

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

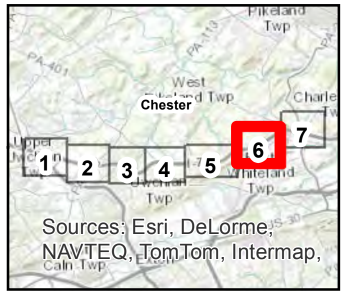
Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

●	Noise Receiver
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
⬭	Buffer: 500 Feet (either side)
▨	Noise Sensitive Area (NSA)
▢	Municipal Boundary
▨	Area of Future Development



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

ST-01 66.6	Receiver ID Measured Noise Level in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

URS

Figure 3 - 6
Measured Noise Levels
Noise Sensitve Areas 20 to 23

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

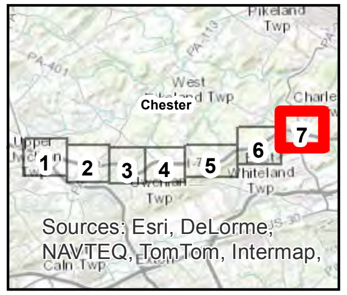
Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

● Noise Receiver
● PA Turnpike Toll Plaza
▲ Short-Term Measurement Location
⬢ Long-Term Measurement Location
⬭ Buffer: 500 Feet (either side)
▢ Noise Sensitive Area (NSA)
▢ Municipal Boundary
🟨 Area of Future Development



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

ST-01 66.6	Receiver ID Measured Noise Level in dBA (A-weighted decibels)

Note: ST-10* could not be accessed during second site survey (Oct 2013).

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

URS

Figure 3 - 7
Measured Noise Levels
Noise Sensitve Areas 24 to 26

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 4/15/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 3 PTC Noise Receptors and Measured Noise Levels.mxd

Legend

🟥 Noise Receiver ≥ 66 dBA
● Noise Receiver <66 dBA
● PA Turnpike Toll Plaza
▲ Short-Term Measurement Location
⬢ Long-Term Measurement Location
Future Roadway
Buffer: 500 Feet (either side)
Noise Sensitive Area (NSA)
Municipal Boundary
Area of Future Development

Note: Noise Levels (NL) in
dBA (A-weighted decibels)

R01-01
64/67/3
Receiver ID
Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

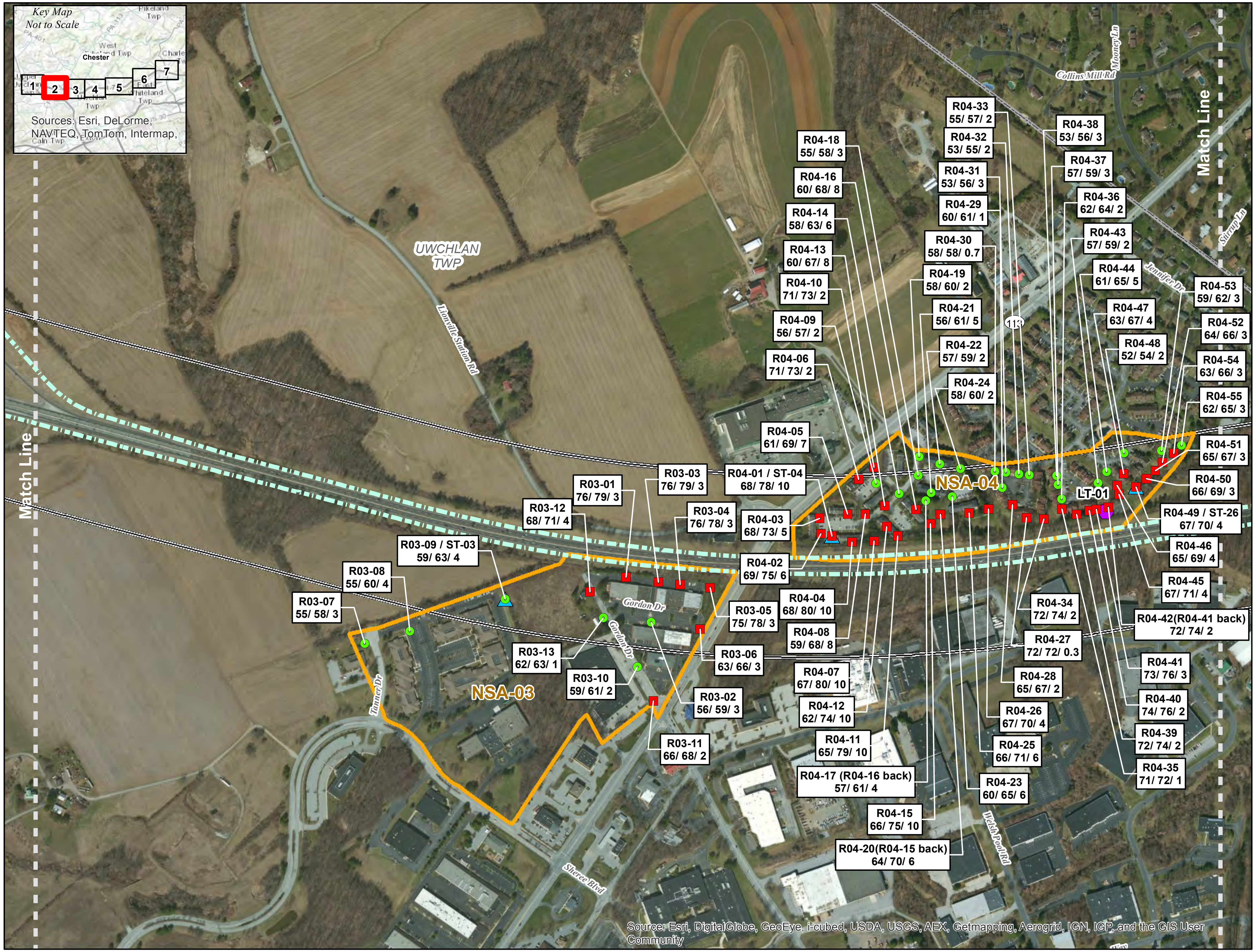
URS

Figure 4 - 1
Future Build Noise Levels
Noise Sensitve Areas 01 and 02

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

🟥 Noise Receiver ≥ 66 dBA
● Noise Receiver <66 dBA
● PA Turnpike Toll Plaza
▲ Short-Term Measurement Location
⬢ Long-Term Measurement Location
- - - Future Roadway
◯ Buffer: 500 Feet (either side)
▭ Noise Sensitive Area (NSA)
▭ Municipal Boundary
🟨 Area of Future Development

Note: Noise Levels (NL) in dBA (A-weighted decibels)

R01-01 64/67/3	Receiver ID Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

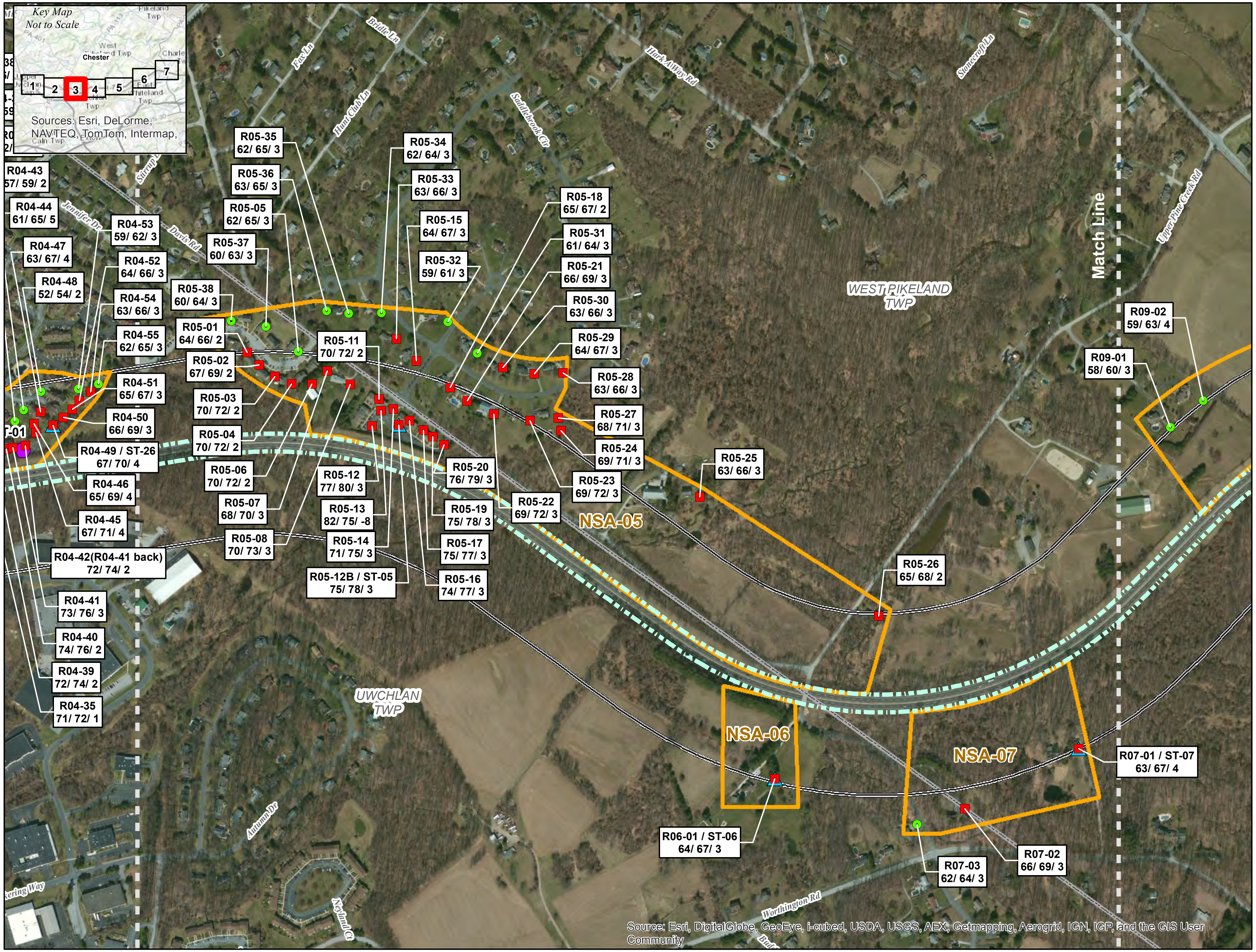
URS

Figure 4 - 2
Future Build Noise Levels
Noise Sensitve Areas 03 and 04

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd



Legend

🟥	Noise Receiver ≥ 66 dBA
●	Noise Receiver <66 dBA
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
▬	Future Roadway
◯	Buffer: 500 Feet (either side)
▭	Noise Sensitive Area (NSA)
▭	Municipal Boundary
▬	Area of Future Development

Note: Noise Levels (NL) in
dBA (A-weighted decibels)

R01-01 64/67/3	Receiver ID Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

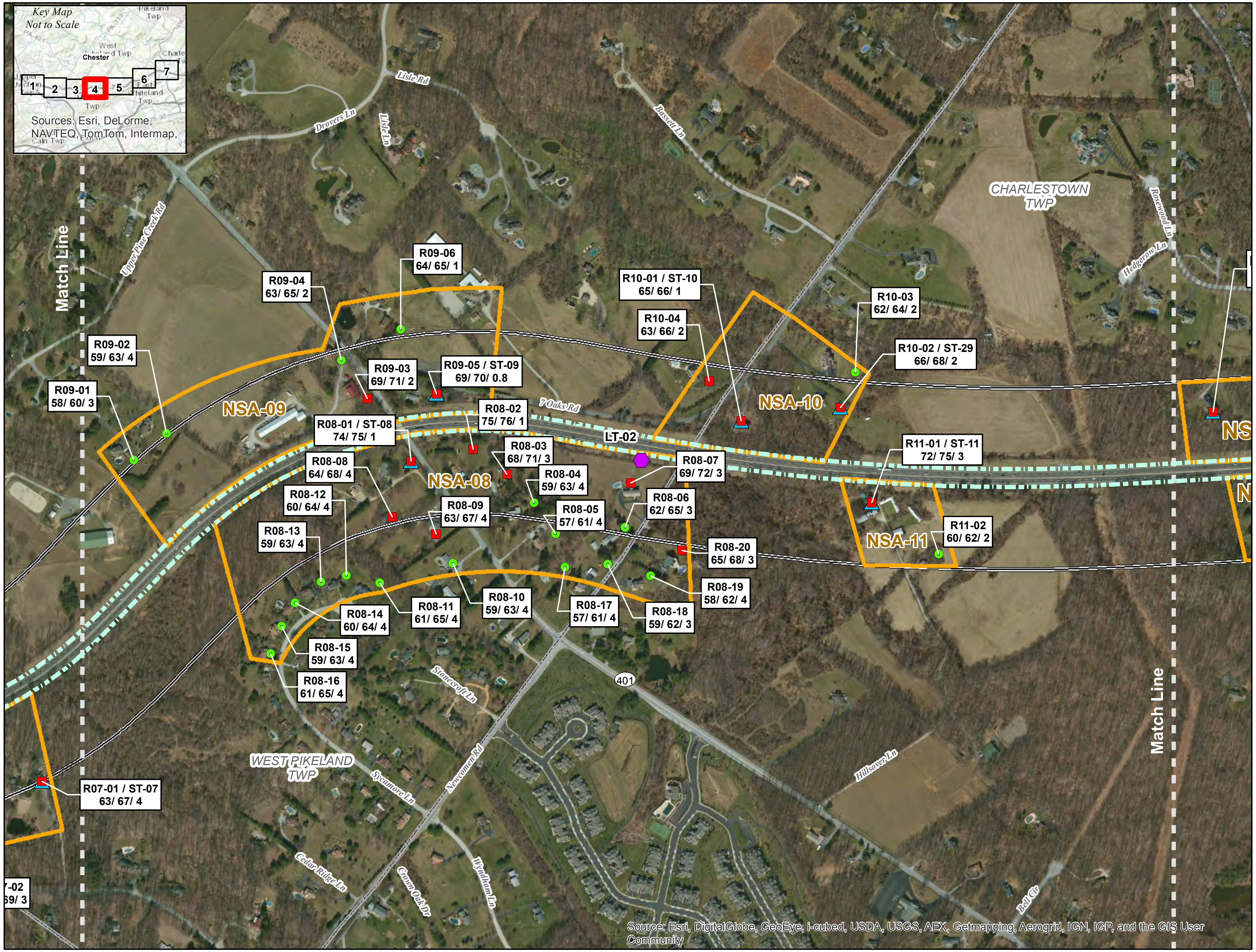
URS

Figure 4 - 3
Future Build Noise Levels
Noise Sensitve Areas 05 to 07

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

🟥	Noise Receiver ≥ 66 dBA
●	Noise Receiver <66 dBA
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
- - -	Future Roadway
◯	Buffer: 500 Feet (either side)
▨	Noise Sensitive Area (NSA)
▨	Municipal Boundary
🟨	Area of Future Development

Note: Noise Levels (NL) in
dBA (A-weighted decibels)

R01-01 64/67/3	Receiver ID Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

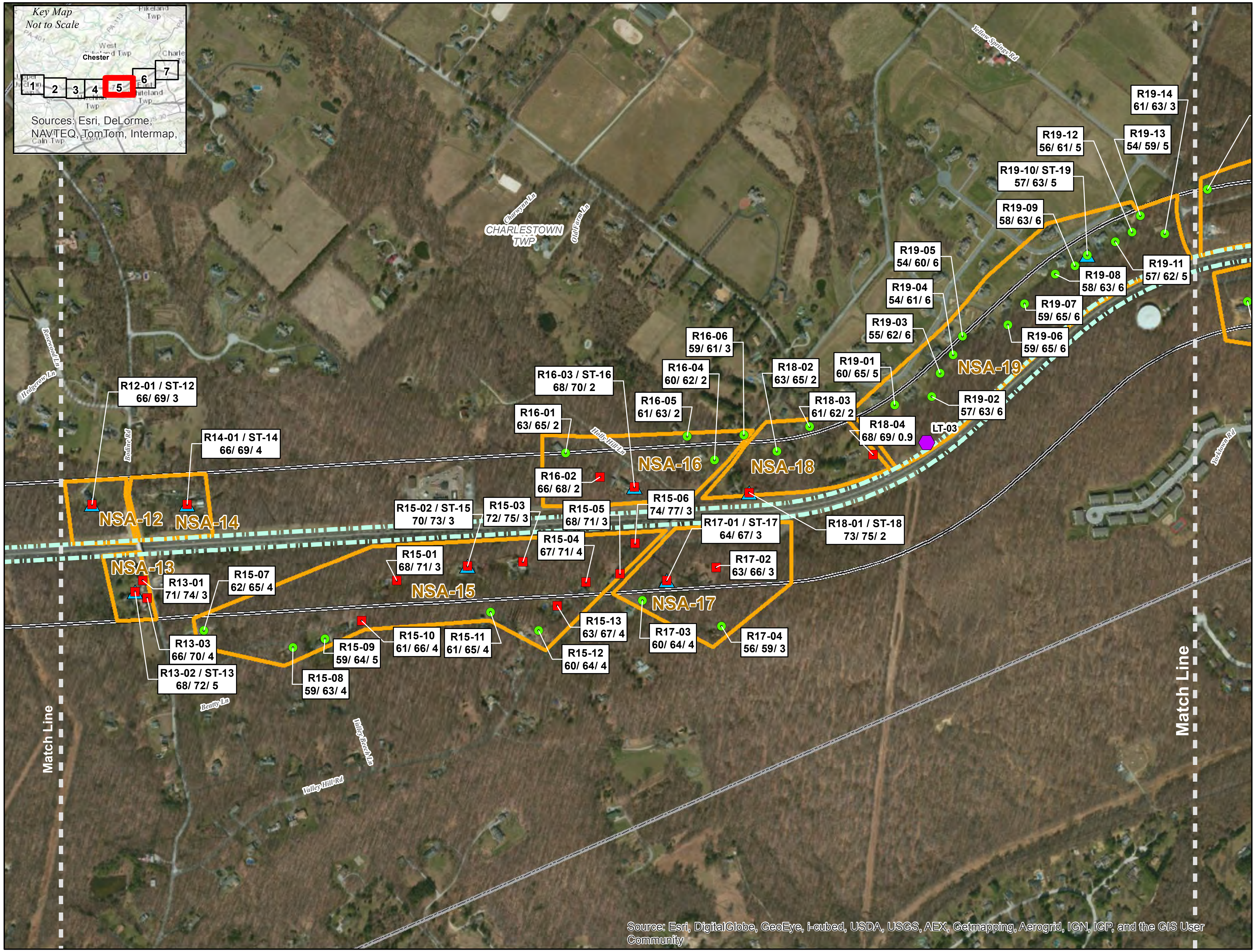
DRAFT

Figure 4 - 4
Future Build Noise Levels
Noise Sensitve Areas 08 to 11

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd



Legend

🟥	Noise Receiver ≥ 66 dBA
●	Noise Receiver <66 dBA
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
▬	Future Roadway
◯	Buffer: 500 Feet (either side)
▭	Noise Sensitive Area (NSA)
▭	Municipal Boundary
🟨	Area of Future Development

Note: Noise Levels (NL) in
dBA (A-weighted decibels)

R01-01 64/67/3	Receiver ID Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 700 1,400
Feet

DRAFT

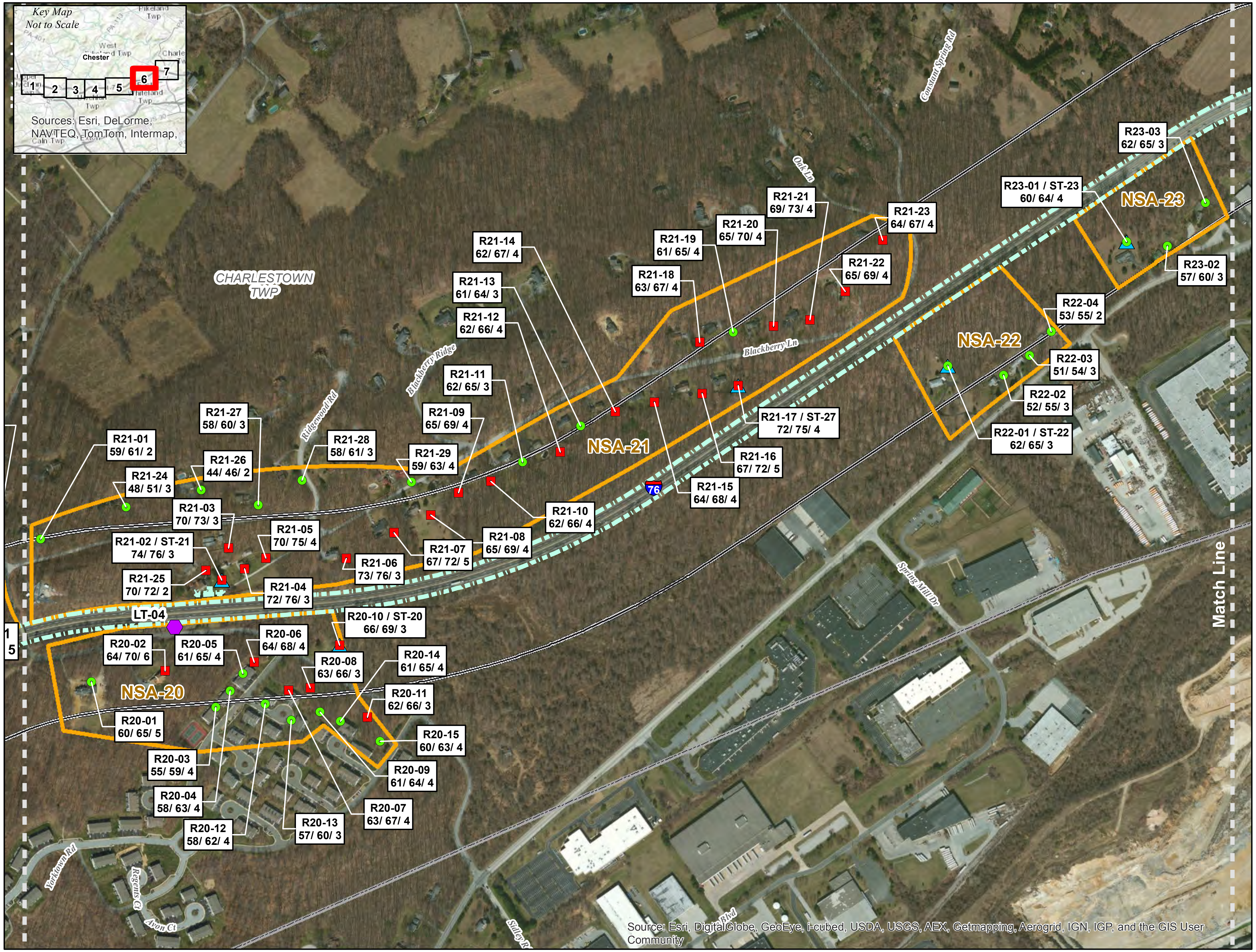
URS

Figure 4 - 5
Future Build Noise Levels
Noise Sensitve Areas 12 to 19

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd



Legend

- 🟥 Noise Receiver ≥ 66 dBA
- ● Noise Receiver <66 dBA
- ● PA Turnpike Toll Plaza
- ▲ Short-Term Measurement Location
- ⬢ Long-Term Measurement Location
- Future Roadway
- ○ Buffer: 500 Feet (either side)
- Noise Sensitive Area (NSA)
- Municipal Boundary
- Area of Future Development

Note: Noise Levels (NL) in
dBA (A-weighted decibels)

R01-01 64/67/3	Receiver ID Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

URS

Figure 4 - 6
Future Build Noise Levels
Noise Sensitve Areas 20 to 23

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd

Legend

🟥	Noise Receiver ≥ 66 dBA
●	Noise Receiver <66 dBA
●	PA Turnpike Toll Plaza
▲	Short-Term Measurement Location
⬢	Long-Term Measurement Location
▬	Future Roadway
○	Buffer: 500 Feet (either side)
▭	Noise Sensitive Area (NSA)
▭	Municipal Boundary
🟨	Area of Future Development

Note: Noise Levels (NL) in
dBA (A-weighted decibels)

R01-01 64/67/3	Receiver ID Existing NL/Future NL/decibel increase

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 550 1,100
Feet

DRAFT

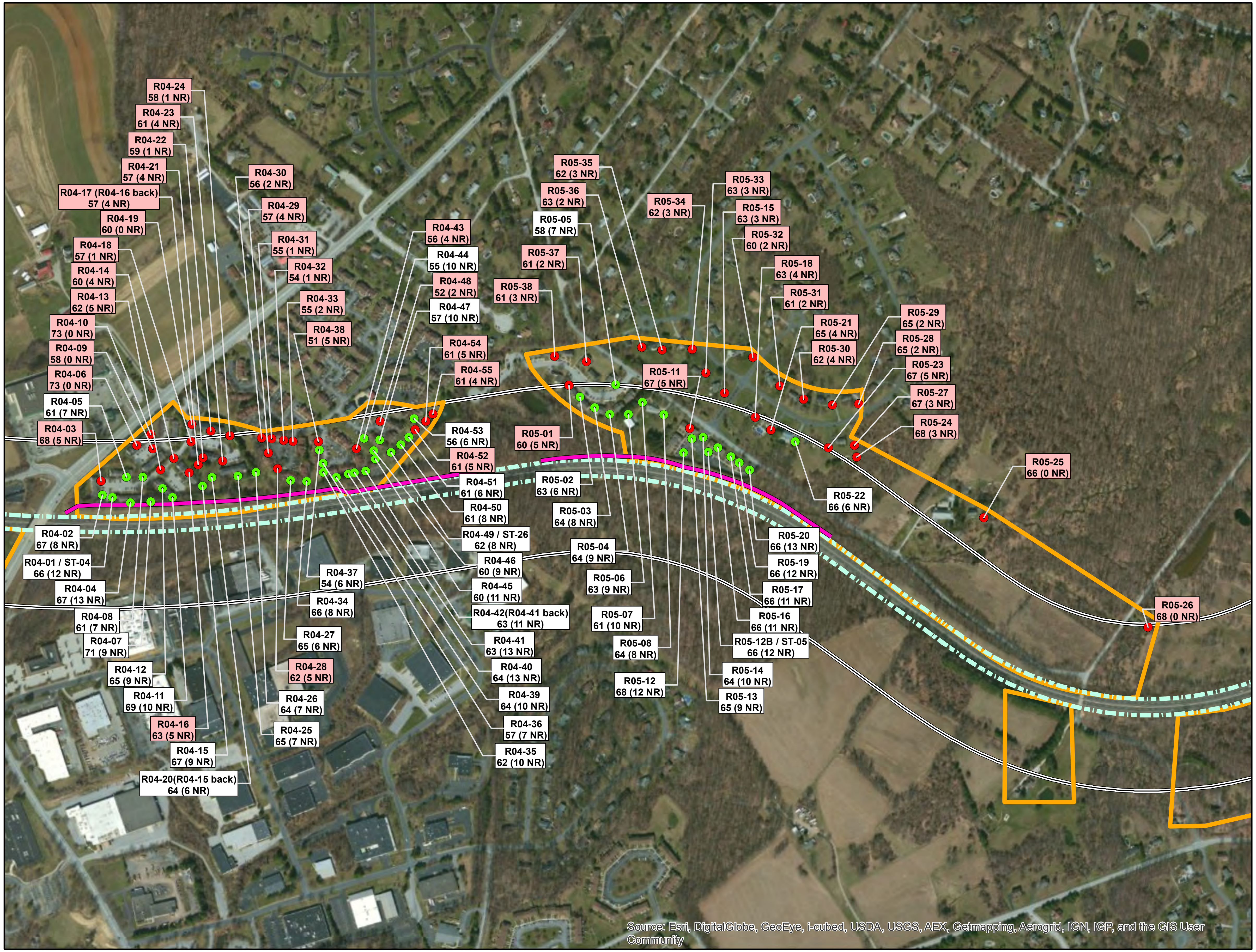
URS

Figure 4 - 7
Future Build Noise Levels
Noise Sensitve Areas 24 to 26

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/14/2014

Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 4 PTC Overall Receivers Future Build Noise Levels.mxd



Legend

🔴 Receivers with Noise Reduction 5 dBA or less

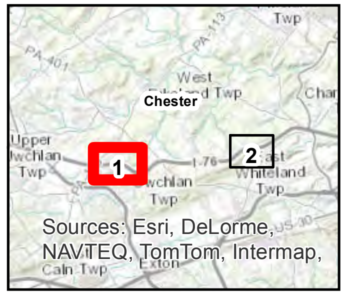
🟢 Receivers with Noise Reduction greater than 5 dBA

▬ Proposed Noise Barrier

┅ Future Roadway

◯ Buffer: 500 Feet (either side)

🟧 Noise Sensitive Area (NSA)



Key Map
Not to Scale

R20-01 64 (4 NR)	Receiver ID DY NL: Design Year Noise Level NR: Noise Reduction from Barrier in dBA (A-weighted decibels)

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

N

0 600 1,200 Feet

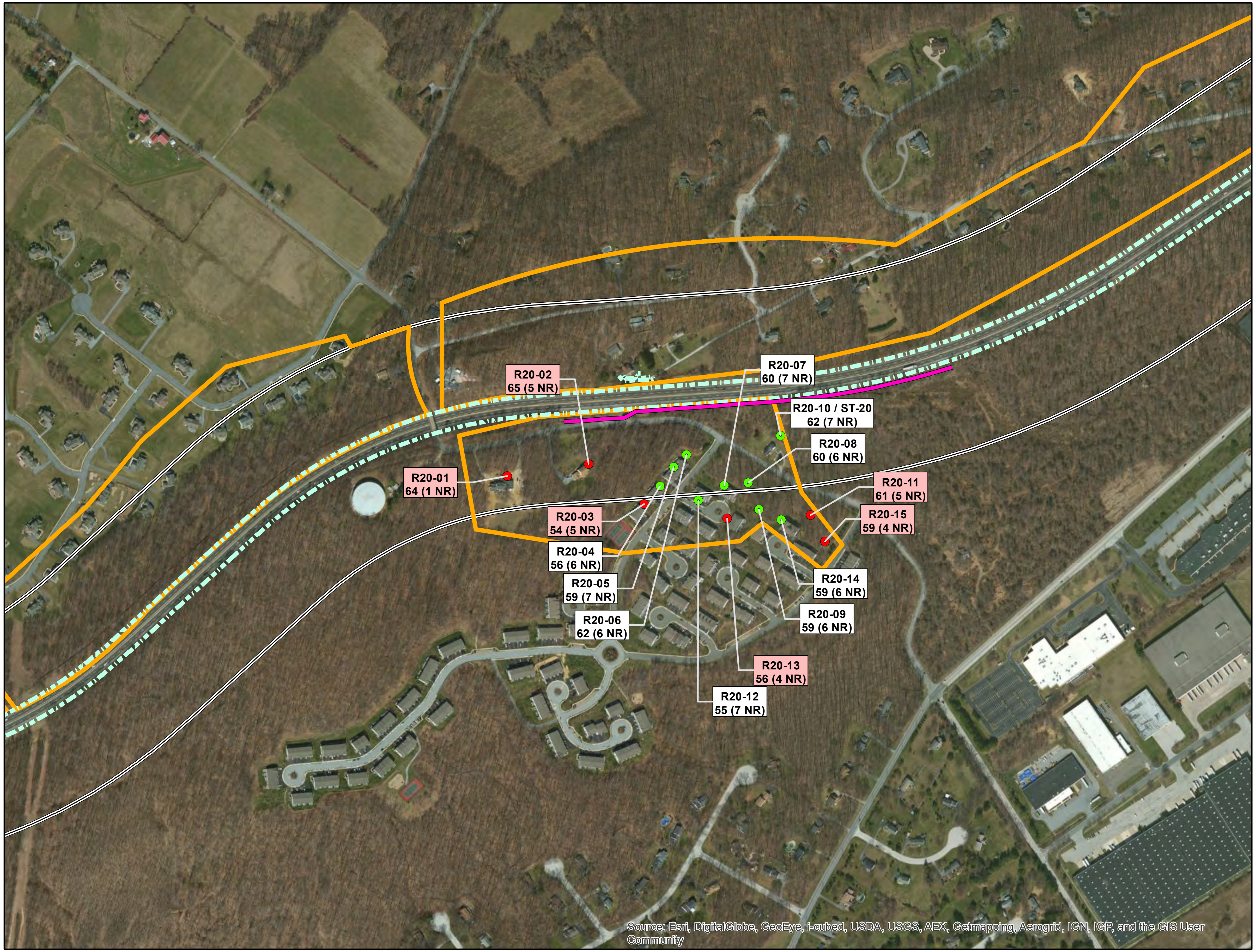
DRAFT URS

Figure 5-1
Noise Wall Barrier Locations
Noise Sensitive Areas 04 and 05

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/15/2014

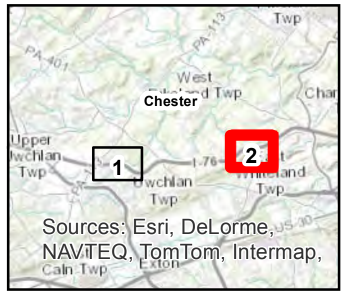
Path: S:\Projects\IMS\COMWTHPA\PATRNPKE\Maps\AcousticalReport\Figure 5 PTC Recommended Noise Barriers.mxd



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Legend

- 🔴 Receivers with Noise Reduction 5 dBA or less
- 🟢 Receivers with Noise Reduction greater than 5 dBA
- ━ Proposed Noise Barrier
- ┅ Future Roadway
- ◎ Buffer: 500 Feet (either side)
- 🟧 Noise Sensitive Area (NSA)



Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap,

Key Map
Not to Scale

R20-01 64 (4 NR)	Receiver ID DY NL: Design Year Noise Level NR: Noise Reduction from Barrier in dBA (A-weighted decibels)

N

NAD 1983 State Plane Pennsylvania South
Projection: Lambert Conformal Conic
Linear Unit: US Foot

References:
Toll Plazas & Municipal Boundaries
provided by PennDOT
TeleAtlas North America (2003)
URS Custom Data

0 500 1,000
Feet

DRAFT

URS

Figure 5-2
Noise Wall Barrier Locations
Noise Sensitive Area 20

Pennsylvania Turnpike Commission
Charlestown, West Pikeland, Uwchlan, and Upper Uwchlan Townships
Chester County, Pennsylvania

Prepared By: PLJ	Checked By: SRS
Job: 21387581.00029	Date: 5/15/2014

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APPENDIX A Fundamentals of Traffic Noise Assessment and Control

Appendix A contains a brief discussion on traffic noise fundamentals and control.

Fundamentals of Traffic Noise Assessment and Control

Noise is generally regarded as unwanted sound. Man-made noise is everywhere, from the busiest urban centers to the most remote national park. Excessive noise can interfere with sleep, work, recreation, and even one's health. One of the major contributors of noise in our society, perhaps the greatest contributor in terms of the number of people affected, is highway or traffic noise. In this appendix, we will briefly discuss:

- How noise is measured and defined;
- How highway noise is generated;
- How highway noise can be reduced; and
- Where to get more information.

How Noise is Measured and Defined

Sound, Noise and Acoustics

Sound is a disturbance created by a moving or vibrating source in a gaseous or liquid medium or the elastic stage of a solid and is capable of being detected by the hearing organs. Sound may be thought of as the mechanical energy of a vibrating object transmitted by pressure waves through a medium to a hearing organ, such as the human ear. For traffic sound, the medium of concern is air. *Noise* is defined as sound that is loud, unpleasant, unexpected, or undesired.

Sound transmission is a process that consists of three components: the sound source, the sound path, and the sound receiver. All three components must be present for sound to exist. Without a source to produce sound, there is no sound. Likewise, without a medium to transmit sound pressure waves, there is also no sound. Finally, sound must be received; a hearing organ, sensor, or object must be present to perceive, register, or be affected by sound or noise. In most situations, there are many different sound sources, paths, and receptors rather than just one of each. *Acoustics* is the field of science that deals with the production, propagation, reception, effects, and control of sound.

Frequency and Hertz

A continuous sound can be described by its *frequency* (pitch) and its *amplitude* (loudness). Frequency relates to and is expressed as the number of pressure oscillations, or cycles, per second. Low-frequency sounds are low in pitch, like the low notes on a piano, whereas high-frequency sounds are high in pitch, like the high notes on a piano. Cycles per second are commonly referred to as Hertz (Hz). A frequency of 250 cycles per second is referred to as 250 Hz. High frequencies are sometimes more conveniently expressed in units of kilo-Hertz (kHz, *i.e.*, thousands of Hertz). The extreme range of frequencies that can be heard by the healthiest human ear spans from 16-20 Hz on the low end of the audible spectrum to about 20,000 Hz (or 20 kHz) on the high end.

Sound Pressure Level and Decibels

The amplitude of a sound determines its loudness. Loudness of sound increases and decreases with increasing and decreasing amplitude, respectively. Sound pressure amplitude is measured in units of micro-Newton per square meter (N/m^2), also called micro-Pascal (µPa). The pressure of a very loud sound may be 200 million µPa, or 10 million times the pressure of the weakest audible sound (20 µPa). Because expressing sound levels in terms of µPa could therefore be very cumbersome, sound pressure level (SPL) is used instead to describe, in logarithmic units, the ratio of actual sound pressures to a reference pressure squared. These units are called bels, named after Alexander Graham Bell. To provide a finer resolution, a bel is subdivided into 10 decibels, abbreviated dB.

Addition of Decibels

Because decibels are logarithmic units, sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one automobile produces an SPL of 70 dB when it passes an observer, two cars passing simultaneously would not produce 140 dB; they would, in fact, combine to produce 73 dBA. When two sounds of equal SPL are combined, they will produce a combined SPL 3 dBA greater than the original individual SPL. In other words, sound energy must be doubled to produce a 3-dBA increase. If two sound levels differ by 10 dBA or more, the combined SPL is equal to the higher SPL; in other words, the lower sound level does not increase the higher sound level.

A-Weighted Decibels

Sound pressure level alone is not a reliable indicator of loudness. The frequency, or pitch, of a sound also has a substantial effect on how humans will respond. Although the intensity (energy per unit area) of the sound is a purely physical quantity, the loudness or human response is determined by the characteristics of the human ear.

Human Response to Changes in Noise Levels

Under controlled conditions in an acoustics laboratory, the trained, healthy human ear is able to discern changes in sound levels of 1 dBA when exposed to steady, single-frequency signals in the mid-frequency range. Outside such controlled conditions, the trained ear can detect changes of 2 dBA in normal environmental noise. It is widely accepted that the average healthy ear, however, can barely perceive noise level changes of 3 dBA. A change of 5 dBA is readily perceptible, and an increase or decrease of 10 dBA is perceived as being twice or half as loud, respectively. As discussed above, a doubling of sound energy results in a 3-dBA increase in sound, which means that a doubling of sound energy (*e.g.*, doubling the volume of traffic on a highway) would result in a barely perceptible change in sound level. **Table A.1** illustrates sound pressure levels in dBA of various sound sources between 0 dBA (threshold of hearing) and 140 dBA (threshold of pain). A relationship between changes in noise level and loudness is indicated in **Table A.2**.

Table A.1
Common Indoor and Outdoor Noise Levels*

Common Outdoor Noise Levels	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	Threshold of Hearing
	0	

[1] Adapted from Guide on Evaluation and Attenuation of Traffic Noise, AASHTO-1974.

Table A.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

Noise Descriptors

Noise in our daily environment fluctuates over time. Some of the fluctuations are minor; some are substantial. Some noise levels occur in regular patterns; others are random. Some noise levels fluctuate rapidly, others slowly. Some noise levels vary widely; others are relatively constant. Various noise descriptors have been developed to describe time-varying noise levels. The following is a list of the noise descriptors most commonly used in traffic noise analysis.

- *Equivalent Sound Level (L_{eq})* — L_{eq} represents an average of the sound energy occurring over a specified period. L_{eq} is, in effect, the steady-state sound level that, in a stated period, would contain the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level, L_{eq}(h), is the energy average of the A-weighted sound levels occurring during a 1-hour period and is the basis for noise abatement criteria (NAC) used by Caltrans and FHWA.
- *Percentile-Exceeded Sound Level (L_x) — L_x* represents the sound level exceeded for a given percentage of a specified period. For example, L_{10} is the sound level exceeded 10% of the time, and L_{90} is the sound level exceeded 90% of the time.
- *Maximum Sound Level (L_{max})* – L_{max} is the highest instantaneous sound level measured during a specified period.
- *Day-Night Level (L_{dn}) – L_{dn}* is the energy average of the A-weighted sound levels occurring during a 24-hour period with 10 dBA added, as a nighttime penalty, to the A-weighted sound levels occurring between 10 p.m. and 7 a.m.

Sound Propagation

When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise reduces with distance depends on the following factors.

- *Geometric Spreading* – Sound from a small, localized source (*i.e.,* a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. Highway noise is not a single, stationary point source of sound. The movement of the vehicles on a highway makes the source of the sound appear to emanate from a line (*i.e.,* a line source) rather than a point. This line source results in cylindrical spreading rather than the spherical spreading that results from a point source. The change in sound level from a line source is 3 dBA per doubling of distance.
- *Ground Absorption* – Most often, the noise path between the highway and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation associated with geometric spreading. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance. This approximation is done for simplification only; for distances of less than 60 meters (200 feet) prediction results based on this scheme are sufficiently accurate. For acoustically hard sites (*i.e.,* those sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receiver), no excess ground attenuation is assumed. For acoustically absorptive or soft sites (*i.e.,* those sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees, between

the source and the receiver), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

- *Atmospheric Effects* – Research by Caltrans and others has shown that atmospheric conditions can have a significant effect on noise levels within 60 meters (200 feet) of a highway. Wind has been shown to be the most important meteorological factor within approximately 150 meters (500 feet) of the source, whereas vertical air temperature gradients are more important for greater distances. Other factors such as air temperature, humidity, and turbulence also have significant effects. Receptors located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur as a result of temperature inversion conditions (*i.e.*, increasing temperature with elevation).
- *Shielding by natural or human-made features* – A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (*e.g.*, hills and dense woods) and human-made features (*e.g.*, buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver specifically to reduce noise. A barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dBA of noise reduction. A taller barrier may provide as much as 20 dBA of noise reduction.

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 50 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 a number of 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) in order to make a significant difference.

How Highway Noise Can Be Reduced

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

<u>Land Use Controls</u>

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 of future highways has already been developed for residential land use.

<u>Quieter Vehicle Noise Sources</u>

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 existing trucks, so as old trucks are phased out and replaced with newer ones the noise produced by the average truck may go down.

<u>Noise Barrier Walls and Berms</u>

Noise barriers, both structural walls and earthen berms, are often constructed specifically for the purpose of reducing highway noise levels. Noise barrier can be very effective for reducing noise levels at nearby homes. Because of their cost, the construction of noise barriers is often restricted to large highway improvement or construction projects.

<u>How Noise Barriers Work</u>

Noise barriers reduce noise levels by interrupting or lengthening the path that the noise takes between the source and the receiver. In order 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 A.1**.

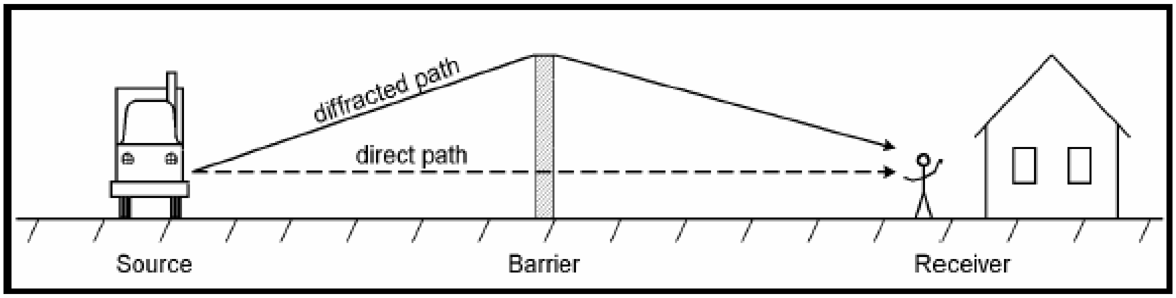

Figure A.1 Simple Noise Barrier Geometry

Noise barriers may work better for some homes than for others. In **Figure A.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 level, 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.

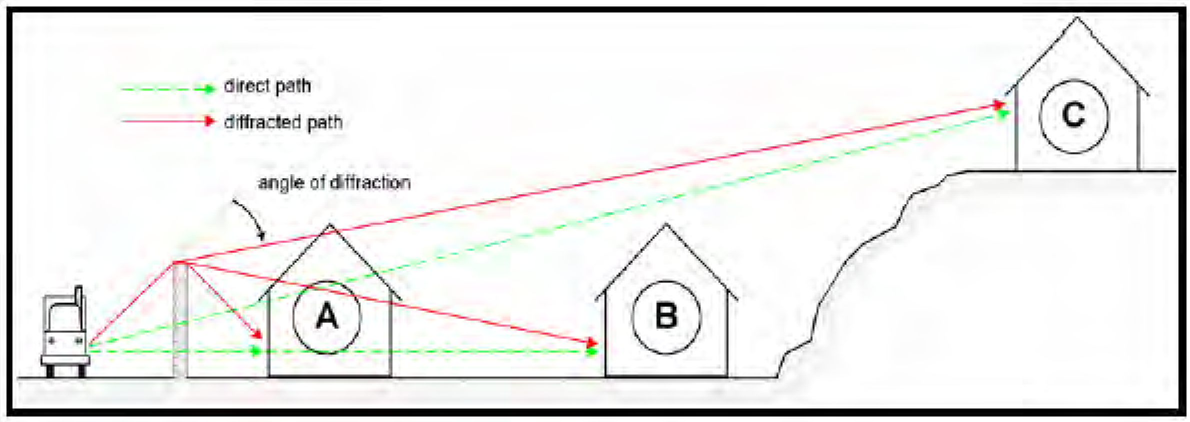

Figure A.2 Path Length Difference for Varying Receiver Geometry

References

1. *Fundamentals and Abatement of Highway Traffic Noise*, Bolt Beranek and Newman, 1973.

2. *Assessment of Noise with Respect to Community Response*, ISO R1996, International Organization for Standardization, Switzerland.

3. Federal Highway Administration, *Procedures for Abatement of Highway Noise and Construction Noise.* 23 CFR Part 772, Final Rule, effective 9 August 1992.

4. Office of Environment and Planning, Memorandum HEP-41 December 1993.

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Appendix B contains the following noise measurement data collected while conducting field noise measurements as part of the noise analysis:

- Photographs and descriptions of measurement locations;
- Hand-written field measurement data sheets containing sketches, noise levels, weather data, traffic information, and other data pertinent to the noise measurement process;
- Traffic counts observed in the field while measurements were being conducted. Classified traffic counts were generally taken from video shot during the noise measurements. Speeds used for validation runs were values indicated on the field data sheets as "Observed" speeds. Existing speeds were estimated by driving through the project roadway during periods with similar traffic conditions and noting vehicle speed. The observed speed was the posted speed limit.
- Sound Level Meter (SLM) data;
- Long Term Measurement Data Charted Time vs. Decibel Level; and
- Calibration certificates for each SLM used to conduct field measurements.

Photograph 1

Date: 11/28/12

Comments:
ST01: Short Term Monitor, reference position in the front yard of the residence at 30 Pennsylvania Road. Camera facing northeast.

IMG_0016

Photograph 2

Date: 11/28/12

Comments:
ST01: Short Term Monitor, reference position in the front yard of the residence at 30 Pennsylvania Road. Camera facing southwest.

IMG_0020

Photograph 3

Date: 11/28/12

Comments:
ST02: Short Term Monitor, reference position in the back yard of 82 East Township Line Road. Camera facing south.

IMG_0024

Photograph 4

Date: 11/28/12

Comments:
ST02: Short Term Monitor, reference position in the back yard of 82 East Township Line Road. Camera facing north.

IMG_0029

Photograph 5

Date: 10/29/13

Comments:
ST03: Short Term Monitor, reference position outside Suite 2100 in the office complex off of Sheree Blvd. Camera facing north.

IMG_1141

Photograph 6

Date: 10/29/13

Comments:
ST03: Short Term Monitor, reference position outside Suite 2100 in the office complex off of Sheree Blvd. Camera facing west.

IMG_1138

	**Photograph 7** **Date:** 11/28/12 **Comments:** ST04: Short-Term Monitor, reference position in the front yard of 1202 Pointe Court in the Pickering Point Complex. Camera facing southwest. IMG_0042
	**Photograph 8** **Date:** 11/28/12 **Comments:** ST04: Short-Term Monitor, reference position in the front yard of 1202 Pointe Court in the Pickering Point Complex. Camera facing north. IMG_0044

	**Photograph 9** **Date:** 11/28/12 **Comments:** ST05: Short-Term Monitor, reference position in the Holly Tree Court Playground. Camera facing southwest. IMG_0051
	**Photograph 10** **Date:** 11/28/12 **Comments:** ST05: Short-Term Monitor, reference position in the Holly Tree Court Playground. Camera facing north. IMG_0053

Photograph 11

Date: 10/29/13

Comments: ST06: Short-Term Monitor, reference position in the side yard of the residence at 200 Upper Pine Creek Road (Greenbrier Farm). Camera facing northeast.

IMG_1147

Photograph 12

Date: 10/29/13

Comments: ST06: Short-Term Monitor, reference position in the side yard of the residence at 200 Upper Pine Creek Road (Greenbrier Farm). Camera facing northwest.

IMG_1152

Photograph 13

Date: 10/29/13

Comments: ST07: Short-Term Monitor, reference position in the side yard of the residence at 511 Worthington Road. Camera facing north.

IMG_1156

Photograph 14

Date: 10/29/13

Comments: ST07: Short-Term Monitor, reference position in the side yard of the residence at 511 Worthington Road. Camera facing northwest.

IMG_1162

Photograph 15

Date: 11/28/12

Comments:
ST08: Short-Term Monitor, reference position in side yard of 1148 Conestoga Road. Camera facing north.

IMG_0068

Photograph 16
Date: 11/28/12

Comments:
ST08: Short-Term Monitor, reference position in side yard of 1148 Conestoga Road. Camera facing northwest.

IMG_0073

Photograph 17
Date: 10/29/13

Comments:
ST09: Short-Term Monitor, reference position in the side yard of a field to the north of 906 Seven Oaks Road. Camera facing south.

IMG_1166

Photograph 18
Date: 10/29/13

Comments:
ST09: Short-Term Monitor, reference position in the side yard of a field to the north of 906 Seven Oaks Road. Camera facing southwest.

IMG_1167

Photograph 19
Date: 11/28/12

Comments:
ST10: Short-Term Monitor, reference position in the side yard of 2056 Seven Oaks Road. Camera facing southwest.

IMG_0086

Photograph 20
Date: 11/28/12

Comments:
ST10: Short-Term Monitor, reference position in the side yard of 2056 Seven Oaks Road. Camera facing southeast.

IMG_0091

	**Photograph 21** **Date:** 11/29/12 **Comments:** ST11: Short-Term Monitor, reference position in the back yard of the residence at 69 Hillsover Road. Camera facing north. IMG_0111
	**Photograph 22** **Date:** 11/29/12 **Comments:** ST11: Short-Term Monitor, reference position in the back yard of the residence at 69 Hillsover Road. Camera facing south. IMG_0109

Photograph 23
Date: 10/29/13

Comments:
ST12: Short-Term Monitor, reference position in the back yard of the residence at 2151 Bodine Road. Camera facing south

IMG_1120

Photograph 24
Date: 10/29/13

Comments:
ST12: Short-Term Monitor, reference position in the back yard of the residence at 2151 Bodine Road. Camera facing northeast.

IMG_1125

Photograph 25
Date: 11/29/12

Comments:
ST13: Short-Term Monitor, reference position in the back yard of the residence at 2 Bodine Road. Camera facing north.

IMG_0119

Photograph 26
Date: 11/29/12

Comments:
ST13: Short-Term Monitor, reference position in the back yard of the residence at 2 Bodine Road. Camera facing east.

IMG_0117

Photograph 27
Date: 10/29/13

Comments:
ST14: Short-Term Monitor, reference position in the side yard of the residence and commercial business (Horticultural Center) at 2148 Bodine Road. Camera facing south.

IMG_1182

Photograph 28
Date: 10/29/13

Comments:
ST14: Short-Term Monitor, reference position in the side yard of the residence and commercial business (Horticultural Center) at 2148 Bodine Road. Camera facing east.

IMG_1188

Photograph 29
Date: 11/30/12

Comments:
ST15: Short-Term Monitor, reference position in the back yard of the residence at 26 Shamrock Hill Lane. Camera facing northeast.

IMG_0175

Photograph 30
Date: 11/30/12

Comments:
ST15: Short-Term Monitor, reference position in the back yard of the residence at 26 Shamrock Hill Lane. Camera facing west.

IMG_0176

Photograph 31
Date: 11/30/12

Comments:
ST16: Short-Term Monitor, reference position in the back yard of the residence at 10 Wood Valley Lane. Camera facing south.

IMG_0139

Photograph 32
Date: 11/30/12

Comments:
ST16: Short-Term Monitor, reference position in the back yard of the residence at 10 Wood Valley Lane. Camera facing northwest.

IMG_0142

Photograph 33
Date: 11/30/12

Comments:
ST17: Short-Term Monitor, reference position in the front yard of the residence at 2198 Valley Hill Road. Camera facing north.

IMG_0180

Photograph 34
Date: 11/30/12

Comments:
ST17: Short-Term Monitor, reference position in the front yard of the residence at 2198 Valley Hill Road. Camera facing south.

IMG_0178

	**Photograph 35** **Date:** 11/30/12 **Comments:** ST18: Short-Term Monitor, reference position in the side yard of the residence at 2236 Valley Hill Road. Camera facing north. IMG_0181
	**Photograph 36** **Date:** 11/30/12 **Comments:** ST18: Short-Term Monitor, reference position in the side yard of the residence at 2236 Valley Hill Road. Camera facing south. IMG_0183

	**Photograph 37** **Date:** 10/29/13 **Comments:** ST19: Short-Term Monitor, reference position in the back yard of the residence at 29 Hollow Drive. Camera facing south. IMG_1095
	**Photograph 38** **Date:** 10/29/13 **Comments:** ST19: Short-Term Monitor, reference position in the back yard of the residence at 29 Hollow Drive. Camera facing north. IMG_1100

Photograph 39
Date: 10/29/13

Comments:
ST20: Short-Term Monitor, reference position in the back yard of the residence at 20624 Yellow Springs Road. Camera facing north.

IMG_1102

Photograph 40
Date: 10/29/13

Comments:
ST20: Short-Term Monitor, reference position in the back yard of the residence at 20624 Yellow Springs Road. Camera southeast.

IMG_1105

Photograph 41
Date: 11/29/12

Comments:
ST21: Short-Term Monitor, reference position in the side yard of the residence at 181 Blackberry Lane. Camera facing northeast.

IMG_0166

Photograph 42
Date: 11/29/12

Comments:
ST21: Short-Term Monitor, reference position in the side yard of the residence at 181 Blackberry Lane. Camera facing north.

IMG_0163

	**Photograph 43** **Date:** 10/29/13 **Comments:** ST22: Short-Term Monitor, reference position in the back yard of the residence at 3149 Phoenixville Pike. Camera facing north. IMG_1084
	**Photograph 44** **Date:** 10/29/13 **Comments:** ST22: Short-Term Monitor, reference position in the back yard of the residence at 3149 Phoenixville Pike. Camera facing south. IMG_1088

Photograph 45
Date: 10/29/13

Comments:
ST23: Short-Term Monitor, reference position in the back yard of the residence at 3199 Phoenixville Pike. Camera facing north.

IMG_1077

Photograph 46
Date: 10/29/13

Comments:
ST23: Short-Term Monitor, reference position in the back yard of the residence at 3199 Phoenixville Pike. Camera facing south.

IMG_1081

	**Photograph 47** **Date:** 11/30/12 **Comments:** ST24: Short-Term Monitor, reference position in the side yard of the church at 3281 Phoenixville Pike. Camera facing north. IMG_0204
	**Photograph 48** **Date:** 11/30/12 **Comments:** ST24: Short-Term Monitor, reference position in the side yard of the church at 3281 Phoenixville Pike. Camera facing east. IMG_0205

Photograph 49
Date: 11/30/12

Comments:
ST25: Short-Term Monitor, reference position near Charleston Elementary School at 2060 Charlestown Road. Camera facing south.

IMG_0208

Photograph 50
Date: 11/30/12

Comments:
ST25: Short-Term Monitor, reference position near Charleston Elementary School at 2060 Charlestown Road. Camera west.

IMG_0210

Photograph 51
Date: 10/29/13

Comments:
ST26: Short-Term Monitor, reference position in the back yard of the residence at 3501 Eaton Court. Camera facing south.

IMG_1129

Photograph 52
Date: 10/29/13

Comments:
ST26: Short-Term Monitor, reference position in the back yard of the residence at 3501 Eaton Court. Camera facing north.

IMG_1134

Photograph 53
Date: 10/29/13

Comments:
ST27: Short-Term Monitor, reference position in the front yard of the residence at 3140 Blackberry Lane. Camera facing south.

IMG_1172

Photograph 54
Date: 10/29/13

Comments:
ST27: Short-Term Monitor, reference position in the front yard of the residence at 3140 Blackberry Lane. Camera facing northwest.

IMG_1175

Photograph 55
Date: 10/29/13

Comments:
ST28: Short-Term Monitor, reference position in the back yard of the residence at 1022 Yellow Springs Road. Camera facing north.

IMG_1067

Photograph 56
Date: 10/29/13

Comments:
ST28: Short-Term Monitor, reference position in the back yard of the residence at 1022 Yellow Springs Road. Camera south.

IMG_1069

Photograph 57
Date: 10/29/13

Comments:
ST29: Short-Term Monitor, reference position in the back yard of the residence at 2068 Seven Oaks Road. Camera facing south.

IMG_1191

Photograph 58
Date: 10/29/13

Comments:
ST29: Short-Term Monitor, reference position in the back yard of the residence at 2068 Seven Oaks Road. Camera facing west.

IMG_1194

Photograph 59
Date: 11/28/12

Comments:
LT01: Long-Term Monitor, reference position in the open area at the end of Eaton Court in the Lion gate Community. Camera facing southeast.

IMG_0003

Photograph 60
Date: 11/28/12

Comments:
LT01: Long-Term Monitor, reference position in the open area at the end of Eaton Court in the Lion gate Community. Camera facing north.

IMG_0005

Photograph 61
Date: 11/28/12

Comments:
LT02: Long-Term Monitor, reference position in the back yard of the residence at 931 Newcomen Road. Camera facing northeast.

IMG_0008

Photograph 62
Date: 11/28/12

Comments:
LT02: Long-Term Monitor, reference position in the back yard of the residence at 931 Newcomen Road. Camera facing south.

IMG_0010

	**Photograph 63** **Date:** 11/29/12 **Comments:** LT03: Long-Term Monitor, reference position in the open area next to the residence at 57 Deerfield Drive. Camera facing southeast. IMG_0097
	**Photograph 64** **Date:** 11/29/12 **Comments:** LT03: Long-Term Monitor, reference position in the open area next to the residence at 57 Deerfield Drive. Camera facing north. IMG_0094

Photograph 65
Date: 11/29/12

Comments:
LT04: Long-Term Monitor, reference position across street from 2111 Yellow Springs Road. Camera facing northwest.

IMG_0101

Photograph 66
Date: 11/29/12

Comments:
LT04: Long-Term Monitor, reference position across street from 2111 Yellow Springs Road. Camera facing south.

IMG_0106

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 WIDENING Project #: Date: 11/28/2012 Page of

Monitoring Location: LT-01 EATON COURT LIONGATE COMM Analyst: JDD

Sound Level Meter

Model #: NOR140

Serial #: 1402984

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Field Calibration

Model #: NOR1251

Serial #: 26629

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114.0 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm]

Precipitation: [✓ Yes] (explain) / No LIGHT SNOW ON GROUND

Avg Wind Speed/Direction: 2-3MPH SW

Topo: [✓ Flat] / Hilly

Terrain: Hard/Soft/[✓ Mixed]/Snow

GPS Coordinates (at SLM location)#

N40°03.914' W075°38.537'

Temp (°F): 33.4 RH (%): 100%

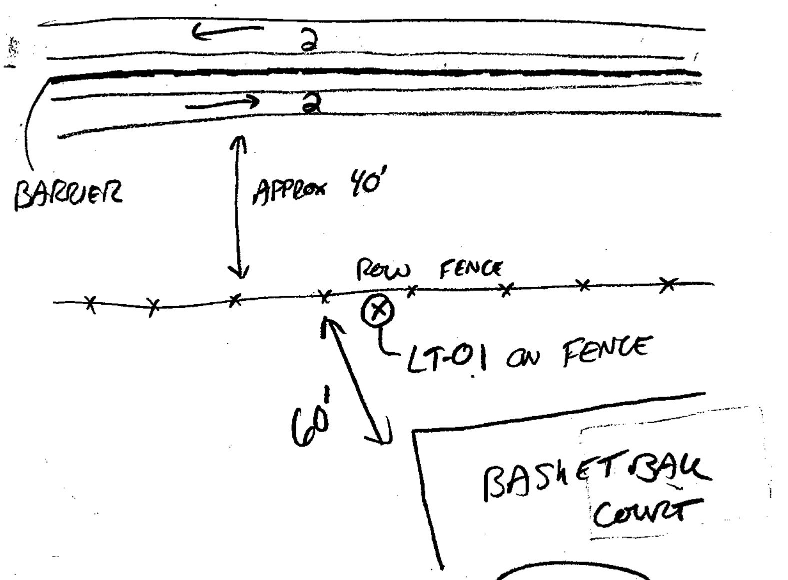
Bar Psr (Hg): 1006.7 Cloud Cover (%): 70%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	08:34	11/28/12	24-HOUR MEASUREMENT						
	15:56	CHECKING BATTERIES							
	21'07	changed batteries							
[illegible]	08:30	RETRIEVED METER (ALREADY SHUT-OFF) (UNKNOWN DATA AMOUNT)							

Roadway Name/Dir	I-76	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	FLAT	
Bus Stops	0	
Stoplights	0	
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 WIDENING Project #: Date: 11/28/2012 Page of
Monitoring Location: LT-02 931 NEWCOMEN ROAD Analyst: JDD

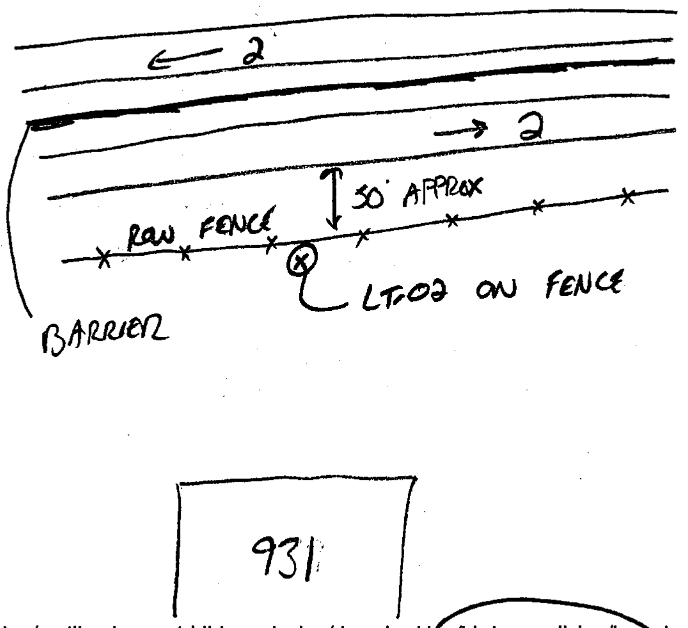
Sound Level Meter	Field Calibration	Weather Data
Model #: LD720	Model #: CAL 200	Model #: K3500
Serial #: 0436	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: Steady/Gusty/[✓ Calm]
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: [✓ Yes] (explain) / No LIGHT SNOW ON GROUND
Windscreen: [✓ Yes] / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0
Topo: Flat / [✓ Hilly]	GPS Coordinates (at SLM location)#	Temp (°F): 34.0° RH (%): 51.8
Terrain: Hard/Soft/[✓ Mixed]/Snow	N40° 03.901' W075° 36.622'	Bar Psr (Hg): 1006.0 Cloud Cover (%): 50%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	09:04	11/28/12	24-HOUR MEASUREMENT						
	15:08	checking batteries							
	2122	changed batteries							
≈	08:45	RETRIEVED METER							

Roadway Name/Dir	I-76	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	FLAT	
Bus Stops	0	
Stoplights	0	
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]
Photos Taken? [✓ Yes] / No
Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/Insects
Additional Notes and Sketches on Reverse

Project Name: PTC 319-312 Project #: ____ Date: 11/29/12 Page ___ of ___

Monitoring Location: LT-03 57 DEERFIELD DRIVE Analyst: JDD

Sound Level Meter

Model #: LD720

Serial #: 0436

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen : [✓ Yes] / No (explain)

Field Calibration

Model #: CAL 200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114.0 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: [✓ Steady] /Gusty/Calm

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 0-2mph

Temp (°F): 34°F RH (%): 56%

Bar Psr (Hg): 1006 Cloud Cover (%): 100%

Topo: Flat / [✓ Hilly]

Terrain: Hard/Soft/[✓ Mixed]/Snow

GPS Coordinates (at SLM location)#

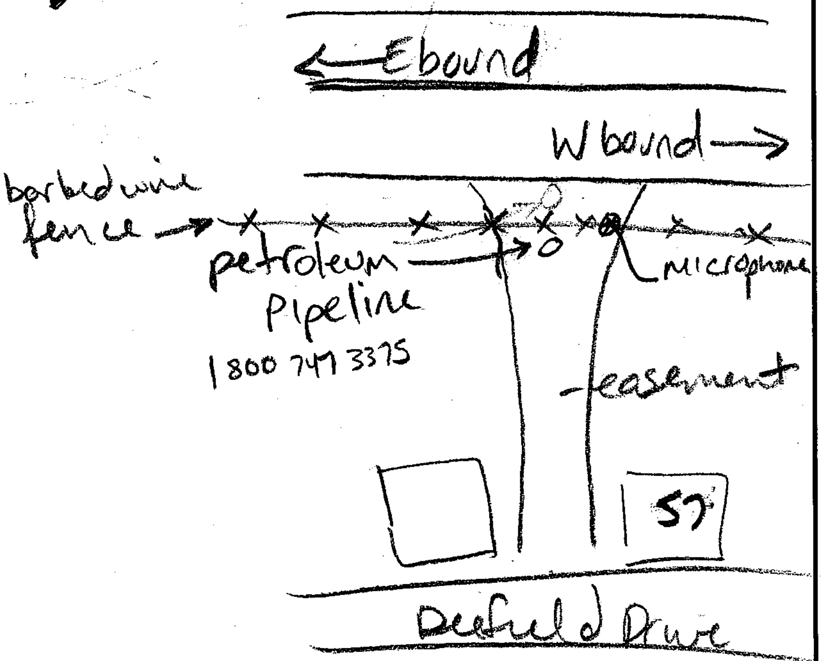
N40°03.9.9' W75°34.737'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	10:14	11/29/12		24-hour		MEASUREMENT			
		10:00	11/30/12	STOPPED	METER				

Roadway Name/Dir	PA TURNSPIKE	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 6 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: ____ Date: 10/28/13 Page ___ of ___
Monitoring Location: LT-04 ACROSS FROM 2111 YELLOW SPRINGS RD Analyst: JDD

Sound Level Meter
Model #: LD 712 SLM
Serial #: 0418
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen : [✓ Yes] / No (explain)

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114.0 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: NONE
Temp (°F): 60.0 RH (%): 50.4
Bar Psr (Hg): 1000.2 Cloud Cover (%): 10% light clouds

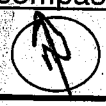
Topo: Flat / [✓ Hilly]
Terrain: Hard/[✓ Soft]/Mixed/Snow

GPS Coordinates (at SLM location)#
N 40°64.180° W 75°34.105'

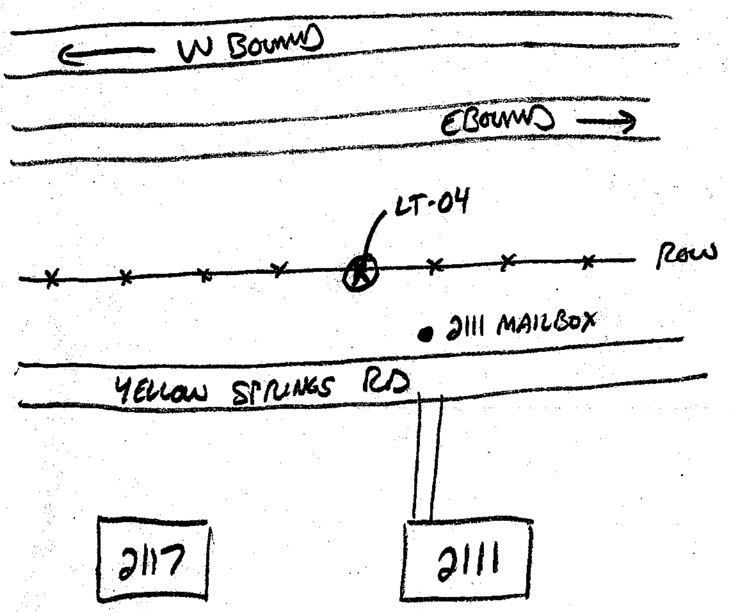
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	17:03	10/28/13		BEGIN 24-HOUR MEASUREMENT					PA turnpike dominates,
	08.53	10/29/13		check batteries /					traffic on yellow springs
				replaced batteries					road audible when
	1704	10/29/13		end reading					present
									Receptor above turnpike grade

Roadway Name/Dir	PA TURNPIKE	
Speed (post/obs)*	65/70	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	FLAT	
Bus Stops	0	
Stoplights	0	
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass



Site Diagram:



\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 8 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Widening Project #: Date: 11/28/12 Page of

Monitoring Location: ST-01 30 Pennsylvania Road Analyst: JDD

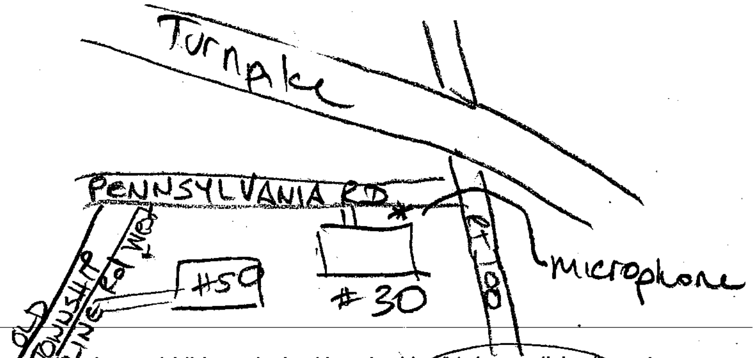
Sound Level Meter	Field Calibration	Weather Data
Model #: LD 820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 [✓ 114]	Wind: Steady/Gusty/[✓ Calm] 0-2 mph
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) [✓ No]
Windscreen : [✓ Yes] / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0-2 mph
Topo: Flat / [✓ Hilly]	GPS Coordinates (at SLM location)#	Temp (°F): 36°F RH (%): 73%
Terrain: Hard/Soft/[✓ Mixed]/Snow	N40°04.210 W75°40.859	Bar Psr (Hg): 1004.7 Cloud Cover (%): 20%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L₁₀	L₅₀	L₉₀	Notes/Events
	935	940	65.4	55.5	73.2	69.7	63.1	58.7	
	940	945	67.2	57.3	79.7	70.3	64.2	60.1	
	945	950	66.6	54.0	78.4	70.0	64.3	57.7	
	950	955	67.0	57.0	76.1	71.0	64.5	60.6	

Roadway Name/Dir	PENNSYLVANIA ROAD	PA Turnpike	
Speed (post/obs)*	35	55/65	
Number of Lanes	2	4	
Width (pave/row)	24'	N/A	
1- or 2- way	2	2	
Grade	FLAT	FLAT	
Bus Stops	—	—	
Stoplights	—	EB	WB
Motorcycles	0	0	0
Automobiles	45	223	183
Medium Trucks	1	13	13
Heavy Trucks	3	55	54
Buses	0	0	0
Count duration	15 min	15 min	

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 8 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/Insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC319-312 Project #: Date: 11/28/12 Page of

Monitoring Location: ST-02 82 E Township Line Rd Analyst: JDD

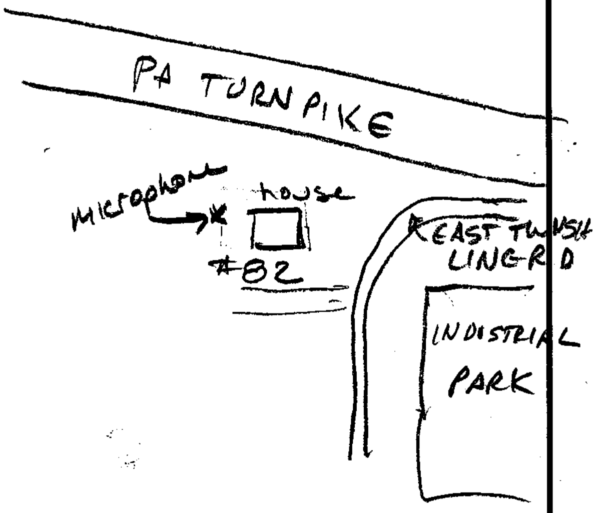
Sound Level Meter	Field Calibration	Weather Data
Model #: LD 820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: Steady / [✓ Gusty] / Calm
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen : [✓ Yes] / No (explain)	Post-Test dBA	Avg Wind Speed/Direction: 5.0 mph
Topo: Flat / [✓ Hilly]	GPS Coordinates (at SLM location)#	Temp (°F): 35 RH (%): 59
Terrain: Hard/Soft/ [✓ Mixed] /Snow	N 40° 04.228 W 75° 40.496	Bar Psr (Hg): 1004.6 Cloud Cover (%): 20%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1005	1010	64.4	56.0	71.9	66.8	63.8	59.8	
	1010	1015	64.1	53.5	74.9	67.1	62.7	58.1	
	1015	1020	65.5	56.2	71.1	68.6	64.5	60.5	

Roadway Name/Dir	PA Turnpike	
Speed (post/obs)*	55 / 65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	E W	
Motorcycles	0 0	
Automobiles	181 210	
Medium Trucks	10 15	
Heavy Trucks	77 59	
Buses	0 2	
Count duration	15 min	

compass

Site Diagram:



\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] /No 11 photos

Additional Notes/Comments:

noise from industrial park across street (backup alarms, grinding noise, etc.)

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/ [✓ birds vocalizing] /Insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of

Monitoring Location: ST03 - Verizon office #2100 180 Sheree Blvd Analyst: JDD SES

Sound Level Meter	Field Calibration	Weather Data
Model #: LD820 SLM	Model #: CAL200	Model #: K3500
Serial #: 1652	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: Steady/Gusty/Calm
Response: [✓ Slow] / Fast / Impl	Pre-Test 114 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen: [✓ Yes] / No (explain)	Post-Test / dBA	Avg Wind Speed/Direction: /
Topo: [✓ Flat] / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 49°F RH (%): 65%
Terrain: Hard/[✓ Soft]/Mixed/Snow	N40°03.859' W75°39.304'	Bar Psr (Hg): Cloud Cover (%): clear

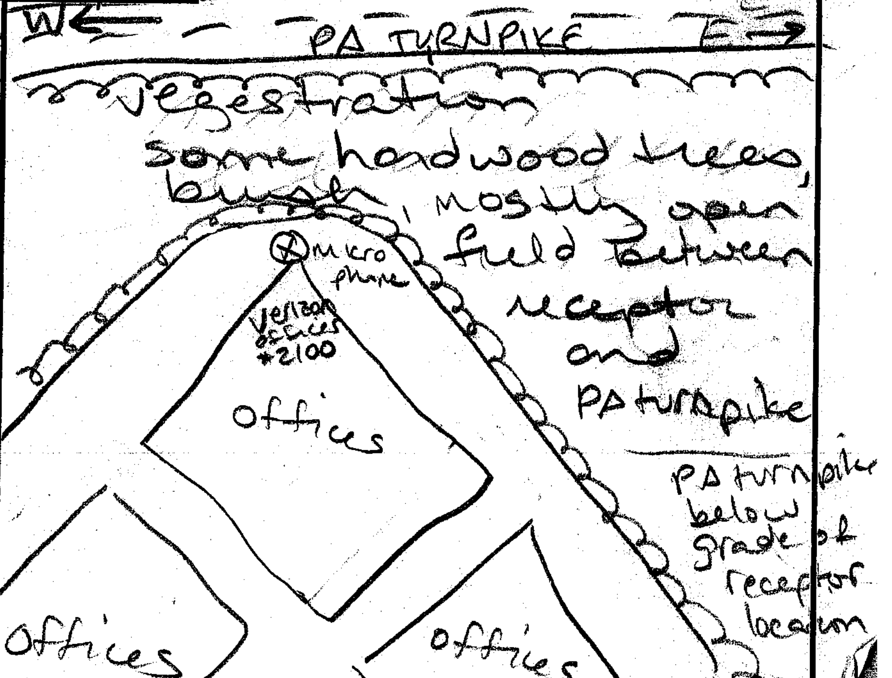
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1050	1055	60.3	53.2	64.6	62.5	60.1	56.4	
	1055	11:00	61.6	55.1	69.6	64.1	61.1	58.3	
	11:00	11:05	60.8	56.3	63.9	62.7	60.5	58.2	
	11:05	11:10	60.3	52.5	64.9	62.4	60.1	57.3	
	11:10	11:15	61.8	55.5	71.3	63.9	60.7	57.5	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram: PA

No Line-of-sight to Turnpike



vegestration some hardwood trees, brush, mostly open field between receptor and PA turnpike

PA turnpike below grade of receptor location

\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7 photos

Additional Notes/Comments:

Other Noise Sources: distant [✓ aircraft]/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: Page of

Monitoring Location: ST-04 Pickering Point Complex 1202, Ambrose Drive Analyst: JDD

Sound Level Meter

Model #: LD820

Serial #: 1651

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Field Calibration

Model #: Cal 200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114.0 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady / [✓ Gusty] / Calm

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 0-2 mph

Topo: [✓ Flat] / Hilly

Terrain: Hard/Soft/[✓ Mixed]/Snow

GPS Coordinates (at SLM location)#

N 40°03.905' W75°38.916'

Temp (°F): 32°F RH (%): 70%

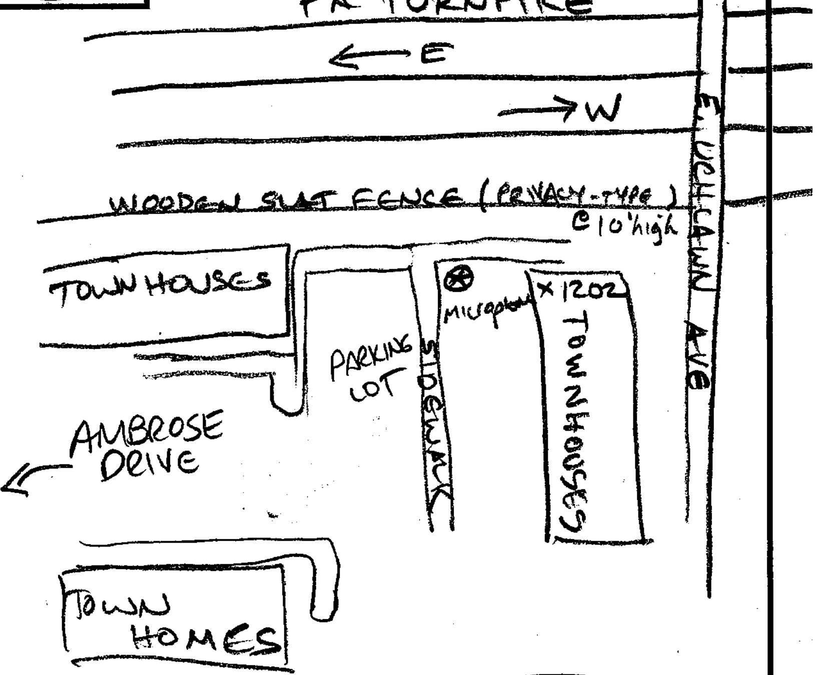
Bar Psr (Hg): 1004.7 Cloud Cover (%): 50%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1120	1125	66.9	57.6	73.3	69.6	65.9	62.4	
	1125	1130	67.2	59.0	73.5	70.5	66.3	61.2	
	1130	1135	66.9	60.1	73.0	69.5	66.2	62.6	

Roadway Name/Dir	PA TURNPIKE	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	E 0 W	
Automobiles	165 173	
Medium Trucks	8 12	
Heavy Trucks	45 46	
Buses	0 3	
Count duration	15 MIN	

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 11/28/12 Page of

Monitoring Location: ST05 Holly Tree Court Playground Analyst: JDD

Sound Level Meter	Field Calibration	Weather Data
Model #: LD820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: [✓ Steady]/Gusty/Calm
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen [✓ Yes] / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0-2 mph
Topo: [✓ Flat] / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 39°F RH (%): 67%
Terrain: Hard/Soft/[✓ Mixed]/Snow	N40°03.934' W75°38.149'	Bar Psr (Hg): 1007 Cloud Cover (%): 50%

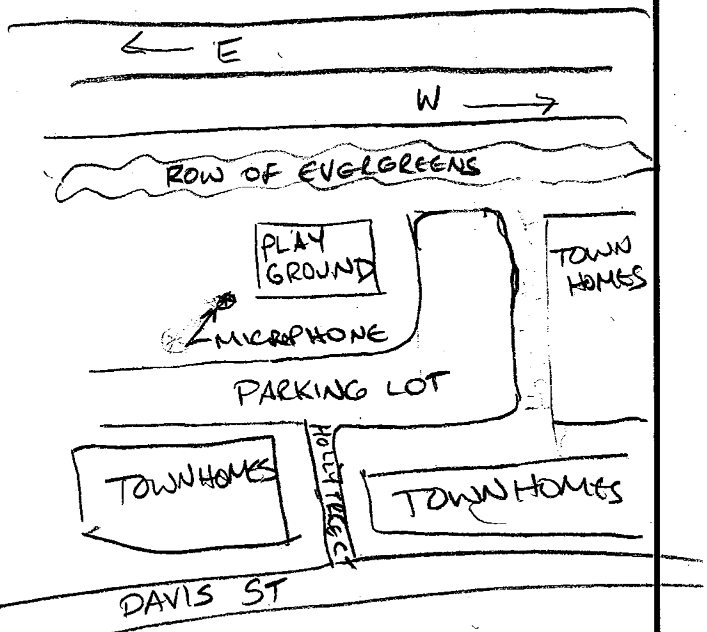
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1145	1150	69.7	61.2	78.8	73.1	67.8	63.5	
	1150	1155	68.4	62.4	75.3	71.7	66.8	64.3	
	1155	12:00 N	68.5	56.9	75.6	72.0	66.4	62.3	

Roadway Name/Dir	PA Turnpike	
Speed (post/obs)*	55 / 65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	E 0 W	
Automobiles	181 168	
Medium Trucks	10 8	
Heavy Trucks	45 55	
Buses	1 2	
Count duration	15 MIN	

compass

↓

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 6

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of

Monitoring Location: ST06 - 200 Upper Pine Creek Rd (Greenbrier Farm) Analyst: JDD SRS

Sound Level Meter

Model #: LD820 SLM

Serial #: 1652

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Field Calibration

Model #: CAL200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test ~~——~~ dBA

Weather Data

Model #: K3500

Serial #: 703474

Wind: Steady/Gusty/[✓ Calm] ocassional light gusts

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 0-2 mph

Temp (°F): 55°F RH (%): 64.7%

Bar Psr (Hg): 1011.7 Cloud Cover (%): Clear

Topo: Flat / [✓ Hilly]

Terrain: Hard/[✓ Soft]/Mixed/Snow

GPS Coordinates (at SLM location)#

N40°03.605' W75°37.715

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1320	1325	60.1	54.3	65.3	62.9	59.5	55.8	
	1325	1330	60.7	51.2	65.5	63.7	60.1	54.4	
	13:30	13:35	60.4	51.0	66.4	63.8	59.0	55.5	
	13:35	13:40	59.1	52.3	63.7	61.9	58.5	54.8	
	13:40	13:45	59.4	51.8	65.0	61.8	58.8	56.2	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	Flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 7 photos

Additional Notes/Comments:

turnpike is above grade to receptor △ pine trees 40' tall

Other Noise Sources: distant [✓ aircraft/roadway] traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/[✓ Insects]

Additional Notes and Sketches on Reverse

beautiful farm!

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of

Monitoring Location: ST07 511 Worthington Rd Analyst:

Sound Level Meter

Model #: ST07

Serial #: 1652

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Topo: [✓ Flat] / Hilly

Terrain: Hard/[✓ Soft]/Mixed/Snow

Field Calibration

Model #: CAL200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test dBA

GPS Coordinates (at SLM location)#

N 40°03.631' W75°37.354'

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm]

Precipitation: Yes (explain)/ [✓ No]

Avg Wind Speed/Direction: —

Temp (°F): 60°F RH (%): 61.6

Bar Psr (Hg): 1010.4 Cloud Cover (%): clear

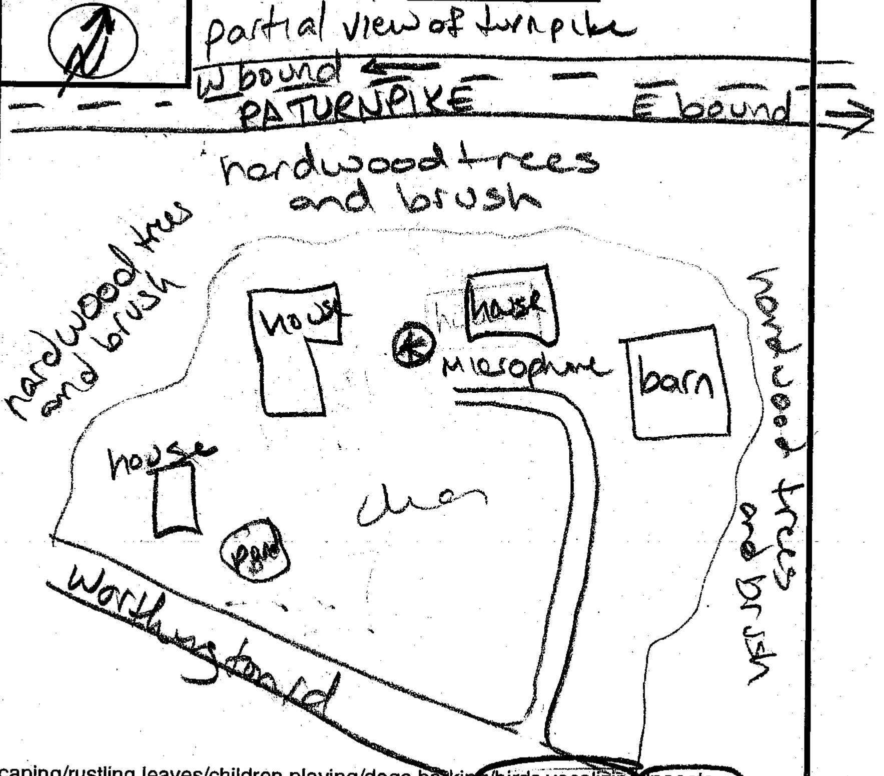
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1355	1400	58.6	46.3	65.8	61.5	57.8	53.5	
	1400	1405	58.1	51.0	62.6	60.5	57.4	54.8	
	14:05	14:10	60.0	53.9	65.3	62.7	59.3	55.8	
	14:10	14:15	59.2	51.4	64.0	61.9	58.4	55.5	
	14:15	14:20	60.0	54.1	64.5	62.4	59.6	56.4	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	flat	flat
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

↗

Site Diagram:



\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7 photos

Additional Notes/Comments:

Other Noise Sources: distant: [✓ aircraft]/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/[✓ insects]

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 11/28/12 Page of

Monitoring Location: ST08 1148 Conestoga Road (Rt 401 Analyst: JDD

Sound Level Meter	Field Calibration	Weather Data
Model #: LD 820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: [✓ Steady]/Gusty/Calm
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen: [✓ Yes] / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0-2mph
Topo: Flat / [✓ Hilly]	GPS Coordinates (at SLM location)#	Temp (°F): 41°F RH (%): 70%
Terrain: Hard/Soft/[✓ Mixed]/Snow	N40°03.906' W75°36.914'	Bar Psr (Hg): 1005 Cloud Cover (%): 20%

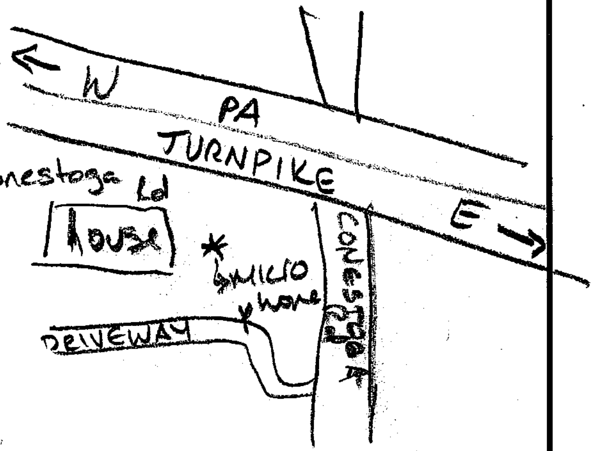
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1345	1350	68.8	59.2	74.9	72.2	67.7	62.3	
	1350	1355	68.0	55.2	73.7	70.8	67.5	61.5	
	1355	1400	68.6	59.0	75.4	71.8	67.6	63.1	

Roadway Name/Dir	PA TURNPIKE	CONESTOGA Rd
Speed (post/obs)*	55/65	OBS 35
Number of Lanes	4	2
Width (pave/row)	N/A	24'
1- or 2- way	2	2
Grade	flat	FLAT
Bus Stops	0	0
Stoplights	0	0
Motorcycles	E 0 W	0
Automobiles	220 208	136
Medium Trucks	18 12	4
Heavy Trucks	48 54	6
Buses	0 1	1
Count duration	15 MIN	→

compass

→

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 9 pictures

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of
Monitoring Location: ST09 906 Seven Oaks Rd Analyst: JDD/SEB

Sound Level Meter
Model #: LD 820SLM
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen : [✓ Yes] / No (explain)

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

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114 dBA
Post-Test — dBA

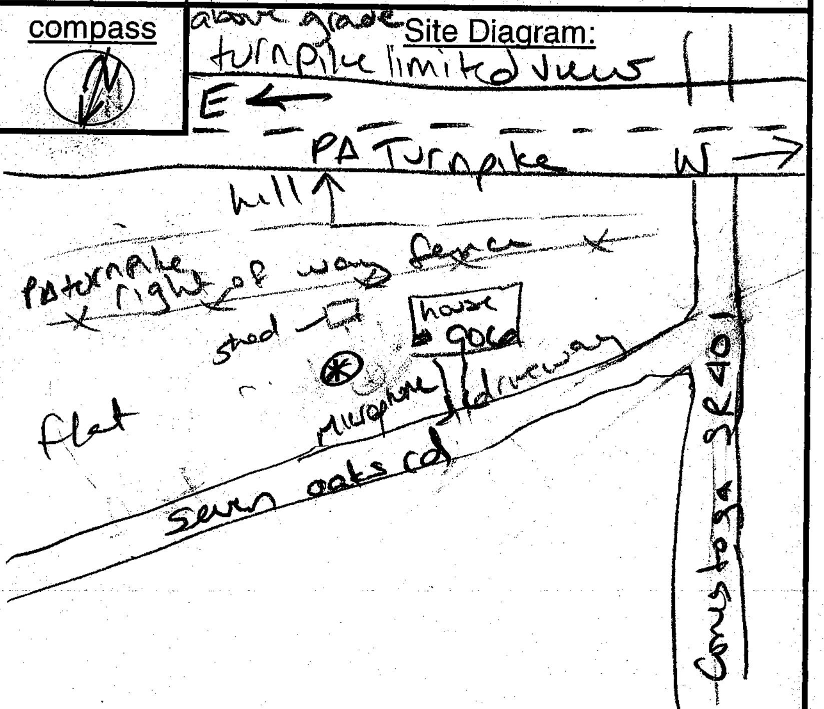
GPS Coordinates (at SLM location)#
N40°03.968' W75°36.880'

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: —
Temp (°F): 60°F RH (%): 62
Bar Psr (Hg): 1009 Cloud Cover (%): clear

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1400	1405	64.6	52.8	73.4	68.6	61.9	56.1	
	1405	1410	66.4	54.9	75.4	69.7	65.0	59.0	
	14:10	14:15	65.7	55.0	74.6	69.5	63.6	59.2	
	14:15	14:20	65.8	55.2	73.0	69.5	64.1	59.6	
	14:20	14:25	66.5	54.6	73.3	70.5	64.3	58.4	
	14:25	14:30	66.1	54.9	74.1	69.9	64.0	57.8	
	14:30	14:35	66.0	54.8	74.2	70.0	64.0	58.4	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]
Photos Taken? [✓ Yes] / No 6 photos
Additional Notes/Comments:

Other Noise Sources: distant: [✓ aircraft]/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/[✓ insects]
Additional Notes and Sketches on Reverse

Project Name: PTC 319.312 Project #: Date: 11/28/12 Page of

Monitoring Location: ST-10 2056 Seven Oaks Road Analyst: JDD

Sound Level Meter

Model #: LD 820

Serial #: 1651

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen [✓ Yes] / No (explain)

Field Calibration

Model #: Cal 200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114.0 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: [✓ Steady] / Gusty / Calm

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 0-2mph

Topo: Flat / [✓ Hilly]

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

GPS Coordinates (at SLM location)#

N 40°03.937' W75° 36.525'

Temp (°F): 38°F RH (%): 58%

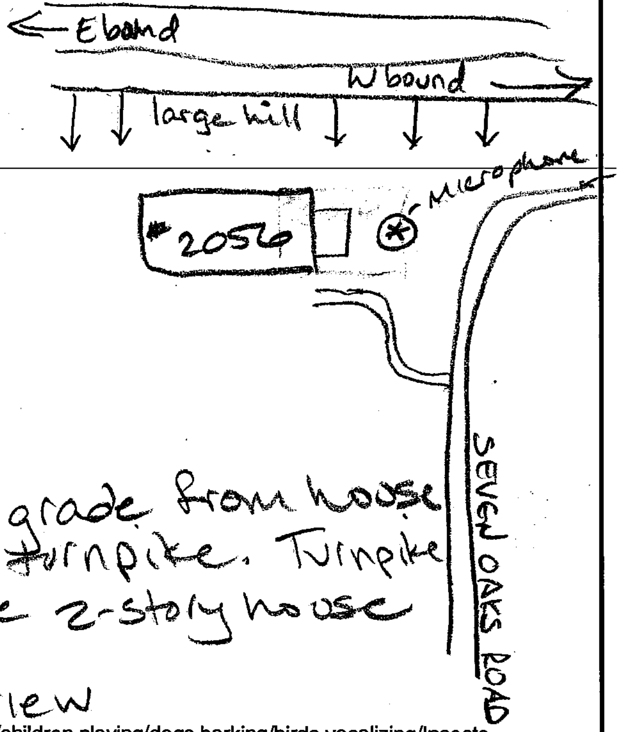
Bar Psr (Hg): 1006 Cloud Cover (%): 20%

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1435	1440	61.2	51.9	67.9	64.7	59.9	56.1	
	1440	1445	61.4	53.5	67.4	64.9	59.6	54.9	
	1445	1450	60.4	50.8	69.0	63.9	58.6	53.6	

Roadway Name/Dir	PA TURNPIKE	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	flat	
Bus Stops	0	
Stoplights	0	
Motorcycles		
Automobiles		
Medium Trucks	*	
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



steep grade from house up to turnpike. Turnpike above 2-story house

- note coordinate system * - Speed estimated by Radar / Driving / Observation

Photos Taken? [✓ Yes] / No 8 pictures

Additional Notes/Comments:

*unable to count due to obstructed view

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects

Additional Notes and Sketches on Reverse

Project Name: PTC 319 - 312 Project #: ______ Date: 11/29/12 Page ___ of ___
Monitoring Location: ST-11 Horsefarm 69 Hillsover Rd Analyst: JDD

Sound Level Meter	Field Calibration	Weather Data
Model #: LD 8200	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: Steady / [✓ Gusty] / Calm — occasional
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen: [✓ Yes] / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0-8mph
Topo: [✓ Flat] / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 38°F RH (%): 56%
Terrain: Hard/Soft/[✓ Mixed]/Snow	N40° 03.861' W75°36.369'	Bar Psr (Hg): 1010 Cloud Cover (%): 100%

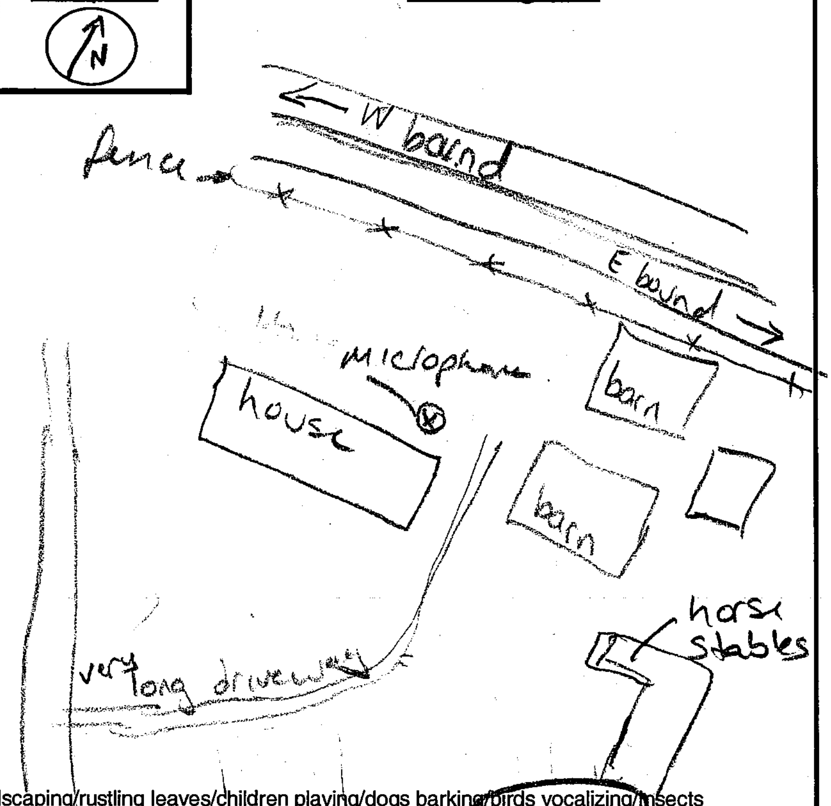
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1100	1105	66.4	55.8	73.2	69.4	65.2	61.1	
	1105	1110	66.6	55.3	73.3	69.8	65.4	62.0	
	1110	1115	66.8	57.9	72.9	69.8	65.7	61.0	

Roadway Name/Dir	PATURNPIKE	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	E 0 W	
Automobiles	190 187	
Medium Trucks	11 10	
Heavy Trucks	59 74	
Buses	1 4	
Count duration	15 min	

compass

N

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 9

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of
Monitoring Location: ST12 2151 Bodine Rd Analyst: JDO/SRS

Sound Level Meter
Model #: LD 820SLM
Serial #: 1652
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)
Topo: [✓ Flat] / Hilly
Terrain: Hard/[✓ Soft]/Mixed/Snow

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114 dBA
Post-Test / dBA

GPS Coordinates (at SLM location)#
N 40°03.934' W75°35.963'

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain)/[✓ No]
Avg Wind Speed/Direction: /
Temp (°F): 41.5 RH (%): 77.7
Bar Psr (Hg): 1009.1 Cloud Cover (%): Clear

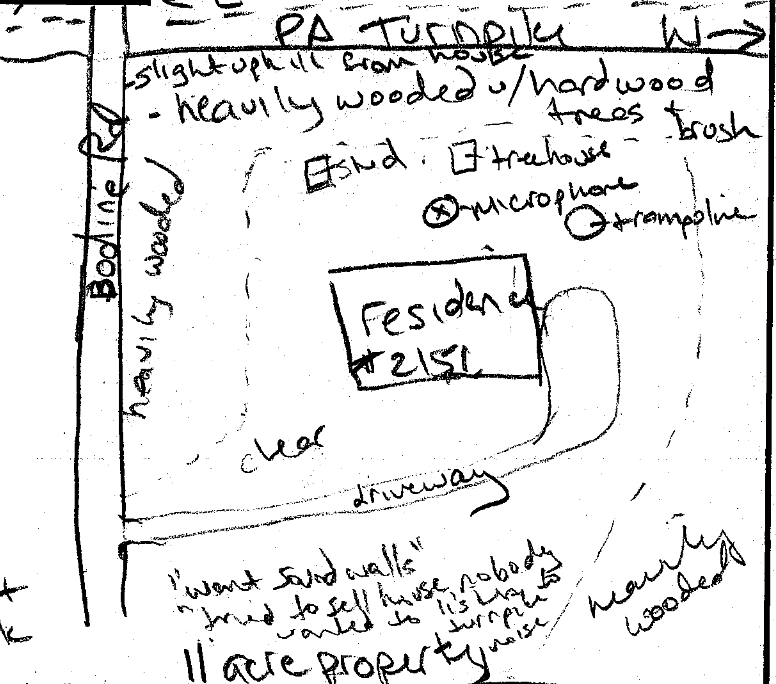
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	0815	0820	67.1	61.7	70.3	69.2	67.0	64.0	
	0820	0825	66.1	59.5	71.0	68.5	65.6	62.7	
	08:25	08:30	66.2	61.2	71.2	68.3	65.7	63.5	
	08:30	08:35	66.2	60.8	70.0	68.5	65.8	63.0	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

PA turnpike is minimally visual at ground level



"want sound walls"
"tried to sell house nobody wanted to listen to turnpike noise"
11 acre property

- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7 photos

Additional Notes/Comments: owner came out @ 830 to talk

Other Noise Sources: distant: [✓ aircraft]/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 11/29/12 Page of

Monitoring Location: ST-13 #2 Bodine Rd Analyst: JOD

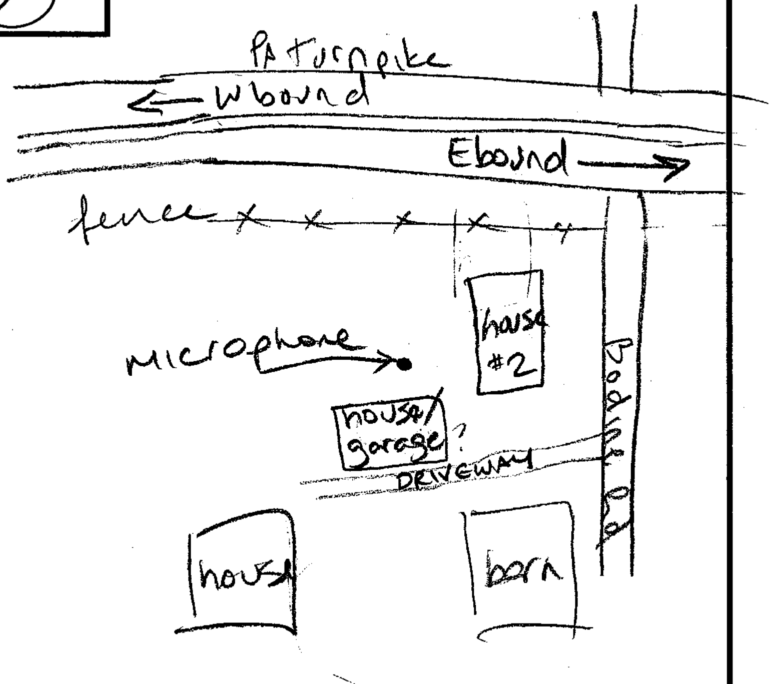
Sound Level Meter	**Field Calibration**	**Weather Data**
Model #: LD 8200	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: [✓ Steady] / Gusty / Calm
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen: [✓ Yes] / No (explain)	Post-Test dBA	Avg Wind Speed/Direction: 0-2 mph
Topo: [✓ Flat] / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 38 °F RH (%): 67 %
Terrain: Hard/Soft/[✓ Mixed]/Snow	N 40° 03.838' W 75° 35.901'	Bar Psr (Hg): 1008 Cloud Cover (%): 50 %

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1130	1135	66.4	54.1	80.1	68.5	64.6	59.7	
	1135	1140	64.7	55.9	71.1	67.5	64.0	59.8	
	1140	1145	66.3	56.6	71.7	69.3	65.3	60.6	
	1145	1150	66.7	58.8	76.0	69.4	65.7	61.7	

Roadway Name/Dir	PA TURNPIKE	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	E 0 W	
Automobiles	172 170	
Medium Trucks	10 8	
Heavy Trucks	46 62	
Buses	0 1	
Count duration	15 MIN	

compass

Site Diagram:



\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 13 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of
Monitoring Location: ST14 - 2148 Bodine Analyst: JDD / SRS

Sound Level Meter
Model #: LD 820 SLM
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen : [✓ Yes] / No (explain)

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: —
Temp (°F): 60° RH (%): 52.5
Bar Psr (Hg): 1007 Cloud Cover (%): clear

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

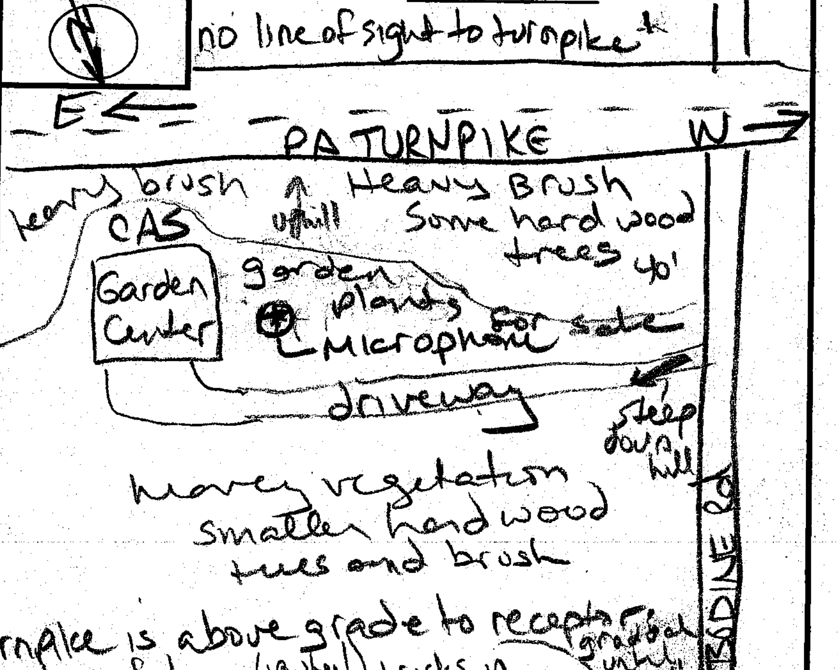
GPS Coordinates (at SLM location)#
N40°03.932' W75°35.824'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1555	1600	65.0	58.9	70.8	67.1	64.7	60.9	
	1600	1605	65.8	58.4	69.9	68.2	65.5	62.0	
	16:05	16:10	66.6	56.5	83.1	68.3	65.3	61.4	
	16:10	16:15	66.4	57.0	75.0	68.5	65.8	62.4	
	16:15	16:20	66.5	60.8	70.5	68.5	66.3	63.6	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 7 pictures

Additional Notes/Comments:

turnpike is above grade to receptor gradual uphill to turnpike
"Can see tops of heavy (18 wheel) trucks in a small area of space"
CAS = "Create A Scene"

Other Noise Sources: distant [✓ aircraft]/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/[✓ insects]

Additional Notes and Sketches on Reverse

Project Name: PTC 319-312 Project #: ____ Date: 11/30/12 Page ____ of ____
Monitoring Location: ST-15 26 Shamrock Hill Ln. Analyst: JDD

Sound Level Meter
Model #: LD 820
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen : [✓ Yes] / No (explain)

Field Calibration
Model #: Cal 200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114.0 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: —
Temp (°F): 31° RH (%): 69.4
Bar Psr (Hg): 1005.1 Cloud Cover (%): 80

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

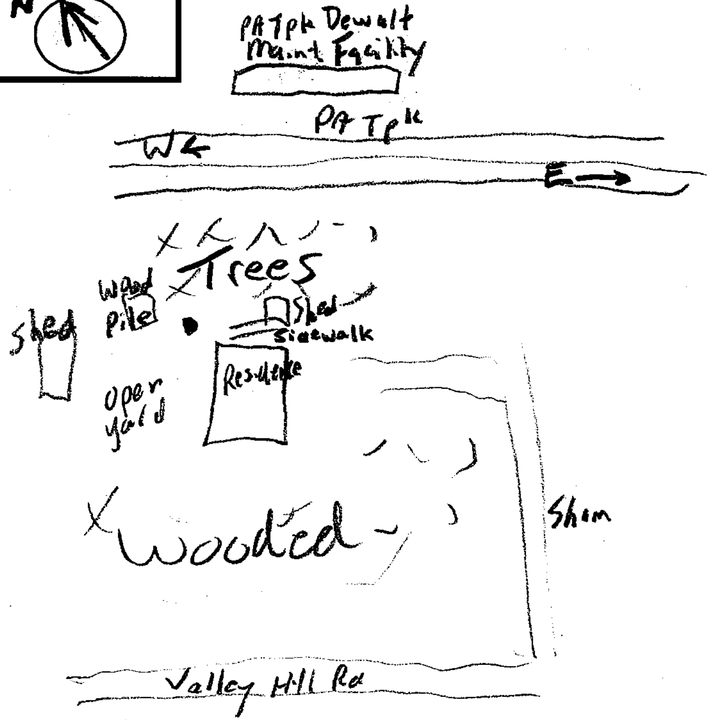
GPS Coordinates (at SLM location)#
N 40° 3.857 W 75° 35.402'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	0855	0900	66.4	60.7	71.2	68.6	66.0	63.3	
	0900	0905	66.3	60.1	73.4	68.5	65.7	62.6	
	0905	0910	66.5	59.1	74.6	69.2	65.6	61.9	

Roadway Name/Dir	PA TPK	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	NA	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	W	E
Automobiles	220	357
Medium Trucks	13	11
Heavy Trucks	56	47
Buses	0	1
Count duration	15 mins	

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes/No] 4 photos

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/Insects

Additional Notes and Sketches on Reverse

Project Name: PTC 319-312 Project #: ____ Date: 11/29/12 Page ____ of ____

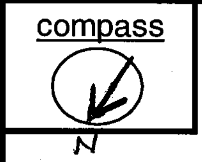
Monitoring Location: ST-16 10 Wood Valley Lane Analyst: JDD

Sound Level Meter	Field Calibration	Weather Data
Model #: LD820O	Model #: CA1200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: [✓ Steady] / Gusty / Calm
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen [✓ Yes] / No (explain)	Post-Test dBA	Avg Wind Speed/Direction: 0.8 VBL
Topo: Flat / Hilly	GPS Coordinates (at SLM location)#	Temp (°F): 45 RH (%): 53.3
Terrain: Hard/Soft/Mixed/[✓ Snow]	N40° 3.945' W75° 35.154'	Bar Psr (Hg): 1004.1 Cloud Cover (%): 0

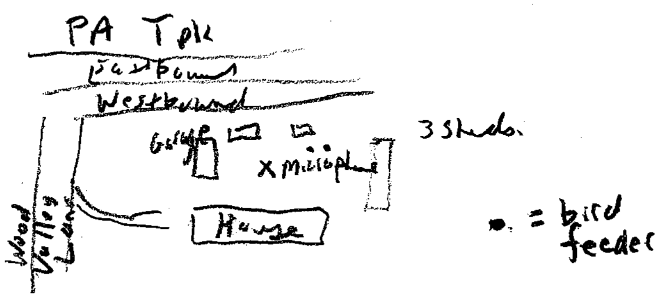
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1425	1430	66.8	60.8	72.3	69.4	66.4	62.6	
	1430	1435	65.5	57.4	72.8	67.9	64.9	61.0	
	1435	1440	66.6	56.3	73.4	69.6	65.9	61.7	

Roadway Name/Dir	PA Tpk		
Speed (post/obs)*	55/65		
Number of Lanes	4		
Width (pave/row)	N/A		
1- or 2- way	2		
Grade	Flat		
Bus Stops	0		
Stoplights	0		
Motorcycles	E 0	W	
Automobiles	248	237	
Medium Trucks	8	15	
Heavy Trucks	44	69	
Buses	1	0	
Count duration	15 mins		

compass



Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 56

Additional Notes/Comments:

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

Project Name: PTC 319-312 Project #: ______ Date: 11/30/12 Page ___ of ___
Monitoring Location: ST-17 2198 Valley Hill Rd Analyst: JDD

Sound Level Meter
Model #: LD 820
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] No (explain)

Field Calibration
Model #: Cal 200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114.0 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) [✓ No]
Avg Wind Speed/Direction: —
Temp (°F): 32 RH (%): 62.1
Bar Psr (Hg): 1004.0 Cloud Cover (%): 90

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

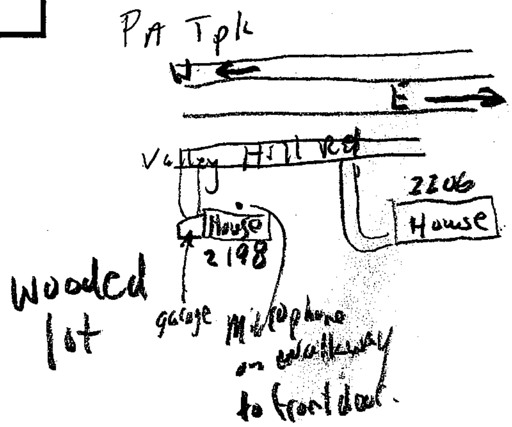
GPS Coordinates (at SLM location)#
N40° 3.834' W75° 35.103'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	0925	0930	62.0	57.3	67.4	64.1	61.5	58.9	
	0930	0935	61.3	54.7	65.3	63.8	61.0	57.2	
	0935	0940	62.2	54.8	67.2	64.7	61.6	57.1	

Roadway Name/Dir	PA Tpk		
Speed (post/obs)*	55/65		
Number of Lanes	4		
Width (pave/row)	NA		
1- or 2- way	2		
Grade	Flat		
Bus Stops	0		
Stoplights	0		
Motorcycles	W 0	E	
Automobiles	188	297	
Medium Trucks	12	13	
Heavy Trucks	57	50	
Buses	3	2	
Count duration	15 mins		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving [✓ Observation]
Photos Taken? [✓ Yes]/No 4 photos
Additional Notes/Comments: Homes are at elevation above the PA Tpk
Field Change: #2198 substituted for #2206 (unable to reach resident at 2206.
Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/Insects
Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 11/30/12 Page of

Monitoring Location: ST-18 2236 Valley Hill Road Analyst: JDD

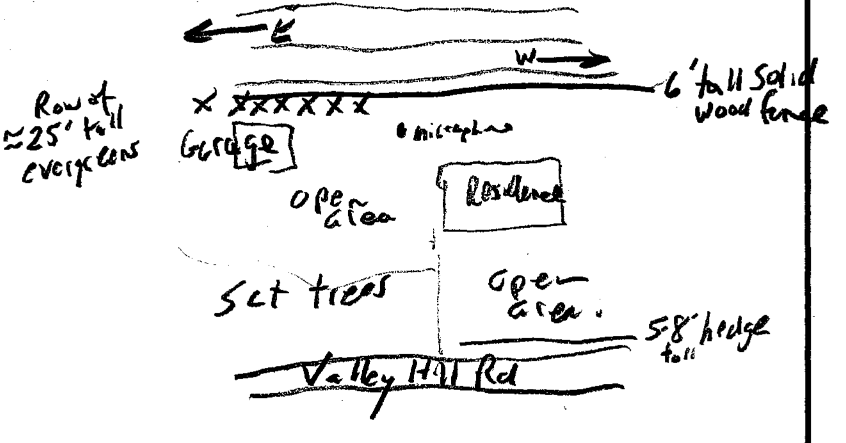
Sound Level Meter	Field Calibration	Weather Data
Model #: LD 820	Model #: Cal 200	Model #: K3500
Serial #: 1651	Serial #: 5789	Serial #: 1703474
Weighting: [✓ A] / C / Flat	Calibration Level (dBA): 94 / [✓ 114]	Wind: Steady/Gust/[✓ Calm]
Response: [✓ Slow] / Fast / Impl	Pre-Test 114.0 dBA	Precipitation: Yes (explain) / [✓ No]
Windscreen: [✓ Yes] / No (explain)	Post-Test — dBA	Avg Wind Speed/Direction: 0
Topo: Flat / [✓ Hilly]	GPS Coordinates (at SLM location)#	Temp (°F): 32 RH (%): 59.1
Terrain: Hard/Soft/[✓ Mixed]/Snow	N 40°3.931' W75°34.979	Bar Psr (Hg): 1004.8 Cloud Cover (%): 60

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	0950	0955	66.7	54.6	74.0	69.6	66.1	61.3	
	0955	1000	66.0	54.0	72.3	68.9	64.9	60.5	
	1000	1005	66.7	53.8	73.8	69.8	65.6	60.4	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	NA	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	* See ST-	17 traffic
Automobiles		Counts
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? ~~Yes~~/No 8

Additional Notes/Comments: This is an address change from 2252 Valley Hill Rd

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 219-312 Project #: Date: 10/28/13 Page of
Monitoring Location: ST-19 29 Hollow Drive Analyst: SRS / JDD

Sound Level Meter
Model #: LD820
Serial #: 1652
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen [✓ Yes] / No (explain)

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 170374
Wind: Steady/Gust/[✓ Calm / light Gusts]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: 0-3 mph ocassional
Temp (°F): 62.0 RH (%): 54.1
Bar Psr (Hg): 1000 Cloud Cover (%): 10 light clouds

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

GPS Coordinates (at SLM location)#
N40°04.185' W75°34.463

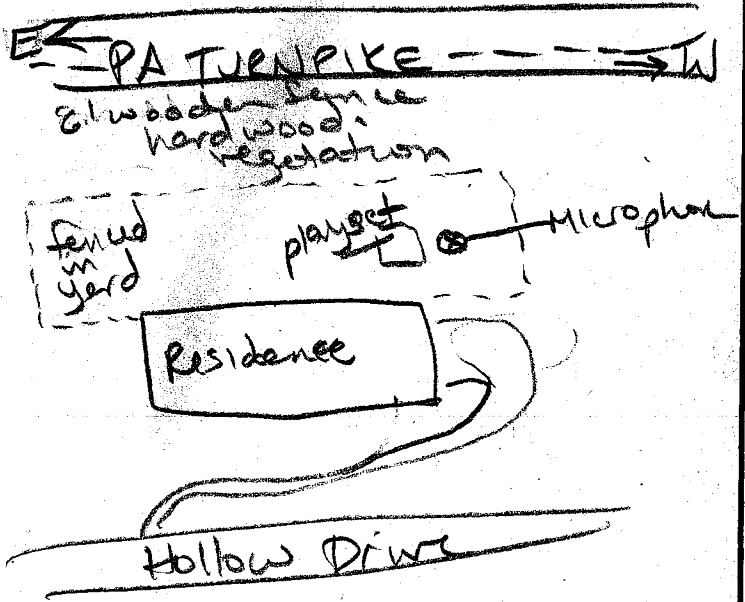
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	16:25	16:30	61.5	54.8	65.3	63.5	61.4	58.1	
	16:30	16:35	61.8	56.9	65.3	63.7	61.7	59.5	
	13:35	16:40	61.4	57.9	65.1	63.2	61.1	58.7	
	16:40	16:45	62.0	57.2	65.0	63.8	61.8	59.3	
	16:45	16:50	60.9	55.3	64.6	62.7	60.8	57.9	
	16:50	16:55	61.5	52.5	65.3	63.1	61.6	59.1	
	16:55	17:00	61.1	56.2	64.1	62.9	61.0	57.5	
	17:00	17:05	61.8	57.2	64.9	63.6	61.5	59.4	
	17:05	17:10	61.5	56.4	64.8	63.3	61.4	59.2	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	4	4
Width (pave/row)	N/A	N/A
1- or 2- way	2	2
Grade	FLAT	FLAT
Bus Stops	0	0
Stoplights	0	0
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration	15MIN	15MIN

compass

Site Diagram:

no line-of-sight to PA turnpike



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]
Photos Taken? [✓ Yes] / No 7 photos
Additional Notes/Comments:

Other Noise Sources: distant [✓ aircraft/roadway] traffic/trains/landscaping/rustling leaves/children playing/dogs barking/birds vocalizing/Insects
Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/28/13 Page of

Monitoring Location: ST-20 2062 Yellow Springs Rd Analyst: JDD / SRS

Sound Level Meter

Model #: LD820

Serial #: 1657

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen [✓ Yes] No (explain)

Field Calibration

Model #: CAL200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm]

Precipitation: Yes (explain) [✓ No]

Avg Wind Speed/Direction: None

Temp (°F): 60.0 RH (%): 53.2

Bar Psr (Hg): 1002.6 Cloud Cover (%): light

Topo: Flat / [✓ Hilly]

Terrain: Hard/[✓ Soft]/Mixed/Snow

GPS Coordinates (at SLM location)#

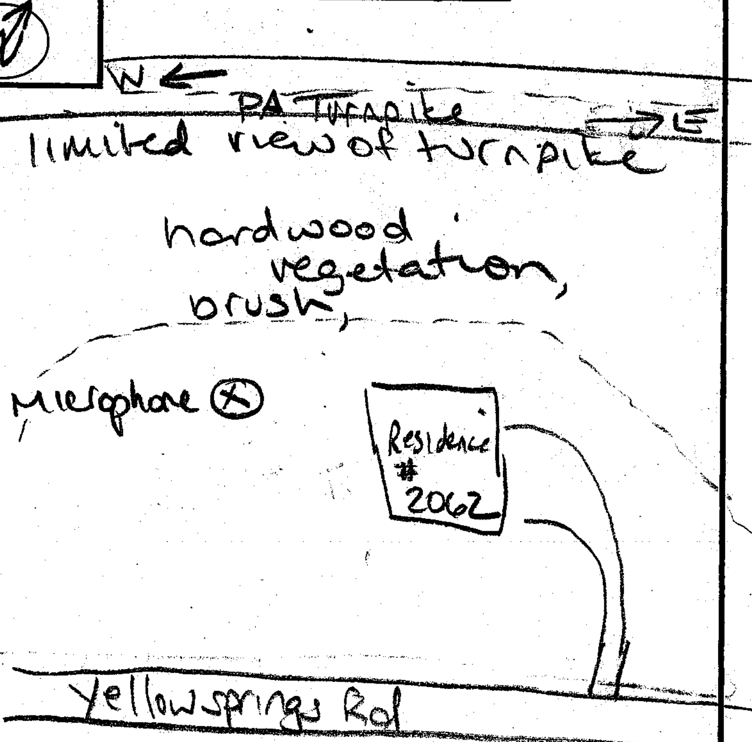
N40°04.165 W75°33.931

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1635	1640	64.4	59.4	68.5	66.7	64.1	61.3	
	1640	1645	65.2	59.4	69.9	67.5	64.8	62.2	
	16:45	16:50	62.9	59.0	67.7	65.0	62.3	60.1	
	16:50	16:55	63.5	58.6	68.5	65.3	63.2	60.4	
									YELLOW SPRINGS ROAD
									15 MIN COUNT
									AUTOS = 40

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:



- note coordinate system * Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7 photos

Additional Notes/Comments:

Other Noise Sources: distant [✓ aircraft/roadway traffic]/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 11/29/12 Page of
Monitoring Location: ST-21 181 Blackberry Ln Analyst: JDD

Sound Level Meter
Model #: LD820
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen [✓ Yes] / No (explain)

Field Calibration
Model #: Cal 200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114.0 dBA
Post-Test —— dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) [✓ No]
Avg Wind Speed/Direction: 0
Temp (°F): 43 RH (%): 53
Bar Psr (Hg): 1003.4 Cloud Cover (%): 0

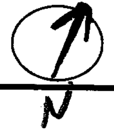
Topo: Flat / [✓ Hilly]
Terrain: Hard/Soft/[✓ Mixed]/Snow

GPS Coordinates (at SLM location)#: N40° 4.227' W75° 34.066'

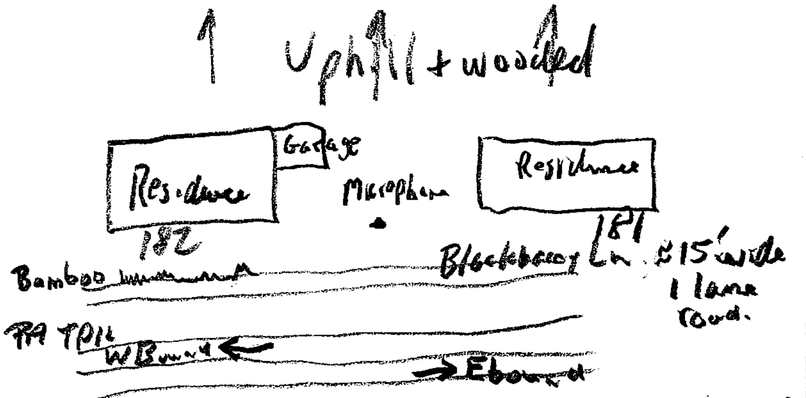
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1555	1600	68.1	57.7	75.2	71.1	67.3	62.3	
	1600	1605	69.5	62.9	74.5	71.9	69.1	65.9	
	1605	1610	68.4	60.1	72.9	71.0	68.0	64.0	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	N/A	
1- or 2- way	2	
Grade	flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	W 0 E	
Automobiles	411 301	
Medium Trucks	21 11	
Heavy Trucks	42 33	
Buses	2 1	
Count duration	15 Min	

compass



Site Diagram:



\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken [✓ Yes] / No 9

Additional Notes/Comments: 4 (m80) Jets flew directly overhead @ low altitude; inaudible 1 Cessna airplane (was audible

Very close to Tpk + on same grade. Very noisy.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: ______ Date: 10/28/13 Page ___ of

Monitoring Location: ST22 3149 Phoenixville Pike Analyst: JDD, SRS

Sound Level Meter

Model #: LD 820SLM

Serial #: 1652

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen [✓ Yes] / No (explain)

Field Calibration

Model #: CAL 200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm] ocassional gusts

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 1-3 mph

Topo: Flat / [✓ Hilly]

Terrain: Hard/[✓ Soft]/Mixed/Snow

GPS Coordinates (at SLM location)#: N 40°04.398' W 75°33.209'

Temp (°F): 64.1 RH (%): 52.4

Bar Psr (Hg): 1005 Cloud Cover (%): 10 (light clou

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	15:45	15:50	62.9	57.3	66.2	65.1	62.6	59.7	
	15:50	15:55	62.1	57.8	66.0	64.2	61.7	59.3	
	15:55	16:00	62.1	55.0	66.2	63.9	61.9	58.6	
	16:00	16:05	61.5	55.7	65.4	63.3	61.3	58.4	
	16:05	16:10	62.8	57.3	75.2	64.6	62.4	60.2	

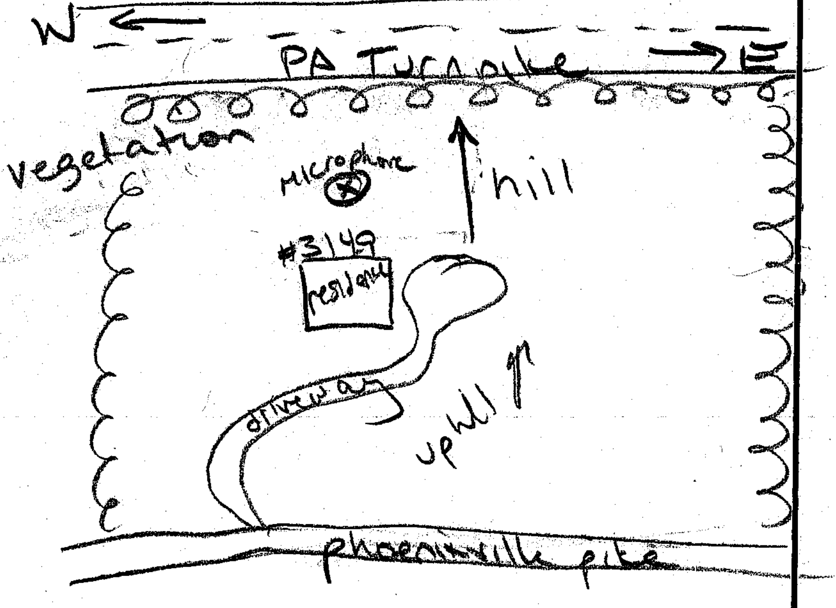
Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

↑

Site Diagram:

partial line-of-sight to turnpike



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7 photos

Additional Notes/Comments:

Other Noise Sources: [✓ distant: aircraft]/[✓ roadway traffic]/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/Insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-317. Project #: Date: 10/28/13 Page of

Monitoring Location: ST 23 3199 Phoenixville Pike Analyst: JDD / SRS

Sound Level Meter

Model #: LD 820 SLM

Serial #: 1651

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen : [✓ Yes] / No (explain)

Topo: Flat / [✓ Hilly]

Terrain: Hard/[✓ Soft]/Mixed/Snow

Field Calibration

Model #: CAL 200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test — dBA

GPS Coordinates (at SLM location)#

N40°04.512' W75°32.989'

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm] / light

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 0-3 mph

Temp (°F): 64.1°F RH (%): 54.5%

Bar Psr (Hg): 1008.0 Cloud Cover (%): 10% light clouds

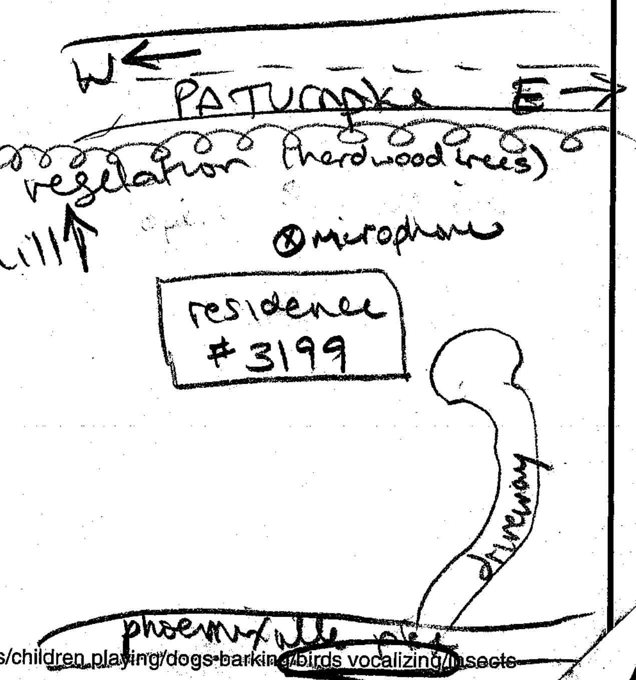
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1530	1535	60.6	56.9	63.4	62.2	60.5	58.1	
	1535	1540	60.3	55.1	64.4	62.3	60.1	56.9	
	15:40	15:45	60.7	56.2	64.6	62.5	60.4	58.1	
	15:45	15:50	61.0	55.4	64.2	63.2	60.7	58.6	
	15:50	15:55	60.2	56.5	63.7	62.3	60.0	57.5	
	15:55	16:00	60.1	55.5	63.6	62.0	59.8	57.4	
	16:00	16:05	60.0	57.4	62.7	61.5	59.7	58.1	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50	50
1- or 2- way	1	1
Grade	Flat	Flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

no direct line-of-sight to turnpike



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 9 photos

Additional Notes/Comments:

Other Noise Sources: distant: [✓ aircraft]/[✓ roadway traffic]/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/~~insects~~

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: ____ Date: 11/30/12 Page ___ of ___
Monitoring Location: ST24 3291 Phoenixville Pike Analyst: JDD

Sound Level Meter
Model #: LD820
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] No (explain)

Field Calibration
Model #: Cal200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114.0 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 703474
Wind: [✓ Steady]/Gusty/Calm
Precipitation: Yes (explain) [✓ No]
Avg Wind Speed/Direction: 1.8 from East
Temp (°F): 43 RH (%): 55.2
Bar Psr (Hg): 101.05 Cloud Cover (%): 100

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

GPS Coordinates (at SLM location)#
N40° 4.593' W75° 32.533'

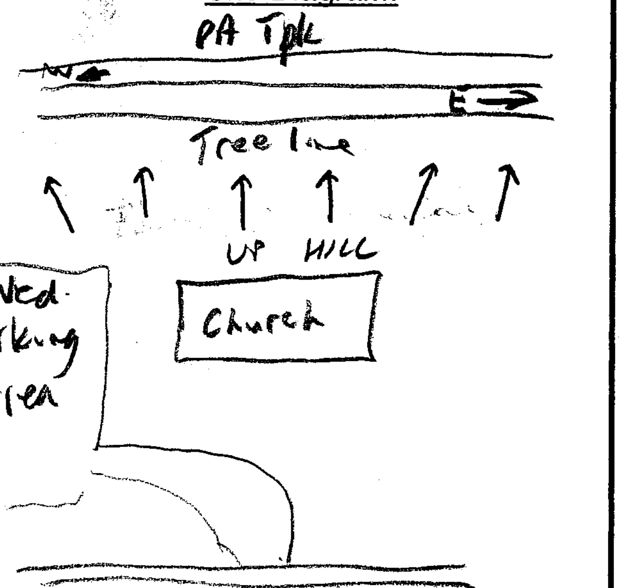
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	12^{25}	12^{30}	58.6	52.0	63.7	60.8	58.4	55.0	
	12^{30}	12^{35}	60.2	54.7	67.6	624	59.3	58.5	
	12^{35}	12^{40}	58.7	53.9	62.8	61.2	58.3	55.6	
	12^{40}	12^{45}	60.1	55.6	69.2	62.0	59.4	56.8	

Roadway Name/Dir	PA Tpk	
Speed (post/obs)*	55/65	
Number of Lanes	4	
Width (pave/row)	NA	
1- or 2- way	2	
Grade	Flat	
Bus Stops	0	
Stoplights	0	
Motorcycles	W 0 E	
Automobiles	181 213	
Medium Trucks	10 13	
Heavy Trucks	74 43	
Buses	1 0	
Count duration	15 mins	

compass

N

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 4 photos Apostolic Christian Church

Additional Notes/Comments:

Slight grade from church to Phoenixville Pike. (2 lanes) Steeper grade from church to Tpk.

Overcast is thicker and lower now than it was at previous samples today.

Other Noise Sources: distant: aircraft/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/Insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312
Project #:
Date: 11/30/12
Page of
Monitoring Location: ST25 near 2060 Charlestown Rd.
Analyst:

Sound Level Meter
Model #: LD820
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: Cal 200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114.0 dBA
Post-Test — dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: [✓ Steady] / Gusty / Calm
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: 2.1E
Temp (°F): 44 RH (%): 59.6
Bar Psr (Hg): 1009.6 Cloud Cover (%): 90

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

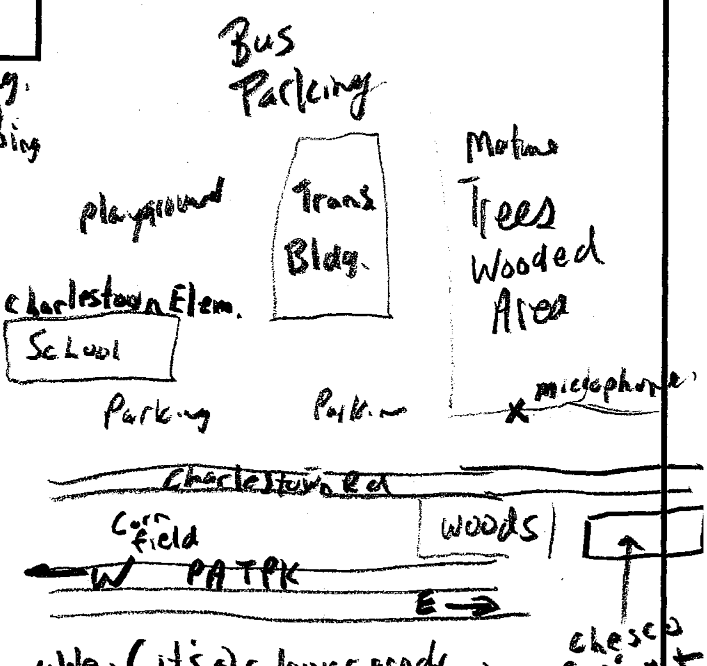
GPS Coordinates (at SLM location)#
DIDN'T TAKE

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	12^{55}	13^{00}	61.4	49.3	72.7	66.5	54.2	50.7	
	13^{00}	13^{05}	61.7	49.3	74.9	66.3	53.8	51.3	
	13^{05}	13^{10}	60.4	49.7	72.1	65.1	54.5	51.3	
	13^{10}	13^{15}	64.7	51.7	78.1	68.7	57.7	53.4	

Roadway Name/Dir	PA Tpk	Charleston Rd
Speed (post/obs)*		40 (school zone 15mph ↖ when flashing. Not flashing during sampling
Number of Lanes		2
Width (pave/row)		≈25 ft
1- or 2- way		2
Grade		crest of a hill
Bus Stops		0
Stoplights		0
Motorcycles	See	0
Automobiles	notes	44
Medium Trucks	for	4
Heavy Trucks	ST24	2
Buses		1
Count duration		15 mins

compass
↑ N

Site Diagram:



\# - note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 8 photos

Additional Notes/Comments: Tpk barely audible. (it's @ a lower grade than the sampling pt.)

Other Noise Sources: distant [✓ aircraft] / roadway traffic / trains / landscaping / rustling leaves / children playing / dogs barking / [✓ birds vocalizing] / insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: Date: 10/29/13 Page of
Monitoring Location: ST 26 (NSA4) 3501 Eaton Ct Analyst: JDD SRS

Sound Level Meter
Model #: LD820SLM
Serial #: 1652
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114 dBA
Post-Test / dBA

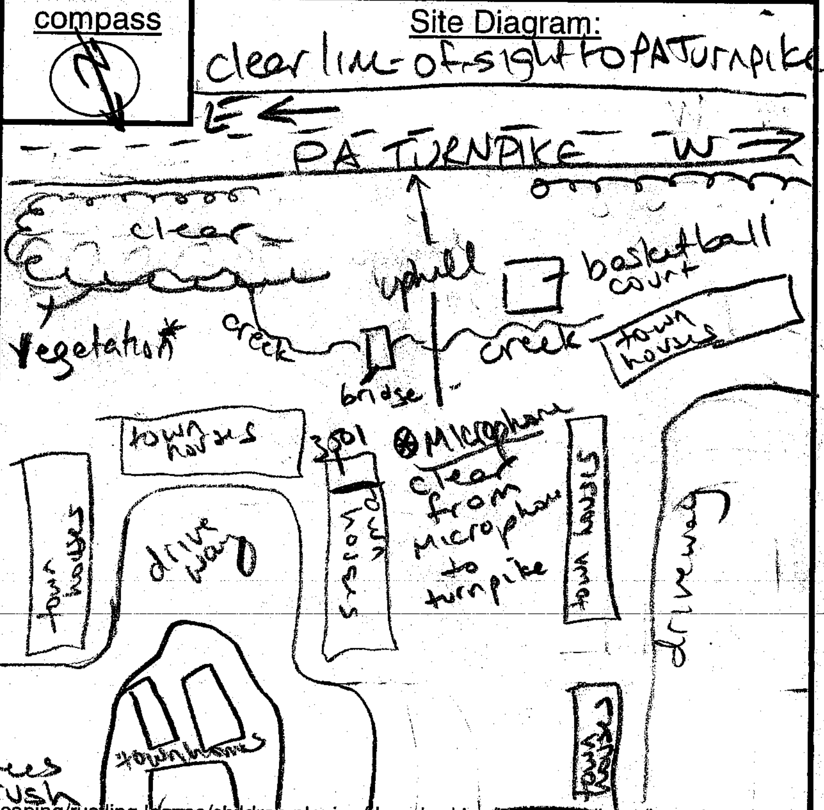
Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: /
Temp (°F): 42.0 RH (%): 75%
Bar Psr (Hg) 1011.6 Cloud Cover (%): clear

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

GPS Coordinates (at SLM location)#
N40°03.947' W75°38.554'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1005	1010	66.8	59.0	73.8	69.5	66.5	61.4	
	1010	1015	65.3	58.3	71.7	68.4	64.0	60.5	
	1015	1020	65.7	55.9	74.0	68.2	64.9	60.0	
	10:20	10:25	65.8	56.0	71.7	68.8	65.0	60.8	
	10:25	10:30	65.3	55.0	74.3	68.5	63.4	58.1	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		


compass

Site Diagram:

- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]
Photos Taken? [✓ Yes] / No 7 photos
Additional Notes/Comments: * hardwood trees and brush

Other Noise Sources: distant [✓ aircraft] / roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/ [✓ birds vocalizing] /insects
Additional Notes and Sketches on Reverse

Wongate @ Chester Springs Community

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: ____ Date: 10/29/13 Page ___ of ___
Monitoring Location: ST27 (NSA19) 3140 Blackberry Lane Analyst: JDD / SRS

Sound Level Meter
Model #: LD 820 SLM
Serial #: 1651
Weighting: [✓ A] / C / Flat
Response: [✓ Slow] / Fast / Impl
Windscreen: [✓ Yes] / No (explain)

Field Calibration
Model #: CAL200
Serial #: 5789
Calibration Level (dBA): 94 / [✓ 114]
Pre-Test 114 dBA
Post-Test / dBA

Weather Data
Model #: K3500
Serial #: 1703474
Wind: Steady/Gusty/[✓ Calm]
Precipitation: Yes (explain) / [✓ No]
Avg Wind Speed/Direction: —
Temp (°F): 60°F RH (%): 62
Bar Psr (Hg): 1009 Cloud Cover (%): clear

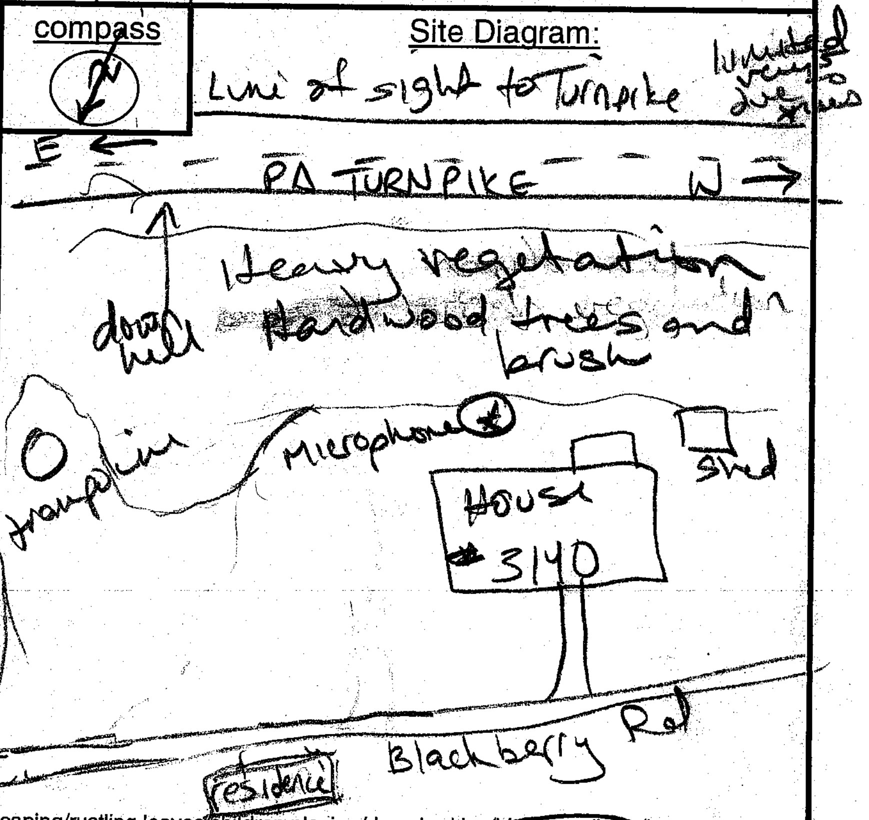
Topo: Flat / [✓ Hilly]
Terrain: Hard/[✓ Soft]/Mixed/Snow

GPS Coordinates (at SLM location)#
N40°04.393' W75°33.457'

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1510	1515	68.2	58.4	73.4	70.9	67.7	62.8	
	1515	1520	67.8	58.1	71.6	69.9	67.7	63.8	
	15:20	15:25	67.8	58.5	72.8	70.0	67.4	63.5	
	15:25	15:30	67.8	58.6	73.3	70.0	67.5	64.0	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	/	/
Stoplights	/	/
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

Site Diagram:



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 7 photos

Additional Notes/Comments:
steady downhill from house to turnpike

Other Noise Sources: distant: [✓ aircraft]/roadway traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

turnpike is below grade to receptor

URS Acoustics and Noise Control Practice

FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: ______ Date: 10/28/13 Page ____ of ____

Monitoring Location: ST-28 1022 Yellowsprings Rd residence Analyst: JDD/SRS

Sound Level Meter

Model #: LD820 SLM

Serial #: 1651

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Topo: Flat / [✓ Hilly]

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

Field Calibration

Model #: CAL200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test — dBA

GPS Coordinates (at SLM location)#

N40°04.502' W75°32.086'

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm]/Light Mostly calm

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: 0-3 mph

Temp (°F): 65.3°F RH (%): 54.3%

Bar Psr (Hg): 1008.4 Cloud Cover (%): Light

ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	14:50	14:55	59.9	54.4	65.6	62.6	59.0	56.4	
	14:55	15:00	59.2	53.3	66.2	61.9	58.3	55.1	
	15:00	15:05	61.5	54.3	70.3	64.3	59.7	56.5	
	15:05	15:10	59.5	52.4	67.3	62.2	58.7	55.7	
	15:10	15:15	60.8	54.3	78.0	62.2	59.2	56.6	
									YELLOW SPRINGS ROAD
									15 MIN COUNT
									AUTOS 66
									MED 3
									HEAVY 3

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops	—	—
Stoplights	—	—
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

turnpike traffic visible from measurement location

- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes] / No 7 photos

Additional Notes/Comments:

Other Noise Sources: [✓ distant: aircraft]/[✓ roadway traffic]/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

URS Acoustics and Noise Control Practice
FIELD NOISE MEASUREMENT DATA FORM

Project Name: PTC 319-312 Project #: — Date: 10/29/13 Page ___ of ___

Monitoring Location: ST79 2068 Seven Oaks Rd Analyst: JDD SES

Sound Level Meter

Model #: LD 820 SLM

Serial #: 1651

Weighting: [✓ A] / C / Flat

Response: [✓ Slow] / Fast / Impl

Windscreen: [✓ Yes] / No (explain)

Field Calibration

Model #: CAL200

Serial #: 5789

Calibration Level (dBA): 94 / [✓ 114]

Pre-Test 114 dBA

Post-Test — dBA

Weather Data

Model #: K3500

Serial #: 1703474

Wind: Steady/Gusty/[✓ Calm]

Precipitation: Yes (explain) / [✓ No]

Avg Wind Speed/Direction: —

Topo: Flat / [✓ Hilly]

Terrain: Hard/[✓ Soft]/[✓ Mixed]/Snow

GPS Coordinates (at SLM location)#

N 40°03.950 W 75°36.404

Temp (°F): 48°F RH (%): 65.6%

Bar Psr (Hg): 1009.7 Cloud Cover (%): clear

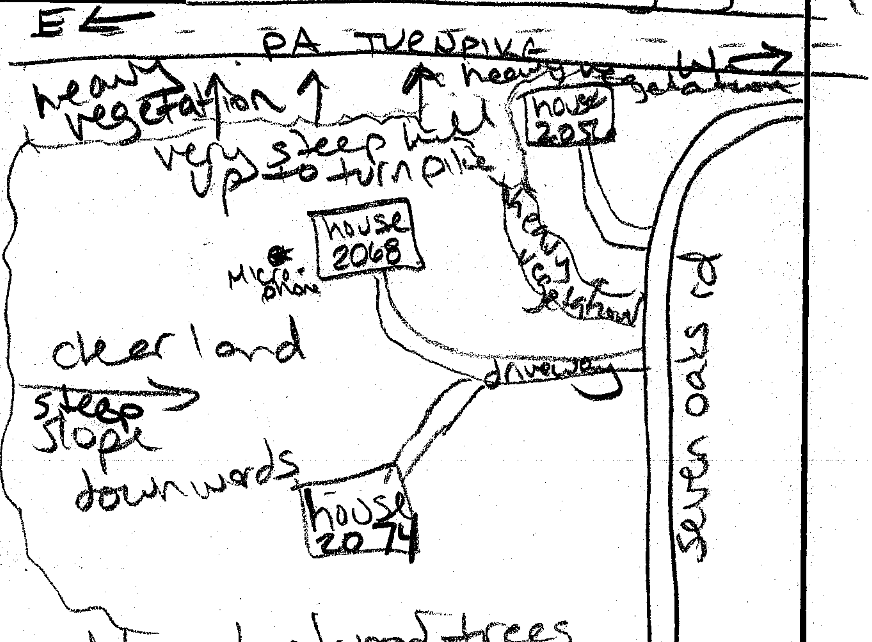
ID	Start Time	Stop Time	L_{eq}	L_{min}	L_{max}	L_{10}	L_{50}	L_{90}	Notes/Events
	1725	1730	62.5	57.1	70.7	64.4	61.6	58.7	
	1730	1735	61.8	55.8	67.8	63.7	61.5	58.9	
	17:35	17:40	62.4	59.1	67.7	63.9	62.2	60.3	
	17:40	17:45	62.2	56.8	67.3	64.0	61.8	59.4	

Roadway Name/Dir	PA TPK EB	PA TPK WB
Speed (post/obs)*	65/70	65/70
Number of Lanes	2	2
Width (pave/row)	50'	50'
1- or 2- way	1	1
Grade	flat	flat
Bus Stops		
Stoplights		
Motorcycles		
Automobiles		
Medium Trucks		
Heavy Trucks		
Buses		
Count duration		

compass

Site Diagram:

limited visibility of turnpike due to heavy vegetation



- note coordinate system * - Speed estimated by Radar / Driving / [✓ Observation]

Photos Taken? [✓ Yes]/No 8 photos

Additional Notes/Comments:

heavy vegetation = hardwood trees, brush

Other Noise Sources: distant [✓ aircraft/roadway] traffic/trains/landscaping/rustling leaves/children playing/dogs barking/[✓ birds vocalizing]/insects

Additional Notes and Sketches on Reverse

turnpike is higher than 2nd floor of house

Observed Traffic Count Conducted During Acoustical Surveys

Receiver	Road	Vehicle Type	Count	Count - Hour Adj.	Speed
ST01	PA Turnpike EB	Auto	223	892	65
		MT	13	52	60
		HT	55	220	60
	PA Turnpike WB	Auto	183	732	65
		MT	13	52	60
		HT	54	216	60
ST02	PA Turnpike EB	Auto	181	724	65
		MT	10	40	60
		HT	77	308	60
	PA Turnpike WB	Auto	210	840	65
		MT	15	60	60
		HT	59	236	60
		Bus	2	8	60
ST03	PA Turnpike EB	Auto	185	740	65
		MT	6	24	60
		HT	51	204	60
		Bus	1	4	60
	PA Turnpike WB	Auto	209	836	65
		MT	6	24	60
		HT	70	280	60
ST04	PA Turnpike EB	Auto	165	660	65
		MT	8	32	60
		HT	45	180	60
	PA Turnpike WB	Auto	173	692	65
		MT	12	48	60
		HT	46	184	60
		Bus	3	12	60
ST05	PA Turnpike EB	Auto	181	724	65
		MT	10	40	60
		HT	45	180	60
		Bus	1	4	60
	PA Turnpike WB	Auto	168	672	65
		MT	8	32	60
		HT	55	220	60
		Bus	2	8	60
ST06	PA Turnpike EB	Auto	215	860	65
		MT	11	44	60
		HT	43	172	60
		Bus	1	4	60
		Moto	1	4	70
	PA Turnpike WB	Auto	229	916	65
		MT	16	64	60
		HT	75	300	60

Observed Traffic Count Conducted During Acoustical Surveys

Receiver	Road	Vehicle Type	Count	Count - Hour Adj.	Speed
ST07	PA Turnpike EB	Auto	214	856	65
		MT	13	52	60
		HT	32	128	60
	PA Turnpike WB	Auto	236	944	65
		MT	10	40	60
		HT	49	196	60
		Bus	2	8	60
ST08	PA Turnpike EB	Auto	220	880	65
		MT	18	72	60
		HT	48	192	60
	PA Turnpike WB	Auto	208	832	65
		MT	12	48	60
		HT	54	216	60
		Bus	1	4	60
	Conestoga Rd	Auto	136	544	35
		MT	4	16	30
		HT	6	24	30
		Bus	1	4	30
ST09	PA Turnpike EB	Auto	214	856	65
		MT	13	52	60
		HT	32	128	60
	PA Turnpike WB	Auto	236	944	65
		MT	10	40	60
		HT	49	196	60
		Bus	2	8	60
ST10	No traffic counted - Receptor replaced with ST29				
ST11	PA Turnpike EB	Auto	190	760	65
		MT	11	44	60
		HT	59	236	60
		Bus	1	4	60
	PA Turnpike WB	Auto	187	748	65
		MT	10	40	60
		HT	74	296	60
		Bus	4	16	60
ST12	PA Turnpike EB	Auto	604	2416	65
		MT	12	48	60
		HT	49	196	60
	PA Turnpike WB	Auto	283	1132	65
		MT	12	48	60
		HT	30	120	60
		Bus	0	0	0
		Moto	1	4	70

Observed Traffic Count Conducted During Acoustical Surveys					
Receiver	**Road**	**Vehicle Type**	**Count**	**Count - Hour Adj.**	**Speed**
ST13	PA Turnpike EB	Auto	172	688	65
		MT	10	40	60
		HT	46	184	60
	PA Turnpike WB	Auto	170	680	65
		MT	8	32	60
		HT	62	248	60
		Bus	1	4	60
ST14	PA Turnpike EB	Auto	271	1084	65
		MT	13	52	60
		HT	35	140	60
	PA Turnpike WB	Auto	572	2288	65
		MT	22	88	60
		HT	72	288	60
		Bus	1	4	60
ST15	PA Turnpike EB	Auto	357	1428	65
		MT	11	44	60
		HT	47	188	60
		Bus	1	4	60
	PA Turnpike WB	Auto	220	880	65
		MT	13	52	60
		HT	56	224	60
ST16	PA Turnpike EB	Auto	248	992	65
		MT	8	32	60
		HT	44	176	60
		Bus	1	4	60
	PA Turnpike WB	Auto	237	948	65
		MT	15	60	60
		HT	69	276	60
ST17	PA Turnpike EB	Auto	297	1188	65
		MT	13	52	60
		HT	50	200	60
		Bus	2	8	60
	PA Turnpike WB	Auto	188	752	65
		MT	12	48	60
		HT	57	228	60
		Bus	3	12	60
ST18	PA Turnpike EB	Auto	297	1188	65
		MT	13	52	60
		HT	50	200	60
		Bus	2	8	60
	PA Turnpike WB	Auto	188	752	65
		MT	12	48	60
		HT	57	228	60
		Bus	3	12	60

Observed Traffic Count Conducted During Acoustical Surveys					
Receiver	**Road**	**Vehicle Type**	**Count**	**Count - Hour Adj.**	**Speed**
ST19/ST20	PA Turnpike EB	Auto	287	1148	65
		MT	8	32	60
		HT	24	96	60
	PA Turnpike WB	Auto	616	2464	65
		MT	9	36	60
		HT	44	176	60
ST21	PA Turnpike EB	Auto	301	1204	65
		MT	11	44	60
		HT	33	132	60
		Bus	1	4	60
	PA Turnpike WB	Auto	411	1644	65
		MT	21	84	60
		HT	42	168	60
		Bus	2	8	60
ST22/ST23	PA Turnpike EB	Auto	253	1012	65
		MT	12	48	60
		HT	35	140	60
		Bus	2	8	60
	PA Turnpike WB	Auto	409	1636	65
		MT	12	48	60
		HT	52	208	60
		Bus	1	4	60
ST24	PA Turnpike EB	Auto	213	852	65
		MT	13	52	60
		HT	43	172	60
	PA Turnpike WB	Auto	181	724	65
		MT	10	40	60
		HT	74	296	60
		Bus	1	4	60
ST25	PA Turnpike EB	Auto	213	852	65
		MT	13	52	60
		HT	43	172	60
	PA Turnpike WB	Auto	181	724	65
		MT	10	40	60
		HT	74	296	60
		Bus	1	4	60
	Charlestown Rd	Auto	44	176	40
		MT	4	16	35
		HT	2	8	35
		Bus	1	4	35

Observed Traffic Count Conducted During Acoustical Surveys

Receiver	Road	Vehicle Type	Count	Count - Hour Adj.	Speed
ST26	PA Turnpike EB	Auto	223	892	65
		MT	9	36	60
		HT	67	268	60
	PA Turnpike WB	Auto	232	928	65
		MT	18	72	60
		HT	51	204	60
ST27	PA Turnpike EB	Auto	281	1124	65
		MT	8	32	60
		HT	31	124	60
	PA Turnpike WB	Auto	345	1380	65
		MT	21	84	60
		HT	46	184	60
ST28	PA Turnpike EB	Auto	250	1000	65
		MT	6	24	60
		HT	30	120	60
	PA Turnpike WB	Auto	270	1080	65
		MT	13	52	60
		HT	64	256	60
ST29	PA Turnpike EB	Auto	263	1052	65
		MT	4	16	60
		HT	18	72	60
		Bus	1	4	60
	PA Turnpike WB	Auto	854	3416	65
		MT	5	20	60
		HT	25	100	60
		Bus	0	0	60
		Moto	1	4	70

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(10)	L(50)	L(90)
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	28-Nov-12	9:34:08	51.1	69.3	76.7	61.7	73	66.6	63.4
ST01	28-Nov-12	9:35:00	300	65.4	73.2	55.5	69.7	63.1	58.7
ST01	28-Nov-12	9:40:00	300	67.2	79.7	57.3	70.3	64.2	60.1
ST01	28-Nov-12	9:45:00	300	66.6	78.4	54	70	64.3	57.7
ST01	28-Nov-12	9:50:00	300	67	76.1	57	71	64.5	60.6
ST01	28-Nov-12	9:55:00	46.1	62.2	68.1	58	64.9	60.8	59
ST01	28-Nov-12	10:02:22	157.8	62.9	69.5	55.8	65.9	61.9	58.1
ST02	28-Nov-12	10:05:00	300	64.4	71.9	56	66.8	63.8	59.8
ST02	28-Nov-12	10:10:00	300	64.1	74.9	53.5	67.1	62.7	58.1
ST02	28-Nov-12	10:15:00	300	65.5	71.1	56.2	68.6	64.5	60.5
ST02	28-Nov-12	10:20:00	99.1	63.8	68.7	57.5	66.7	62.9	59.4
ST02	28-Nov-12	10:46:07	232.9	60.7	67.7	53.9	63	59.8	57.1
ST03	29-Oct-13	10:50:00	300	60.3	64.6	53.2	62.5	60.1	56.4
ST03	29-Oct-13	10:55:00	300	61.6	69.5	55	64.1	61.1	58.3
ST03	29-Oct-13	11:00:00	300	60.8	63.9	56.3	62.7	60.5	58.2
ST03	29-Oct-13	11:05:00	300	60.3	64.9	52.5	62.4	60.1	57.3
ST03	29-Oct-13	11:10:00	300	61.8	71.3	55.5	63.9	60.7	57.5
ST03	29-Oct-13	11:15:00	49.5	62.5	66.9	57.3	64.4	62	59.6
ST03	29-Oct-13	13:15:31	268.5	59.7	64.9	52.4	62.9	58.8	55.2
ST04	28-Nov-12	11:20:00	300	66.9	73.3	57.6	69.6	65.9	62.4
ST04	28-Nov-12	11:25:00	300	67.2	73.5	59	70.5	66.2	61.2
ST04	28-Nov-12	11:30:00	300	66.9	73	60.1	69.5	66.2	62.6
ST04	28-Nov-12	11:35:00	75.8	67.9	77.5	60.7	69.2	65.4	62
ST04	28-Nov-12	11:44:18	41.7	71.3	75.3	66.8	74.1	70.4	68
ST05	28-Nov-12	11:45:00	300	69.7	78.8	61.2	73.1	67.7	63.5
ST05	28-Nov-12	11:50:00	300	68.4	75.3	62.4	71.7	66.8	64.3
ST05	28-Nov-12	11:55:00	300	68.5	75.6	56.9	72	66.4	62.3
ST05	28-Nov-12	12:00:00	146.3	68.6	75.9	62.4	72.6	66.4	63.3
ST05	28-Nov-12	13:10:29	271	60.4	63.8	56	62.5	60.1	57.6
ST06	29-Oct-13	13:20:00	300	60.1	65.3	54.3	62.9	59.5	55.8
ST06	29-Oct-13	13:25:00	300	60.7	65.5	51.2	63.7	60.1	54.4
ST06	29-Oct-13	13:30:00	300	60.4	66.4	51	63.8	59	55.4
ST06	29-Oct-13	13:35:00	300	59.1	63.7	52.3	61.8	58.5	54.8
ST06	29-Oct-13	13:40:00	300	59.4	65	51.8	61.7	58.8	56.2
ST06	29-Oct-13	13:45:00	48.2	63.6	69.4	56.7	68.2	60.7	57.8
ST06	29-Oct-13	13:52:33	146.2	60.3	65.7	54.4	62.6	59.5	57
ST07	29-Oct-13	13:55:00	300	58.6	65.8	46.2	61.5	57.8	53.5
ST07	29-Oct-13	14:00:00	300	58.1	62.5	51	60.4	57.4	54.8
ST07	29-Oct-13	14:05:00	300	60	65.3	53.9	62.7	59.2	55.8
ST07	29-Oct-13	14:10:00	300	59.1	64	51.4	61.8	58.4	55.5
ST07	29-Oct-13	14:15:00	300	60	64.4	54.1	62.4	59.6	56.4
ST07	29-Oct-13	14:20:00	34.5	60	64.1	57.3	62	59.5	58.1
ST08	28-Nov-12	13:45:00	300	68.8	74.9	59.2	72.2	67.7	62.3
ST08	28-Nov-12	13:50:00	300	68	73.7	55.2	70.8	67.5	61.5
ST08	28-Nov-12	13:55:00	300	68.6	75.4	59	71.8	67.6	63.1
ST08	28-Nov-12	14:00:00	161.3	67.4	72.9	55.8	70.5	66.6	62.1
ST08	28-Nov-12	14:06:57	182.9	65.4	74.5	53.3	68.8	63.1	57.7

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(10)	L(50)	L(90)
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ST09	29-Oct-13	13:57:14	165.2	65.1	72.5	50.9	69.3	62.6	57.2
ST09	29-Oct-13	14:00:00	300	64.6	73.4	52.8	68.6	61.9	56.1
ST09	29-Oct-13	14:05:00	300	66.4	75.4	54.9	69.7	65	59
ST09	29-Oct-13	14:10:00	300	65.7	74.6	55	69.5	63.6	59.2
ST09	29-Oct-13	14:15:00	300	65.8	73	55.2	69.5	64.1	59.6
ST09	29-Oct-13	14:20:00	300	66.5	73.3	54.6	70.5	64.3	58.4
ST09	29-Oct-13	14:25:00	300	66.1	74.1	54.9	69.9	64	57.8
ST09	29-Oct-13	14:30:00	300	66	74.2	54.8	70	64	58.4
ST09	29-Oct-13	14:35:00	222	65.9	72.4	54.9	69.6	64	58.6
ST09	29-Oct-13	15:07:54	125.2	68.4	75.5	63.3	70.6	67.9	64.6
ST10	28-Nov-12	14:35:00	300	61.2	67.9	51.9	64.7	59.9	56.1
ST10	28-Nov-12	14:40:00	300	61.4	67.4	53.5	64.9	59.6	54.9
ST10	28-Nov-12	14:45:00	300	60.4	69	50.8	63.9	58.6	53.6
ST10	28-Nov-12	14:50:00	13.5	60.2	63.6	56.2	63.2	59.4	56.3
ST10	29-Nov-12	10:57:04	175	66.8	71.9	58.1	69.5	66.1	62
ST11	29-Nov-12	11:00:00	300	66.4	73.2	55.8	69.4	65.2	61.1
ST11	29-Nov-12	11:05:00	300	66.6	73.3	55.3	69.8	65.4	62
ST11	29-Nov-12	11:10:00	300	66.8	72.9	57.9	69.8	65.7	61
ST11	29-Nov-12	11:15:00	11.2	65.1	66.7	61.2	66.7	65	62.8
ST11	29-Nov-12	11:27:55	124.8	63.7	67.5	57.5	66	63.4	59.4
ST12	29-Oct-13	8:13:45	74.7	67.1	71.5	63.9	69	66.6	64.7
ST12	29-Oct-13	8:15:00	300	67.1	70.3	61.7	69.2	67	64
ST12	29-Oct-13	8:20:00	300	66.1	71	59.5	68.5	65.6	62.7
ST12	29-Oct-13	8:25:00	300	66.2	71.1	61.2	68.3	65.7	63.5
ST12	29-Oct-13	8:30:00	300	66.2	70	60.8	68.5	65.8	63
ST12	29-Oct-13	8:35:00	240	64.9	69.8	58.6	67.2	64.5	60.8
ST12	29-Oct-13	10:02:50	129.5	65.7	71.3	54.7	69	64.7	60.3
ST13	29-Nov-12	11:30:00	300	66.4	80.1	54.1	68.5	64.6	59.7
ST13	29-Nov-12	11:35:00	300	64.7	71.1	55.9	67.5	64	59.8
ST13	29-Nov-12	11:40:00	300	66.3	71.7	56.6	69.3	65.3	60.6
ST13	29-Nov-12	11:45:00	300	66.7	76	58.8	69.4	65.7	61.7
ST13	29-Nov-12	11:50:00	11.7	64.4	68	58.8	67.6	62.4	59
ST13	29-Nov-12	13:19:09	50.3	65.3	68.4	60.6	67.4	64.9	61.9
ST14	29-Oct-13	15:55:00	300	65	70.8	58.9	67.1	64.7	60.9
ST14	29-Oct-13	16:00:00	300	65.8	69.9	58.4	68.2	65.5	62
ST14	29-Oct-13	16:05:00	300	66.5	83.1	56.5	68.3	65.3	61.4
ST14	29-Oct-13	16:10:00	300	66.4	75	57	68.5	65.8	62.4
ST14	29-Oct-13	16:15:00	300	66.5	70.4	60.8	68.4	66.3	63.6
ST14	29-Oct-13	16:20:00	164	65.6	72.9	59.6	67.6	64.9	62.8
ST14	29-Oct-13	17:21:22	217.2	62.3	67.7	57.2	64.4	61.7	59.8
ST15	30-Nov-12	8:55:00	300	66.4	71.2	60.7	68.6	66	63.3
ST15	30-Nov-12	9:00:00	300	66.3	73.4	60.1	68.5	65.7	62.6
ST15	30-Nov-12	9:05:00	300	66.5	74.6	59.1	69.2	65.6	61.9
ST15	30-Nov-12	9:10:00	137	66.7	70	61.9	69.2	66.5	63.4
ST15	30-Nov-12	9:24:24	35.5	60.6	62.8	57.2	61.9	60.8	58.1
ST16	29-Nov-12	14:25:00	300	66.8	72.3	60.8	69.4	66.4	62.6
ST16	29-Nov-12	14:30:00	300	65.5	72.8	57.4	67.9	64.9	61
ST16	29-Nov-12	14:35:00	300	66.6	73.4	56.3	69.6	65.9	61.7
ST16	29-Nov-12	14:40:00	262.4	67.1	71.3	62.7	69.4	66.7	63.9
ST16	29-Nov-12	14:58:21	98.3	60.8	62.8	53.1	62.5	61.1	56.6

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(10)	L(50)	L(90)
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ST17	30-Nov-12	9:25:00	300	62	67.4	57.3	64.1	61.5	58.9
ST17	30-Nov-12	9:30:00	300	61.3	65.3	54.7	63.8	61	57.2
ST17	30-Nov-12	9:35:00	300	62.2	67.2	54.8	64.7	61.6	57.1
ST17	30-Nov-12	9:40:00	163.5	60.8	67.1	52.1	63.7	59.6	54.7
ST17	30-Nov-12	9:48:07	112.7	66.8	72.8	55.5	70.6	65.2	60.4
ST18	30-Nov-12	9:50:00	300	66.7	74	54.6	69.6	66.1	61.3
ST18	30-Nov-12	9:55:00	300	66	72.3	54	68.9	64.9	60.5
ST18	30-Nov-12	10:00:00	300	66.7	73.8	53.8	69.8	65.6	60.4
ST18	30-Nov-12	10:05:00	87.8	67.4	71.4	60.9	70.4	66.9	62
ST18	30-Nov-12	11:38:06	113.5	62.1	67.5	57.1	64.3	61.6	58.4
ST19	28-Oct-13	16:25:00	300	61.5	65.3	54.8	63.5	61.4	58.1
ST19	28-Oct-13	16:30:00	300	61.8	65.3	56.9	63.7	61.7	59.5
ST19	28-Oct-13	16:35:00	300	61.3	65.1	57.9	63.2	61.1	58.7
ST19	28-Oct-13	16:40:00	300	61.9	65	57.2	63.8	61.8	59.3
ST19	28-Oct-13	16:45:00	300	60.9	64.6	55.3	62.7	60.7	57.9
ST19	28-Oct-13	16:50:00	300	61.5	65.3	52.4	63.1	61.6	59.1
ST19	28-Oct-13	16:55:00	300	61.1	64.1	56.2	62.9	61	57.5
ST19	28-Oct-13	17:00:00	300	61.8	64.9	57.2	63.6	61.5	59.4
ST19	28-Oct-13	17:05:00	300	61.5	64.8	56.4	63.3	61.4	59.2
ST19	28-Oct-13	17:10:00	60.4	63.3	67.8	56.9	65.9	62.6	60.4
ST20	28-Oct-13	16:35:00	300	64.4	68.5	59.4	66.7	64.1	61.3
ST20	28-Oct-13	16:40:00	300	65.2	69.9	59.4	67.5	64.8	62.2
ST20	28-Oct-13	16:45:00	300	62.9	67.7	59	65	62.3	60.1
ST20	28-Oct-13	16:50:00	300	63.5	68.5	58.6	65.3	63.2	60.4
ST20	28-Oct-13	16:55:00	223.3	63.6	67.2	57.4	66.2	63.2	59.4
ST21	29-Nov-12	15:55:00	300	68.1	75.2	57.7	71.1	67.3	62.3
ST21	29-Nov-12	16:00:00	300	69.5	74.5	62.9	71.9	69.1	65.9
ST21	29-Nov-12	16:05:00	300	68.4	72.9	60.1	71	68	64
ST21	29-Nov-12	16:10:00	13.7	67.9	70.4	62.8	70	68.1	63.6
ST21	30-Nov-12	8:15:38	261.4	62.2	66.9	57.1	63.9	62.1	59.2
ST22	28-Oct-13	15:40:44	255.5	62.1	66.6	57.3	63.8	61.8	59.6
ST22	28-Oct-13	15:45:00	300	62.9	66.2	57.3	65.1	62.6	59.7
ST22	28-Oct-13	15:50:00	300	62.1	66	57.8	64.2	61.7	59.3
ST22	28-Oct-13	15:55:00	300	62.1	66.2	55	63.9	61.9	58.6
ST22	28-Oct-13	16:00:00	300	61.5	65.4	55.7	63.3	61.3	58.3
ST22	28-Oct-13	16:05:00	300	62.8	75.2	57.3	64.6	62.4	60.2
ST22	28-Oct-13	16:10:00	14.4	61.8	62.9	60.4	62.8	62.1	60.6
ST22	28-Oct-13	16:20:15	284.8	61.4	69.9	56.5	62.9	61.2	59
ST23	28-Oct-13	15:30:00	300	60.6	63.4	56.9	62.2	60.5	58.1
ST23	28-Oct-13	15:35:00	300	60.3	64.4	55.1	62.3	60.1	56.9
ST23	28-Oct-13	15:40:00	300	60.7	64.6	56.2	62.5	60.4	58.1
ST23	28-Oct-13	15:45:00	300	61	64.2	55.4	63.2	60.7	58.6
ST23	28-Oct-13	15:50:00	300	60.2	63.7	56.5	62.3	60	57.5
ST23	28-Oct-13	15:55:00	300	60.1	63.6	55.5	62	59.8	57.4
ST23	28-Oct-13	16:00:00	300	60	62.7	57.4	61.5	59.7	58.1
ST23	28-Oct-13	16:05:00	123.3	60.5	63.3	56.6	61.9	60.4	58.1
ST23	28-Oct-13	16:33:36	83.7	66.1	70.4	62.4	67.9	65.8	63.7

Site	Date	Time	Duration	Leq	Lmax	Lmin	L(10)	L(50)	L(90)
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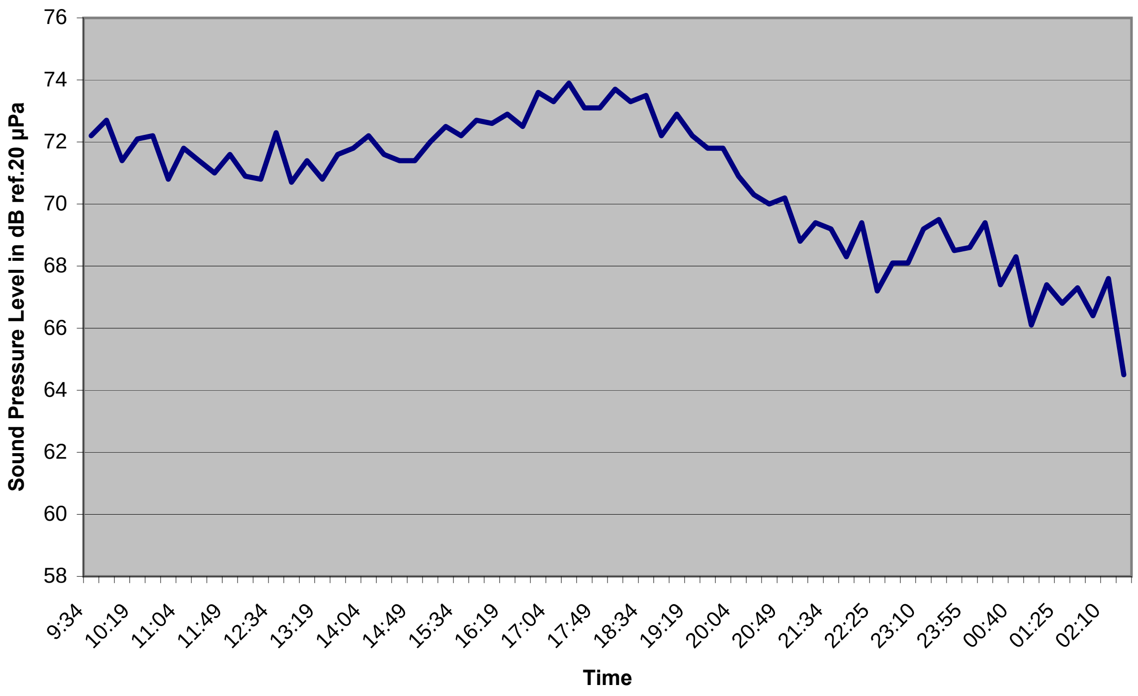
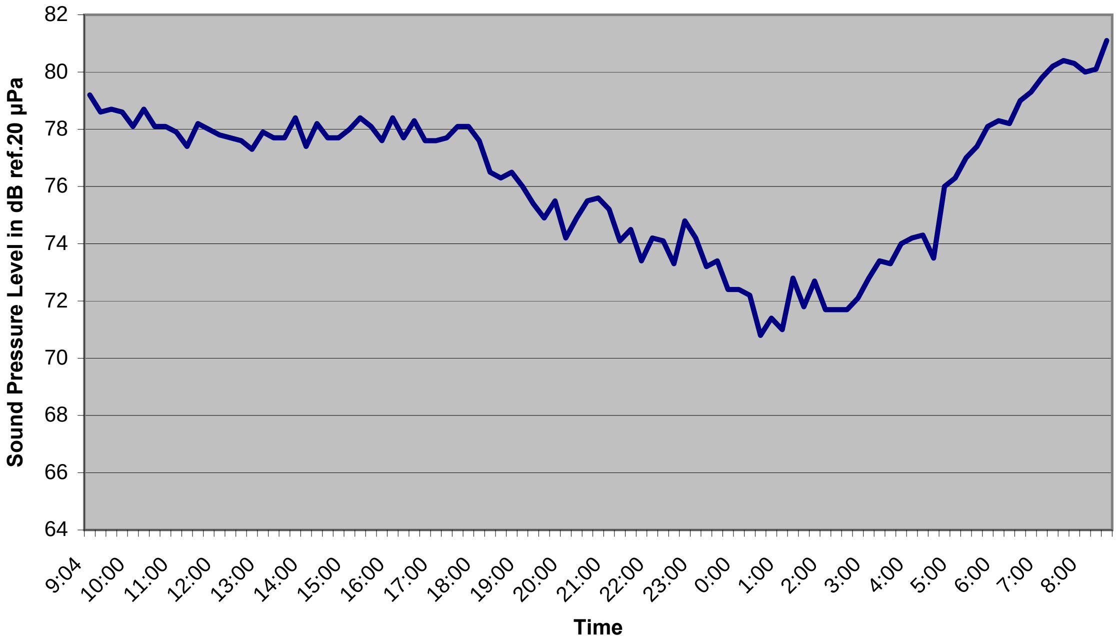
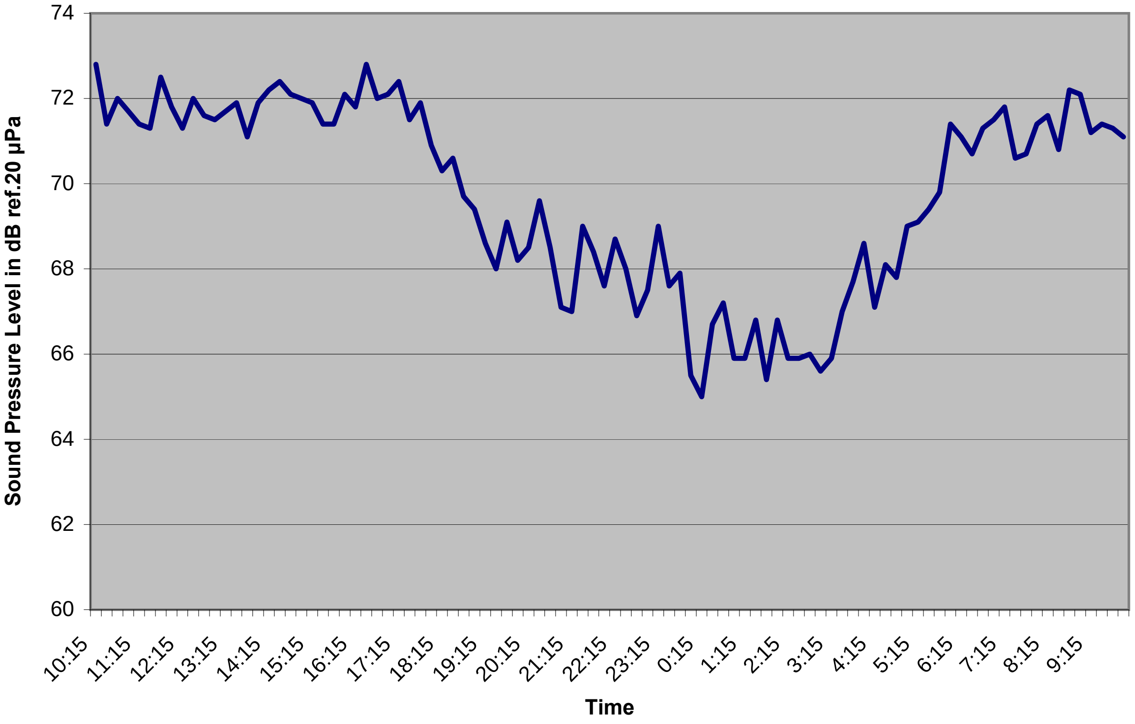
ST24	30-Nov-12	12:25:00	300	58.6	63.7	52	60.8	58.4	55
ST24	30-Nov-12	12:30:00	300	60.2	67.6	54.7	62.4	59.3	56.5
ST24	30-Nov-12	12:35:00	300	58.7	62.8	53.9	61.2	58.3	55.6
ST24	30-Nov-12	12:40:00	300	60.1	69.2	55.6	62	59.4	56.8
ST24	30-Nov-12	12:45:00	17.8	61.3	63.3	57.1	63	61	59.7
ST24	30-Nov-12	12:52:53	126.2	63.2	76.1	52.2	67.4	57.6	53.6
ST25	30-Nov-12	12:55:00	300	61.4	72.7	49.3	66.5	54.2	50.7
ST25	30-Nov-12	13:00:00	300	61.7	74.9	49.3	66.3	53.8	51.3
ST25	30-Nov-12	13:05:00	300	60.4	72.1	49.7	65.1	54.5	51.3
ST25	30-Nov-12	13:10:00	300	64.7	78.1	51.7	68.7	57.7	53.4
ST25	30-Nov-12	13:15:00	15.5	63.4	69.3	54.1	67.3	60.1	54.5
ST26	29-Oct-13	10:05:00	300	66.8	73.8	58.9	69.4	66.5	61.4
ST26	29-Oct-13	10:10:00	300	65.3	71.7	58.3	68.4	64	60.5
ST26	29-Oct-13	10:15:00	300	65.7	74	55.8	68.2	64.8	60
ST26	29-Oct-13	10:20:00	300	65.8	71.7	56	68.8	65	60.8
ST26	29-Oct-13	10:25:00	300	65.3	74.3	55	68.5	63.4	58
ST26	29-Oct-13	10:30:00	219	65.2	75.5	52.8	68.2	63.2	57.5
ST26	29-Oct-13	10:45:20	280	61.8	66.1	55	63.9	61.4	59
ST27	29-Oct-13	15:10:00	300	68.2	73.4	58.4	70.9	67.7	62.8
ST27	29-Oct-13	15:15:00	300	67.8	71.6	58.1	69.9	67.7	63.8
ST27	29-Oct-13	15:20:00	300	67.8	72.8	58.5	70	67.4	63.5
ST27	29-Oct-13	15:25:00	300	67.8	73.3	58.6	70	67.5	64
ST27	29-Oct-13	15:30:00	85.7	68.3	72.7	59.7	70.7	68.1	63.3
ST27	29-Oct-13	15:52:47	132.8	65.2	70.5	60.1	67.5	65	61.1
ST28	28-Oct-13	14:47:56	123.8	60.5	65.7	53.6	63.1	59.8	56.4
ST28	28-Oct-13	14:50:00	300	59.9	65.6	54.4	62.6	59	56.4
ST28	28-Oct-13	14:55:00	300	59.2	66.2	53.3	61.9	58.3	55.1
ST28	28-Oct-13	15:00:00	300	61.5	70.3	54.3	64.3	59.7	56.5
ST28	28-Oct-13	15:05:00	300	59.5	67.2	52.4	62.2	58.7	55.7
ST28	28-Oct-13	15:10:00	300	60.8	78	54.3	62.2	59.2	56.6
ST28	28-Oct-13	15:15:00	213.9	60.2	66.8	55.4	62.7	59.2	56.8
ST28	28-Oct-13	15:29:30	29.7	58.4	60.5	56.7	59.8	58.4	57
ST29	29-Oct-13	17:25:00	300	62.4	70.7	57.1	64.4	61.6	58.7
ST29	29-Oct-13	17:30:00	300	61.8	67.8	55.8	63.7	61.5	58.9
ST29	29-Oct-13	17:35:00	300	62.4	67.7	59.1	63.9	62.2	60.3
ST29	29-Oct-13	17:40:00	300	62.2	67.3	56.8	64	61.8	59.4
ST29	29-Oct-13	17:45:00	1.8	61.2	64.4	60.2	64.3	60.6	60.2



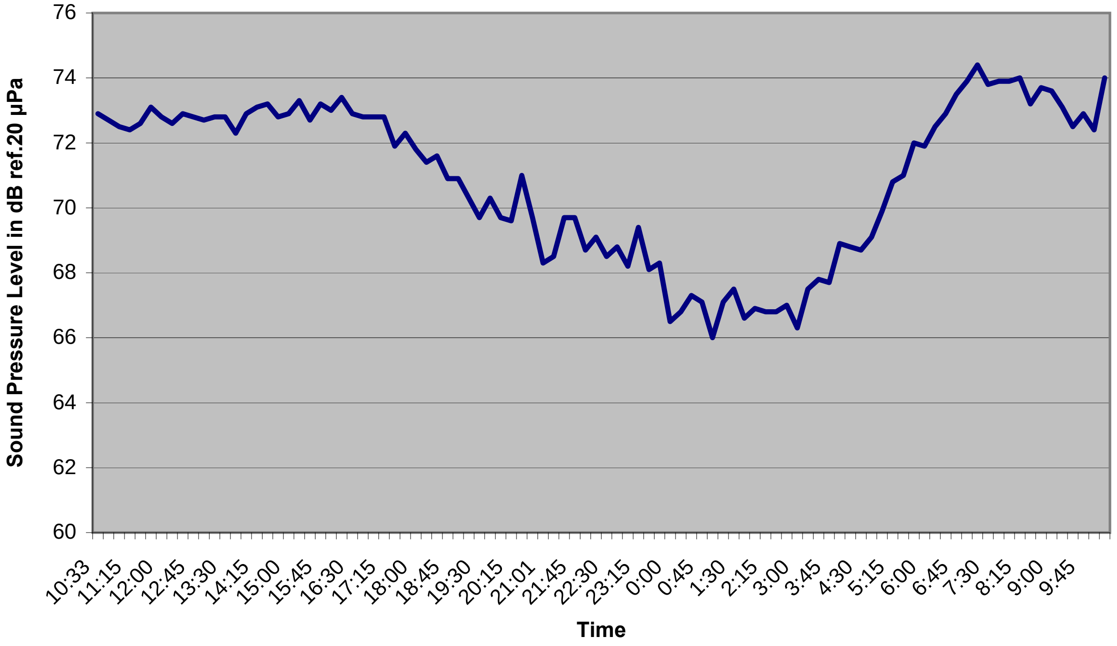
Pennsylvania Turnpike Authority Widening Project 312-319
Long Term Noise Measurement LT1



Pennsylvania Turnpike Authority Widening Project 312-319
Long Term Noise Measurement LT2



Pennsylvania Turnpike Authority Widening Project 312-319
Long Term Noise Measurement LT3



Pennsylvania Turnpike Authority Widening Project 312-319
Long Term Noise Measurement LT4

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180218

Instrument Model 820, Serial Number 1651, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

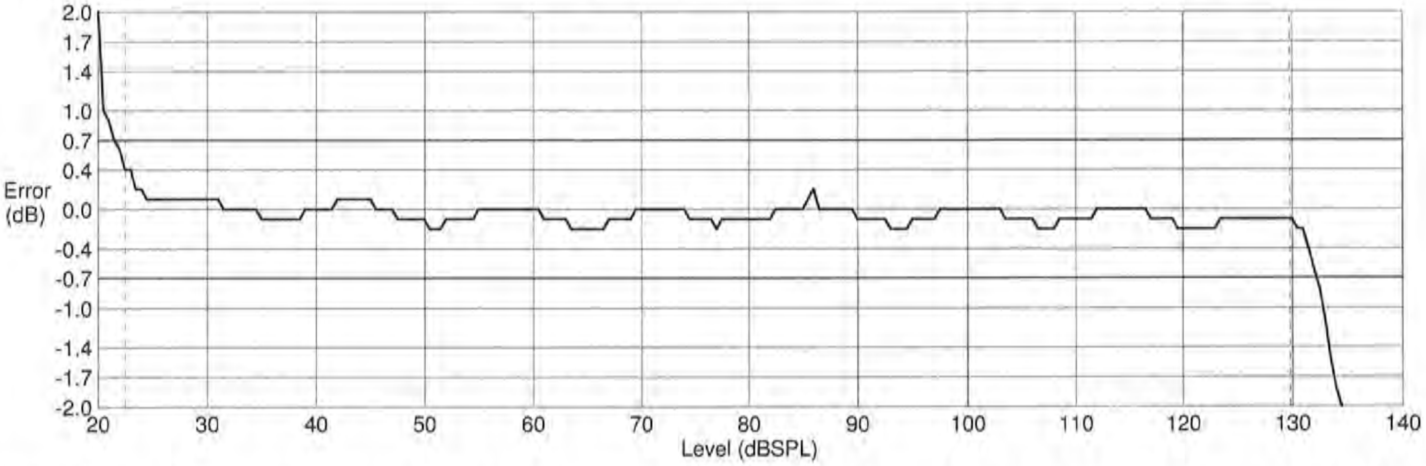
The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2581

Signed: Ron Harris
Technician: Ron Harris

Sound Level Meter Model: 820A Serial Number: A1651
Log Linearity, Differential Linearity and Range Data

This Type 1 Sound Level Meter (including attached PRM828 preamplifier and ADP005 18 pF input adapter) was calibrated with a reference 1kHz sine wave at a level of 114.0 dBSPL. The instrument's Log Linearity A-weighted slow response was then electrically tested using a 1kHz sine wave from 18.0 dBSPL to 138.0 dBSPL in 0.5 dB increments.



Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB
18.0	**20.0**	**2.0**	38.5	38.4	-0.1	59.0	59.0	0.0	79.5	79.4	-0.1	100.0	100.0	0.0	120.5	120.3	-0.2
18.5	**20.4**	**1.9**	39.0	39.0	0.0	59.5	59.5	0.0	80.0	79.9	-0.1	100.5	100.5	0.0	121.0	120.8	-0.2
19.0	**20.5**	**1.5**	39.5	39.5	0.0	60.0	60.0	0.0	80.5	80.4	-0.1	101.0	101.0	0.0	121.5	121.3	-0.2
19.5	**20.9**	**1.4**	40.0	40.0	0.0	60.5	60.5	0.0	81.0	80.9	-0.1	101.5	101.5	0.0	122.0	121.8	-0.2
20.0	**21.1**	**1.1**	40.5	40.5	0.0	61.0	60.9	-0.1	81.5	81.4	-0.1	102.0	102.0	0.0	122.5	122.3	-0.2
20.5	**21.5**	**1.0**	41.0	41.0	0.0	61.5	61.4	-0.1	82.0	81.9	-0.1	102.5	102.5	0.0	123.0	122.8	-0.2
21.0	**21.9**	**0.9**	41.5	41.5	0.0	62.0	61.9	-0.1	82.5	82.5	0.0	103.0	103.0	0.0	123.5	123.4	-0.1
21.5	**22.2**	**0.7**	42.0	42.1	0.1	62.5	62.4	-0.1	83.0	83.0	0.0	103.5	103.4	-0.1	124.0	123.9	-0.1
22.0	**22.6**	**0.6**	42.5	42.6	0.1	63.0	62.9	-0.1	83.5	83.5	0.0	104.0	103.9	-0.1	124.5	124.4	-0.1
22.5	22.9	0.4	43.0	43.1	0.1	63.5	63.3	-0.2	84.0	84.0	0.0	104.5	104.4	-0.1	125.0	124.9	-0.1
23.0	23.4	0.4	43.5	43.6	0.1	64.0	63.8	-0.2	84.5	84.5	0.0	105.0	104.9	-0.1	125.5	125.4	-0.1
23.5	23.7	0.2	44.0	44.1	0.1	64.5	64.3	-0.2	85.0	85.0	0.0	105.5	105.4	-0.1	126.0	125.9	-0.1
24.0	24.2	0.2	44.5	44.6	0.1	65.0	64.8	-0.2	85.5	85.6	0.1	106.0	105.9	-0.1	126.5	126.4	-0.1
24.5	24.6	0.1	45.0	45.1	0.1	65.5	65.3	-0.2	86.0	86.2	0.2	106.5	106.3	-0.2	127.0	126.9	-0.1
25.0	25.1	0.1	45.5	45.5	0.0	66.0	65.8	-0.2	86.5	86.5	0.0	107.0	106.8	-0.2	127.5	127.4	-0.1
25.5	25.6	0.1	46.0	46.0	0.0	66.5	66.3	-0.2	87.0	87.0	0.0	107.5	107.3	-0.2	128.0	127.9	-0.1
26.0	26.1	0.1	46.5	46.5	0.0	67.0	66.9	-0.1	87.5	87.5	0.0	108.0	107.8	-0.2	128.5	128.4	-0.1
26.5	26.6	0.1	47.0	47.0	0.0	67.5	67.4	-0.1	88.0	88.0	0.0	108.5	108.4	-0.1	129.0	128.9	-0.1
27.0	27.1	0.1	47.5	47.4	-0.1	68.0	67.9	-0.1	88.5	88.5	0.0	109.0	108.9	-0.1	129.5	129.4	-0.1
27.5	27.6	0.1	48.0	47.9	-0.1	68.5	68.4	-0.1	89.0	89.0	0.0	109.5	109.4	-0.1	**130.0**	**129.9**	**-0.1**
28.0	28.1	0.1	48.5	48.4	-0.1	69.0	68.9	-0.1	89.5	89.5	0.0	110.0	109.9	-0.1	**130.5**	**130.3**	**-0.2**
28.5	28.6	0.1	49.0	48.9	-0.1	69.5	69.5	0.0	90.0	89.9	-0.1	110.5	110.4	-0.1	**131.0**	**130.8**	**-0.2**
29.0	29.1	0.1	49.5	49.4	-0.1	70.0	70.0	0.0	90.5	90.4	-0.1	111.0	110.9	-0.1	**131.5**	**131.1**	**-0.4**
29.5	29.6	0.1	50.0	49.9	-0.1	70.5	70.5	0.0	91.0	90.9	-0.1	111.5	111.4	-0.1	**132.0**	**131.4**	**-0.6**
30.0	30.1	0.1	50.5	50.3	-0.2	71.0	71.0	0.0	91.5	91.4	-0.1	112.0	112.0	0.0	**132.5**	**131.7**	**-0.8**
30.5	30.6	0.1	51.0	50.8	-0.2	71.5	71.5	0.0	92.0	91.9	-0.1	112.5	112.5	0.0	**133.0**	**131.9**	**-1.1**
31.0	31.1	0.1	51.5	51.3	-0.2	72.0	72.0	0.0	92.5	92.4	-0.1	113.0	113.0	0.0	**133.5**	**132.0**	**-1.5**
31.5	31.5	0.0	52.0	51.9	-0.1	72.5	72.5	0.0	93.0	92.8	-0.2	113.5	113.5	0.0	**134.0**	**132.2**	**-1.8**
32.0	32.0	0.0	52.5	52.4	-0.1	73.0	73.0	0.0	93.5	93.3	-0.2	114.0	114.0	0.0	**134.5**	**132.2**	**-2.3**
32.5	32.5	0.0	53.0	52.9	-0.1	73.5	73.5	0.0	94.0	93.8	-0.2	114.5	114.5	0.0	**135.0**	**132.2**	**-2.8**
33.0	33.0	0.0	53.5	53.4	-0.1	74.0	74.0	0.0	94.5	94.3	-0.2	115.0	115.0	0.0	**135.5**	**132.0**	**-3.5**
33.5	33.5	0.0	54.0	53.9	-0.1	74.5	74.4	-0.1	95.0	94.9	-0.1	115.5	115.5	0.0	**136.0**	**132.0**	**-4.0**
34.0	34.0	0.0	54.5	54.4	-0.1	75.0	74.9	-0.1	95.5	95.4	-0.1	116.0	116.0	0.0	**136.5**	**132.0**	**-4.5**
34.5	34.5	0.0	55.0	55.0	0.0	75.5	75.4	-0.1	96.0	95.9	-0.1	116.5	116.5	0.0	**137.0**	**132.0**	**-5.0**
35.0	34.9	-0.1	55.5	55.5	0.0	76.0	75.9	-0.1	96.5	96.4	-0.1	117.0	116.9	-0.1	**137.5**	**132.2**	**-5.3**
35.5	35.4	-0.1	56.0	56.0	0.0	76.5	76.4	-0.1	97.0	96.9	-0.1	117.5	117.4	-0.1	**138.0**	**132.2**	**-5.8**
36.0	35.9	-0.1	56.5	56.5	0.0	77.0	76.8	-0.2	97.5	97.5	0.0	118.0	117.9	-0.1			
36.5	36.4	-0.1	57.0	57.0	0.0	77.5	77.4	-0.1	98.0	98.0	0.0	118.5	118.4	-0.1			
37.0	36.9	-0.1	57.5	57.5	0.0	78.0	77.9	-0.1	98.5	98.5	0.0	119.0	118.9	-0.1			
37.5	37.4	-0.1	58.0	58.0	0.0	78.5	78.4	-0.1	99.0	99.0	0.0	119.5	119.3	-0.2			
38.0	37.9	-0.1	58.5	58.5	0.0	79.0	78.9	-0.1	99.5	99.5	0.0	120.0	119.8	-0.2			

Plotted per typical sensitivity of a 2541 microphone; 44.5 mV/Pa & 17.1 pF.

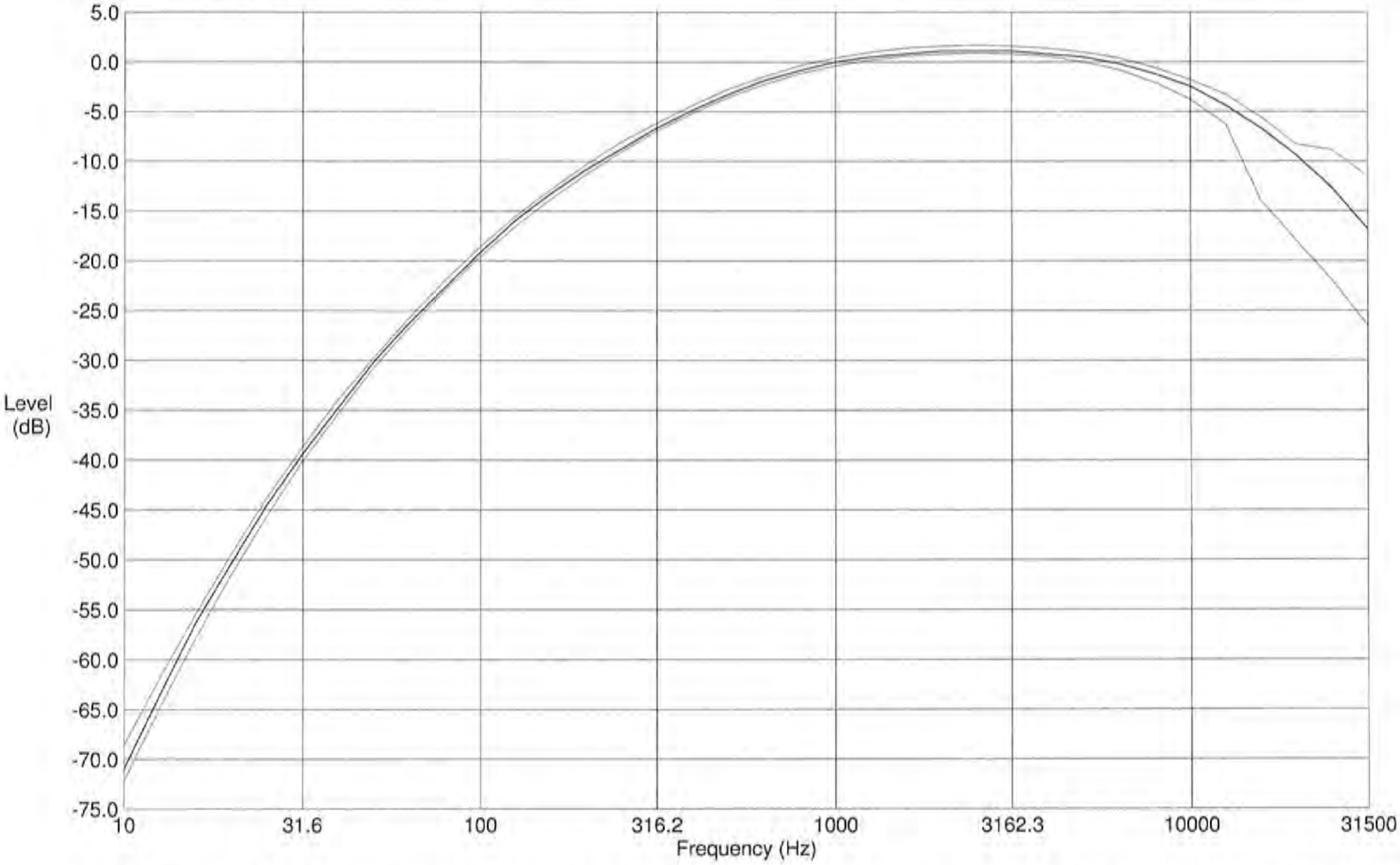
Overload occurs at 129.9 dBSPL.
Primary indicator range: 107.3 dB (lower limit: 22.5 dBSPL to upper limit: 129.8 dBSPL).
Dynamic range: 112.7 dB (noise floor: 17.1 dBSPL to upper limit: 129.8 dBSPL).

This instrument is in compliance with IEC 60651 (2001-10) 7.9 and 7.10, ANSI S1.4-1983 3.2 and IEC 60804 (2001-10) 9.2.1 for Type 1 sound level meters when used with a Larson Davis Type 1 microphone.

Technician: Ron Harris Test Date: 02OCT2013

Sound Level Meter Model: 820A Serial Number: A1651
Certificate of A-Weight Electrical Conformance

This Type 1 Sound Level Meter (including attached PRM828 preamplifier and ADP005 18 pF input adapter) was calibrated with a reference 1kHz sine wave at a level of 114.0 dBSPL. The instrument's A-weighted response was then electrically tested using a 2.0 Vrms sinewave at exact frequencies as specified in IEC 60651 (2001-10) and ANSI S1.4-1983.



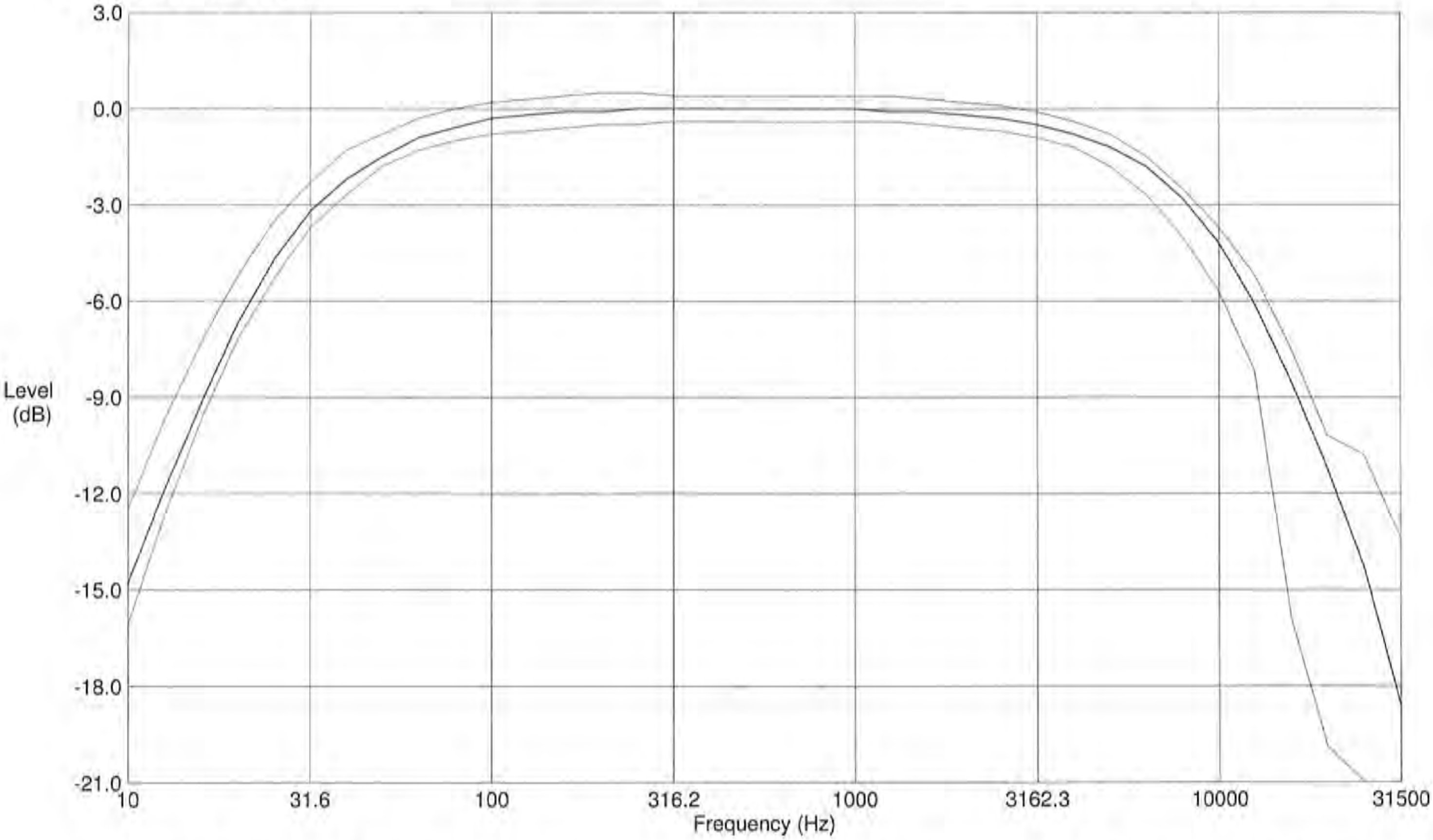
Freq (Hz)	Theor	Measured	Error	Tolerance
10.00	-70.4	-71.00	-0.60	+1.8, -1.8
12.59	-63.4	-63.60	-0.20	+1.5, -1.5
15.85	-56.7	-56.40	0.30	+1.2, -1.2
19.95	-50.5	-50.40	0.10	+1.0, -1.0
25.12	-44.7	-44.50	0.20	+0.9, -0.9
31.62	-39.4	-39.40	0.00	+0.7, -0.7
39.81	-34.6	-34.70	-0.10	+0.7, -0.7
50.12	-30.2	-30.10	0.10	+0.5, -0.5
63.10	-26.2	-26.20	0.00	+0.5, -0.5
79.43	-22.5	-22.70	-0.20	+0.5, -0.5
100.00	-19.1	-19.20	-0.10	+0.5, -0.5
125.89	-16.1	-16.00	0.10	+0.5, -0.5
158.49	-13.4	-13.30	0.10	+0.5, -0.5
199.53	-10.9	-10.90	0.00	+0.5, -0.5
251.19	-8.6	-8.80	-0.20	+0.5, -0.5
316.23	-6.6	-6.70	-0.10	+0.4, -0.4
398.11	-4.8	-4.90	-0.10	+0.4, -0.4
501.19	-3.2	-3.30	-0.10	+0.4, -0.4
630.96	-1.9	-1.90	0.00	+0.4, -0.4
794.33	-0.8	-0.90	-0.10	+0.4, -0.4
1000.00	0.0	0.00	0.00	+0.4, -0.4
1258.90	0.6	0.50	-0.10	+0.4, -0.4
1584.90	1.0	0.80	-0.20	+0.4, -0.4
1995.30	1.2	1.10	-0.10	+0.4, -0.4
2511.90	1.3	1.10	-0.20	+0.4, -0.4
3162.30	1.2	1.10	-0.10	+0.4, -0.4
3981.10	1.0	0.80	-0.20	+0.4, -0.4
5011.90	0.5	0.50	0.00	+0.5, -0.5
6309.60	-0.1	-0.20	-0.10	+0.5, -0.7
7943.30	-1.1	-1.20	-0.10	+0.5, -1.0
10000.00	-2.5	-2.50	0.00	+0.7, -1.3
12589.00	-4.3	-4.40	-0.10	+1.0, -2.0
15849.00	-6.6	-6.70	-0.10	+1.0, -7.4
19953.00	-9.3	-9.40	-0.10	+1.0, -8.7
25119.00	-12.4	-12.70	-0.30	+3.5, -9.6
31623.00	-15.8	-16.80	-1.00	+4.3, -10.7

This instrument is in compliance with IEC 60651 (2001-10) 6.1 and 9.2.2, ANSI S1.4-1983 5.1 and 8.2.1, and IEC 60804 (2001-10) 5.1 for Type 1 sound level meters when used with a Larson Davis Type 1 microphone.

Technician: Ron Harris   Test Date: 02OCT2013

Sound Level Meter Model: 820A Serial Number: A1651
Certificate of C-Weight Electrical Conformance

This Type 1 Sound Level Meter (including attached PRM828 preamplifier and ADP005 18 pF input adapter) was calibrated with a reference 1kHz sine wave at a level of 114.0 dBSPL. The instrument's C-weighted response was then electrically tested using a 2.0 Vrms sinewave at exact frequencies as specified in IEC 60651 (2001-10) and ANSI S1.4-1983.



Freq (Hz)	Theor	Measured	Error	Tolerance
10.00	-14.3	-14.80	-0.50	+1.8, -1.8
12.59	-11.2	-11.90	-0.70	+1.5, -1.5
15.85	-8.5	-9.20	-0.70	+1.2, -1.2
19.95	-6.2	-6.70	-0.50	+1.0, -1.0
25.12	-4.4	-4.70	-0.30	+0.9, -0.9
31.62	-3.0	-3.20	-0.20	+0.7, -0.7
39.81	-2.0	-2.20	-0.20	+0.7, -0.7
50.12	-1.3	-1.50	-0.20	+0.5, -0.5
63.10	-0.8	-0.90	-0.10	+0.5, -0.5
79.43	-0.5	-0.60	-0.10	+0.5, -0.5
100.00	-0.3	-0.30	0.00	+0.5, -0.5
125.89	-0.2	-0.20	0.00	+0.5, -0.5
158.49	-0.1	-0.10	0.00	+0.5, -0.5
199.53	0.0	-0.10	-0.10	+0.5, -0.5
251.19	0.0	0.00	0.00	+0.5, -0.5
316.23	0.0	0.00	0.00	+0.4, -0.4
398.11	0.0	0.00	0.00	+0.4, -0.4
501.19	0.0	0.00	0.00	+0.4, -0.4
630.96	0.0	0.00	0.00	+0.4, -0.4
794.33	0.0	0.00	0.00	+0.4, -0.4
1000.00	0.0	0.00	0.00	+0.4, -0.4
1258.90	0.0	-0.10	-0.10	+0.4, -0.4
1584.90	-0.1	-0.10	0.00	+0.4, -0.4
1995.30	-0.2	-0.20	0.00	+0.4, -0.4
2511.90	-0.3	-0.30	0.00	+0.4, -0.4
3162.30	-0.5	-0.50	0.00	+0.4, -0.4
3981.10	-0.8	-0.80	0.00	+0.4, -0.4
5011.90	-1.3	-1.20	0.10	+0.5, -0.5
6309.60	-2.0	-1.80	0.20	+0.5, -0.7
7943.30	-3.0	-2.80	0.20	+0.5, -1.0
10000.00	-4.4	-4.20	0.20	+0.7, -1.3
12589.00	-6.2	-6.10	0.10	+1.0, -2.0
15849.00	-8.5	-8.50	0.00	+1.0, -7.4
19953.00	-11.2	-11.20	0.00	+1.0, -8.7
25119.00	-14.3	-14.30	0.00	+3.5, -9.6
31623.00	-17.7	-18.60	-0.90	+4.3, -10.7

This instrument is in compliance with IEC 60651 (2001-10) 6.1 and 9.2.2, ANSI S1.4-1983 5.1 and 8.2.1, and IEC 60804 (2001-10) 5.1 for Type 1 sound level meters when used with a Larson Davis Type 1 microphone.

Technician: Ron Harris   Test Date: 02OCT2013

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180220

Instrument Model 820, Serial Number 1652, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8160, ANSI S1.4 1983, IEC 651-Type 1 1979, and IEC 804-Type 1 1985.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

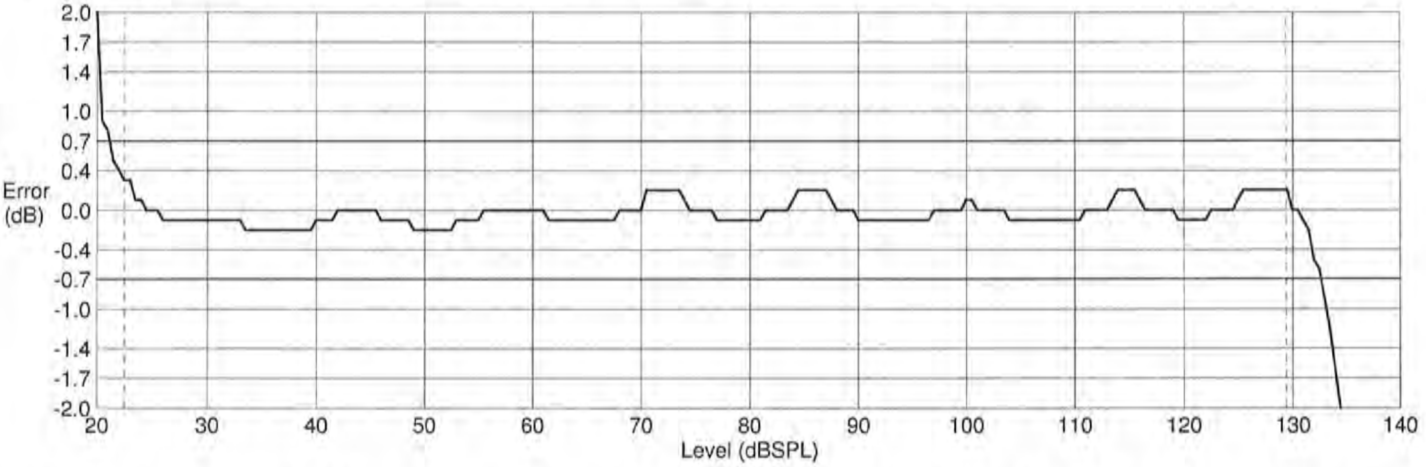
The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"AS RECEIVED" data same as shipped data.
Tested with PRM828-2582

Signed: Ron Harris
Technician: Ron Harris

Sound Level Meter Model: 820A Serial Number: A1652
Log Linearity, Differential Linearity and Range Data

This Type 1 Sound Level Meter (including attached PRM828 preamplifier and ADP005 18 pF input adapter) was calibrated with a reference 1kHz sine wave at a level of 114.0 dBSPL. The instrument's Log Linearity A-weighted slow response was then electrically tested using a 1kHz sine wave from 18.0 dBSPL to 138.0 dBSPL in 0.5 dB increments.



Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB	Levl dBSPL	Meas dBSPL	Err dB
18.0	**20.0**	**2.0**	38.5	38.3	-0.2	59.0	59.0	0.0	79.5	79.4	-0.1	100.0	100.1	0.1	120.5	120.4	-0.1
18.5	**20.3**	**1.8**	39.0	38.8	-0.2	59.5	59.5	0.0	80.0	79.9	-0.1	100.5	100.6	0.1	121.0	120.9	-0.1
19.0	**20.5**	**1.5**	39.5	39.3	-0.2	60.0	60.0	0.0	80.5	80.4	-0.1	101.0	101.0	0.0	121.5	121.4	-0.1
19.5	**20.8**	**1.3**	40.0	39.9	-0.1	60.5	60.5	0.0	81.0	80.9	-0.1	101.5	101.5	0.0	122.0	121.9	-0.1
20.0	**21.0**	**1.0**	40.5	40.4	-0.1	61.0	61.0	0.0	81.5	81.5	0.0	102.0	102.0	0.0	122.5	122.5	0.0
20.5	**21.4**	**0.9**	41.0	40.9	-0.1	61.5	61.4	-0.1	82.0	82.0	0.0	102.5	102.5	0.0	123.0	123.0	0.0
21.0	**21.8**	**0.8**	41.5	41.4	-0.1	62.0	61.9	-0.1	82.5	82.5	0.0	103.0	103.0	0.0	123.5	123.5	0.0
21.5	**22.0**	**0.5**	42.0	42.0	0.0	62.5	62.4	-0.1	83.0	83.0	0.0	103.5	103.5	0.0	124.0	124.0	0.0
22.0	**22.4**	**0.4**	42.5	42.5	0.0	63.0	62.9	-0.1	83.5	83.5	0.0	104.0	103.9	-0.1	124.5	124.5	0.0
22.5	22.8	0.3	43.0	43.0	0.0	63.5	63.4	-0.1	84.0	84.1	0.1	104.5	104.4	-0.1	125.0	125.1	0.1
23.0	23.3	0.3	43.5	43.5	0.0	64.0	63.9	-0.1	84.5	84.7	0.2	105.0	104.9	-0.1	125.5	125.7	0.2
23.5	23.6	0.1	44.0	44.0	0.0	64.5	64.4	-0.1	85.0	85.2	0.2	105.5	105.4	-0.1	126.0	126.2	0.2
24.0	24.1	0.1	44.5	44.5	0.0	65.0	64.9	-0.1	85.5	85.7	0.2	106.0	105.9	-0.1	126.5	126.7	0.2
24.5	24.5	0.0	45.0	45.0	0.0	65.5	65.4	-0.1	86.0	86.2	0.2	106.5	106.4	-0.1	127.0	127.2	0.2
25.0	25.0	0.0	45.5	45.5	0.0	66.0	65.9	-0.1	86.5	86.7	0.2	107.0	106.9	-0.1	127.5	127.7	0.2
25.5	25.5	0.0	46.0	45.9	-0.1	66.5	66.4	-0.1	87.0	87.2	0.2	107.5	107.4	-0.1	128.0	128.2	0.2
26.0	25.9	-0.1	46.5	46.4	-0.1	67.0	66.9	-0.1	87.5	87.6	0.1	108.0	107.9	-0.1	128.5	128.7	0.2
26.5	26.4	-0.1	47.0	46.9	-0.1	67.5	67.4	-0.1	88.0	88.0	0.0	108.5	108.4	-0.1	129.0	129.2	0.2
27.0	26.9	-0.1	47.5	47.4	-0.1	68.0	68.0	0.0	88.5	88.5	0.0	109.0	108.9	-0.1	**129.5**	**129.7**	**0.2**
27.5	27.4	-0.1	48.0	47.9	-0.1	68.5	68.5	0.0	89.0	89.0	0.0	109.5	109.4	-0.1	**130.0**	**130.0**	**0.0**
28.0	27.9	-0.1	48.5	48.4	-0.1	69.0	69.0	0.0	89.5	89.5	0.0	110.0	109.9	-0.1	**130.5**	**130.5**	**0.0**
28.5	28.4	-0.1	49.0	48.8	-0.2	69.5	69.5	0.0	90.0	89.9	-0.1	110.5	110.4	-0.1	**131.0**	**130.9**	**-0.1**
29.0	28.9	-0.1	49.5	49.3	-0.2	70.0	70.0	0.0	90.5	90.4	-0.1	111.0	111.0	0.0	**131.5**	**131.3**	**-0.2**
29.5	29.4	-0.1	50.0	49.8	-0.2	70.5	70.7	0.2	91.0	90.9	-0.1	111.5	111.5	0.0	**132.0**	**131.5**	**-0.5**
30.0	29.9	-0.1	50.5	50.3	-0.2	71.0	71.2	0.2	91.5	91.4	-0.1	112.0	112.0	0.0	**132.5**	**131.9**	**-0.6**
30.5	30.4	-0.1	51.0	50.8	-0.2	71.5	71.7	0.2	92.0	91.9	-0.1	112.5	112.5	0.0	**133.0**	**132.1**	**-0.9**
31.0	30.9	-0.1	51.5	51.3	-0.2	72.0	72.2	0.2	92.5	92.4	-0.1	113.0	113.0	0.0	**133.5**	**132.3**	**-1.2**
31.5	31.4	-0.1	52.0	51.8	-0.2	72.5	72.7	0.2	93.0	92.9	-0.1	113.5	113.6	0.1	**134.0**	**132.4**	**-1.6**
32.0	31.9	-0.1	52.5	52.3	-0.2	73.0	73.2	0.2	93.5	93.4	-0.1	114.0	114.2	0.2	**134.5**	**132.4**	**-2.1**
32.5	32.4	-0.1	53.0	52.9	-0.1	73.5	73.7	0.2	94.0	93.9	-0.1	114.5	114.7	0.2	**135.0**	**132.4**	**-2.6**
33.0	32.9	-0.1	53.5	53.4	-0.1	74.0	74.1	0.1	94.5	94.4	-0.1	115.0	115.2	0.2	**135.5**	**132.4**	**-3.1**
33.5	33.3	-0.2	54.0	53.9	-0.1	74.5	74.5	0.0	95.0	94.9	-0.1	115.5	115.7	0.2	**136.0**	**132.4**	**-3.6**
34.0	33.8	-0.2	54.5	54.4	-0.1	75.0	75.0	0.0	95.5	95.4	-0.1	116.0	116.1	0.1	**136.5**	**132.3**	**-4.2**
34.5	34.3	-0.2	55.0	54.9	-0.1	75.5	75.5	0.0	96.0	95.9	-0.1	116.5	116.5	0.0	**137.0**	**132.4**	**-4.6**
35.0	34.8	-0.2	55.5	55.5	0.0	76.0	76.0	0.0	96.5	96.4	-0.1	117.0	117.0	0.0	**137.5**	**132.4**	**-5.1**
35.5	35.3	-0.2	56.0	56.0	0.0	76.5	76.5	0.0	97.0	97.0	0.0	117.5	117.5	0.0	**138.0**	**132.5**	**-5.5**
36.0	35.8	-0.2	56.5	56.5	0.0	77.0	76.9	-0.1	97.5	97.5	0.0	118.0	118.0	0.0			
36.5	36.3	-0.2	57.0	57.0	0.0	77.5	77.4	-0.1	98.0	98.0	0.0	118.5	118.5	0.0			
37.0	36.8	-0.2	57.5	57.5	0.0	78.0	77.9	-0.1	98.5	98.5	0.0	119.0	119.0	0.0			
37.5	37.3	-0.2	58.0	58.0	0.0	78.5	78.4	-0.1	99.0	99.0	0.0	119.5	119.4	-0.1			
38.0	37.8	-0.2	58.5	58.5	0.0	79.0	78.9	-0.1	99.5	99.5	0.0	120.0	119.9	-0.1			

Plotted per typical sensitivity of a 2541 microphone; 44.5 mV/Pa & 17.1 pF.

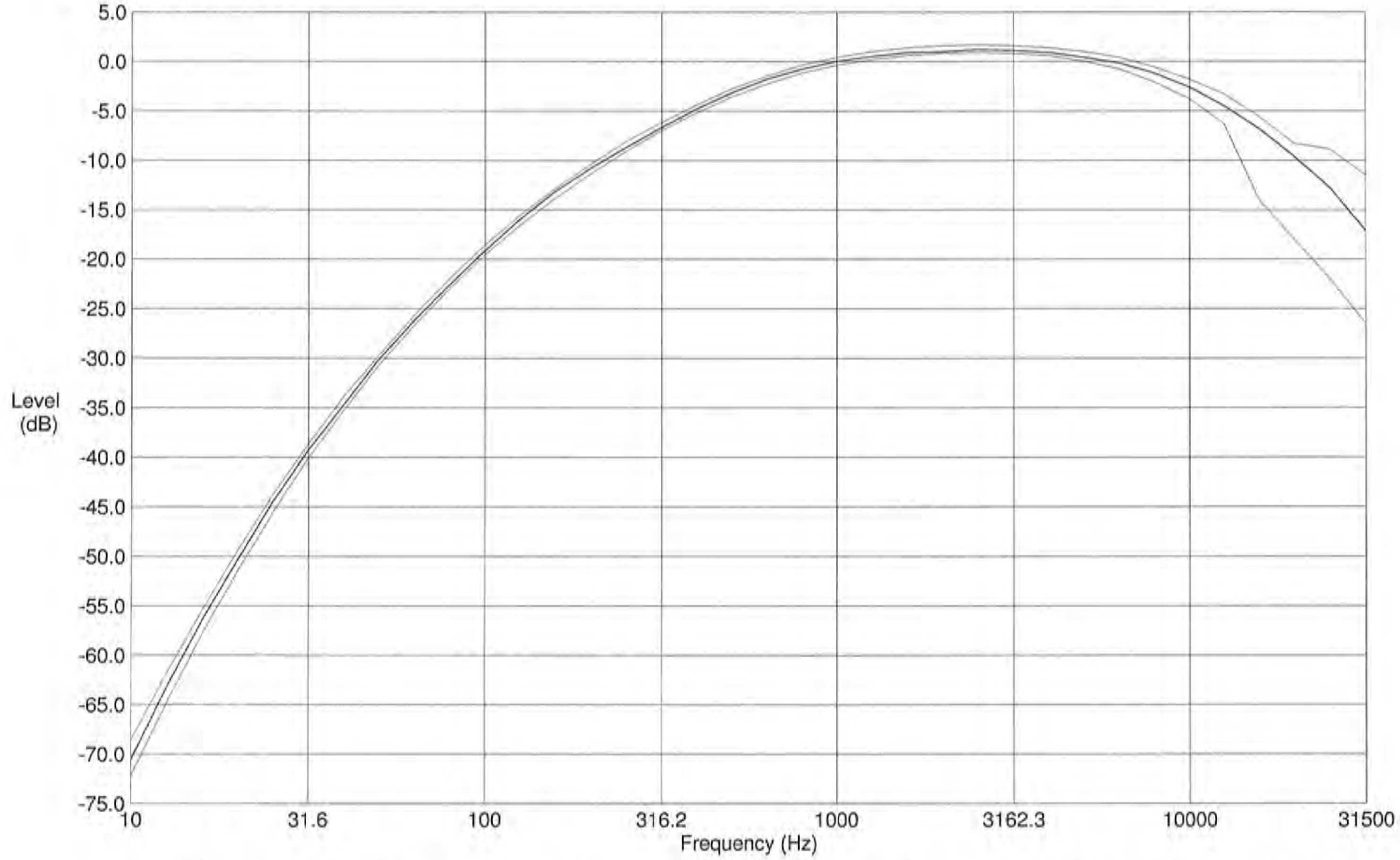
Overload occurs at 129.5 dBSPL.
Primary indicator range: 106.9 dB (lower limit: 22.5 dBSPL to upper limit: 129.4 dBSPL).
Dynamic range: 112.3 dB (noise floor: 17.1 dBSPL to upper limit: 129.4 dBSPL).

This instrument is in compliance with IEC 60651 (2001-10) 7.9 and 7.10, ANSI S1.4-1983 3.2 and IEC 60804 (2001-10) 9.2.1 for Type 1 sound level meters when used with a Larson Davis Type 1 microphone.

Technician: Ron Harris Test Date: 02OCT2013

Sound Level Meter Model: 820A Serial Number: A1652
Certificate of A-Weight Electrical Conformance

This Type 1 Sound Level Meter (including attached PRM828 preamplifier and ADP005 18 pF input adapter) was calibrated with a reference 1kHz sine wave at a level of 114.0 dBSPL. The instrument's A-weighted response was then electrically tested using a 1.9 Vrms sinewave at exact frequencies as specified in IEC 60651 (2001-10) and ANSI S1.4-1983.



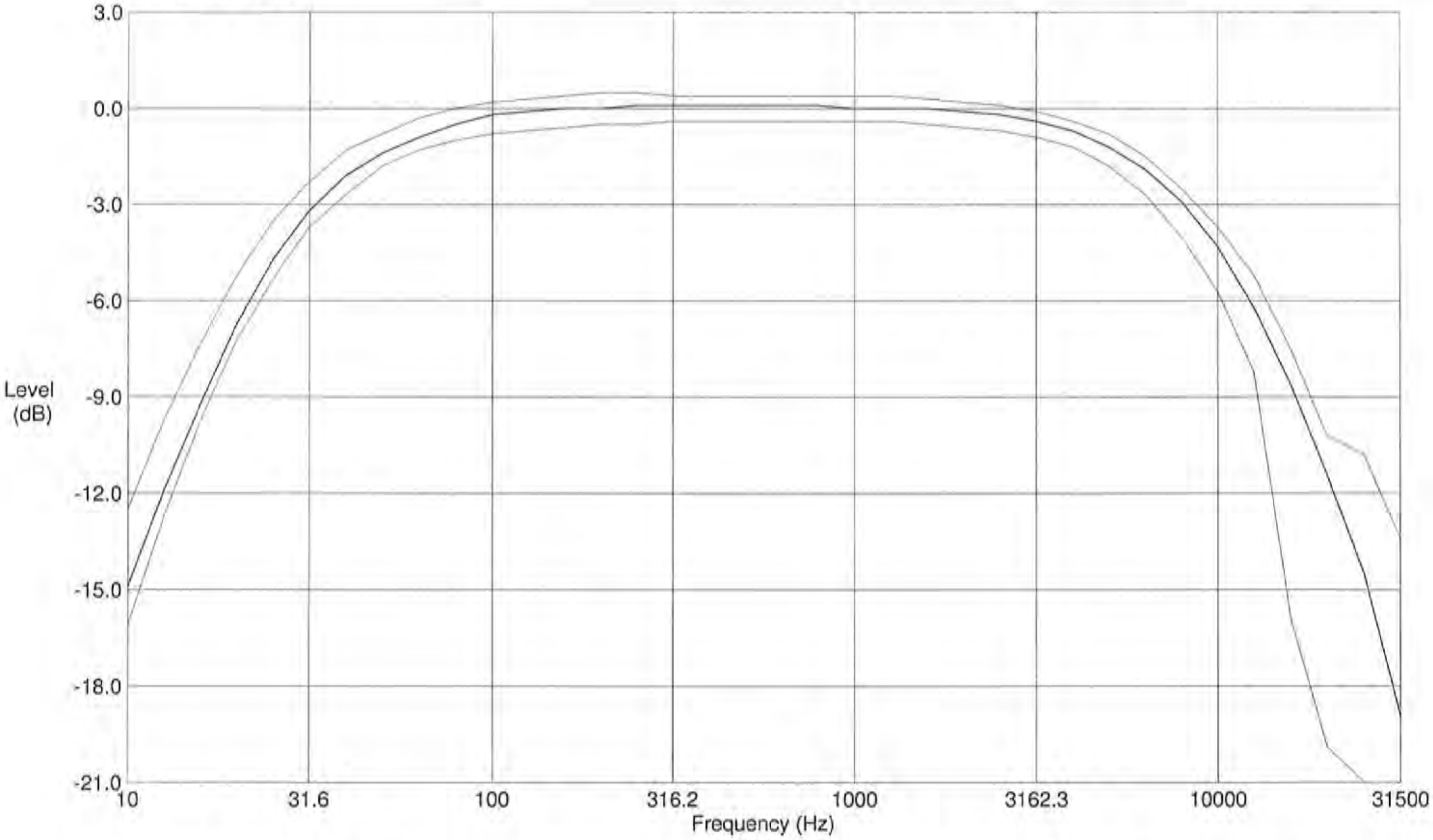
Freq (Hz)	Theor	Measured	Error	Tolerance
10.00	-70.4	-70.60	-0.20	+1.8, -1.8
12.59	-63.4	-63.30	0.10	+1.5, -1.5
15.85	-56.7	-56.50	0.20	+1.2, -1.2
19.95	-50.5	-50.40	0.10	+1.0, -1.0
25.12	-44.7	-44.50	0.20	+0.9, -0.9
31.62	-39.4	-39.30	0.10	+0.7, -0.7
39.81	-34.6	-34.70	-0.10	+0.7, -0.7
50.12	-30.2	-30.10	0.10	+0.5, -0.5
63.10	-26.2	-26.20	0.00	+0.5, -0.5
79.43	-22.5	-22.60	-0.10	+0.5, -0.5
100.00	-19.1	-19.20	-0.10	+0.5, -0.5
125.89	-16.1	-16.00	0.10	+0.5, -0.5
158.49	-13.4	-13.20	0.20	+0.5, -0.5
199.53	-10.9	-10.80	0.10	+0.5, -0.5
251.19	-8.6	-8.70	-0.10	+0.5, -0.5
316.23	-6.6	-6.70	-0.10	+0.4, -0.4
398.11	-4.8	-4.80	0.00	+0.4, -0.4
501.19	-3.2	-3.20	0.00	+0.4, -0.4
630.96	-1.9	-1.80	0.10	+0.4, -0.4
794.33	-0.8	-0.80	0.00	+0.4, -0.4
1000.00	0.0	0.00	0.00	+0.4, -0.4
1258.90	0.6	0.50	-0.10	+0.4, -0.4
1584.90	1.0	0.90	-0.10	+0.4, -0.4
1995.30	1.2	1.00	-0.20	+0.4, -0.4
2511.90	1.3	1.20	-0.10	+0.4, -0.4
3162.30	1.2	1.10	-0.10	+0.4, -0.4
3981.10	1.0	0.90	-0.10	+0.4, -0.4
5011.90	0.5	0.40	-0.10	+0.5, -0.5
6309.60	-0.1	-0.20	-0.10	+0.5, -0.7
7943.30	-1.1	-1.20	-0.10	+0.5, -1.0
10000.00	-2.5	-2.60	-0.10	+0.7, -1.3
12589.00	-4.3	-4.50	-0.20	+1.0, -2.0
15849.00	-6.6	-6.80	-0.20	+1.0, -7.4
19953.00	-9.3	-9.60	-0.30	+1.0, -8.7
25119.00	-12.4	-12.80	-0.40	+3.5, -9.6
31623.00	-15.8	-17.10	-1.30	+4.3, -10.7

This instrument is in compliance with IEC 60651 (2001-10) 6.1 and 9.2.2, ANSI S1.4-1983 5.1 and 8.2.1, and IEC 60804 (2001-10) 5.1 for Type 1 sound level meters when used with a Larson Davis Type 1 microphone.

Technician: Ron Harris   Test Date: 02OCT2013

Sound Level Meter Model: 820A Serial Number: A1652
Certificate of C-Weight Electrical Conformance

This Type 1 Sound Level Meter (including attached PRM828 preamplifier and ADP005 18 pF input adapter) was calibrated with a reference 1kHz sine wave at a level of 114.0 dBSPL. The instrument's C-weighted response was then electrically tested using a 1.9 Vrms sinewave at exact frequencies as specified in IEC 60651 (2001-10) and ANSI S1.4-1983.



Freq (Hz)	Theor	Measured	Error	Tolerance
10.00	-14.3	-14.90	-0.60	+1.8, -1.8
12.59	-11.2	-11.90	-0.70	+1.5, -1.5
15.85	-8.5	-9.20	-0.70	+1.2, -1.2
19.95	-6.2	-6.70	-0.50	+1.0, -1.0
25.12	-4.4	-4.70	-0.30	+0.9, -0.9
31.62	-3.0	-3.20	-0.20	+0.7, -0.7
39.81	-2.0	-2.10	-0.10	+0.7, -0.7
50.12	-1.3	-1.40	-0.10	+0.5, -0.5
63.10	-0.8	-0.90	-0.10	+0.5, -0.5
79.43	-0.5	-0.50	0.00	+0.5, -0.5
100.00	-0.3	-0.20	0.10	+0.5, -0.5
125.89	-0.2	-0.10	0.10	+0.5, -0.5
158.49	-0.1	0.00	0.10	+0.5, -0.5
199.53	0.0	0.00	0.00	+0.5, -0.5
251.19	0.0	0.10	0.10	+0.5, -0.5
316.23	0.0	0.10	0.10	+0.4, -0.4
398.11	0.0	0.10	0.10	+0.4, -0.4
501.19	0.0	0.10	0.10	+0.4, -0.4
630.96	0.0	0.10	0.10	+0.4, -0.4
794.33	0.0	0.10	0.10	+0.4, -0.4
1000.00	0.0	0.00	0.00	+0.4, -0.4
1258.90	0.0	0.00	0.00	+0.4, -0.4
1584.90	-0.1	0.00	0.10	+0.4, -0.4
1995.30	-0.2	-0.10	0.10	+0.4, -0.4
2511.90	-0.3	-0.20	0.10	+0.4, -0.4
3162.30	-0.5	-0.40	0.10	+0.4, -0.4
3981.10	-0.8	-0.70	0.10	+0.4, -0.4
5011.90	-1.3	-1.20	0.10	+0.5, -0.5
6309.60	-2.0	-1.90	0.10	+0.5, -0.7
7943.30	-3.0	-2.90	0.10	+0.5, -1.0
10000.00	-4.4	-4.30	0.10	+0.7, -1.3
12589.00	-6.2	-6.20	0.00	+1.0, -2.0
15849.00	-8.5	-8.60	-0.10	+1.0, -7.4
19953.00	-11.2	-11.40	-0.20	+1.0, -8.7
25119.00	-14.3	-14.50	-0.20	+3.5, -9.6
31623.00	-17.7	-18.90	-1.20	+4.3, -10.7

This instrument is in compliance with IEC 60651 (2001-10) 6.1 and 9.2.2, ANSI S1.4-1983 5.1 and 8.2.1, and IEC 60804 (2001-10) 5.1 for Type 1 sound level meters when used with a Larson Davis Type 1 microphone.

Technician: Ron Harris   Test Date: 02OCT2013

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180213

Instrument Model PRM828, Serial Number 2581, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Agilent Technologies	34401A	MY41044529	12 Months	25JAN2014	5954339
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

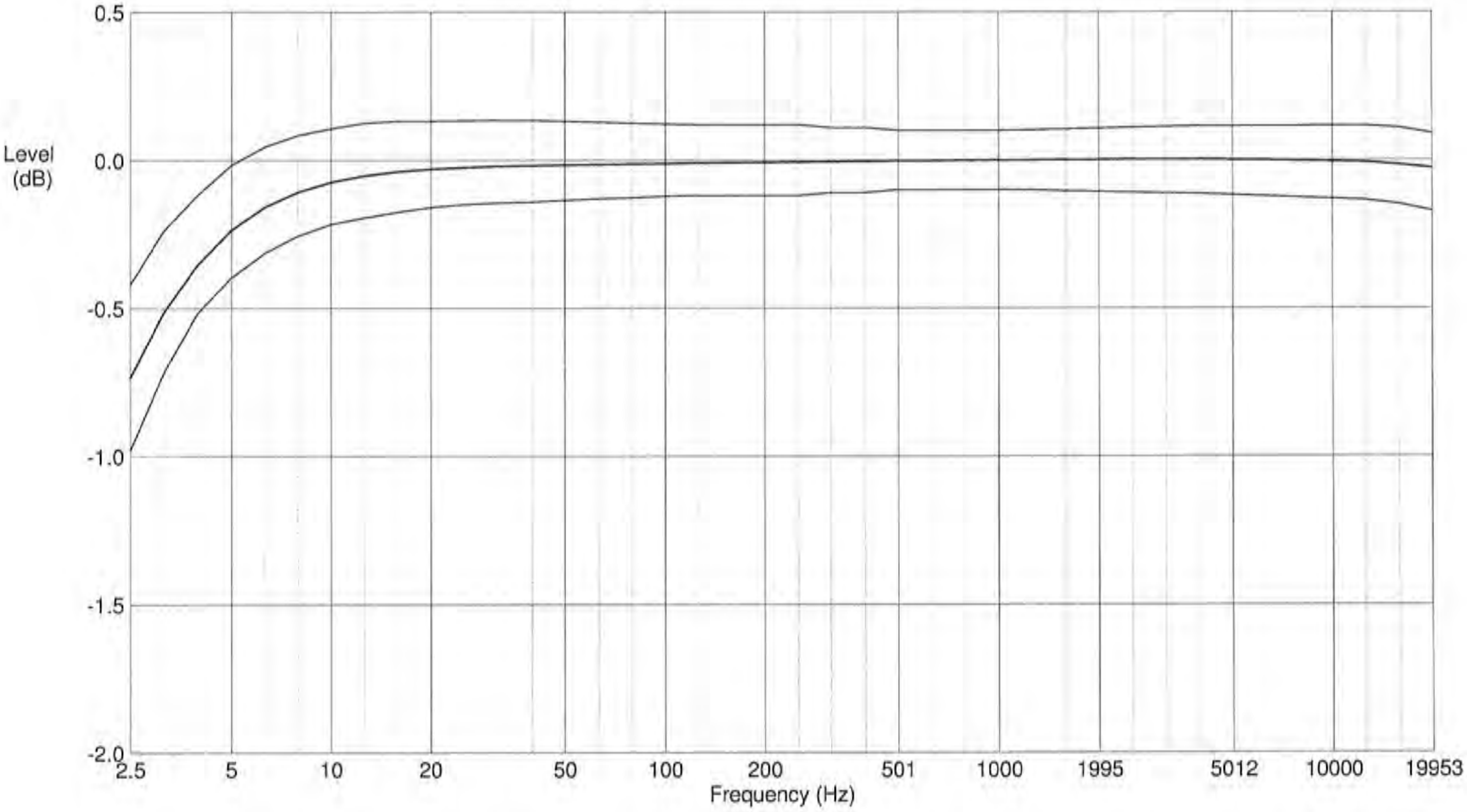
The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.

Signed: Ron Harris
Technician: Ron Harris

Preamplifier Model: 828 Serial Number: 2581
Certificate of Electrical Conformance

Frequency response of this model 828 preamplifier was tested at a level of 1 Vrms with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 0.8923 Vrms (-0.989 dBV), uncertainty 0.033 dB. Results are displayed relative to the level at 1kHz.



Freq (Hz)	Measured (dB)	Uncert (dB)	Tolerance (dB)
2.51	-0.73	0.075	-0.42, -0.98
3.16	-0.51	0.058	-0.24, -0.72
3.98	-0.35	0.058	-0.12, -0.52
5.01	-0.24	0.036	-0.02, -0.40
6.31	-0.16	0.036	+0.05, -0.31
7.94	-0.11	0.036	+0.08, -0.26
10.00	-0.07	0.016	+0.11, -0.22
12.59	-0.05	0.016	+0.13, -0.19
15.85	-0.04	0.016	+0.13, -0.18
19.95	-0.03	0.016	+0.13, -0.16
25.12	-0.03	0.016	+0.13, -0.15
31.62	-0.02	0.016	+0.14, -0.14
39.81	-0.02	0.016	+0.14, -0.14
50.12	-0.02	0.016	+0.13, -0.14
63.10	-0.02	0.016	+0.13, -0.13
79.43	-0.01	0.016	+0.13, -0.13
100.00	-0.01	0.016	+0.12, -0.12
125.89	-0.01	0.016	+0.12, -0.12
158.49	-0.01	0.016	+0.12, -0.12
199.53	-0.01	0.016	+0.12, -0.12
251.19	-0.01	0.016	+0.12, -0.12
316.23	-0.01	0.016	+0.11, -0.11
398.11	-0.00	0.016	+0.11, -0.11
501.19	-0.00	0.016	+0.10, -0.10
630.96	-0.00	0.016	+0.10, -0.10
794.33	-0.00	0.016	+0.10, -0.10
1000.00	0.00	0.016	+0.10, -0.10
1258.90	0.00	0.016	+0.10, -0.10
1584.90	0.00	0.016	+0.10, -0.10
1995.30	0.00	0.016	+0.11, -0.11
2511.90	0.00	0.016	+0.11, -0.11
3162.30	0.00	0.016	+0.11, -0.11
3981.10	0.00	0.016	+0.11, -0.11
5011.90	0.00	0.016	+0.12, -0.12
6309.60	-0.00	0.016	+0.12, -0.12
7943.30	-0.00	0.016	+0.12, -0.13
10000.00	-0.01	0.016	+0.12, -0.13
12589.00	-0.01	0.016	+0.12, -0.14
15849.00	-0.02	0.016	+0.11, -0.15
19953.00	-0.03	0.016	+0.09, -0.17
25250.00	-0.05	0.022	n/a n/a
31500.00	-0.07	0.022	n/a n/a
39750.00	-0.12	0.022	n/a n/a
50000.00	-0.21	0.022	n/a n/a
63000.00	-0.36	0.047	n/a n/a
79500.00	-0.70	0.047	n/a n/a
100000.00	-1.39	0.047	n/a n/a
126000.00	-2.48	0.063	n/a n/a

Noise floor data: 1kHz (1/3 Octave) = 0.55 uV, -5.2 dBuV, uncertainty = 0.47 dB
Flat (20Hz-20kHz) = 5.1 uV, 14.2 dBuV, uncertainty = 0.47 dB
Awt = 3.5 uV, 10.9 dBuV, uncertainty = 0.46 dB

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

Technician: Ron Harris   Test Date: 02OCT2013

PCB PIEZOTRONICS
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Certificate of Calibration and Conformance

Certificate Number 2013-180214

Instrument Model PRM828, Serial Number 2582, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8135.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Agilent Technologies	34401A	MY41044529	12 Months	25JAN2014	5954339
Larson Davis	LDSigGn/2209	0277 / 0109	12 Months	08MAR2014	2013-171090

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 23 ° Centigrade

Relative Humidity: 32 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

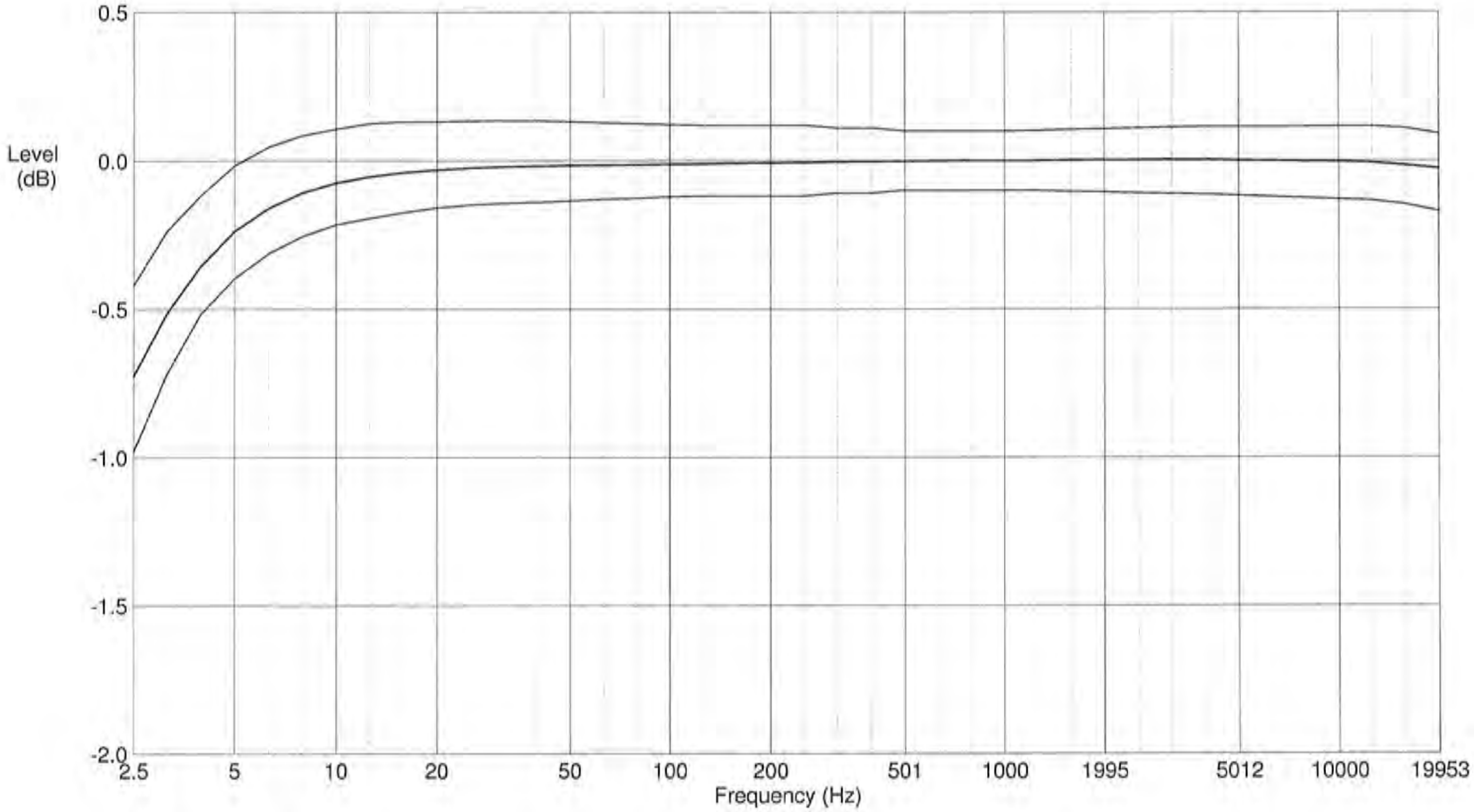
The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

"As received" data is the same as shipped data.

Signed: Ron Harris
Technician: Ron Harris

Preamplifier Model: 828 Serial Number: 2582
Certificate of Electrical Conformance

Frequency response of this model 828 preamplifier was tested at a level of 1 Vrms with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 0.8903 Vrms (-1.009 dBV), uncertainty 0.033 dB. Results are displayed relative to the level at 1kHz.



Freq (Hz)	Measured (dB)	Uncert (dB)	Tolerance (dB)
2.51	-0.73	0.075	-0.42, -0.98
3.16	-0.51	0.058	-0.24, -0.72
3.98	-0.36	0.058	-0.12, -0.52
5.01	-0.24	0.036	-0.02, -0.40
6.31	-0.16	0.036	+0.05, -0.31
7.94	-0.11	0.036	+0.08, -0.26
10.00	-0.08	0.016	+0.11, -0.22
12.59	-0.05	0.016	+0.13, -0.19
15.85	-0.04	0.016	+0.13, -0.18
19.95	-0.03	0.016	+0.13, -0.16
25.12	-0.03	0.016	+0.13, -0.15
31.62	-0.02	0.016	+0.14, -0.14
39.81	-0.02	0.016	+0.14, -0.14
50.12	-0.02	0.016	+0.13, -0.14
63.10	-0.02	0.016	+0.13, -0.13
79.43	-0.01	0.016	+0.13, -0.13
100.00	-0.01	0.016	+0.12, -0.12
125.89	-0.01	0.016	+0.12, -0.12
158.49	-0.01	0.016	+0.12, -0.12
199.53	-0.01	0.016	+0.12, -0.12
251.19	-0.01	0.016	+0.12, -0.12
316.23	-0.01	0.016	+0.11, -0.11
398.11	-0.00	0.016	+0.11, -0.11
501.19	-0.00	0.016	+0.10, -0.10
630.96	-0.00	0.016	+0.10, -0.10
794.33	0.00	0.016	+0.10, -0.10
1000.00	0.00	0.016	+0.10, -0.10
1258.90	0.00	0.016	+0.10, -0.10
1584.90	0.00	0.016	+0.10, -0.10
1995.30	0.00	0.016	+0.11, -0.11
2511.90	0.00	0.016	+0.11, -0.11
3162.30	0.00	0.016	+0.11, -0.11
3981.10	0.00	0.016	+0.11, -0.11
5011.90	0.00	0.016	+0.12, -0.12
6309.60	-0.00	0.016	+0.12, -0.12
7943.30	-0.00	0.016	+0.12, -0.13
10000.00	-0.01	0.016	+0.12, -0.13
12589.00	-0.01	0.016	+0.12, -0.14
15849.00	-0.02	0.016	+0.11, -0.15
19953.00	-0.03	0.016	+0.09, -0.17
25250.00	-0.05	0.022	n/a n/a
31500.00	-0.08	0.022	n/a n/a
39750.00	-0.12	0.022	n/a n/a
50000.00	-0.21	0.022	n/a n/a
63000.00	-0.36	0.047	n/a n/a
79500.00	-0.67	0.047	n/a n/a
100000.00	-1.33	0.047	n/a n/a
126000.00	-2.39	0.063	n/a n/a

Noise floor data: 1kHz (1/3 Octave) = 0.41 uV, -7.8 dBuV, uncertainty = 0.47 dB
Flat (20Hz-20kHz) = 5.1 uV, 14.1 dBuV, uncertainty = 0.47 dB
Awt = 3.5 uV, 10.8 dBuV, uncertainty = 0.46 dB

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

Technician: Ron Harris   Test Date: 02OCT2013

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180698

Microphone Model 377B20, Serial Number 137300, was calibrated on 10OCT2013. The microphone meets factory specifications per Test Procedure D0001.8167.

New Instrument
Date Calibrated: 10OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Hewlett Packard	34401A	3146A62099	12 Months	26NOV2013	5884920
Larson Davis	PRM915	0102	12 Months	04DEC2013	2012-167168
Larson Davis	PRM916	0102	12 Months	13DEC2013	2012-167454
Larson Davis	2559	2504	12 Months	03JAN2014	19648-1
Larson Davis	CAL250	42630	12 Months	04JAN2014	2013-168402
Larson Davis	2900	0575	12 Months	24JUL2014	2013-177110
Larson Davis	PRM902	0206	12 Months	15AUG2014	2013-178254
Larson Davis	MTS1000 / 2201	1000 / 0100	12 Months	03SEP2014	SM090313

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

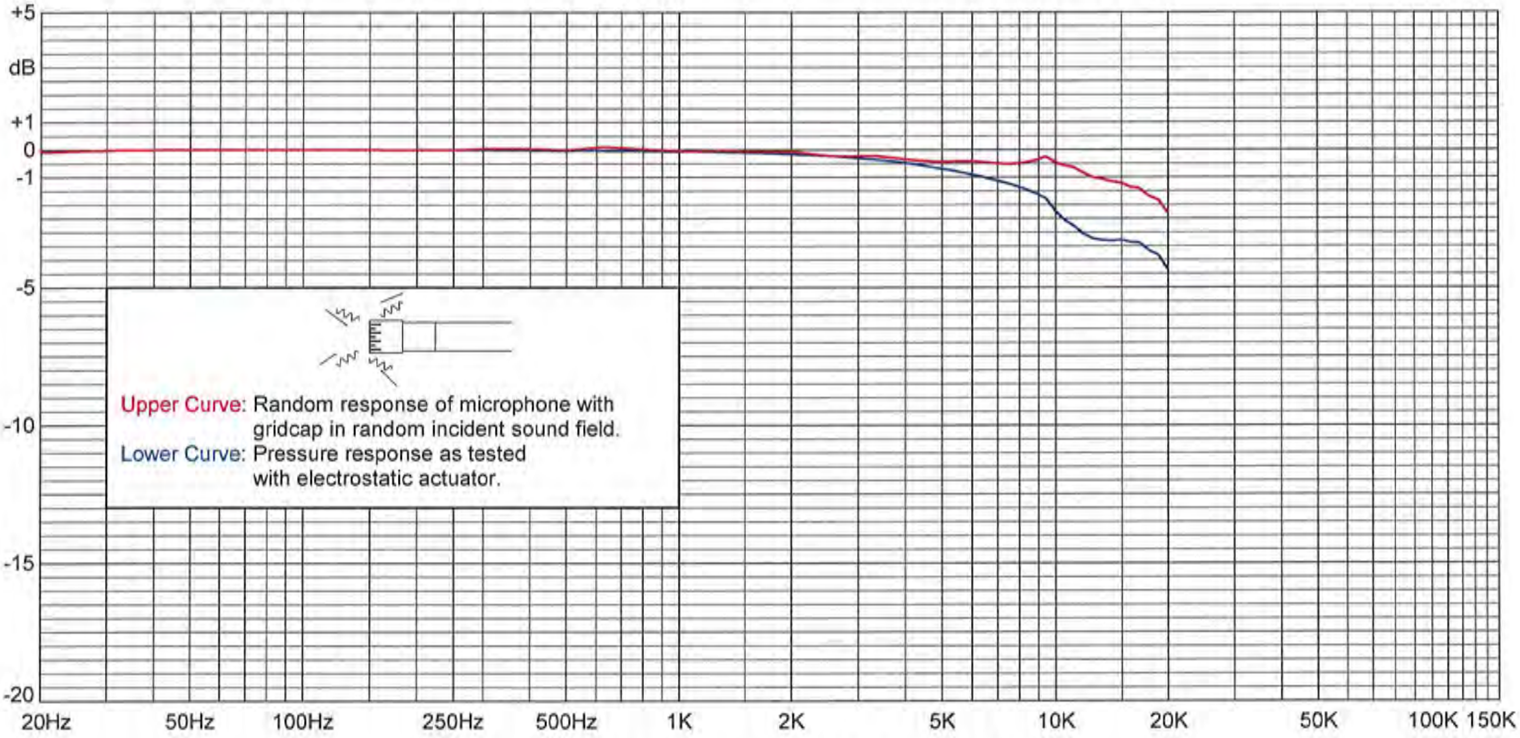
Signed: Abraham Ortega
Technician: Abraham Ortega

Larson Davis

PCB 1/2" Microphone Calibration Chart
Model: 377B20 Serial Number: 137300

Open Circuit Sensitivity @ 1015.1 mbar & 251.19 Hz
-25.80 dB re 1V/Pascal
51.27 mV/Pascal
-0.22 K_0(-dB re 50 mV/Pascal)
Expanded Uncertainty @ ~95% confidence level
0.2 dB

Capacitance @ 251.2 Hz
12.4 pF
Lower Limiting Frequency
-3 dB @ **1.41** Hz
Test Conditions:
Polarization Voltage **0** V
Ambient Pressure **1015.1** mbar
Temperature **25.2** °C
Relative Humidity **36.0** %



Frequency Response (0 dB @ 251.19 Hz)
Random and actuator response with reference to level at 251.19 Hz

Freq (Hz)	Upper (dB)	Lower (dB)
19.95	-0.07	-0.07
25.12	-0.03	-0.03
31.62	0.00	-0.00
39.81	0.01	0.01
50.12	0.01	0.01
63.10	0.02	0.02
79.43	0.01	0.01
100.00	0.01	0.01
125.89	0.01	0.01
158.49	0.01	0.01
199.53	0.00	0.00
251.19	0.00	0.00
316.23	0.05	-0.01
398.11	0.05	-0.01
501.19	0.00	-0.02
630.96	0.11	-0.03
794.33	0.03	-0.04
1000.00	-0.03	-0.05
1059.25	-0.06	-0.06
1122.02	-0.05	-0.06
1188.50	-0.05	-0.07
1258.93	-0.04	-0.08
1333.52	-0.03	-0.08
1412.54	-0.04	-0.09
1496.24	-0.06	-0.10
1584.89	-0.07	-0.11
1678.80	-0.07	-0.12
1778.28	-0.07	-0.13
1883.65	-0.06	-0.14
1995.26	-0.06	-0.15
2113.49	-0.09	-0.17
2238.72	-0.14	-0.19
2371.37	-0.18	-0.20
2511.89	-0.21	-0.21
2660.73	-0.23	-0.24
2818.38	-0.23	-0.26
2985.38	-0.22	-0.29
3162.28	-0.22	-0.32
3349.65	-0.22	-0.35
3548.13	-0.26	-0.39
3758.37	-0.29	-0.42
3981.07	-0.34	-0.47
4216.97	-0.37	-0.51
4466.84	-0.39	-0.56
4731.51	-0.42	-0.63
5011.87	-0.43	-0.69
5308.84	-0.42	-0.74
5623.41	-0.42	-0.81
5956.62	-0.41	-0.88
6309.57	-0.43	-0.96
6683.44	-0.46	-1.05
7079.46	-0.49	-1.13
7498.94	-0.52	-1.23
7943.28	-0.49	-1.32
8413.95	-0.45	-1.46
8912.51	-0.36	-1.60
9440.61	-0.25	-1.76
10000.00	-0.46	-2.23
10592.54	-0.57	-2.55
11220.19	-0.64	-2.77
11885.02	-0.83	-3.04
12589.25	-1.00	-3.23
13335.21	-1.06	-3.27
14125.38	-1.15	-3.30
14962.36	-1.20	-3.27
15848.93	-1.35	-3.35
16788.04	-1.40	-3.37
17782.80	-1.68	-3.65
18836.49	-1.82	-3.82
19952.62	-2.27	-4.32

Abraham Ortega 10OCT2013
Larson-Davis Model 9700 ES Microphone Calibration System

PCB PIEZOTRONICS®
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180699

Microphone Model 377B20, Serial Number 137305, was calibrated on 10OCT2013. The microphone meets factory specifications per Test Procedure D0001.8167.

New Instrument
Date Calibrated: 10OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Hewlett Packard	34401A	3146A62099	12 Months	26NOV2013	5884920
Larson Davis	PRM915	0102	12 Months	04DEC2013	2012-167168
Larson Davis	PRM916	0102	12 Months	13DEC2013	2012-167454
Larson Davis	2559	2504	12 Months	03JAN2014	19648-1
Larson Davis	CAL250	42630	12 Months	04JAN2014	2013-168402
Larson Davis	2900	0575	12 Months	24JUL2014	2013-177110
Larson Davis	PRM902	0206	12 Months	15AUG2014	2013-178254
Larson Davis	MTS1000 / 2201	1000 / 0100	12 Months	03SEP2014	SM090313

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as printed on microphone calibration chart.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

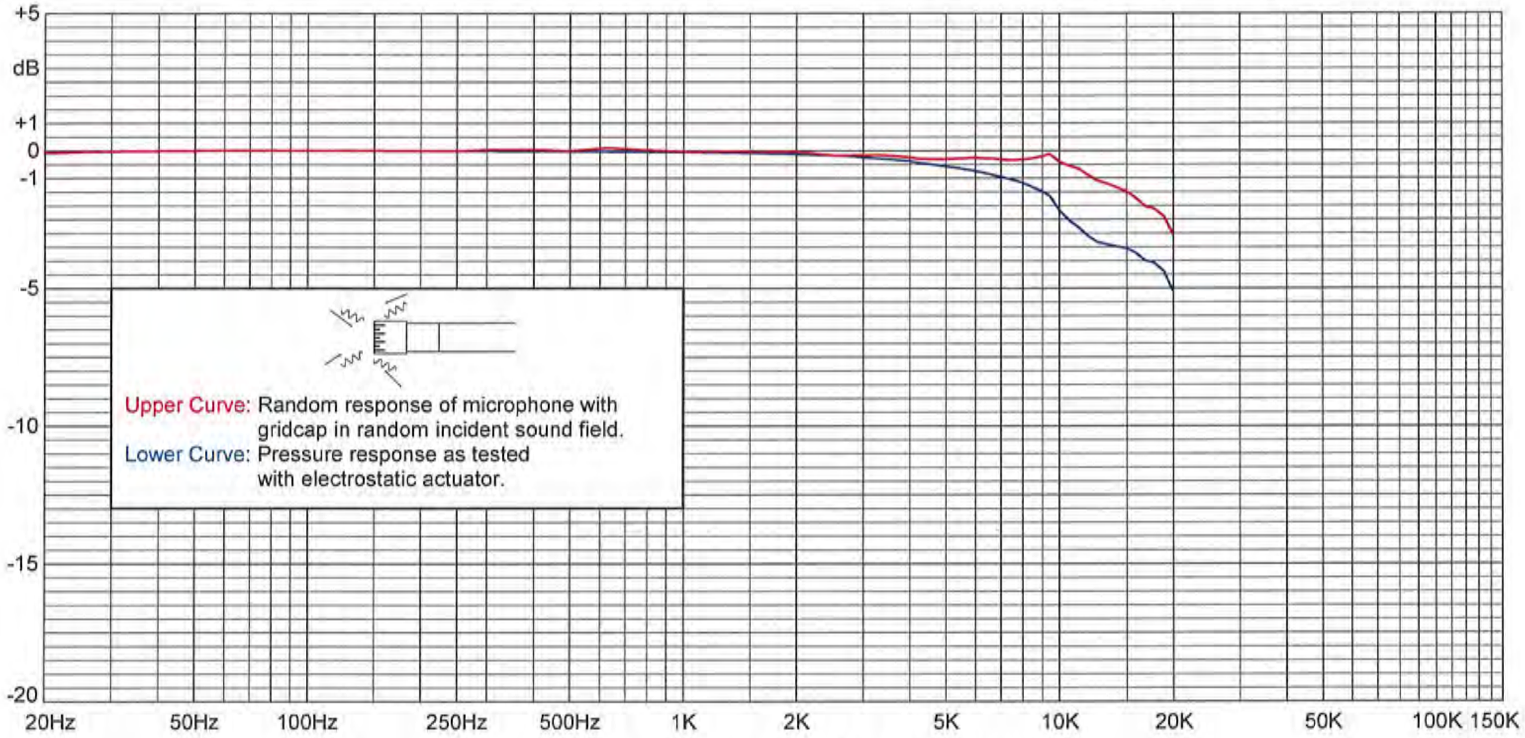
Signed:
Technician: Abraham Ortega

Larson Davis

PCB 1/2" Microphone Calibration Chart
Model: 377B20 Serial Number: 137305

Open Circuit Sensitivity @ 1015.0 mbar & 251.19 Hz
-26.05 dB re 1V/Pascal
49.85 mV/Pascal
+0.03 K_0(-dB re 50 mV/Pascal)
Expanded Uncertainty @ ~95% confidence level
0.2 dB

Capacitance @ 251.2 Hz
12.0 pF
Lower Limiting Frequency
-3 dB @ **1.44** Hz
Test Conditions:
Polarization Voltage **0** V
Ambient Pressure **1015.0** mbar
Temperature **25.2** °C
Relative Humidity **36.0** %



Frequency Response (0 dB @ 251.19 Hz)
Random and actuator response with reference to level at 251.19 Hz

Freq (Hz)	Upper (dB)	Lower (dB)
19.95	-0.07	-0.07
25.12	-0.03	-0.03
31.62	-0.01	-0.01
39.81	0.00	0.00
50.12	0.01	0.01
63.10	0.01	0.01
79.43	0.01	0.01
100.00	0.01	0.01
125.89	0.01	0.01
158.49	0.01	0.01
199.53	0.00	0.00
251.19	0.00	0.00
316.23	0.06	-0.00
398.11	0.05	-0.01
501.19	0.00	-0.02
630.96	0.12	-0.02
794.33	0.04	-0.03
1000.00	-0.02	-0.04
1059.25	-0.05	-0.05
1122.02	-0.04	-0.05
1188.50	-0.03	-0.05
1258.93	-0.02	-0.06
1333.52	-0.02	-0.07
1412.54	-0.02	-0.07
1496.24	-0.04	-0.08
1584.89	-0.04	-0.08
1678.80	-0.04	-0.09
1778.28	-0.04	-0.10
1883.65	-0.03	-0.11
1995.26	-0.03	-0.12
2113.49	-0.05	-0.13
2238.72	-0.10	-0.15
2371.37	-0.12	-0.14
2511.89	-0.16	-0.16
2660.73	-0.17	-0.18
2818.38	-0.17	-0.20
2985.38	-0.16	-0.23
3162.28	-0.15	-0.25
3349.65	-0.15	-0.28
3548.13	-0.17	-0.30
3758.37	-0.20	-0.33
3981.07	-0.23	-0.36
4216.97	-0.28	-0.42
4466.84	-0.30	-0.47
4731.51	-0.30	-0.51
5011.87	-0.29	-0.55
5308.84	-0.28	-0.60
5623.41	-0.27	-0.66
5956.62	-0.25	-0.72
6309.57	-0.26	-0.79
6683.44	-0.28	-0.87
7079.46	-0.31	-0.95
7498.94	-0.34	-1.05
7943.28	-0.31	-1.14
8413.95	-0.28	-1.29
8912.51	-0.21	-1.45
9440.61	-0.12	-1.63
10000.00	-0.39	-2.16
10592.54	-0.53	-2.51
11220.19	-0.64	-2.77
11885.02	-0.87	-3.08
12589.25	-1.08	-3.31
13335.21	-1.19	-3.40
14125.38	-1.33	-3.48
14962.36	-1.46	-3.53
15848.93	-1.70	-3.70
16788.04	-2.01	-3.98
17782.80	-2.10	-4.07
18836.49	-2.38	-4.38
19952.62	-3.04	-5.09

Abraham Ortega 10OCT2013
Larson-Davis Model 9700 ES Microphone Calibration System

PCB PIEZOTRONICS™
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2013-180256

Instrument Model CAL200, Serial Number 5789, was calibrated on 02OCT2013. The instrument meets factory specifications per Procedure D0001.8190, IEC 60942:2003.

Instrument found to be in calibration as received: YES
Date Calibrated: 02OCT2013
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Larson Davis	PRM915	0112	12 Months	08OCT2013	2012-164811
Larson Davis	2559	2504	12 Months	03JAN2014	19648-1
PCB	1502B02FJ15PSIA	1342	12 Months	14JAN2014	3441014716
Larson Davis	2900	0661	12 Months	08APR2014	2013-172252
Larson Davis	MTS1000/2201	0111	12 Months	22AUG2014	SM082213
Larson Davis	PRM902	0480	12 Months	23AUG2014	2013-178669
Hewlett Packard	34401A	3146A10352	12 Months	03SEP2014	6214490

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Environmental test conditions as shown on calibration report.

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

Before: 113.95 dB, 93.94 dB, 1000.0 Hz @ sea level.
After: Refer to Certificate of Measured Output.

Signed: Scott Montgomery
Technician: Scott Montgomery

LARSON DAVIS
A PCB PIEZOTRONICS DIV.

Larson Davis CAL200 Acoustic Calibrator, SN: 5789
Certificate of Measured Output

Performance at Reference Conditions

Nominal Level (dB SPL):	94	114
Measured Level (dB SPL):	**94.00**	**114.01**
Expanded Uncertainty (dB):	0.137	0.132
Level Error Limit (dB):	±0.34	±0.33
Nominal Frequency (Hz):	1000	1000
Measured Frequency (Hz):	**1000.1**	**1000.0**
Expanded Uncertainty (Hz):	0.2	0.2
Frequency Error Limit (Hz):	±10.0	±10.0
Measured Distortion (%):	0.39	0.35
Expanded Uncertainty (%):	0.25	0.25
Distortion Limit (%):	2.0	2.0

The data is aquired by the insert voltage calibration method using the reference microphone's open circuit sensitivity.

Environmental Conditions

Temperature (°C):	24	24
Relative Humidity (%):	34	35
Static Pressure (kPa):	101.1	101.2

Reference Microphone

Model: Larson Davis 2559
Serial Number: 2504
Open Circuit Sensitivity: 11.440 mV/Pascal
Uncertainty: 0.110 dB

Influence of Static Pressure

Nominal Level (dB SPL): 114

Nominal Pressure (kPa)	Pressure (kPa)	Level Change (dB)	Frequency Change (Hz)	Distortion (%)
108.0	108.0	-0.03	0.00	0.37
101.3	101.4	0.00	0.00	0.35
92.0	92.0	0.03	-0.00	0.33
83.0	83.0	0.03	-0.00	0.31
74.0	74.0	-0.02	-0.00	0.30
65.0	65.1	-0.11	-0.01	0.29
Expanded Uncertainty:	1.0	0.04	0.20	0.25
Limit:		±0.30	±10.0	2.0

Reference microphone corrections applied.

Environmental Conditions

Temperature (°C):	24
Relative Humidity (%):	32

Reference Microphone

Model: Larson Davis 2559
Serial Number: 2504

Static pressure was measured with a calibrated Motorola pressure sensor MPX2100AP.
Temperature and humidity was measured with a calibrated Fluke 1620A sensor.
Expanded uncertainty of environmental measurements: 0.3 °C, 3 %RH, 1.0 kPa
Uncertainty values are given at 95% confidence level (k = 2).

A Sound Level Meter can be calibrated to a level (L) defined as: L = measured level + pressure sensitivity or if a Sound Level Meter is calibrated using the nominal level, the adjustments to data (X) are defined as:
X = measured level - nominal level - pressure sensitivity

Scott Montgomery   Larson Davis Calibrator Calibration System   10 / 02 / 2013

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Appendix C contains the following traffic data used in this analysis:

- Certified traffic data for existing and future conditions;
- Modeled existing traffic data;
- Modeled future traffic data.

Traffic for Existing Models (2012)										
Roadway	Traffic Volumes and Speeds (mph) for One Hour									
	Auto		Medium Truck		Heavy Truck		Bus		Motorcycle	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
I-76 EB (entire corridor)	2379	65	82	65	274	65	0	0	0	0
I-76 WB (entire corridor)	2688	65	89	65	177	65	0	0	0	0
Pottsdown Pike NB	872	45	13	45	13	45	0	0	0	0
Pottsdown Pike SB	862	45	13	45	13	45	0	0	0	0
E. Uwchlan NB	1511	45	15	45	15	45	0	0	0	0
E. Uwchlan SB	1511	45	15	45	15	45	0	0	0	0
Conestoga NB	839	35	17	35	17	35	0	0	0	0
Conestoga SB	839	35	17	35	17	35	0	0	0	0
Yellow Springs NB	297	35	6	35	6	35	0	0	0	0
Yellow Springs SB	297	35	6	35	6	35	0	0	0	0
Phoenixville NB	756	45	8	45	8	45	0	0	0	0
Phoenixville SB	756	45	8	45	8	45	0	0	0	0
Charleston NB	875	40	23	40	23	40	0	0	0	0
Charleston SB	875	40	23	40	23	40	0	0	0	0
Warner EB	297	35	6	35	6	35	0	0	0	0
Warner WB	297	35	6	35	6	35	0	0	0	0
Warner WB at Phoenixville	148	35	3	35	3	35	0	0	0	0
Morehall NB	875	40	23	40	23	40	0	0	0	0
Morehall SB	875	40	23	40	23	40	0	0	0	0
76EB-Ramp to 29	403	25	14	25	46	25	0	0	0	0
76EB-East of 29 ramp	1977	65	68	65	227	65	0	0	0	0

Traffic for Future Models (2038)										
Roadway	Traffic Volumes and Speeds (mph) for One Hour									
	Auto		Medium Truck		Heavy Truck		Bus		Motorcycle	
	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
I-76 EB (entire corridor)	3505	70	121	70	403	70	0	0	0	0
I-76 WB (entire corridor)	3958	70	130	70	261	70	0	0	0	0
Pottsdown Pike NB	1130	50	17	50	17	50	0	0	0	0
Pottsdown Pike SB	1116	50	17	50	17	50	0	0	0	0
E. Uwchlan NB	1958	50	20	50	20	50	0	0	0	0
E. Uwchlan SB	1958	50	20	50	20	50	0	0	0	0
Conestoga NB	1087	40	23	40	23	40	0	0	0	0
Conestoga SB	1087	40	23	40	23	40	0	0	0	0
Yellow Springs NB	384	40	8	40	8	40	0	0	0	0
Yellow Springs SB	384	40	8	40	8	40	0	0	0	0
Phoenixville NB	979	50	10	50	10	50	0	0	0	0
Phoenixville SB	979	50	10	50	10	50	0	0	0	0
Charleston NB	1133	45	30	45	30	45	0	0	0	0
Charleston SB	1133	45	30	45	30	45	0	0	0	0
Warner EB	384	40	8	40	8	40	0	0	0	0
Warner WB	384	40	8	40	8	40	0	0	0	0
Warner WB at Phoenixville	192	40	4	40	4	40	0	0	0	0
Morehall NB	1133	45	30	45	30	45	0	0	0	0
Morehall SB	1133	45	30	45	30	45	0	0	0	0
76EB-Ramp to 29	593	30	20	30	68	30	0	0	0	0
76EB-East of 29 ramp	2912	70	100	70	335	70	0	0	0	0

PTC 312-319
Traffic Projections

I-76 (Pennsylvania Turnpike)

Project No. 21387580	
Computed by KWS	Date 11/10/2012
Checked by CM	Date 11/16/2012

Current Traffic Data

Westbound Eastbound

Data from PTC	Westbound	Eastbound	Total
2011 ADT =	26,570	21,898	48,468
Percent Trucks =	9.0%	13.0%	10.8%
2011 ADTT =	2391	2847	5238
DHV Factors - K =	10.95%	12.31%	
D =	N/A	N/A	
T =	9%	13%	

Average Daily Traffic Growth Factors

Current Year = 2012

Use 1.5% annual growth factor

Side	Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
Westbound	2011	1.50%	26,570	26,969	2391	2427
Eastbound	2011	1.50%	21,898	22,226	2847	2889

Design Year ADT Projections

Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT (Westbound)	26,969	**29,489**	**39,717**
ADT (Eastbound)	22,226	**24,303**	**32,733**

Design Year ADTT Projections

Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT (Westbound)	2427	**2654**	**3575**
ADTT (Eastbound)	2889	**3159**	**4255**

Design Hour Volumes

Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV (Westbound) = **4349**
DHV (Eastbound) = **4029**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Truck Factor
DDHV [TRUCKS] WB = **391**
DDHV [TRUCKS] EB = **524**

Design Year = 2012

Use Formula DHV = K * ADT
where K = DHV K-fac
DHV (Westbound) = **2953**
DHV (Eastbound) = **2736**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Trucl
DDHV [TRUCKS] WB = **266**
DDHV [TRUCKS] EB = **356**

SR 100 (Pottstown Pike)

Project No. 21387580
Computed by KWS Date 7/26/2012
Checked by CM Date

ITMS Current Traffic Count Data
SR 0100 (Segments 0320 and 0321)

Data from ITMS Dated 5/30/2012	Northbound 0320	Southbound 0321	Total
2011 ADT =	14,696	14,521	29,217
Percent Trucks =	7.0%	7.0%	7.0%
2010 ADTT =	1028	1016	2044
DHV Factors - K =	10%	10%	10%
D =	60%	60%	60%
T =	3%	3%	3%

Average Daily Traffic Growth Factors
Current Year = 2012
Assume 1.0% Growth Factor

Segment	Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
0320	2010	1.00%	14,696	14,991	1028	1049
0321	2010	1.00%	14,521	14,813	1016	1036

Design Year ADT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT (Northbound)	14,991	**15,914**	**19,418**
ADT (Southbound)	14,813	**15,724**	**19,186**

Design Year ADTT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT (Northbound)	1049	**1113**	**1358**
ADTT (Southbound)	1036	**1100**	**1342**

Design Hour Volumes
Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV (Northbound) = **1942**
DHV (Southbound) = **1919**

Use Formula DDHV = D * DHV [Directional DHV]
where D = DHV Directional Factor
DDHV (Northbound) = **1165**
DDHV (Southbound) = **1151**

Design Yeai 2012

Use Formul: DHV = K * AD
where
DHV (Northbo
DHV (Southbc

Use Formul: DDHV = D * D
where
DDHV (Northt
DDHV (Southl

SR 0029 (Charlestown Road)

Project No. 21387580
Computed by KWS Date 7/26/2012
Checked by CM Date

ITMS Current Traffic Count Data
SR 0029 (Segment 0070)
Data from ITMS Dated 5/30/2012

2011 ADT = 15,077
Percent Trucks = 9.0%
2011 ADTT = 1357
DHV Factors - K = 11%
D = 55%
T = 5%

Average Daily Traffic Growth Factors
Current Year = 2012
Assume 1.0% Growth Factor

Segment	Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
0070	2011	1.00%	15,077	15,228	1357	1371

Design Year ADT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT	15,228	**16,165**	**19,724**

Design Year ADTT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT	1371	**1455**	**1775**

Design Hour Volumes
Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV = **2170**

Use Formula DDHV = D * DHV [Directional DHV]
where D = DHV Directional Factor
DDHV = **1193**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Truck Factor
DDHV [TRUCKS] = **60**

Design Yea 2012

Use Formul DHV = K * AD
where
DHV =

Use Formul DDHV = D * D
where
DDHV =

Use Formul DDHV [TRUC
where
DDHV [TRUC

SR 0401 (Conestoga Road)

Project No. 21387580
Computed by KWS Date 7/26/2012
Checked by CM Date

ITMS Current Traffic Count Data
SR 0401 (Segment 0250)
Data from ITMS Dated 5/30/2012

2011 ADT =	10,813
Percent Trucks =	5.0%
2011 ADTT =	560
DHV Factors - K =	10%
D =	80%
T =	4%

Average Daily Traffic Growth Factors
Current Year = 2012
Assume 1.0% Growth Factor

Segment	Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
0250	2011	1.00%	10,813	10,921	560	566

Design Year ADT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT	10,921	**11,593**	**14,146**

Design Year ADTT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT	566	**600**	**732**

Design Hour Volumes
Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV = **1415**

Use Formula DDHV = D * DHV [Directional DHV]
where D = DHV Directional Factor
DDHV = **1132**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Truck Factor
DDHV [TRUCKS] = **45**

Design Yeai 2012

Use Formul DHV = K * AD
where
DHV =

Use Formul DDHV = D * D
where
DDHV =

Use Formul DDHV [TRUCI
where
DDHV [TRUC

SR 1003 (Phoenixville Pike)

Project No. 21387580
Computed by KWS Date 7/26/2012
Checked by CM Date

ITMS Current Traffic Count Data
SR 1003 (Segment 0060)
Data from ITMS Dated 5/30/2012

2009 ADT =	12,373
Percent Trucks =	4.0%
2009 ADTT =	495
DHV Factors - K =	11%
D =	55%
T =	2%

Average Daily Traffic Growth Factors
Current Year = 2012
Assume 1.0% Growth Factor

Segment	Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
0060	2009	1.00%	12,373	12,748	495	510

Design Year ADT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT	12,748	**13,532**	**16,512**

Design Year ADTT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT	510	**541**	**660**

Design Hour Volumes
Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV = **1816**

Use Formula DDHV = D * DHV [Directional DHV]
where D = DHV Directional Factor
DDHV = **999**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Truck Factor
DDHV [TRUCKS] = **20**

Design Yeai 2012

Use Formul: DHV = K * AD
where
DHV =

Use Formul: DDHV = D * D
where
DDHV =

Use Formul: DDHV [TRUCI
where
DDHV [TRUC

T-488 (Yellow Springs Road)

Project No. 21387580	
Computed by AMY	Date 8/3/2012
Checked by CM	Date

Current Traffic Count Data

Existing Plans

2008 ADT =		3001
Percent Trucks =		4.0%
2008 ADTT =		120
DHV Factors - K =	11%	
D =	90%	
T =	4%	

Average Daily Traffic Growth Factors

Current Year = 2012

Assume 1.0% Growth Factor

Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
2008	1.00%	3001	3123	120	125

Design Year ADT Projections

Current Year = 2012

Opening Year = 2018

Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n

where n = number of years

GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT	3123	**3315**	**4045**

Design Year ADTT Projections

Current Year = 2012

Opening Year = 2018

Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n

where n = number of years

GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT	125	**133**	**162**

Design Hour Volumes

Design Year = 2038

Use Formula DHV = K * ADT

where K = DHV K-factor

DHV = **445**

Use Formula DDHV = D * DHV [Directional DHV]

where D = DHV Directional Factor

DDHV = **400**

Use Formula DDHV [TRUCKS] = DDHV * T

where T = DHV Truck Factor

DDHV [TRUCKS] = **16**

Design Yea 2012

Use Formul DHV = K * AD

where

DHV =

Use Formul DDHV = D * D

where

DDHV =

Use Formul DDHV [TRUC

where

DDHV [TRUC

T-466 (Pine Creek Road)

Project No. 21387580	
Computed by KWS	Date 7/26/2012
Checked by CM	Date

Current Traffic Count Data
6/27/2012 one hour count

2012 ADT =		788
Percent Trucks =		2.0%
2012 ADTT =		16
DHV Factors - K =	8%	
D =	50%	
T =	2%	

Average Daily Traffic Growth Factors
Current Year = 2012
Assume 1.0% Growth Factor

Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
2009	1.00%	788	812	16	16

Design Year ADT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT	812	**862**	**1052**

Design Year ADTT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT	16	**17**	**21**

Design Hour Volumes
Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV = **84**

Use Formula DDHV = D * DHV [Directional DHV]
where D = DHV Directional Factor
DDHV = **42**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Truck Factor
DDHV [TRUCKS] = **1**

SR 1023 (Seven Oaks Road)

Project No. 21387580
Computed by KWS Date 7/31/2012
Checked by CM Date

ITMS Current Traffic Count Data
SR 1023 (Segment 0020)
Data from ITMS Dated 5/30/2012

2010 ADT =	689
Percent Trucks =	10.0%
2010 ADTT =	69

DHV Factors - K = 11%
D = 55%
T = 5%

Average Daily Traffic Growth Factors
Current Year = 2012
Assume 1.0% Growth Factor

Segment	Base Year	Growth %	Base ADT	Current ADT	Base ADTT	Current ADTT
0150	2010	1.20%	689	706	69	71

Design Year ADT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADT(future) = ADT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADT	706	**758**	**962**

Design Year ADTT Projections
Current Year = 2012
Opening Year = 2018
Design Year = 2038

Use Formula ADTT(future) = ADTT(base) * (1+GF)^n
where n = number of years
GF = Growth Factor as a decimal

	Current	Opening	Design
Year	2012	**2018**	**2038**
ADTT	71	**76**	**96**

Design Hour Volumes
Design Year = 2038

Use Formula DHV = K * ADT
where K = DHV K-factor
DHV = **106**

Use Formula DDHV = D * DHV [Directional DHV]
where D = DHV Directional Factor
DDHV = **58**

Use Formula DDHV [TRUCKS] = DDHV * T
where T = DHV Truck Factor
DDHV [TRUCKS] = **3**

Traffic Data for MP 312 to MP 319

Between Downingtown I/C and Valley Forge I/C

Traffic Volumes[1]

	2013	2043
Eastbound ADT	24,087	37,649
Westbound ADT	23,462	36,673
Peak Hour (EB) 12.70%	3,059	4,781
Peak Hour (WB) 13.20%	3,097	4,841

Peak Month: EB=October, WB=October

Vehicle Composition(%) (Peak Hour):

	EB	WB
PTC Class 1=	89%	89%
PTC Classes 2-3=	4%	5%
PTC Classes 4-9=	7%	6%

Growth Factors:	1.50%	1.50%

Notes:

[1] The 2011 volume and assumed growth are similar to the 2013 volume and assumed growth.

SR 29 (January 1, 2013 thru November 24, 2013)	
Entry – 1,082,895 (ADT = 3,302)	
Exit – 1,252,439 (ADT = 3,818)	
Downington EB K Factor	12.31
Growth	1.5
Exit 2013 DHV	470
2014 DHV	477
2015 DHV	484
2016 DHV	491
2017 DHV	499
2018 DHV	506
2019 DHV	514
2020 DHV	522
2021 DHV	529
2022 DHV	537
2023 DHV	545
2024 DHV	554
2025 DHV	562
2026 DHV	570
2027 DHV	579
2028 DHV	588
2029 DHV	596
2030 DHV	605
2031 DHV	614
2032 DHV	624
2033 DHV	633
2034 DHV	643
2035 DHV	652
2036 DHV	662
2037 DHV	672
2038 DHV	682
2012 DHV	463

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Appendix D contains a table summarizing the TNM modeling runs used to predict noise levels in the noise sensitive areas (NSAs). Each row in the table summarizes a receptor point, showing the following information:

- Receptor point
- Dwelling Unit (how many families are represented at each point)
- Modeled existing noise level
- Future ‘No Build’ noise level
- Future “Build’ noise level
- Future “Build with Barrier’ noise level (where applicable)
- Future Barrier Insertion Loss (IL) (where applicable)

The complete TNM 2.5 runs used for this report have been digitally archived and are available upon request.

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project

Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA-01						
R01-01	1	64	66	67	62	5
R01-02 / ST-01	1	68	71	71	66	6
R01-03	1	71	73	72	65	7
R01-04	1	68	70	70	65	5
R01-05	1	65	67	67	64	3
R01-06	1	69	71	72	70	2
R01-07	0	73	76	77	--	--
NSA-02						
R02-01 / ST-02	1	69	71	73	66	7
R02-02	1	61	63	62	60	2
R02-03	1	64	66	65	62	3
R02-04	1	61	64	62	61	2
NSA-03						
R03-01	0	76	79	79		
R03-02	0	56	58	59		
R03-03	0	76	78	79		
R03-04	0	76	78	78		
R03-05	0	75	78	78		
R03-06	0	63	65	66		
R03-07	1	55	57	58		
R03-08	0	55	57	60		
R03-09 / ST-03	0	59	61	63		
R03-10	0	59	61	61		
R03-11	0	66	69	68		
R03-12	0	68	70	71		
R03-13	0	62	64	63		

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project
Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA-04						
R04-01 / ST-04	1	68	70	78	66	12
R04-02	2	69	71	75	67	8
R04-03	3	68	70	73	68	5
R04-04	3	68	70	80	67	13
R04-05	3	61	64	69	61	7
R04-06	3	71	73	73	73	0
R04-07	4	67	70	80	71	9
R04-08	3	59	62	68	61	7
R04-09	6	56	58	57	58	0
R04-10	3	71	73	73	73	0
R04-11	3	65	68	79	69	10
R04-12	3	62	64	74	65	9
R04-13	3	60	62	67	62	5
R04-14	4	58	60	63	60	4
R04-15	3	66	68	75	67	9
R04-16	4	60	63	68	63	5
R04-17 (R04-16 back)	0	57	59	61	57	4
R04-18	3	55	57	58	57	1
R04-19	3	58	60	60	60	0
R04-20(R04-15 back)	0	64	66	70	64	6
R04-21	3	56	58	61	57	4
R04-22	3	57	59	59	59	1
R04-23	4	60	62	65	61	4
R04-24	4	58	60	60	58	1
R04-25	4	66	68	71	65	7
R04-26	6	67	69	70	64	7
R04-27	2	72	74	72	65	6
R04-28	2	65	68	67	62	5
R04-29	1	60	62	61	57	4
R04-30	1	58	60	58	56	2
R04-31	2	53	55	56	55	1
R04-32	2	53	56	55	54	1
R04-33	2	55	57	57	55	2
R04-34	2	72	75	74	66	8
R04-35	2	71	73	72	62	10
R04-36	2	62	64	64	57	7
R04-37	2	57	59	59	54	6
R04-38	2	53	56	56	51	5
R04-39	4	72	74	74	64	10

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project

Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
R04-40	4	74	77	76	64	13
R04-41	4	73	76	76	63	13
R04-42(R04-41 back)	4	72	74	74	63	11
R04-43	2	57	60	59	56	4
R04-44	2	61	63	65	55	10
R04-45	2	67	70	71	60	11
R04-46	0	65	68	69	60	9
R04-47	6	63	65	67	57	10
R04-48	6	52	54	54	52	2
R04-49 / ST26	2	67	69	70	62	8
R04-50	2	66	68	69	61	8
R04-51	2	65	67	67	61	6
R04-52	4	64	66	66	61	5
R04-53	2	59	61	62	56	6
R04-54	2	63	65	66	61	5
R04-55	2	62	65	65	61	4

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project

Summary of TNM Modeling Data

Noise Sensitive Area (NSA) Receptor	Dwelling Units	TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
		Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA 05						
R05-01	3	64	66	66	60	5
R05-02	3	67	69	69	63	6
R05-03	3	70	72	72	64	8
R05-04	3	70	73	72	64	9
R05-05	6	62	65	65	58	7
R05-06	3	70	73	72	63	9
R05-07	3	68	70	70	61	10
R05-08	1	70	72	73	64	8
R05-11	2	70	73	72	67	5
R05-12	3	77	79	80	68	12
R05-12B / ST-05	20	75	78	78	66	12
R05-13	2	72	74	75	65	9
R05-14	3	71	74	75	64	10
R05-15	1	64	67	67	63	3
R05-16	2	74	76	77	66	11
R05-17	3	75	77	77	66	11
R05-18	1	65	68	67	63	4
R05-19	2	75	78	78	66	12
R05-20	3	76	79	79	66	13
R05-21	1	66	69	69	65	4
R05-22	1	69	71	72	66	6
R05-23	1	69	72	72	67	5
R05-24	1	69	71	71	68	3
R05-25	1	63	65	66	66	0
R05-26	1	65	68	68	68	0
R05-27	1	68	71	71	67	3
R05-28	1	63	66	66	65	2
R05-29	1	64	67	67	65	2
R05-30	1	63	65	66	62	4
R05-31	1	61	63	64	61	2
R05-32	1	59	61	61	60	2
R05-33	1	63	66	66	63	3
R05-34	1	62	64	64	62	3
R05-35	1	62	65	65	62	3
R05-36	1	63	65	65	63	2
R05-37	6	60	63	63	61	2
R05-38	6	60	63	64	61	3

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project
Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA 06						
R06-01 / ST-06	1	64	67	67		
NSA 07						
R07-01 / ST-07	2	63	66	67		
R07-02	1	66	68	69		
R07-03	1	62	64	64		
NSA 08						
R08-01 / ST-08	1	74	77	75	69	6
R08-02	1	75	77	76	66	10
R08-03	1	68	70	71	64	7
R08-04	1	59	61	63	58	5
R08-05	1	57	59	61	58	3
R08-06	1	62	65	65	65	1
R08-07	1	69	72	72	72	0
R08-08	1	64	67	68	63	5
R08-09	1	63	65	67	62	5
R08-10	1	59	61	63	58	5
R08-11	1	61	63	65	60	5
R08-12	1	60	62	64	60	4
R08-13	1	59	61	63	60	3
R08-14	1	60	62	64	63	1
R08-15	1	59	61	63	63	1
R08-16	1	61	63	65	65	0
R08-17	1	57	59	61	58	3
R08-18	1	59	61	62	60	2
R08-19	1	58	61	62	61	1
R08-20	1	65	67	68	68	0
NSA 09						
R09-01	1	58	60	60		
R09-02	1	59	61	63		
R09-03	1	69	71	71	66	5
R09-04	1	63	65	65	64	1
R09-05 / ST-09	1	69	72	70	63	7
R09-06	3	64	66	65	62	3
NSA 10						
R10-01 / ST-10	1	65	68	66	60	6
R10-02 / ST-29	1	66	69	68	62	7
R10-03		62	64	64	60	4
R10-04	1	63	66	66	60	5

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project

Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA 11						
R11-01 / ST-11	1	72	74	75	68	7
R11-02	1	60	62	62	61	1
NSA 12						
R12-01 / ST-12	1	66	68	69		
NSA 13						
R13-01	1	71	73	74	67	7
R13-02 / ST-13	1	68	70	72	67	6
R13-03	1	66	69	70	65	5
NSA 14						
R14-01 / ST-14	1	66	68	69		
NSA 15						
R15-01	1	68	71	71	66	5
R15-02 / ST-15	1	70	72	73	65	8
R15-03	1	72	74	75	65	10
R15-04	1	67	69	71	64	7
R15-05	1	68	71	71	64	7
R15-06	1	74	77	77	65	12
R15-07	1	62	64	65	65	0
R15-08	1	59	61	63	63	1
R15-09	1	59	61	64	63	1
R15-10	1	61	64	66	64	2
R15-11	1	61	64	65	61	4
R15-12	1	60	62	64	59	4
R15-13	1	63	65	67	62	5
NSA 16						
R16-01	1	63	65	65	61	4
R16-02	1	66	68	68	61	6
R16-03 / ST-16	1	68	70	70	64	7
R16-04	1	60	63	62	60	2
R16-05	1	61	63	63	61	2
R16-06	1	59	61	61	61	0
NSA 17						
R17-01 / ST-17	1	64	67	67	65	2
R17-02	1	63	65	66	60	6
R17-03	1	60	63	64	63	1
R17-04	1	56	58	59	59	1

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project
Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA 18						
R18-01 / ST-18	1	73	75	75	68	7
R18-02	1	63	65	65	63	1
R18-03	1	61	63	62	61	2
R18-04	1	68	70	69	64	5
NSA 19						
R19-01	1	60	65	65		
R19-02	1	57	62	63		
R19-03	1	55	60	62		
R19-04	1	54	60	61		
R19-05	1	54	59	60		
R19-06	1	59	64	65		
R19-07	1	59	65	65		
R19-08	1	58	63	63		
R19-09	1	58	63	63		
R19-10 / ST-19	1	57	63	63		
R19-11	1	57	62	62		
R19-12	1	56	61	61		
R19-13	1	54	58	59		
R19-14	1	61	66	63		
NSA 20						
R20-01	1	60	64	65	64	1
R20-02	1	64	69	70	65	5
R20-03	3	55	59	59	54	5
R20-04	3	58	63	63	56	6
R20-05	3	61	66	65	59	7
R20-06	3	64	68	68	62	6
R20-07	3	63	67	67	60	7
R20-08	3	63	67	66	60	6
R20-09	3	61	65	64	59	6
R20-10 / ST-20	1	66	70	69	62	7
R20-11	4	62	66	66	61	5
R20-12	4	58	62	62	55	7
R20-13	4	57	61	60	56	4
R20-14	3	61	66	65	59	6
R20-15	5	60	64	63	59	4

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project
Summary of TNM Modeling Data

Noise Sensitive Area (NSA) Receptor	Dwelling Units	TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
		Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA 21						
R21-01	1	59	61	61	61	0
R21-02 / ST-21	1	74	76	76	63	13
R21-03	1	70	73	73	68	5
R21-04	1	72	75	76	63	13
R21-05	1	70	73	75	63	12
R21-06	1	73	76	76	65	11
R21-07	1	67	70	72	63	9
R21-08	1	65	67	69	62	7
R21-09	1	65	68	69	63	6
R21-10	1	62	64	66	61	5
R21-11	1	62	64	65	61	5
R21-12	1	62	65	66	61	5
R21-13	1	61	63	64	60	4
R21-14	1	62	65	67	62	5
R21-15	1	64	66	68	62	6
R21-16	1	67	69	72	64	8
R21-17 / ST-27	1	72	74	75	65	10
R21-18	1	63	65	67	61	6
R21-19	1	61	63	65	59	6
R21-20	1	65	68	70	62	8
R21-21	1	69	72	73	64	9
R21-22	1	65	67	69	64	5
R21-23	1	64	66	67	66	2
R21-24	1	48	50	51	51	0
R21-25	1	70	73	72	67	5
R21-26	1	44	46	46	45	0
R21-27	1	58	60	60	57	3
R21-28	1	58	60	61	58	3
R21-29	1	59	61	63	59	4
NSA 22						
R22-01 / ST-22	1	62	64	65		
R22-02	1	52	54	55		
R22-03	1	51	53	54		
R22-04	1	53	55	55		
NSA 23						
R23-01 / ST-23	1	60	63	64		
R23-02	1	57	59	60		
R23-03	1	62	65	65		

Pennsylvania Turnpike Commission 312-319 Widening and Reconstruction Project
Summary of TNM Modeling Data

		TNM Modeling Output, Sound Pressure Level (SPL) in dBA				
Noise Sensitive Area (NSA) Receptor	Dwelling Units	Modeled Existing SPL	Modeled Future 'No Build' SPL	Modeled Future 'Build' SPL	Future 'Build with Barrier' SPL	Barrier Insertion Loss, in dB
NSA 24						
R24-01 / ST-24	1	64	66	66		
R24-02	0	71	74	73		
NSA 25						
R25-01	na	68	71	71	71	0
R25-02	na	69	72	72	72	0
R25-03 / ST-25	0	70	71	72	71	0
R25-04	4	63	65	65		
R25-05	4	65	67	68	65	2
R25-06	5	67	70	70	66	4
R25-07	4	68	71	71	66	5
R25-08	4	69	72	72	68	4
R25-09	2	69	71	71	69	2
R25-10	2	67	69	69		
R25-11	2	66	68	67		
R25-12	2	65	68	67		
R25-13	4	52	55	55		
R25-14	2	62	64	65		
R25-15	2	59	61	62		
R25-16	na	50	52	52		
R25-17	2	51	53	53		
R25-18	4	52	54	54		
NSA 26						
R26-01	1	70	71	71	70	1
R26-02	1	69	71	71	67	5
R26-03 / ST-28	1	65	67	67	62	5
R26-04	1	67	69	69		
R26-05	1	69	72	72		

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Appendix E presents PennDOT Pub. #24's Appendix A "Warranted, Reasonable and Feasible Worksheets"

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014

Project Name PTC 312 - 319

County Chester

SR, Section I-76, M.P. 312 - 319

Community Name and/or NSA # NSA01

Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	6
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

   a. Date community was permitted (for new developments or developments planned for or under construction) ____na____

   b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): ____na____

   c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

   a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? __x__ Yes ______ No

   b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes __x__ No

   c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes __x__ No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

   a. Total number of impacted receptor units: ____6____

   b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: ____67%____

   c. Is the percentage 50 or greater? __x__ Yes ______ No

2. Can the noise wall be designed and physically constructed at the proposed location? __x__ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? __x__ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? __x__ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? __x__ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? __x__ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? __x__ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ______ Yes ______ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 12801

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 4

c. SF/BR = 2a/2b 3200

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ______ Yes __x__ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ______ Yes ______ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ______ Yes ______ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ______ Yes ______ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ______ Yes ______ No

e. Does the noise wall reduce design year noise levels back to existing levels? ______ Yes ______ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date

(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA02
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	1
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes x No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes No

3. Can the noise wall be constructed without causing a safety problem? x Yes No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.”

________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 6199

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 1

c. SF/BR = 2a/2b 6199

d. Is 2c less than or equal to the MaxSF/BR value of 2000?

________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor?

________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation?

________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation?

________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors?

________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels?

________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA03
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted
    Category B units impacted 1
    Category C units impacted
    Category D units impacted (if interior analysis required)
    Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ______ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 0%

c. Is the percentage 50 or greater? ______ Yes x No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 4800

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 1

c. SF/BR = 2a/2b 4800

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ___x___ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point?	______ Yes	______ No
b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum	______ Yes	______ No

Decision

Is the Noise Wall WARRANTED?	x Yes	______ No
Is the Noise Wall FEASIBLE?	x Yes	______ No
Is the Noise Wall REASONABLE?	______ Yes	x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager — Date

Qualified Professional Performing the Analysis
(name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA04
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted
    Category B units impacted 77
    Category C units impacted
    Category D units impacted (if interior analysis required)
    Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 77

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes ____ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” _____ Yes _____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 31985

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 95

c. SF/BR = 2a/2b 337

d. Is 2c less than or equal to the MaxSF/BR value of 2000? x Yes _____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? x Yes _____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? x Yes _____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? x Yes _____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? x Yes _____ No

e. Does the noise wall reduce design year noise levels back to existing levels? x Yes _____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? x Yes ____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum x Yes ____ No

Decision

Is the Noise Wall WARRANTED? x Yes ____ No

Is the Noise Wall FEASIBLE? x Yes ____ No

Is the Noise Wall REASONABLE? x Yes ____ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ____ Date

Qualified Professional Performing the Analysis
(name, title, and company name) ____ Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA05
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	70
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? ___x___ Yes ______ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes ___x___ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes ___x___ No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 70

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 96%

c. Is the percentage 50 or greater? ___x___ Yes ______ No

2. Can the noise wall be designed and physically constructed at the proposed location? ___x___ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? ___x___ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? ___x___ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? ___x___ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? ___x___ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? ___x___ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” Yes No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 26394

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 67

c. SF/BR = 2a/2b 394

d. Is 2c less than or equal to the MaxSF/BR value of 2000? x Yes No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? x Yes No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? x Yes No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? x Yes No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? x Yes No

e. Does the noise wall reduce design year noise levels back to existing levels? x Yes No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? x Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum x Yes ______ No

Decision

Is the Noise Wall WARRANTED? x Yes ______ No

Is the Noise Wall FEASIBLE? x Yes ______ No

Is the Noise Wall REASONABLE? x Yes ______ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

______________________________ ______________

PennDOT, Engineering District Environmental Manager Date

______________________________ ______________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date: 5/15/2014
Project Name: PTC 312 - 319
County: Chester
SR, Section: I-76, M.P. 312 - 319
Community Name and/or NSA #: NSA06
Noise Wall Identification (i.e., Wall 1):

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted:
    Category B units impacted: 1
    Category C units impacted:
    Category D units impacted (if interior analysis required):
    Category E units impacted:

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes ____ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.”

________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall: 13280

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss): 1

c. SF/BR = 2a/2b: 13280

d. Is 2c less than or equal to the MaxSF/BR value of 2000?

________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor?

________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation?

________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation?

________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors?

________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels?

________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior_noise levels by at least 7 dB(A) for the facility’s analysis point? ______ Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ______ Yes ______ No

Decision

Is the Noise Wall WARRANTED? __x__ Yes ______ No

Is the Noise Wall FEASIBLE? __x__ Yes ______ No

Is the Noise Wall REASONABLE? ______ Yes __x__ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ______ Date

Qualified Professional Performing the Analysis
(name, title, and company name) ______ Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA07
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	2
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)	na	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na	
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."	Yes	No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x Yes	No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?	Yes	x No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?	Yes	x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:	2	
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	100%	
c. Is the percentage 50 or greater?	x Yes	No
2. Can the noise wall be designed and physically constructed at the proposed location?	x Yes	No
3. Can the noise wall be constructed without causing a safety problem?	x Yes	No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x Yes	No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x Yes	No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x Yes	No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x Yes	No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ____ Yes ____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 10560

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 2

c. SF/BR = 2a/2b 5280

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ____ Yes ____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ____ Yes ____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ____ Yes ____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ____ Yes ____ No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes ____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point?		Yes		No
b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum		Yes		No

Decision

Is the Noise Wall WARRANTED?	x	Yes		No
Is the Noise Wall FEASIBLE?	x	Yes		No
Is the Noise Wall REASONABLE?		Yes	x	No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager

Date

Qualified Professional Performing the Analysis
(name, title, and company name)

Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014

Project Name PTC 312 - 319

County Chester

SR, Section I-76, M.P. 312 - 319

Community Name and/or NSA # NSA08

Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   - Category A units impacted
   - Category B units impacted 7
   - Category C units impacted
   - Category D units impacted (if interior analysis required)
   - Category E units impacted

Warranted

1. Community Documentation				
a. Date community was permitted (for new developments or developments planned for or under construction)	na			
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	na			
c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .”		Yes		No
2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.				
a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?	x	Yes		No
b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?		Yes	x	No
c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?		Yes	x	No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units				
a. Total number of impacted receptor units:	7			
b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:	100%			
c. Is the percentage 50 or greater?	x	Yes		No
2. Can the noise wall be designed and physically constructed at the proposed location?	x	Yes		No
3. Can the noise wall be constructed without causing a safety problem?	x	Yes		No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?	x	Yes		No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?	x	Yes		No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?	x	Yes		No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?	x	Yes		No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 19934

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 7

c. SF/BR = 2a/2b 2848

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA09
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	2
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? __x__ Yes ______ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes __x__ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes __x__ No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 2

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? ______ Yes __x__ No

2. Can the noise wall be designed and physically constructed at the proposed location? __x__ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? __x__ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? __x__ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? __x__ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? __x__ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? __x__ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 6650

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 2

c. SF/BR = 2a/2b 3325

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ______ Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ______ Yes ______ No

Decision

Is the Noise Wall WARRANTED? x Yes ______ No

Is the Noise Wall FEASIBLE? x Yes ______ No

Is the Noise Wall REASONABLE? ______ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager Date

Qualified Professional Performing the Analysis
(name, title, and company name) Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA10
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	3
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation
    a. Date community was permitted (for new developments or developments planned for or under construction) na
    b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na
    c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.
    a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? [✓ Yes] No
    b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes [✓ No]
    c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes [✓ No]

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units
    a. Total number of impacted receptor units: 3
    b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%
    c. Is the percentage 50 or greater? [✓ Yes] No
2. Can the noise wall be designed and physically constructed at the proposed location? [✓ Yes] No
3. Can the noise wall be constructed without causing a safety problem? [✓ Yes] No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? [✓ Yes] No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? [✓ Yes] No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? [✓ Yes] No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? [✓ Yes] No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall ____8810____

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) ____3____

c. SF/BR = 2a/2b ____2937____

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point?		Yes		No
b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum		Yes		No

Decision

Is the Noise Wall WARRANTED?	x	Yes		No
Is the Noise Wall FEASIBLE?	x	Yes		No
Is the Noise Wall REASONABLE?		Yes	x	No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager Date

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA11
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted
    Category B units impacted 1
    Category C units impacted
    Category D units impacted (if interior analysis required)
    Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes No

3. Can the noise wall be constructed without causing a safety problem? x Yes No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ____ Yes ____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 5508

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 1

c. SF/BR = 2a/2b 5508

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ____ Yes ____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ____ Yes ____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ____ Yes ____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ____ Yes ____ No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes ____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA12
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	1
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation
   a. Date community was permitted (for new developments or developments planned for or under construction) na
   b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na
   c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.
   a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? [✓ Yes] No
   b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes [✓ No]
   c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes [✓ No]

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units
   a. Total number of impacted receptor units: 1
   b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%
   c. Is the percentage 50 or greater? [✓ Yes] No
2. Can the noise wall be designed and physically constructed at the proposed location? [✓ Yes] No
3. Can the noise wall be constructed without causing a safety problem? [✓ Yes] No
4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? [✓ Yes] No
5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? [✓ Yes] No
6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? [✓ Yes] No
7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? [✓ Yes] No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ____ Yes ____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 7200

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 1

c. SF/BR = 2a/2b 7200

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ____ Yes ____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ____ Yes ____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ____ Yes ____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ____ Yes ____ No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes ____ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior_noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014

Project Name PTC 312 - 319

County Chester

SR, Section I-76, M.P. 312 - 319

Community Name and/or NSA # NSA13

Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted

Category B units impacted 3

Category C units impacted

Category D units impacted (if interior analysis required)

Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ___ Yes ___ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ___ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ___ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ___ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 3

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes ___ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ___ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ___ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ___ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ___ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ___ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ___ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ______ Yes ______ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 6600

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 3

c. SF/BR = 2a/2b 2200

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ______ Yes __x__ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ______ Yes ______ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ______ Yes ______ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ______ Yes ______ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ______ Yes ______ No

e. Does the noise wall reduce design year noise levels back to existing levels? ______ Yes ______ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ________ Date

Qualified Professional Performing the Analysis ________ Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA14
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted
    Category B units impacted 1
    Category C units impacted
    Category D units impacted (if interior analysis required)
    Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes ____ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 5600

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 1

c. SF/BR = 2a/2b 5600

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ______ Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ______ Yes ______ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ______ No

Is the Noise Wall FEASIBLE? ___x___ Yes ______ No

Is the Noise Wall REASONABLE? ______ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ______ Date

Qualified Professional Performing the Analysis
(name, title, and company name) ______ Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA15
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   Category A units impacted
   Category B units impacted 8
   Category C units impacted
   Category D units impacted (if interior analysis required)
   Category E units impacted

Warranted

1. Community Documentation

  a. Date community was permitted (for new developments or developments planned for or under construction) na

  b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

  c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

  a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes No

  b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes x No

  c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes x No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

  a. Total number of impacted receptor units: 8

  b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 88%

  c. Is the percentage 50 or greater? x Yes No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes No

3. Can the noise wall be constructed without causing a safety problem? x Yes No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

__________ Yes __________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 32500

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 7

c. SF/BR = 2a/2b 4643

d. Is 2c less than or equal to the MaxSF/BR value of 2000? __________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor?

__________ Yes __________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation?

__________ Yes __________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation?

__________ Yes __________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors?

__________ Yes __________ No

e. Does the noise wall reduce design year noise levels back to existing levels?

__________ Yes __________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point?		Yes		No
b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum		Yes		No

Decision

Is the Noise Wall WARRANTED?	x	Yes		No
Is the Noise Wall FEASIBLE?	x	Yes		No
Is the Noise Wall REASONABLE?		Yes	x	No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager

Date

Qualified Professional Performing the Analysis
(name, title, and company name)

Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA16
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted
    Category B units impacted 2
    Category C units impacted
    Category D units impacted (if interior analysis required)
    Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) ___na___

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): ___na___

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? ___x___ Yes ______ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes ___x___ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes ___x___ No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: ___2___

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: ___100%___

c. Is the percentage 50 or greater? ___x___ Yes ______ No

2. Can the noise wall be designed and physically constructed at the proposed location? ___x___ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? ___x___ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? ___x___ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? ___x___ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? ___x___ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? ___x___ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.”

________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 12800

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 2

c. SF/BR = 2a/2b 6400

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ____ Yes ____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ____ Yes ____ No

Decision

Is the Noise Wall WARRANTED? __x__ Yes ____ No

Is the Noise Wall FEASIBLE? __x__ Yes ____ No

Is the Noise Wall REASONABLE? ____ Yes __x__ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ____ Date

Qualified Professional Performing the Analysis ____ Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date 5/15/2014

Project Name PTC 312 - 319

County Chester

SR, Section I-76, M.P. 312 - 319

Community Name and/or NSA # NSA17

Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community

   Category A units impacted

   Category B units impacted 2

   Category C units impacted

   Category D units impacted (if interior analysis required)

   Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 50%

c. Is the percentage 50 or greater? x Yes ____ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 22900

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 1

c. SF/BR = 2a/2b 22900

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ______ Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ______ Yes ______ No

Decision

Is the Noise Wall WARRANTED? x Yes ______ No

Is the Noise Wall FEASIBLE? x Yes ______ No

Is the Noise Wall REASONABLE? ______ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager — Date

Qualified Professional Performing the Analysis
(name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date: 5/15/2014
Project Name: PTC 312 - 319
County: Chester
SR, Section: I-76, M.P. 312 - 319
Community Name and/or NSA #: NSA18
Noise Wall Identification (i.e., Wall 1):

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    - Category A units impacted:
    - Category B units impacted: 2
    - Category C units impacted:
    - Category D units impacted (if interior analysis required):
    - Category E units impacted:

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 2

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes ____ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ____ Yes ____ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 8532

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 2

c. SF/BR = 2a/2b 4266

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ____ Yes x No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ____ Yes ____ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ____ Yes ____ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ____ Yes ____ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ____ Yes ____ No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes ____ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior_noise levels by at least 7 dB(A) for the facility's analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA19
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	0
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction)

na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):

na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."

________ Yes ________ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?

________ Yes ____x____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?

________ Yes ____x____ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?

________ Yes ____x____ No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units:

0

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss:

0%

c. Is the percentage 50 or greater?

________ Yes ____x____ No

2. Can the noise wall be designed and physically constructed at the proposed location?

____x____ Yes ________ No

3. Can the noise wall be constructed without causing a safety problem?

____x____ Yes ________ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?

____x____ Yes ________ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?

____x____ Yes ________ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?

____x____ Yes ________ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?

____x____ Yes ________ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall na

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) na

c. SF/BR = 2a/2b na

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ________ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? _______ Yes _______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _______ Yes _______ No

Decision

Is the Noise Wall WARRANTED? _______ Yes ___x___ No

Is the Noise Wall FEASIBLE? _______ Yes ___x___ No

Is the Noise Wall REASONABLE? _______ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

_______________________________ _______________

PennDOT, Engineering District Environmental Manager — Date

_______________________________ _______________

Qualified Professional Performing the Analysis — Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA20
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   Category A units impacted
   Category B units impacted 15
   Category C units impacted
   Category D units impacted (if interior analysis required)
   Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ____ Yes ____ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes ____ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ____ Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ____ Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 15

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes ____ No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes ____ No

3. Can the noise wall be constructed without causing a safety problem? x Yes ____ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes ____ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes ____ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes ____ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes ____ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ______ Yes ______ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 20457

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 34

c. SF/BR = 2a/2b 602

d. Is 2c less than or equal to the MaxSF/BR value of 2000? __x__ Yes ______ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? __x__ Yes ______ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? __x__ Yes ______ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? __x__ Yes ______ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? __x__ Yes ______ No

e. Does the noise wall reduce design year noise levels back to existing levels? __x__ Yes ______ No

4. Noise Reduction Design Goals (Activity Category D) A "yes" answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility's analysis point? x Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a "point of diminishing returns' evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum x Yes ______ No

Decision

Is the Noise Wall WARRANTED? x Yes ______ No

Is the Noise Wall FEASIBLE? x Yes ______ No

Is the Noise Wall REASONABLE? x Yes ______ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

______________________________ ______________
PennDOT, Engineering District Environmental Manager Date

______________________________ ______________
Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date: 5/15/2014
Project Name: PTC 312 - 319
County: Chester
SR, Section: I-76, M.P. 312 - 319
Community Name and/or NSA #: NSA21
Noise Wall Identification (i.e., Wall 1):

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
    Category A units impacted:
    Category B units impacted: 10
    Category C units impacted:
    Category D units impacted (if interior analysis required):
    Category E units impacted:

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) ______________________

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): ______________________

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? __x__ Yes ______ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes __x__ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes __x__ No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 10

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? __x__ Yes ______ No

2. Can the noise wall be designed and physically constructed at the proposed location? __x__ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? __x__ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? __x__ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? __x__ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? __x__ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? __x__ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ______ Yes ______ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 54919

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 21

c. SF/BR = 2a/2b 2615

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ______ Yes __x__ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ______ Yes ______ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ______ Yes ______ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ______ Yes ______ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ______ Yes ______ No

e. Does the noise wall reduce design year noise levels back to existing levels? ______ Yes ______ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior_noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? x Yes ________ No

Is the Noise Wall FEASIBLE? x Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ____________

PennDOT, Engineering District Environmental Manager Date

____ ____________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date	5/15/2014
Project Name	PTC 312 - 319
County	Chester
SR, Section	I-76, M.P. 312 - 319
Community Name and/or NSA #	NSA22
Noise Wall Identification (i.e., Wall 1)	

General

1. Type of project (new location, reconstruction, etc.):	Widening and Reconstruction
2. Total number of impacted receptor units in community	
Category A units impacted	
Category B units impacted	0
Category C units impacted	
Category D units impacted (if interior analysis required)	
Category E units impacted	

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) __na__

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): __na__

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." ______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? ______ Yes __x__ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? ______ Yes __x__ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? ______ Yes __x__ No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: __0__

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: __0%__

c. Is the percentage 50 or greater? ______ Yes __x__ No

2. Can the noise wall be designed and physically constructed at the proposed location? __x__ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem? __x__ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? __x__ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? __x__ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? __x__ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? __x__ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

_______ Yes _______ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — na

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — na

c. SF/BR = 2a/2b — na

d. Is 2c less than or equal to the MaxSF/BR value of 2000? _______ Yes _______ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? _______ Yes _______ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _______ Yes _______ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? _______ Yes _______ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? _______ Yes _______ No

e. Does the noise wall reduce design year noise levels back to existing levels? _______ Yes _______ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ________ Yes x ________ No

Is the Noise Wall FEASIBLE? ________ Yes x ________ No

Is the Noise Wall REASONABLE? ________ Yes x ________ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

____ ________________

PennDOT, Engineering District Environmental Manager Date

____ ________________

Qualified Professional Performing the Analysis Date
(name, title, and company name)

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date: 5/15/2014
Project Name: PTC 312 - 319
County: Chester
SR, Section: I-76, M.P. 312 - 319
Community Name and/or NSA #: NSA23
Noise Wall Identification (i.e., Wall 1):

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   - Category A units impacted:
   - Category B units impacted: 0
   - Category C units impacted:
   - Category D units impacted (if interior analysis required):
   - Category E units impacted:

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? Yes [✓ No]

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes [✓ No]

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes [✓ No]

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 0

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? [✓ Yes] No

2. Can the noise wall be designed and physically constructed at the proposed location? [✓ Yes] No

3. Can the noise wall be constructed without causing a safety problem? [✓ Yes] No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? [✓ Yes] No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? [✓ Yes] No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? [✓ Yes] No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? [✓ Yes] No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall na

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) na

c. SF/BR = 2a/2b na

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ________ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point?		Yes		No
b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum		Yes		No

Decision

Is the Noise Wall WARRANTED?		Yes	x	No
Is the Noise Wall FEASIBLE?		Yes	x	No
Is the Noise Wall REASONABLE?		Yes	x	No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager
Date

Qualified Professional Performing the Analysis
(name, title, and company name)
Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date: 5/15/2014
Project Name: PTC 312 - 319
County: Chester
SR, Section: I-76, M.P. 312 - 319
Community Name and/or NSA #: NSA24
Noise Wall Identification (i.e., Wall 1):

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   - Category A units impacted:
   - Category B units impacted: 1
   - Category C units impacted:
   - Category D units impacted (if interior analysis required):
   - Category E units impacted:

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) na

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): na

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to “Decision” block and answer “no” to warranted question. As the reason for this decision, state that “Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* .” Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A “yes” answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes x No

Feasibility – Questions 1c through 7 must all be answered “yes” for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 1

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 100%

c. Is the percentage 50 or greater? x Yes No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes No

3. Can the noise wall be constructed without causing a safety problem? x Yes No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall."

________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall ____4608____

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) ____1____

c. SF/BR = 2a/2b ____4608____

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? _____ Yes _____ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum _____ Yes _____ No

Decision

Is the Noise Wall WARRANTED? __x__ Yes _____ No

Is the Noise Wall FEASIBLE? __x__ Yes _____ No

Is the Noise Wall REASONABLE? _____ Yes __x__ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager _____ Date

Qualified Professional Performing the Analysis
(name, title, and company name) _____ Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date 5/15/2014
Project Name PTC 312 - 319
County Chester
SR, Section I-76, M.P. 312 - 319
Community Name and/or NSA # NSA25
Noise Wall Identification (i.e., Wall 1)

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   - Category A units impacted
   - Category B units impacted 27
   - Category C units impacted
   - Category D units impacted (if interior analysis required)
   - Category E units impacted

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) 9/3/2013

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ." Yes No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1? x Yes No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)? Yes x No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category? Yes x No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: 27

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: 15%

c. Is the percentage 50 or greater? x Yes No

2. Can the noise wall be designed and physically constructed at the proposed location? x Yes No

3. Can the noise wall be constructed without causing a safety problem? x Yes No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel? x Yes No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations? x Yes No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner? x Yes No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner? x Yes No

Reasonableness

1. Community Desires Related to the Barrier TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to “Decision” block and answer “no” to reasonableness question. As the reason for this decision, state that “The majority of the benefited receptor unit owners do not desire the noise wall.” ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall 53972

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) 4

c. SF/BR = 2a/2b 13493

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A “yes” answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a “point of diminishing returns” evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall.

na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ________ Yes ________ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ________ Yes ________ No

Decision

Is the Noise Wall WARRANTED? ___x___ Yes ________ No

Is the Noise Wall FEASIBLE? ___x___ Yes ________ No

Is the Noise Wall REASONABLE? ________ Yes ___x___ No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ________________ Date

Qualified Professional Performing the Analysis
(name, title, and company name) ________________ Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – <u>Noise Wall</u>

Date: 5/15/2014
Project Name: PTC 312 - 319
County: Chester
SR, Section: I-76, M.P. 312 - 319
Community Name and/or NSA #: NSA26
Noise Wall Identification (i.e., Wall 1):

General

1. Type of project (new location, reconstruction, etc.): Widening and Reconstruction

2. Total number of impacted receptor units in community
   - Category A units impacted:
   - Category B units impacted: 5
   - Category C units impacted:
   - Category D units impacted (if interior analysis required):
   - Category E units impacted:

Warranted

1. Community Documentation

a. Date community was permitted (for new developments or developments planned for or under construction) ___na___

b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI): ___na___

c. Does the date in 1.a precede the date in 1.b? If yes, proceed to Warranted Item 2. If no, consideration of noise abatement is not warranted. Proceed to "Decision" block and answer "no" to warranted question. As the reason for this decision, state that "Community was permitted after the date of approval of *CE, ROD, or FONSI, as appropriate* ."

______ Yes ______ No

2. Criteria requiring consideration of noise abatement (note N/A if category is not impacted or present or analysis not required). A "yes" answer to any of the following three questions requires the consideration of noise abatement.

a. With the proposed project, are design year noise levels predicted to approach or exceed the NAC level(s) in Table 1?

___x___ Yes ______ No

b. With the proposed project, is there predicted to be a substantial design year noise level increase of 10 dB(A) or more at Activity Category A, B, C, D, or E receptor(s)?

______ Yes ___x___ No

c. With the proposed project, are design year noise levels predicted to be less than existing noise levels, but still approach or exceed the NAC levels in Table 1 for the relevant Activity Category?

______ Yes ___x___ No

Feasibility – Questions 1c through 7 must all be answered "yes" for a noise barrier to be determined to be feasible.

1. Impacted receptor units

a. Total number of impacted receptor units: ___5___

b. Percentage of impacted receptor units receiving 5 dB(A) or more insertion loss: ___100%___

c. Is the percentage 50 or greater?

______ Yes ___x___ No

2. Can the noise wall be designed and physically constructed at the proposed location?

___x___ Yes ______ No

3. Can the noise wall be constructed without causing a safety problem?

___x___ Yes ______ No

4. Can the noise wall be constructed without restricting access to vehicular or pedestrian travel?

___x___ Yes ______ No

5. Can the noise wall be constructed in a manner that allows for access for required maintenance and inspection operations?

___x___ Yes ______ No

6. Can the noise wall be constructed in a manner that permits utilities to function in a normal manner?

___x___ Yes ______ No

7. Can the noise wall be constructed in a manner that permits drainage features to function in a normal manner?

___x___ Yes ______ No

Reasonableness

1. Community Desires Related to the Barrier — TBD at a later date

a. Do at least 50 percent of the responding benefited receptor unit owner(s) and renters desire the noise wall? If yes, continue with Reasonableness questions. If no, the noise wall can be considered not to be reasonable. Proceed to "Decision" block and answer "no" to reasonableness question. As the reason for this decision, state that "The majority of the benefited receptor unit owners do not desire the noise wall." ________ Yes ________ No

2. Square Footage Per Benefited Receptor (SF/BR) Evaluation

a. Area (SF) of the proposed noise wall — 40000

b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss) — 5

c. SF/BR = 2a/2b — 8000

d. Is 2c less than or equal to the MaxSF/BR value of 2000? ________ Yes ____x____ No

3. Noise Reduction Design Goals (Activity Categories A, B, C, and E) A "yes" answer is required to Question 3a. for the noise wall to be determined to be reasonable. Questions 3b through 3e represent desirable goals that need not be met for a noise wall to be determined reasonable. However, they must be addressed and should be considered in the determination of the recommended noise wall. — na

a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor? ________ Yes ________ No

b. Does the noise wall provide an insertion loss of at least 7 dB(A) for more receptors than required under 3a.while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

c. Does the noise wall provide insertion losses of greater than 7 dB(A) while still conforming to the MaxSF/BR value of 2,000 and a "point of diminishing returns" evaluation? ________ Yes ________ No

d. Does the noise wall reduce future exterior levels to the low-60-decibel range (60-63) for Category B and C receptors and the upper-60 dB(A) range (65-68) for Category E receptors? ________ Yes ________ No

e. Does the noise wall reduce design year noise levels back to existing levels? ________ Yes ________ No

4. Noise Reduction Design Goals (Activity Category D) A “yes” answer is required to Question 4a. for the barrier to be determined to be reasonable. Question 4b represents a desirable goal that need not be met for a noise wall to be determined reasonable. However, this goal must be addressed and should be considered in the determination of the recommended noise wall. na

a. Does noise wall reduce design year interior noise levels by at least 7 dB(A) for the facility’s analysis point? ______ Yes ______ No

b. While conforming to the MaxSF/BR criteria and justified by a “point of diminishing returns’ evaluation, does the noise wall provide an interior insertion loss above the 7 dB(A) minimum ______ Yes ______ No

Decision

Is the Noise Wall WARRANTED? x Yes ______ No

Is the Noise Wall FEASIBLE? x Yes ______ No

Is the Noise Wall REASONABLE? ______ Yes x No

Additional Reasons for Decision:

Responsible/Qualified Individuals Making the Above Decisions

PennDOT, Engineering District Environmental Manager ______ Date

Qualified Professional Performing the Analysis
(name, title, and company name) ______ Date

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To	Kevin W. Scheurich, P.E. PTC	Page	1
CC			
Subject	NSA 21 Noise Reanalysis		
From	Paul Burge, INCE Bd. Cert, AECOM		
Date	December 29, 2016		

Introduction and Background

In May of 2014, URS Corporation (now AECOM) issued a report entitled "Traffic Noise Technical Report Full Depth Roadway Reconstruction and Widening of The Pennsylvania Turnpike (I-76) From Milepost 312 to 319". This report applied FHWA, PennDOT and PTC policy to assess potential noise impacts and evaluate noise abatement for noise sensitive land uses within the project area. The report identified 26 different Noise Sensitive Areas (NSAs), each including one or more individual noise sensitive properties, such as homes, schools and churches. Of the 26 NSAs, evaluated noise abatement in the form of noise walls were recommended for three NSAs. For the remaining NSAs, noise abatement was determined to be not warranted, feasible or reasonable under FHWA/PennDOT/PTC policy.

One of the NSAs with noise impacted properties, but for which it was determined that noise abatement was not reasonable was NSA 21. This is the residential area in the vicinity of Malvern, PA, north of the Turnpike, east of the Yellow Springs Road overpass, including homes along Blackberry Lane (as shown in Figure 4-6 of the May 2014 report). NSA 21 was evaluated to have 21 impacted homes (future project noise level 66 dBA or greater), and for which a 54,919 square foot barrier would provide benefit (5 dBA or greater noise reduction) to all 21 impacted homes. The barrier area per benefited receptor of 2615 SF/BR exceeded the maximum limit of 2000 SF/BR, as such the barrier was determined to be not reasonable.

More recently, an area resident reviewing the noise report identified a few discrepancies. The primary concern was related to the noise barrier analysis for NSA 21. One of the homes on Blackberry Lane near the eastern end of the NSA was not included in the original analysis. Upon review, it was confirmed that this home at 3195 Blackberry Lane was not yet constructed at the start of the analysis, but had received its building permit on November 26, 2012, and was constructed sometime in 2013. Since the home was not yet constructed at the initiation of the project, it was not included in the project drawings or aerial mapping and, as such, it was inadvertently omitted from the analysis. As a result of this observation, the analysis has been revised to include the missing home. The results of that analysis are reported below.

In addition, the resident also identified some inconsistencies in the field data sheets recorded during the noise measurement work. These included errors in recording the direction that the camera was facing for one of the site photos, and the date identified on one of the data sheets. For the camera direction inconsistency, the photo log, location ST21 photo #41, noted the camera direction as "northeast" but should have been noted as "southeast", and location ST21 photo #42 noted camera direction as "north" should have been more accurately noted as "northeast". There was also a discrepancy discovered when a comparison of the dates reported on field data sheets and corresponding photographs for Measurement location LT04 was made. The discrepancy in the documentation occurred due to the determination that, in some locations, insufficient traffic data had been collected at the time of the initial noise measurement. As a result, some of the noise measurement and traffic data had to be collected again and some of the data sheets describing the location of the measurements were reused from the initial measurement. It should be noted, however, that noise measurements and concurrent traffic counts are conducted to validate the accuracy of the computer model by comparing measured data to predicted data. This validated computer model is then used to predict existing and future noise levels at any given location. Aside from the model validation, the results of the noise measurements are not used in the impact assessment or mitigation evaluation analysis. Lastly, the resident correctly identified that on Figures 3-6 and 4-6, Whisper Lane was incorrectly identified as Blackberry Ridge, and questioned whether Blackberry Ridge was mistakenly excluded from the analysis. Blackberry Ridge was excluded from the analysis since it is outside the 500 foot buffer area as defined under the heading "Defining Area of Potential Impact" on Page 2-4 of the Noise Report (and the closest home on Blackberry Ridge is at least 700 feet from the Turnpike).

Reanalysis with New Receptor

As described above, the residence at 3195 Blackberry Lane (situated directly across Blackberry Lane from the Turnpike) has now been incorporated into a revised Traffic Noise Model (TNM) model run, with a new receptor point (R21-22A) modeled at the front of the residence facing the Turnpike. The new receptor location is now shown in Figure 1, below. Please note that in this original project aerial from 2012 that the home on this lot does not yet exist, but it is clearly visible on more recent internet based mapping.

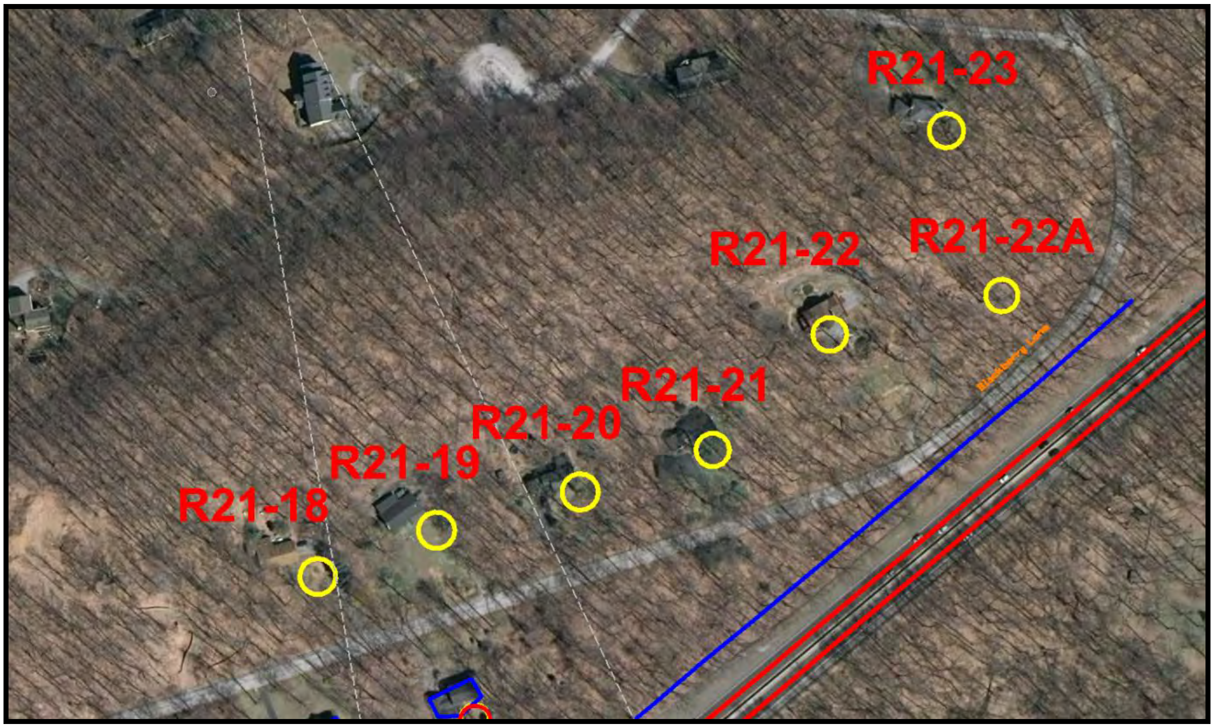

Figure 1. Location of New Noise Receptor R21-22A

(Aerial photo: August 2012, Delaware Valley Regional Planning Commission – PA Spatial Data Access Site)

Results and Recommendations

In re-evaluating NSA-21 with receptor R21-22A in place, it was determined that the new receptor is impacted with a future project noise level of 70 dBA without a barrier or 69 dBA with the originally analyzed barrier. Therefore the original noise barrier design was extended to the east by approximately 350 feet to achieve the required 5 dBA reduction at R21-22A.

Table 1 contains a receptor level barrier analysis for both original and updated barrier designs showing the results of the added receptor R21-22A. The updated result is that the area/benefited receptor value for the revised analysis exceeds the maximum allowable value of 2000 SF/BR. As a result, the noise barrier is still not recommended. Table 2 shows a side by side comparison of wall panel height by station number for the original and updated noise barrier designs.

Table 1. NSA-21 Updated Noise Barrier Analysis Detail

Receptor ID	**Future Build Predicted Noise Level (dBA, No Barrier)**	**Future Build Predicted Noise Level and Noise Reduction with Barrier (dBA, Leq))**			
		Original		**Updated**	
		Level	Reduction	Level	Reduction
R21-01	61	61	0	61	0
R21-02 / ST-21	76	63	13	63	13
R21-03	73	68	5	68	5
R21-04	76	63	13	63	13
R21-05	75	63	12	63	12
R21-06	76	65	11	65	11
R21-07	72	63	9	63	9
R21-08	69	62	7	62	7
R21-09	69	63	6	63	6
R21-10	66	61	5	61	5
R21-11	65	61	5	61	5
R21-12	66	61	5	61	5
R21-13	64	60	4	60	4
R21-14	67	62	5	62	5
R21-15	68	62	6	62	6
R21-16	72	64	8	64	8
R21-17 / ST-27	75	65	10	65	10
R21-18	67	61	6	61	6
R21-19	65	59	6	59	6
R21-20	70	62	8	62	8
R21-21	73	64	9	64	9
R21-22	69	64	5	62	7
R21-22A*	70	NA	NA	65	5
R21-23	67	66	2	65	3
R21-24	51	51	0	51	0
R21-25	72	67	5	67	5
R21-26	46	45	0	45	0
R21-27	60	57	3	57	3
R21-28	61	58	3	58	3
R21-29	63	59	4	59	4
Total Area (ft^2)		54,919		57,656	
Total # Benefitted Receptors		21		22	
Area / Benefitted Receptor		2,615		2,621	

* An additional receptor, R21-22A, was added to the area after the initial report was submitted (and not included in original barrier analysis)

Yellow highlight denotes impact, green highlight denotes benefit

Table 2. NSA 21 Analyzed Barrier Profile

Station #	Original Panel Height (ft)	Revised Panel Height (ft)
493+80	0	0
493+40	0	0
492+90	0	0
492+40	0	0
491+40	0	0
490+80	0	0
490+50	0	0
489+50	0	0
488+40	0	0
487+50	0	0
486+40	0	0
485+80	0	0
485+50	0	8
484+50	0	8
483+60	0	8
483+20	0	8
482+10	8	8
481+10	14	14
480+20	14	14
479+10	16	16
478+10	18	18
477+10	18	18
476+10	18	18
475+90	16	16
474+90	14	14
473+80	12	12
472+90	12	12
471+90	10	10
470+80	10	10
469+80	10	10
468+80	10	10
467+80	8	8
466+80	8	8
465+70	8	8
465+40	10	10
464+40	12	12
463+40	14	14
463+40	14	14
462+30	12	12
461+30	10	10
461+20	12	12
460+30	10	10
460+00	12	12
459+00	12	12
458+00	12	12
456+90	12	12
456+60	14	14
455+60	12	12
454+60	12	12
453+60	12	12
452+50	12	12
451+50	16	16
450+50	16	16
449+70	16	16
448+60	16	16
448+20	18	18
447+20	18	18
446+20	18	18
445+70	14	14
445+50	14	14
444+90	18	18
443+90	18	18
443+80	18	18
442+90	12	12
442+50	12	12
442+40	14	14
441+90	14	14
441+40	12	12
441+00	10	10
440+20	0	0
439+20	0	0
438+20	0	0
437+20	0	0
436+20	0	0

In addition, see the following revised/updated report tables below:

- Table ES-1 (Revised) shows the updated Summary of Identified Noise Sensitive Areas (NSAs).
- Table 4-1 (Revised) shows the updated Predicted Noise Levels and Impact Summary.
- Table 5-1 (Revised) shows the updated Summary of Barrier Analysis for Each NSA Location.
- Table 5-20 (Revised) shows the Updated NSA 21 Barrier Analysis Summary (similar to Tables reported for other NSAs in the full Technical Report).

Table ES-1 (Revised 12/29/16). Summary of Identified Noise Sensitive Areas (NSAs)

NSA ID	Land Use	Activity Category	Noise Abatement Criteria	Number of Modeled Receivers	Number of Receptors/ Equivalent Residential Units	Predicted Existing Noise Level, Range of Leq(1h), dBA	Predicted Future Noise Level Range of Leq(1h), dBA	Type of Impact NAC/ Increase/ None or Both
1	Residential/ Commercial	B, E	66, 71	7	6	64 - 71	67 - 72	NAC
2	Residential/ Commercial	B, E	66, 71	4	4	61 - 69	62 - 73	NAC
3	Commercial	E	71	13	0	55 - 76	58 - 79	NAC
4	Residential	B	66	55	153	52 - 74	54 – 80	NAC
5	Residential	B	66	38	95	59 - 82	61 – 80	NAC
6	Residential	B	66	1	1	64 - 64	67 – 67	NAC
7	Residential	B	66	3	4	62 - 66	64 – 69	NAC
8	Residential	B	66	20	20	57 - 75	61 – 76	NAC
9	Residential	B	66	6	8	58 - 69	60 – 71	NAC
10	Residential	B	66	4	4	62 - 66	64 – 68	NAC
11	Residential	B	66	2	2	60 - 72	62 – 75	NAC
12	Residential	B	66	1	1	66 - 66	69 – 69	NAC
13	Residential	B	66	3	3	66 - 71	70 – 74	NAC
14	Residential	B	66	1	1	66 - 66	69 – 69	NAC
15	Residential	B	66	13	13	59 - 74	63 – 77	NAC
16	Residential	B	66	6	6	59 - 68	61 – 70	NAC
17	Residential	B	66	4	4	56 - 64	59 – 67	NAC
18	Residential	B	66	4	4	61 - 73	62 – 75	NAC
19	Residential	B	66	14	14	54 - 61	59 – 65	None
20	Residential	B	66	15	44	55 - 66	59 – 70	NAC
21	Residential	B	66	30	30	44 - 74	46 – 76	NAC
22	Residential	B	66	4	4	51 - 62	54 – 65	None
23	Residential	B	66	3	3	57 - 62	60 – 65	None
24	Church	C	66	2	1	64 - 71	66 – 73	NAC
25	School/Future Residential	B	66	18	42	50 - 70	52 – 72	NAC
26	Residential	B	66	5	5	65 - 70	67 - 72	NAC
TOTAL				275	472			

Table 4- 1(Revised 12/29/16). Updated Predicted Noise Levels and Impact Summary

NSA ID	Dwelling Units	Predicted Noise Levels (range) Leq (1h), dBA		Impacted Receptors	
		Existing	Future Build	Number	Type
1	6*	64 - 71	67 - 72	6	NAC
2	4	61 - 69	62 - 73	1	NAC
3	2	55 - 77	58 - 79	1	NAC
4	153	52 - 74	54 - 80	77	NAC
5	95	59 - 82	61 - 80	70	NAC
6	2	64 - 64	67 - 67	1	NAC
7	3	62 - 66	64 - 69	2	NAC
8	20	57 - 75	61 - 76	7	NAC
9	8	58 - 69	60 - 71	2	NAC
10	4	62 - 66	64 - 68	3	NAC
11	2	60 - 72	62 - 75	1	NAC
12	1	66 - 66	69 - 69	1	NAC
13	3	66 - 71	70 - 74	3	NAC
14	1	66 - 66	69 - 69	1	NAC
15	13	59 - 74	63 - 77	8	NAC
16	6	59 - 68	61 - 70	2	NAC
17	4	56 - 64	59 - 67	2	NAC
18	4	61 - 73	62 - 75	2	NAC
19	14	54 - 61	59 - 65	0	None
20	44	55 - 66	59 - 70	15	NAC
21	30	44 - 74	46 - 76	21	NAC
22	4	51 - 62	54 - 65	0	None
23	3	57 - 62	60 - 65	0	None
24	1	64 - 71	66 - 73	1	NAC
25	42	50 - 70	52 - 72	27	NAC
26	5	65 - 70	67 - 72	5	NAC

* A seventh receptor is shown within the NSA. The seventh receptor is a hotel with no planned outdoor activities for their guests (i.e., no pool, no picnic area, etc.). Therefore, it is not considered as an impacted receptor.

Table 5-1 (12/29/16). Updated Summary of Barrier Analysis For Each NSA Location

NSA	Description	Number of Impacted Receptors	Method[1]	Feasible?[2]	Reasonable?[3]	Proposed Barrier Length (ft)	Average Height (ft)	Barrier Total Sq. Ft.	Number of Benefited Receptors	Sq. Ft. / BDU[3]	Recommended?
1	South of I-76 and west of Pottstown Pike (SR-100)	6	TNM	Yes	No	1300	9.85	12801	4	3200	No
2	North of I-76, between E. Township Line Rd. and the curve at Haywood Dr.	1	TNM	Yes	No	500	12.40	6199	1	6199	No
3	South of I-76 and west of Uwchlan Ave.	1	Screening Analysis	No	No	600	8.00	4800	1	4800	No
4	North of I-76 and east of Uwchlan Ave.	77	TNM	Yes	Yes	2570	12.45[4]	31985	95	337	Yes
5	North of I-76, east of Uwchlan Ave. at Pickering Station Dr.	70	TNM	Yes	Yes	1925	13.71[5]	26394	67	394	Yes
6	South of I-76 and west of Pine Creek Rd.	1	Screening Analysis	Yes	No	1660	8.00	13280	1	13280	No
7	South of I-76 and east of Pine Creek Rd.	2	Screening Analysis	Yes	No	1320	8.00	10560	2	5280	No
8	South of I-76 at Conestoga Rd. (SR-401)	7	TNM	Yes	No	1538	12.96	19934	7	2848	No
9	North of I-76 at Conestoga Rd. (SR-401)	2	TNM	Yes	No	785	8.47	6650	2	3325	No
10	North of I-76 at 7 Oaks Rd.	3	TNM	Yes	No	1101	8.00	8810	3	2937	No
11	South of I-76 between Conestoga Rd. and Bodine Rd.	1	TNM	Yes	No	470	11.72	5508	1	5508	No
12	North of I-76 and west of Bodine Rd.	1	Screening Analysis	Yes	No	900	8.00	7200	1	7200	No
13	South of I-76 and west of Bodine Rd.	3	TNM	Yes	No	400	16.50	6600	3	2200	No
14	North of I-76 and east of Bodine Rd.	1	Screening Analysis	Yes	No	700	8.00	5600	1	5600	No
15	South of I-76 and west of Valley Hill Rd.	8	TNM	Yes	No	2250	14.40	32500	7	4629	No
16	North of I-76 and west of Valley Hill Rd.	2	TNM	Yes	No	1000	12.80	12800	2	6400	No
17	South of I-76 and east of Valley Hill Rd.	2	TNM	Yes	No	1235	14.00	22900	1	22900	No
18	North of I-76 and east of Valley Hill Rd.	2	TNM	Yes	No	1042	8.19	8532	2	4266	No
19	North of I-76 and west of Yellow Springs Rd.	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
20	South of I-76 at the intersection of Yellow Springs Rd. and Brandywine Rd.	15	TNM	Yes	Yes	1966	10.416	20457	34	602	Yes
21	North of I-76 and east of Yellow Springs Rd. (homes on Blackberry Ln.)	21	TNM	Yes	No	4504	12.80	57656	22	2621	No
22	South of I-76 and north of Phoenixville Pike	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
23	South of I-76 and north of Phoenixville Pike, near Spring Mill Rd.	0	NA	NA	NA	NA	NA	NA	NA	NA	NA
24	South of I-76 and north of Phoenixville Pike, near Spring Mill Rd.	1	Screening Analysis	Yes	No	576	8.00	4608	NA	4608	No
25	North of I-76 and Charlestown Rd., west of Phoenixville Pike[7]	27	TNM	No[2]	No	2699	20.00	53972	4	13493	No
26	South of I-76 and east of Charlestown Rd.	5	TNM	Yes	No	2000	20	40000	5	8000	No

1 Screening Analysis consisted of an estimation calculation.

2 Noise abatement considered feasible if a minimum of 5 dBA Insertion Loss (IL) for a majority (50% or greater) of the impacted receptors.

3 Noise abatement considered reasonable if the Maximum Square Footage per Benefited Receptor (MaxSF/BR) has a value of 2000 or less. One benefited receptor must have an IL of 7 dBA.

4 Barrier minimum height is 8.00 feet, maximum height is 20.00 feet

5 Barrier minimum height is 12.00 feet, maximum height is 20.00 feet

6 Barrier minimum height is 8.00 feet, maximum height is 16.00 feet

7 Not applicable since not feasible. Barrier at turnpike ROW?shoulder is not feasible, no barriers on arterial roadways.

Table 5-20 (12/29/16). NSA 21 Updated Barrier Analysis Summary

Descriptions	Results
Number of Impacted Receptors	21
Number of Benefited Receptors	22
Barrier Evaluation Method	TNM
Length (ft.)	4,504
Average Height (ft.)	12.8
Minimum Height (ft.)	8
Maximum Height (ft.)	18
Area (ft^2)	57,656
Calculated SF/BR	2,621
Number of Receptors Meeting Design Goal (7 dBA)	11
Design Goal Met?	Yes
Feasible?	Yes
Reasonable?	No
Recommended?	**No**