Draft

Preliminary Design -- Traffic Noise Report

Pennsylvania Turnpike Commission
Milepost 28 to Milepost 31
Roadway and Bridge Reconstruction
Allegheny and Butler Counties
Project Number T-028.45T001-2

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Executive Summary

The Pennsylvania Turnpike Commission is proposing the reconstruction of a portion of the Pennsylvania Turnpike mainline between the Cranberry Interchange (Exit 28) and the Warrendale Toll Plaza. This project will not use Federal funding. This Preliminary Design Noise Analysis Report presents the results of a traffic noise analysis conducted using the current project plans and the procedures contained in PennDOT *Publication No. 24* (Project Level Highway Traffic Noise Handbook) issued December 12, 2013.

24-hour noise monitoring was conducted at two sites along the Turnpike within the project area. The 24-hour noise study indicated that Turnpike traffic noise levels were almost exactly the same from 7:00 AM to 7:00 PM. Therefore, it was determined that short-term traffic noise monitoring conducted at any time during the day would capture peak noise hour conditions. Short-term noise monitoring was conducted at 20 sites on June 26, 2014.

FHWA's Traffic Noise Model (Version 2.5) computer program was used to predict the Existing and Design Year (2039) noise levels generated by traffic on the reconstructed Turnpike mainline, I-79, US 19, multiple ramps, and the local roads associated with the no-build and build alternatives. Noise impacts were identified and noise mitigation, including noise barriers, were evaluated according the procedures contained in PennDOT *Publication No. 24.*

Two build alternatives are currently under consideration for this project. Both include the widening of the Turnpike mainline and other improvements. The key difference between the two alternatives is the removal of the Warrendale Toll Plaza and the pavement surrounding the plaza will result in higher traffic speeds, different future traffic noise levels, and the potential for additional traffic noise impacts.

The noise analysis results are summarized for the five Noise Study Areas (NSA) as follows:

NSA A

NSA A includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike. No traffic noise impacts were predicted and no noise mitigation was required with either alternative.

NSA B

This NSA includes the highway-oriented commercial and retail development along US 19, north of the Turnpike. No traffic noise impacts were predicted and no noise mitigation was required with either alternative.

NSA C

This NSA includes the commercial and light industrial sites along Commonwealth Drive, near Thorn Hill Road, south of the Turnpike. No traffic noise impacts were predicted and no noise mitigation was required with either alternative.

NSA D

This NSA includes the residential area along Northgate Drive, south of the Turnpike. NSA D includes a new residential development (under construction in 2015) at the western end of Northgate Drive along with office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential. In NSA D, some Year 2039 noise levels were considered an impact per PennDOT *Publication No. 24* with both alternatives.

The construction of a noise barrier for the new residential development at the western end of Northgate Drive is warranted with either alternative. However, because no noise barrier along the Turnpike could provide a substantial reduction (>5 dBA) in noise at any site in the new residential development, due to the noise generated by traffic on I-79, noise barriers along the Turnpike are not feasible and not recommended in this portion of NSA D with either alternative.

Also in NSA D, the construction of a noise barrier for the existing residences east of Mt. Pleasant Road can be considered warranted and feasible. However, because the square footage per benefited receiver exceeds 2,000 square feet, a noise barrier is not reasonable and is not recommended if the Warrendale Toll Plaza remains in place. PennDOT *Publication No. 24* states that noise barriers with a maximum square footage per benefited greater than 2,000 are not considered reasonable.

If the Warrendale Toll Plaza is removed, the construction of a 689' long, 12-16' high noise barrier along the eastbound Turnpike mainline for the existing residences east of Mt. Pleasant Road can be considered warranted, feasible, and reasonable given that the barrier meets the 7dB Insertion Loss Design Goal, noise levels at 100% of the impacted receivers will be reduced to the low-60-decibel range, and the square footage per benefited receiver is less than 2,000 square feet. Therefore, the construction of Barrier D -- East is recommended as part of the Build without Warrendale Toll Plaza alternative.

NSA E

This NSA includes the existing and planned hilltop residential areas north of the Turnpike. The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza. In NSA E, some Year 2039 noise levels were considered an impact per PennDOT *Publication No. 24* with both alternatives.

The construction of noise barriers for the impacted receiver sites in the western portions of NSA E overlooking I-79 can be considered warranted. Because no noise barriers along the Turnpike could provide a substantial reduction (>5 dBA) in noise at any site in the western portions of NSA E, noise barriers are not feasible and not recommended in this portion of NSA E with either alternative.

In the alternative in which the Warrendale Toll Plaza is removed, additional noise traffic impacts were predicted in the neighborhood just west of Mt. Pleasant Road and a noise barrier was warranted and feasible. However, because the square footage per benefited receiver exceeds 2,000 square feet, the noise barrier is not reasonable and is not recommended. PennDOT *Publication No. 24* states that noise barriers with a maximum square footage per benefited greater than 2,000 are not considered reasonable.

1. Introduction

The Pennsylvania Turnpike Commission (PTC) is proposing the reconstruction of a portion of the Pennsylvania Turnpike (I-76) from Milepost 28 to Milepost 31, located in Marshall Township, Allegheny County and Cranberry Township, Butler County, Pennsylvania (See Figure 1). More generally, this project involves the existing Turnpike mainline between the Cranberry Interchange (Exit 28 connecting to US 19 and I-79) and the Warrendale Toll Plaza (See Figure 2). This project will not use Federal funding.

This *Draft* Preliminary Design Noise Analysis Report presents the results of a traffic noise analysis using the current project plans and the procedures contained in PennDOT *Publication No. 24* (Project Level Highway Traffic Noise Handbook) issued December 12, 2013.

2. Background and History

The project area includes the Turnpike mainline, the I-79 mainline, and the US 19 highway oriented commercial corridor. The project area also includes the Cranberry Interchange ramps to/from the Turnpike to US 19 and I-79 and the acceleration/deceleration lanes west of the Warrendale Toll Plaza. Within the project area, the Turnpike is crossed by Thorn Hill Road and crosses over US 19 and Mt. Pleasant Road.

The project will involve:

- widening the Turnpike mainline from four travel lanes to six travel lanes,
- widening the Turnpike median from 10 feet to 26 feet,
- replacement of the Thorn Hill Road bridge over the Turnpike,
- replacement of the bridge carrying the Turnpike over US 19,
- shifting the Turnpike mainline to the north near US 19, and
- modifying/replacing culverts over various streams to accommodate the widened roadway.

In the early 2000s a noise analysis of the Warrendale Toll Plaza was conducted and noise barriers (walls) were built east of Mt. Pleasant Road. This study includes the western portion of the area protected by those existing noise barriers.

Two build alternatives are currently proposed for this project. Both include the widening of the Turnpike mainline and other improvements as stated above. The key difference between the two alternatives is the removal of the Warrendale Toll Plaza in NSA D and NSA E. This is important because the removal of the Warrendale Toll Plaza and the pavement surrounding the plaza will produce higher traffic speeds where the toll plaza previously stood. This results in different future traffic noise levels and the potential for additional traffic noise impacts. Both the Build with the Warrendale Toll Plaza alternative and the Build without the Warrendale Toll Plaza alternative were analyzed as part of this study.

3. Noise Study Areas

The project area has been divided into five Noise Study Areas based upon existing land use patterns and topography (See Figure 3).

NSA A

This NSA includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike. In 2014 construction of only one commercial building had been completed. The noise sensitive land use in NSA A was an office building. This facility did not have a noise sensitive outdoor activity area.

NSA B

This NSA includes the highway oriented commercial and retail development along US 19, north of the Turnpike. The noise sensitive land uses in NSA B are hotels, offices, and restaurants. With the exception of a small picnic area at the Comfort Inn, none of the existing facilities have noise sensitive outdoor activity areas.

NSA C

This NSA includes the commercial and light industrial sites along Commonwealth Drive near Thorn Hill Road, south of the Turnpike. In 2014 construction of most commercial buildings had been completed. The noise sensitive land uses in NSA C are offices. None of the existing facilities have noise sensitive outdoor activity areas.

NSA D

This NSA includes the residential area along Northgate Drive, south of the Turnpike. NSA D also includes a new residential development under construction in 2014 and 2015 at the western end of Northgate Drive and office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential.

NSA D also includes Warrendale Park south of the existing Warrendale Toll Plaza noise wall.

NSA E

This NSA includes the existing and planned hilltop residential areas north of the Turnpike. The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza.

NSA E also includes the Venango Trails development (off Freeport Road) and Venango Trails Estates (off Mt. Pleasant Road). Both of these residential areas were under development in 2014 and 2015.
(See: www.venangotrails.com)

4. Purpose

The purpose of this Preliminary Design Traffic Noise Report is to document the existing noise levels and noise sources in the project area, compare the predicted future noise levels associated with the no-build alternative and the two build alternatives, identify any future noise impacts, and evaluate the possible mitigation of identified noise impacts.

5. Regulations and Guidance

ms consultants, inc. conducted traffic noise analyses and prepared this report according to the procedures contained in PennDOT *Publication No. 24* (Project Level Highway Traffic Noise Handbook) issued December 12, 2013 and the regulations issued by the Federal Highway Administration (FHWA) in 23 CFR 772.

6. Methodology

Noise Descriptors

Noise levels are described as hourly A-weighted equivalent sound level in decibels, or dBA Leq(h). The decibel (dB) is a measure used to express the relative measure of a sound in comparison with a standard reference level. At the threshold of pain, the sound pressure is one million times greater than the sound pressure at the threshold of hearing. The decibel scale is used to logarithmically compress this large range of numeric values. By using the decibel scale, the range of sounds can be expressed as 0 to 120 dB rather than 1 to 1,000,000. In general, the average person cannot detect an increase or decrease in noise (sound pressure) level of less than 3 dBA. A change in noise level of 5 dBA is readily perceptible by most people. An increase or decrease in noise level of 10 dBA is perceived as a doubling or halving of the noise level.

Sound frequency is expressed as cycles per second or Hertz (Hz). The human ear can detect a wide range of frequencies from 20 to 20,000 Hz, but is most sensitive to sounds over a frequency range of 200 to 5,000 Hz. The human ear does not respond in a uniform manner to different frequency sounds. A sound pressure level of 70 dB will be perceived as much louder at 1,000 Hz than at 100 Hz. To account for this, various weighting methods have been developed to reflect human sensitivity to noise. The purpose of a weighting method is to de-emphasize the frequency ranges in which the human ear is less sensitive. The most commonly used measure of noise level is the A-weighted sound level (dBA). The dBA sound level is widely used for transportation-related noise measurements and specifications for community noise ordinances and standards. The dBA has been shown to be highly correlated to human response to noise.

In addition to noise fluctuating in frequency, environmental noise will fluctuate in intensity from moment to moment. Over a period of time there will be quiet moments and peak levels resulting from noisy, identifiable sources (trucks, aircraft, etc.). Because of these fluctuations, it is common practice to average these noise level fluctuations over a specified period of time. The equivalent sound level over a given period of interest, Leq, is equal to the equivalent steady-state noise level which, in a stated time period, would contain the same acoustical energy as the time-varying noise levels that actually occurred during the same time period. The hourly value of Leq, based upon the peak-hour percentage of the annual average daily traffic, is referred to as Leq(h). Surveys have shown that Leq properly predicts annoyance, and this descriptor is commonly used for noise measurement, prediction, and impact assessment.

Noise Monitoring

An Ambient Noise Monitoring work plan was prepared by **ms consultants, inc.** and approved by the PTC and the project's design manager, prior to any traffic noise monitoring activity on private property. The work plan included a discussion of noise monitoring procedures, a map of short-term (15-minute) and long-term (24-hour) monitoring locations, and an explanation of site access procedures.

A Metrosonics db-3100 sound analyzer (dosimeter) was utilized to obtain existing traffic noise levels. Standardized field data sheets for existing condition documentation were also completed at every ambient noise monitoring site.

24-hour noise monitoring was conducted at two sites along the Turnpike in NSA B and NSA D (See Figure 3). 24-hour noise monitoring was conducted from 10:00 AM May 29, 2014 to 10:00 AM May 30, 2014. Weather conditions at the site were noted at the beginning and end of the 24-hour monitoring period. Additionally, weather conditions obtained from Personal Weather Station MC3603 in Cranberry Township (2 miles east of Exit 28) were also reviewed to confirm that acceptable conditions existed throughout the 24-hour study (See Appendix 1).

The 24-hour noise study indicated that Turnpike (I-76) traffic noise levels were almost exactly the same from 7:00 AM to 7:00 PM. Therefore, it was determined that short-term traffic noise monitoring conducted at any time during the day would capture peak noise hour conditions. Short-term ambient noise monitoring was conducted on June 26, 2014, during weather conditions suitable for outdoor activity. Each site was monitored for a period of at least 15 minutes. Weather conditions and noise sources were noted at each site (See Appendix 2).

During short-term traffic noise monitoring, traffic counts on the Turnpike, I-79 mainline, US 19, and Northgate Drive were conducted using video tape and manual methods. Observed travel speed was determined by radar gun and by driving the Turnpike and I-79.

Noise Level Prediction

FHWA's Traffic Noise Model (Version 2.5) computer program was used to predict the Existing and Design Year (2039) noise levels generated by traffic on the reconstructed Turnpike mainline, I-79, US 19, multiple ramps, and the local roads associated with the no-build and build alternatives. Roadway location and elevation data was determined from project plans, profiles, and cross sections available in June 2015. Receiver locations and elevations were developed from project area base maps and approved subdivision plans.

The existing conditions, Design Year no-build, and Design Year build TNM models used traffic data that was developed from traffic forecasts prepared specifically for the project (See Appendix 3). Observed traffic was used only for TNM model validation. The existing conditions analysis involved 2013 traffic traveling at the observed speeds. The Design Year analysis for the With Warrendale Toll Plaza alternative involved 2039 traffic traveling at the observed speeds. However, traffic using the booth lanes was decelerated to a stop and accelerated to the observed speed (65 mph - Turnpike mainline) and traffic using EZ-Pass lanes was set to 55 mph. To account for the free-flow mainline conditions in the Without Warrendale Toll Plaza alternative, the Design Year analysis involved 2039 Turnpike mainline traffic traveling at design speed (70 mph). TNM's Traffic Control Devices (a software function) was used to account for acceleration at the US 19 signals, the Cranberry Interchange (Exit 28) ramps, and the Warrendale Toll Plaza.

Undeveloped Lands

PennDOT *Publication No. 24* explains that in order to assist local planning officials, the distance to impact thresholds for the various FHWA land use activity categories should be determined in undeveloped areas. Because approved development plans for the undeveloped areas in NSA E have been included in this analysis, there are no undeveloped lands in the MP 28-31 project area. The areas not included in the development plans are steep hill sides, which will not be developed in the foreseeable future.

Noise Impact Assessment

According to PennDOT *Publication No. 24*, a project is defined as having a traffic noise impact if either of the following conditions occur:

1. Predicted noise levels approach or exceed the FHWA Noise Abatement Criteria (NAC) as presented in Table 1.
2. Predicted noise levels are a substantial increase over the existing noise levels. According to PennDOT *Publication No. 24*, a substantial increase occurs where the future noise level increases 10 dB(A) or more above the existing noise level.

Table 1
Noise Abatement Criteria (23 CFR 772)
Hourly Weighted Sound Levels dB(A) For Various Land Use Activity Categories

Land Use Activity Category	Leq(h)	Description of Land Use Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B*	67 (exterior)	Residential.
C*	67 (exterior)	Active sports 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 (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*	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A, B, or C.
F	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities, (water resources, water treatment, electrical), and warehousing.
G	--	Undeveloped lands that are not permitted.
* Includes undeveloped lands permitted for this activity category.		

Because traffic noise impacts were identified with the build alternatives, the feasibility (acoustical performance) and reasonability (effectiveness) of mitigation via structural noise barriers (walls)

were evaluated using TNM 2.5. Noise mitigation via traffic management measures, horizontal and vertical alignment modifications, buffer zone creation, or noise insulation of Activity Category D structures was also considered, if appropriate. Note: There were no substantial increase impacts related to the MP 28-31 reconstruction project.

7. TNM Model Validation

To verify the accuracy of TNM 2.5, existing traffic noise levels were predicted for the monitoring sites and compared to the on-site monitoring results. This was accomplished by developing a TNM model of the existing roadways including the traffic volume, average vehicular speed, and percentage of trucks observed during the monitoring period. As shown in Table 2, the difference in the two values was within +/- 3 dB(A) indicating the model was within the level of accuracy required by PennDOT *Publication No. 24* (See Appendix 4).

Table 2
Model Validation Results dBA

Location	Monitored Noise Level	Predicted Noise Level	Difference
Site A-1	60	61	1
Site A-2	58	57	-1
Site B-1	75	75	0
Site B-2	63	63	0
Site B-3	70	69	-1
Site B-4	64	65	1
Site C-1	67	68	1
Site C-2	61	60	-1
Site D-1	62	65	3
Site D-2	60	62	2
Site D-3	62	65	3
Site D-4	59	59	0
Site D-5	55	57	2
Site D-6	54	56	2
Site E-1	64	65	1
Site E-2	61	62	1
Site E-5	58	59	1
Site E-6	56	55	-1
Site E-7	57	58	1
Site E-8	55	55	0

Noise monitoring sites are shown on Figure 3.
Sites E-3 and E-4 are planned sites that were not cleared and graded in May 2014.

8. Noise Modeling

Because TNM was predicting existing noise levels accurately, the validation model was expanded to predict existing peak-hour noise levels in each NSA. For this study, peak-hour was assumed to be the Design Hourly Volume (DHV) on the Turnpike and the existing PM peak-hour traffic on I-79 and other roadways. Appendix 5 contains the TNM output from the existing conditions model. This modeled existing noise level was later used as the existing noise level in future no-build, build (with and without Toll Plaza), and barrier evaluation models.

TNM 2.5 was also used to predict Design Year (2039) traffic noise levels associated with the no-build and build alternative. Design Year traffic noise was predicted for a total of 285 receiver sites (See Figure 4 thru Figure 8). These modeling sites represent numerous residential sites, hotels, commercial sites, and the park adjacent to the Turnpike mainline, I-79, Exit 28 ramps, and the local roads associated with the MP 28-31 reconstruction project.

- TNM 2.5 output for the no-build alternative is presented in Appendix 6.
- TNM 2.5 output for the build With Toll Plaza alternative is in Appendix 7.
- TNM 2.5 output for the build Without Toll Plaza alternative is in Appendix 8.

NSA A

This NSA includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike (See Figure 4). In 2014, construction of only one commercial building had been completed. The noise sensitive land use in NSA A was an office building. As shown in Table 1, office buildings are considered Activity Category E.

Because two project alternatives are being considered, NSA A was analyzed for scenarios in which the Toll Plaza remained and in which the Toll Plaza was removed. Because of the distance between this NSA and the Warrendale Toll Plaza, the predicted noise levels for both alternatives are the same. The predicted noise levels for both alternatives are included in the Build Alternatives - 2039 column in Table 3 below.

Table 3
NSA A -- Predicted Noise Levels dB(A)

Receiver	NAC Activity Category	Existing	No-Build Alternative - 2039		Build Alternatives - 2039	
			Predicted	Increase	Predicted	Increase
A-1	E	61	63	2	62	1

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

As shown in Table 3, Year 2039 no-build peak-hour noise level was 61 decibels. This no-build noise level does not approach or exceed FHWA NAC for Activity Category E land uses.

The Year 2039 build peak-hour noise level was 62 decibels. In NSA A, the Year 2039 build noise levels will not approach or exceed FHWA NAC. Also, Year 2039 noise levels do not increase 10 dB(A) or more above the existing noise level and are not considered a substantial increase. **Therefore, no traffic noise impacts are predicted in NSA A with either alternative.**

NSA B

This NSA includes the highway oriented commercial and retail development along US 19, north of the Turnpike (See Figure 5). The noise sensitive land uses in NSA B are hotels, offices, and restaurants. As shown in Table 1, hotels, offices, and restaurants are considered Activity Category E and the other commercial and retail development are considered Activity Category F.

Because two project alternatives are being considered, NSA B was analyzed for scenarios in which the Toll Plaza remained and in which the Toll Plaza was removed. Because of the distance between this NSA and the Warrendale Toll Plaza, the predicted noise levels for both alternatives are the same. The predicted noise levels for both alternatives are included in the Build Alternatives - 2039 column in Table 4 below.

Table 4
NSA B -- Predicted Noise Levels dB(A)

Receiver	NAC Activity Category	Existing	No-Build Alternative - 2039		Build Alternatives - 2039	
			Predicted	Increase	Predicted	Increase
B-1 (Hotel)	E	69	70	1	**71**	2
B-2 (Hotel)	E	**73**	**74**	1	**76**	3
B-3 (Hotel)	E	**71**	**72**	1	**74**	3
B-4 (Hotel)	E	65	66	1	67	2
B-5	E	67	69	2	69	2
B-6 (Daycare)	C	**71**	**73**	2	**74**	3
B-7 (Car Dealer)	F	71	73	2	75	4
B-8 (Hotel)	E	65	67	2	66	1
B-9 (Hotel)	E	66	68	2	68	2
B-10	E	67	69	2	69	2
B-1ii (Hotel)	E	61	63	2	62	1
B-1iii (Gas Station)	F	65	67	2	67	2
B-2ii (Hotel)	E	63	65	2	65	2
B-2iii	E	64	65	1	65	1
B-2iv	E	70	**72**	2	**71**	1
B-3ii (Hotel)	E	61	63	2	63	2
B-3iii	E	64	65	1	65	1
B-3iv (Gas Station)	F	73	74	1	74	1
B-4iiia	E	62	63	1	64	2
B-4iiib	E	63	65	2	65	2
B-4iva	E	70	**71**	1	**71**	1
B-4ivb (Gas Station)	F	66	68	2	68	2
B-5iia	E	64	66	2	66	2
B-5iib	E	65	67	2	67	2
B-5iic	E	65	66	1	67	2
B-5iva	E	64	65	1	65	1
B-5ivb	E	64	66	2	66	2
B-6ii	E	66	67	1	67	1

B-6iv	E	63	65	2	65	2
B-7iv	E	64	65	1	65	1
B-8iv	E	67	70	3	68	1
B-9iv	E	65	67	2	66	1
B-10iva (Hotel)	E	61	63	2	63	2
B-10ivb (Pool)	C	62	64	2	64	2

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

As shown in Table 4, Year 2039 no-build peak-hour noise levels ranged from 63 to 74 decibels in NSA B with the highest noise levels at first-row receivers near the Turnpike mainline. These no-build noise levels approach or exceed FHWA NAC for Activity Category C and E land uses.

Year 2039 build noise levels do not increase 10 dB(A) or more above the existing noise level and are not considered a substantial increase. Year 2039 build exterior peak-hour noise levels ranged from 62 to 76 decibels and will approach or exceed FHWA NAC. More specifically, at Receivers B-2, B-3, B-6, B-2iv, and B-4iva the build exterior peak-hour noise levels are predicted to exceed FHWA NAC. However, these sites do not have noise sensitive outdoor activity areas.

Because the buildings associated with Receivers B-2, B-3, and B-6 are of modern construction with double-pane windows and air-conditioning, according to FHWA Policy and Guidance, they can be assumed to have at least a 25 dB difference between exterior and interior levels. Therefore, the highest exterior noise level (76 dBA) equates to an interior noise level of 51 dBA, which is below the FHWA NAC for sensitive interior uses of 52 dBA (See Table 1). **Because the predicted interior traffic noise levels at Receivers B-2, B-3, and B-6 cannot be considered an impact, there are no traffic noise impacts predicted in NSA B with either alternative.**

NSA C

This NSA includes the commercial and light industrial sites along Commonwealth Drive near Thorn Hill Road, south of the Turnpike (See Figure 6). In 2014, construction of most commercial buildings had been completed. The noise sensitive land uses in NSA C are offices. As shown in Table 1, offices are considered Activity Category E and industrial sites are Activity Category F.

Because two project alternatives are being considered, NSA C was analyzed for scenarios in which the Toll Plaza remained and in which the Toll Plaza was removed. Because of the distance between this NSA and the Warrendale Toll Plaza, the predicted noise levels for both alternatives are the same. The predicted noise levels for both alternatives are included in the Build Alternatives - 2039 column in Table 5 below.

Table 5
NSA C -- Predicted Noise Levels dB(A)

Receiver	NAC Activity Category	Existing	No-Build Alternative - 2039		Build Alternatives - 2039	
			Predicted	Increase	Predicted	Increase
C-1	E	60	61	1	62	2
C-2	E	67	68	1	69	2
C-3	E	67	68	1	69	2
C-4	E	63	65	2	64	1
C-5	E	63	65	2	65	2
C-6	E	64	66	2	64	0
C-7 (Trucking)	F	60	62	2	62	2
C-8	E	61	62	1	62	1
C-9	E	60	62	2	62	2
C-2ii	E	58	60	2	60	2
C-3ii	E	57	59	2	60	3
C-4ii	E	58	60	2	61	3
C-5iia	E	58	60	2	60	2
C-5iib	E	56	58	2	58	2
C-6iia	E	57	58	1	59	2
C-6iib	E	57	58	1	58	1

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

As shown in Table 5, Year 2039 no-build peak-hour noise levels ranged from 58 to 68 decibels in NSA C with the highest noise levels at first-row receivers adjacent to the Turnpike.

In this NSA, Year 2039 build peak-hour noise levels ranged from 58 to 69 decibels. No sites approach or exceed FHWA NAC for Activity Category E land uses and Year 2039 noise levels do not increase 10 dB(A) or more above the existing noise level and are not considered a substantial increase. **Therefore, no traffic noise impacts are predicted in NSA C with either alternative.**

NSA D

This NSA includes the residential area along Northgate Drive, south of the Turnpike (See Figure 7). NSA D also includes a new residential development under construction in 2014 at the western end of Northgate Drive and office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential. As shown in Table 1, single and multi-family family homes are considered Activity Category B and buildings, restaurants, and other commercial sites are considered Activity Category E.

Because two project alternatives are being considered, NSA D was analyzed for scenarios with the Warrendale Toll Plaza and without the Warrendale Toll Plaza.

Table 6
NSA D -- Predicted Noise Levels dB(A)

Receiver	NAC Activity Category	Existing	No-Build Alternative - 2039		Build Alternative w/ Plaza - 2039		Build Alternative w/o Plaza- 2039	
			Predicted	Increase	Predicted	Increase	Predicted	Increase
D-1	B	67	69	2	69	2	69	2
D-2	B	67	69	2	68	1	68	1
D-3	B	67	69	2	68	1	68	1
D-4	B	67	69	2	68	1	68	1
D-5	B	66	68	2	67	1	67	1
D-6 (Pool)	C	64	65	1	65	1	65	1
D-7 (Community Bldg)	C	63	65	2	64	1	64	1
D-8	B	64	65	1	64	0	65	1
D-9	B	63	65	2	64	1	64	1
D-10	B	63	65	2	63	0	63	0
D-11	B	63	65	2	63	0	63	0
D-12	B	62	64	2	62	0	63	0
D-13	B	62	64	2	62	0	63	1
D-14	B	62	64	2	62	0	63	1
D-15	B	62	64	2	62	0	62	0
D-16	B	62	64	2	62	0	63	1
D-17	B	62	64	2	62	0	63	1
D-18	B	60	62	2	62	2	62	2
D-19	F	61	63	2	63	2	63	2
D-20	C	60	61	1	62	2	62	2
D-21	B	62	63	1	63	1	64	2
D-22	E	65	66	1	65	0	65	0
D-23	E	65	67	2	65	0	66	1
D-24	B	63	65	2	65	2	66	3
D-25	B	63	65	2	65	2	66	3
D-26	C	61	63	2	65	4	66	5
D-27	F	62	63	1	67	5	67	5
D-28	F	61	62	1	66	5	66	5
D-30	B	59	61	2	61	2	62	3
D-31	E	59	60	1	61	2	62	3
D-32	F	59	60	1	61	2	62	3
D-33	F	70	71	1	71	1	72	2

D-34	B	**68**	**70**	2	**69**	1	**72**	4
D-37	B	57	59	2	60	3	61	4
D-38	B	57	58	1	58	1	61	4
D-1ii	B	**67**	**69**	2	**68**	1	**68**	1
D-2ii	B	**67**	**69**	2	**68**	1	**68**	1
D-3ii	B	**67**	**69**	2	**67**	0	**67**	0
D-4ii	B	**66**	**68**	2	**67**	1	**67**	1
D-7ii	B	63	65	2	64	1	64	1
D-8ii	B	63	64	1	63	0	63	0
D-10ii	B	62	64	2	63	0	63	1
D-11ii	B	62	64	2	62	0	63	1
D-12ii	B	62	64	2	62	0	62	0
D-13ii	B	62	63	1	62	0	62	0
D-14ii	B	62	63	1	62	0	62	0
D-15ii	B	61	63	2	61	0	61	0
D-16ii	B	61	63	2	61	0	61	0
D-17ii	B	61	62	1	61	0	62	1
D-18ii	F	57	59	2	59	2	60	3
D-22ii	F	62	64	2	64	2	64	2
D-22iii	B	60	62	2	62	2	63	3
D-23ii	E	63	64	1	64	1	65	2
D-25ii	E	62	64	2	64	2	65	3
D-25iii	E	60	62	2	62	2	63	3
D-26iia	E	61	62	1	64	3	64	3
D-26iib	B	60	62	2	63	3	63	3
D-26iii	F	59	61	2	62	3	63	4
D-27iia	B	61	63	2	63	2	64	3
D-27iib	B	61	62	1	63	2	63	2
D-28iia	B	60	62	2	62	2	63	3
D-28iib	B	60	62	2	62	2	63	3
D-28iii	E	57	59	2	59	2	60	3
D-29a	F	62	63	1	65	3	65	3
D-29b	E	60	61	1	62	2	60	0
D-29iia	B	60	62	2	62	2	62	2
D-29iib	B	60	62	2	62	2	63	3
D-32iiia	E	60	61	1	62	2	62	2
D-32iiib	F	60	62	2	63	3	63	3
D-33ii	B	63	65	2	**66**	3	**67**	4
D-33iii	B	61	63	2	64	3	65	4
D-33iv	B	60	61	1	62	2	63	3
D-33va	B	59	60	1	61	2	62	3
D-33vb	F	62	64	2	64	2	65	3
D-33vi	B	60	62	2	62	2	63	3
D-34ii	B	65	**67**	2	**68**	3	**68**	3
D-34iii	B	64	65	1	**66**	2	**67**	3
D-34iv	F	61	63	2	63	2	64	3
D-34v	F	62	64	2	64	2	65	3
D-34vi	F	57	59	2	60	3	60	3
D-35v	B	57	58	1	59	2	60	3
D-35via	B	59	60	1	61	2	61	2
D-35vib	B	58	60	2	60	2	61	3

D-36v	B	56	58	2	59	3	61	5
D-36via	B	58	60	2	60	2	61	3
D-36vib	B	58	60	2	60	2	61	3
D-36vii	B	62	63	1	64	2	64	2
D-37iii	B	58	59	1	60	2	61	3
D-37iv	B	57	58	1	59	2	60	3
D-37va	B	56	58	2	59	3	60	4
D-37via	B	58	59	1	59	1	61	3
D-37vib	B	59	60	1	60	1	61	2
D-37vb	B	57	59	2	59	2	60	3
D-37vc	B	57	59	2	59	2	61	4
D-37viia	B	60	61	1	62	2	63	3
D-37viib	B	61	62	1	63	2	64	3
D-38iiia	B	56	57	1	58	2	59	3
D-38iiib	B	58	60	2	60	2	62	4
D-38iiic	B	58	59	1	59	1	62	4
D-38iiid	B	58	60	2	60	2	63	5
D-38vi	B	63	65	2	65	2	**66**	3

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.
***** Predicted exterior noise level.

As shown in Table 6, Year 2039 no-build peak-hour noise levels ranged from 57 to 70 decibels in NSA D with the highest noise levels in the new residential development at the western end of Northgate Drive and the existing residential sites just east of Mt. Pleasant Road. At these sites the no-build noise levels approach or exceed FHWA NAC for Activity Category B land uses.

Year 2039 build with the Warrendale Toll Plaza peak-hour noise levels also ranged from 59 to 72 decibels. Year 2039 build without the Warrendale Toll Plaza peak-hour noise levels ranged from 58 to 72 decibels. In both alternatives, Year 2039 noise levels do not increase 10 dB(A) or more above the existing noise level and are not considered a substantial increase.

In NSA D, the Year 2039 with or without the Warrendale Toll Plaza build noise levels will approach or exceed FHWA NAC and traffic noise impacts are predicted.

NSA E

This NSA includes the existing and planned hilltop residential areas north of the Turnpike. The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza (See Figure 8). As shown in Table 1, single family homes are considered Activity Category B.

Because two project alternatives are being considered, NSA E was analyzed for scenarios with the Warrendale Toll Plaza and without the Warrendale Toll Plaza.

Table 7
NSA E -- Predicted Noise Levels dB(A)

Receiver	NAC Activity Category	Existing	No-Build Alternative - 2039		Build Alternative w/ Plaza - 2039		Build Alternative w/o Plaza- 2039	
			Predicted	Increase	Predicted	Increase	Predicted	Increase
E-1	B	65	67	2	67	2	67	2
E-2	B	65	67	2	67	2	67	2
E-3	B	65	67	2	67	2	67	2
E-4	B	66	67	1	67	1	67	1
E-5	B	65	67	2	67	2	67	2
E-6	B	65	67	2	67	2	67	2
E-7	B	65	66	1	66	1	66	1
E-8	B	65	67	2	67	2	67	2
E-9	B	65	66	1	66	1	66	1
E-10	B	64	66	2	66	2	66	2
E-11	B	64	66	2	66	2	66	2
E-12	B	64	66	2	66	2	66	2
E-13	B	65	67	2	66	1	66	1
E-14	B	65	67	2	67	2	67	2
E-15	B	65	67	2	66	1	66	1
E-16	B	65	67	2	67	2	67	2
E-17	B	65	66	1	66	1	66	1
E-18	B	63	64	1	64	1	64	1
E-19	B	61	63	2	63	2	63	2
E-20	B	60	61	1	61	1	61	1
E-21	B	58	60	2	60	2	60	2
E-22	B	57	59	2	59	2	59	2
E-23	B	53	55	2	54	1	54	1
E-24	B	50	52	2	51	1	51	1
E-25	B	51	53	2	52	1	52	1
E-26	B	52	54	2	53	1	53	1
E-27	B	52	54	2	53	1	53	1
E-28	B	52	53	2	52	0	52	0
E-29	B	51	53	2	52	1	52	1
E-30	B	53	54	1	54	1	54	1
E-31	B	53	55	2	54	1	54	1
E-32	B	54	55	1	55	1	55	1
E-33	B	52	54	2	54	2	54	2
E-34	B	51	52	1	52	1	52	1
E-35	B	45	47	2	47	2	47	2
E-36	B	65	66	1	65	0	68	3

E-37	B	60	61	1	60	0	63	3
E-38	B	61	62	1	62	1	64	3
E-39	B	59	61	2	59	0	63	4
E-40	B	58	59	1	59	1	63	5
E-41	B	59	61	2	60	1	65	6
E-42	B	57	58	1	58	1	62	5
E-43	B	57	59	2	58	1	62	5
E-44	B	55	57	2	56	1	60	5
E-45	B	57	59	2	59	2	64	7
E-46	B	56	58	2	57	1	62	1
E-1ii	B	54	56	2	56	2	56	2
E-2ii	B	58	60	2	60	2	60	2
E-3ii	B	60	62	2	62	2	62	2
E-3iii	B	60	61	1	61	1	61	1
E-3iv	B	59	60	1	60	1	60	1
E-3v	B	59	60	1	61	2	61	2
E-3vi	B	58	60	2	60	2	60	2
E-4ii	B	60	61	1	62	2	62	2
E-4vi	B	58	59	1	59	1	59	1
E-5ii	B	60	62	2	62	2	62	2
E-5iii	B	57	59	2	59	2	59	2
E-5vi	B	57	59	2	59	2	59	2
E-6ii	B	61	63	2	63	2	63	2
E-6iii	B	57	58	1	58	1	58	1
E-6vi	B	57	59	2	59	2	59	2
E-7ii	B	60	62	2	62	2	62	2
E-7iii	B	57	58	1	58	1	58	1
E-7vi	B	56	58	2	58	2	58	2
E-8ii	B	60	62	2	62	2	62	2
E-8iii	B	55	57	2	57	2	57	2
E-8vi	B	56	58	2	58	2	58	2
E-9ii	B	60	62	2	62	2	62	2
E-9via	B	56	57	1	57	1	57	1
E-9vib	B	55	57	2	57	2	57	2
E-10ii	B	58	59	2	59	1	59	1
E-10iii	B	57	59	2	59	2	59	2
E-10iv	B	56	58	2	58	2	58	2
E-10v	B	56	57	2	57	1	57	1
E-10vi	B	55	57	2	57	2	57	2
E-16ii	B	59	61	2	61	2	61	2
E-17ii	B	58	60	2	60	2	60	2
E-18ii	B	56	57	2	57	1	57	1
E-19ii	B	55	57	2	57	2	57	2
E-22ii	B	55	57	2	57	2	57	2
E-23iia	B	55	56	1	56	1	56	1
E-23iib	B	54	55	1	55	1	55	1
E-23iic	B	53	54	1	54	1	54	1
E-24iia	B	52	53	1	54	2	54	2
E-24iib	B	52	53	1	53	1	53	1
E-25ii	B	39	41	2	40	1	40	1
E-26ii	B	38	39	1	39	1	39	1

E-27ii	B	37	38	1	38	1	38	1
E-28ii	B	36	38	2	38	2	38	2
E-29ii	B	36	38	2	38	2	38	2
E-30ii	B	36	37	1	37	1	37	1
E-34ii	B	35	37	2	37	2	37	2
E-34iii	B	36	38	2	38	2	38	2
E-34iv	B	37	39	2	39	2	39	2
E-34ix	B	52	54	2	53	1	53	1
E-34v	B	39	41	2	41	2	41	2
E-34vi	B	41	43	2	43	2	43	2
E-34vii	B	45	47	2	47	2	47	2
E-34viii	B	52	53	1	53	1	53	1
E-35ii	B	43	44	1	44	1	44	1
E-35iii	B	46	47	1	46	0	46	0
E-35iv	B	45	47	2	46	1	46	1
E-35ix	B	43	45	2	44	1	44	1
E-35v	B	44	46	2	45	1	45	1
E-35vi	B	44	45	1	44	0	44	0
E-35vii	B	43	45	2	44	1	44	1
E-35viii	B	43	44	1	44	1	44	1
E-35x	B	48	50	2	49	1	49	1
E-36ii	B	62	63	1	61	-1	65	3
E-36iii	B	58	60	2	59	1	63	5
E-36iv	B	54	56	2	55	1	58	4
E-36v	B	56	58	2	57	1	61	5
E-36vi	B	55	57	2	57	2	60	5
E-37ii	B	56	58	2	57	1	60	4
E-37iii	B	54	55	1	55	1	57	3
E-37iv	B	51	53	2	52	1	55	4
E-37v	B	51	53	2	53	2	56	5
E-38ii	B	58	60	2	59	1	62	4
E-38iii	B	57	59	2	58	1	60	3
E-38iv	B	56	58	2	57	1	59	3
E-38va	B	55	57	2	57	2	57	2
E-38vb	B	55	57	2	57	2	58	3
E-40ii	B	56	58	2	57	1	61	5
E-40iii	B	54	56	2	56	2	58	4
E-41ii	B	55	57	2	56	1	60	5
E-41iv	B	55	57	2	56	1	60	5
E-42ii	B	56	57	1	57	1	61	5
E-43ii	B	56	57	1	57	1	61	5
E-44ii	B	55	56	1	56	1	60	5
E-45ii	B	55	57	2	56	1	61	6
E-45iii	B	56	58	2	58	2	62	6
E-45iv	B	56	57	1	57	1	61	5
E-45v	B	55	56	1	56	1	60	5
E-46ii	B	53	54	2	54	1	59	6
E-46iii	B	50	52	2	52	2	56	6
E-46iv	B	49	50	1	50	1	54	5

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

As shown in Table 7, Year 2039 no-build peak-hour noise levels ranged from 37 to 67 decibels in NSA E with the highest noise levels at the first-row receivers adjacent to I-79. Some of these no-build noise levels approach or exceed FHWA NAC for Activity Category B land uses.

Year 2039 build with the Warrendale Toll Plaza peak-hour noise levels also ranged from 37 to 67 decibels. Year 2039 build without the Warrendale Toll Plaza peak-hour noise levels ranged from 37 to 68 decibels. In both alternatives, Year 2039 noise levels do not increase 10 dB(A) or more above the existing noise level and are not considered a substantial increase.

In NSA E, the Year 2039 build with or without the Warrendale Toll Plaza noise levels will approach or exceed FHWA NAC and traffic noise impacts are predicted.

9. Traffic Noise Abatement

According to PennDOT *Publication No. 24*, when the predicted design year noise levels approach or exceed FHWA NAC or when predicted design year noise levels substantially increase, noise mitigation must be considered. Traffic noise mitigation measures may include:

- Traffic management measures,
- Horizontal and vertical alignment modifications,
- Acquisition of right-of-way for buffer zones, or
- Construction of noise barriers.

Traffic management measures which impose vehicle size or weight restrictions, lower speed limits, time-of-operation restrictions, or rerouting traffic were not considered appropriate as noise abatement measures on this project. Vehicle size or weight restrictions were not considered because it is impractical to prohibit heavy vehicles from using the Pennsylvania Turnpike (I-76). Lowering the posted speed was not considered effective because of the subsequent reduction in highway capacity and incentive to use the highway or other state routes. Time-of-operation constraints or the rerouting of traffic were also not appropriate because the highways involved are interstate or state routes.

Additional changes in vertical alignment or shifting the horizontal alignment of the Turnpike was not considered appropriate as noise abatement measures on this project. Alignment modifications are constrained by the location of adjacent residential/commercial land uses, existing highways, and the hilly terrain.

The development of buffer zones to provide noise mitigation was not considered appropriate as a noise abatement measure for this project. The amount of additional right-of-way required to create effective buffer zones would negatively impact existing residential/commercial areas.

In order to recommend a noise barrier for inclusion in a highway improvement project, PennDOT *Publication No. 24* and 23 CFR 772 require the barrier to be warranted, feasible, and reasonable. A noise barrier is warranted when the predicted design year no-barrier noise levels approach or exceed FHWA NAC or when the predicted design year no-barrier noise levels substantially increase over the existing sound levels and when other traffic noise mitigation measures are not appropriate for a project. If a noise barrier is warranted, its feasibility is investigated.

A noise barrier is considered feasible when it can provide a substantial reduction in traffic noise. Specifically, PennDOT *Publication No. 24* states that a barrier should provide an Insertion Loss of at least 5 dBA at 50% of the impacted receivers. A noise barrier is also considered feasible if it is physically possible to construct and maintain, and if it does not create restrictions to drainage, utilities, vehicular or pedestrian traffic and if it does not create safety problems such as reduced sight distances and insufficient clear zones. Once a barrier location is determined to be feasible, its reasonableness is evaluated.

According to PennDOT *Publication No. 24* issued December 12, 2013, a noise barrier is considered reasonable if it meets the barrier Design Goal (7dB Insertion Loss for at least one impacted receiver) and the Maximum Square Footage of Abatement Per Benefited Receiver (MaxSF/BR) is equal to or less than 2,000 square feet. Benefited Receivers are residential dwelling units, or Equivalent Residential Units (ERUs), which are provided with a minimum Insertion Loss of 5 dBA as determined by FHWA's Traffic Noise Model (TNM). To determine barrier reasonability, the total square footage of a barrier is divided by the number of Benefited Receivers. PennDOT *Publication No. 24* states that noise barriers with a MaxSF/BR greater than 2,000 are not considered reasonable.

For the Pennsylvania Turnpike Milepost 28-31 reconstruction project, the feasibility and economic reasonability of potential barriers were evaluated using the TNM Version 2.5.

Two build alternatives are currently proposed for this project. Both include the widening of the Turnpike mainline and other improvements. The key difference between the two alternatives is the removal of the Warrendale Toll Plaza in NSA D and NSA E. Because there were traffic noise impacts, abatement for both the Build with the Warrendale Toll Plaza alternative and the Build without the Warrendale Toll Plaza alternative were analyzed as part of this study.

Build with Warrendale Toll Plaza Alternative

NSA A

This NSA includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike (See Figure 4). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA with either alternative.

NSA B

This NSA includes the highway oriented commercial and retail development along US 19, north of the Turnpike (See Figure 5). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA B with either alternative.

NSA C

This NSA includes the commercial and light industrial sites along Commonwealth Drive near Thorn Hill Road, south of the Turnpike (See Figure 6). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA C with either alternative.

NSA D

This NSA includes the residential area along Northgate Drive, south of the Turnpike (See Figure 7). NSA D also includes a new residential development under construction in 2014 at the western end of Northgate Drive and office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential. As shown in Table 6, Year 2039 build peak-hour noise levels ranged from 57 to 70 decibels. These Year 2039 build noise levels will approach or exceed FHWA NAC in the Build with the Warrendale Toll Plaza alternative.

Barrier D – West

For the receiver sites in the new residential development at the western end of Northgate Drive, it was determined that not even a 20' high noise barrier along the eastbound Turnpike mainline could provide a substantial reduction (>5 dBA) in noise at any site due to the noise generated by traffic on I-79. (See Table 8, Figure 7, Appendix 7, and Appendix 8).

Barrier D – East

For the existing residential sites just east of Mt. Pleasant Road, it was determined that Barrier D – East, a 690' long, 12'-16' high noise barrier along the eastbound Turnpike mainline, would be feasible because it could reduce noise levels at least 5 decibels at 100% of the impacted receivers, it is physically possible to construct without creating a safety problem, it does not restrict maintenance access, and it allows for the adequate functioning of highway drainage (See Table 8, Figure 7, Appendix 7, and Appendix 9).

Barrier D – East can also be considered reasonable because it meets the barrier Design Goal of a 7 decibel insertion loss for at least one receiver and exterior noise levels at 100% of the impacted receivers will be reduced to the low-60-decibel range. However, the square footage of the most effective barrier configuration is 2,602 square feet per benefited receiver. PennDOT *Publication No. 24* states that the Maximum Square Footage of Abatement Per Benefited Receiver (MaxSF/BR) must be equal to or less than 2,000 square feet. Note: Multiple configurations for Barrier D – East were evaluated in order to confirm that no other barrier height could provide feasible and reasonable noise mitigation (See Appendices 7 and 9).

Table 8 – Build with Warrendale Toll Plaza
NSA D -- Barrier D – West and Barrier D – East
Predicted Noise Reduction dB(A)

Receiver	NAC Activity Category	Build Alternative without Barrier	Build Alternative with Barrier	Noise Reduction (IL)
D-1	B	**69**	**68**	1
D-2	B	**68**	**68**	0
D-3	B	**68**	**67**	1
D-4	B	**68**	**67**	1
D-5	B	**67**	**67**	0
D-6	C	**65**	64	1
D-7	C	64	63	1

D-8	B	64	64	0
D-9	B	64	63	1
D-10	B	63	62	1
D-11	B	63	62	1
D-12	B	62	61	1
D-13	B	62	61	1
D-14	B	62	61	1
D-15	B	62	61	1
D-16	B	62	61	1
D-17	B	62	61	1
D-1ii	B	**67**	**67**	0
D-2ii	B	**67**	**67**	0
D-3ii	B	**67**	**66**	1
D-4ii	B	**66**	**66**	0
D-7ii	B	63	63	0
D-8ii	B	63	62	1
D-10ii	B	62	62	0
D-11ii	B	62	61	1
D-12ii	B	62	61	1
D-13ii	B	62	60	2
D-14ii	B	62	60	2
D-15ii	B	61	60	1
D-16ii	B	61	60	1
D-17ii	B	61	60	1
D-33	F	71	61	10
D-34	B	**69**	64	**5**
D-33ii	B	**68**	61	**7**
D-33iii	B	64	60	4
D-33iv	B	62	58	4
D-34ii	B	**68**	61	**7**
D-34iii	B	**66**	61	**5**
D-34iv	B	63	60	3

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

The construction of Barrier D -- West can be considered warranted. Because it could not provide a substantial reduction (>5 dBA) in noise at any site, it is not feasible and construction is not recommended as part of the Build with Warrendale Toll Plaza alternative.

The construction of Barrier D -- East can be considered warranted and feasible. However, because the square footage per benefited receiver exceeds 2,000 square feet, it is not reasonable and is not recommended as part of the Build with Warrendale Toll Plaza alternative.

NSA E

This NSA includes the existing and planned hilltop residential areas north of the Turnpike (See Figure 8). The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza. As shown in Table 7, Year 2039 build peak-hour noise levels ranged from 37 to 67 decibels. These Year 2039 build noise levels will approach or exceed FHWA NAC in the Build with the Warrendale Toll Plaza alternative.

Barrier E

For the impacted receiver sites in the western portions of NSA E overlooking I-79, it was determined that not even a 20' high series of noise barriers along the westbound Turnpike mainline could provide a substantial reduction (>5 dBA) in noise at any site due to the noise generated by traffic on I-79. (See Table 9, Figure 8, Appendix 7 and Appendix 9).

Table 9 – Build with Warrendale Toll Plaza
NSA E -- Barrier E (3 barriers)
Predicted Noise Reduction dB(A)

Receiver	NAC Activity Category	Build Alternative without Barrier	Build Alternative with Barrier	Noise Reduction (IL)
E-1	B	67	67	0
E-2	B	67	67	0
E-3	B	67	67	0
E-4	B	67	67	0
E-5	B	67	67	0
E-6	B	67	67	0
E-7	B	67	66	1
E-8	B	67	66	1
E-9	B	66	66	0
E-10	B	66	66	0
E-11	B	66	65	1
E-12	B	66	66	0
E-13	B	67	66	1
E-14	B	67	66	1
E-15	B	67	66	1
E-16	B	67	66	1
E-17	B	66	65	1
E-18	B	65	64	1
E-19	B	63	62	1
E-20	B	62	61	1
E-21	B	61	60	1
E-22	B	59	59	0
E-23	B	55	54	1
E-1ii	B	56	56	0
E-2ii	B	60	60	0
E-3ii	B	61	61	0
E-3iii	B	61	61	0
E-4ii	B	61	61	0

E-5ii	B	62	62	0
E-5iii	B	59	59	0
E-6ii	B	62	62	0
E-6iii	B	58	58	0
E-7ii	B	62	62	0
E-7iii	B	58	58	0
E-8ii	B	62	62	0
E-8iii	B	57	57	0
E-9ii	B	62	62	0
E-10ii	B	59	59	0
E-10iii	B	59	59	0
E-16ii	B	60	60	0
E-17ii	B	59	59	0
E-18ii	B	57	57	0
E-19ii	B	56	56	0

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

The construction of Barrier E can be considered warranted. Because it could not provide a substantial reduction (>5 dBA) in noise at any site, it is not feasible and construction is not recommended as part of the Build with Warrendale Toll Plaza alternative.

Build Without Warrendale Toll Plaza Alternative

NSA A

This NSA includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike (See Figure 4). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA A in the Build without the Warrendale Toll Plaza alternative.

NSA B

This NSA includes the highway oriented commercial and retail development along US 19, north of the Turnpike (See Figure 5). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA B in the Build without the Warrendale Toll Plaza alternative.

NSA C

This NSA includes the commercial and light industrial sites along Commonwealth Drive near Thorn Hill Road, south of the Turnpike (See Figure 6). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA C in the Build without the Warrendale Toll Plaza alternative.

NSA D

This NSA includes the residential area along Northgate Drive, south of the Turnpike (See Figure 7). NSA D also includes a new residential development under construction in 2014 at the western end of Northgate Drive and office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential. As shown in Table 6, Year 2039 build without the Warrendale Toll Plaza peak-hour noise levels ranged from 58 to 72 decibels. These Year 2039 build noise levels will approach or exceed FHWA NAC.

Barrier D – West

For the receiver sites in the new residential development at the western end of Northgate Drive, it was determined that not even a 20' high noise barrier along the eastbound Turnpike mainline could provide a substantial reduction (>5 dBA) in noise at any impacted site due to the noise generated by traffic on I-79. (See Table 10, Figure 9, Appendix 8, and Appendix 9).

Barrier D – East

For the existing residential sites just east of Mt. Pleasant Road, it was determined that Barrier D – East, a 689' long, 12-16' high noise barrier along the eastbound Turnpike mainline, would be feasible because it could reduce noise levels at least 5 decibels at 100% of the impacted receivers, it is physically possible to construct without creating a safety problem, it does not restrict maintenance access, and it allows for the adequate functioning of highway drainage (See Table 10, Figure 9, Appendix 8, and Appendix 9).

Barrier D – East can also be considered reasonable because it meets the barrier Design Goal of a 7 decibel insertion loss for at least one receiver, exterior noise levels at 100% of the impacted receivers will be reduced to the low-60-decibel range, and the square footage of the barrier configuration is 1,735 square feet per benefited receiver. PennDOT *Publication No. 24* states that the Maximum Square Footage of Abatement Per Benefited Receiver (MaxSF/BR) must be equal to or less than 2,000 square feet. Note: Multiple configurations for Barrier D – East were evaluated in order to confirm the optimal configuration that provides feasible and reasonable noise mitigation (See Appendices 8 and 9).

Existing Barrier Gap Closure

It was determined that the removal of the Warrendale Toll Plaza would create a traffic noise impact to receiver D-38vi, which is a residential receiver located along the south side of Warrendale Bayne Road. In an effort to provide mitigation at this site, closing the gap for the Warrendale Toll Plaza access road in the existing noise barriers was analyzed. TNM 2.5 showed that closing the gap with a 20' noise wall would only reduce the noise level at the impacted receiver by 0.3 decibels and a 1.3 decibel maximum reduction at other receivers nearby. Because the additional noise wall does not provide at least 5 decibels of reduction at the impacted receiver, closing the gap is not considered feasible noise mitigation and not recommended.

Table 10 – Build without Warrendale Toll Plaza
NSA D -- Barrier D – West and Barrier D – East
Predicted Noise Reduction dB(A)

Receiver	NAC Activity Category	Build Alternative without Barrier	Build Alternative with Barrier	Noise Reduction (IL)
D-1	B	**69**	**68**	1
D-2	B	**68**	**68**	0
D-3	B	**68**	**67**	1
D-4	B	**68**	**67**	1
D-5	B	**67**	**67**	0
D-6	C	**65**	64	1
D-7	C	64	63	1
D-8	B	64	64	0
D-9	B	64	63	1
D-10	B	63	62	1
D-11	B	63	62	1
D-12	B	62	61	1
D-13	B	62	61	1
D-14	B	62	61	1
D-15	B	62	61	1
D-16	B	62	61	1
D-17	B	62	61	1
D-1ii	B	**67**	67	0
D-2ii	B	**67**	67	0
D-3ii	B	**67**	66	1
D-4ii	B	**66**	66	0
D-7ii	B	63	63	0
D-8ii	B	63	62	1
D-10ii	B	62	62	0
D-11ii	B	62	61	1
D-12ii	B	62	61	1
D-13ii	B	62	60	2
D-14ii	B	62	60	2
D-15ii	B	61	60	1
D-16ii	B	61	60	1
D-17ii	B	61	60	1
D-33	F	72	62	10
D-34	B	**72**	64	**8**
D-33ii	B	**67**	61	**6**
D-33iii	B	65	60	**5**
D-33iv	B	63	58	**5**
D-34ii	B	**68**	61	**7**
D-34iii	B	**67**	62	**5**
D-34iv	B	64	60	4

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

The construction of Barrier D -- West can be considered warranted. Because it could not provide a substantial reduction (>5 dBA) in noise at any site, it is not feasible and construction is not recommended as part of the Build without Warrendale Toll Plaza alternative.

The construction of Barrier D -- East can be considered warranted and feasible. Furthermore, it is reasonable given that it meets the 7dB Insertion Loss Design Goal, noise levels at 100% of the impacted receivers will be reduced to the low-60-decibel range, and the square footage per benefited receiver is less than 2,000 square feet. Therefore, the construction of Barrier D -- East is recommended as part of the Build without Warrendale Toll Plaza alternative.

NSA E

This NSA includes the existing and planned hilltop residential areas north of the Turnpike (See Figure 8). The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza. As shown in Table 7, Year 2039 build peak-hour noise levels ranged from 37 to 67 decibels. These Year 2039 build noise levels will approach or exceed FHWA NAC.

Barrier E

For the impacted receiver sites in the western portions of NSA E overlooking I-79, it was determined that not even a 20' high series of noise barriers along the westbound Turnpike mainline could provide a substantial reduction (>5 dBA) in noise at any site due to the noise generated by I-79 traffic (See Table 11, Figure 10, Appendix 8 and Appendix 9).

Barrier E -- East

For the existing residential sites just west of Mt. Pleasant Road, it was determined that Barrier E -- East, a 1100' long, 20' high noise barrier along the westbound Turnpike mainline, would be feasible because it could reduce noise levels at least 5 decibels at 100% of the impacted receivers, it is physically possible to construct without creating a safety problem, it does not restrict maintenance access, and it allows for the adequate functioning of highway drainage (See Table 11, Figure 10, Appendix 8 and Appendix 9).

However, Barrier E -- East cannot be considered reasonable because the square footage of the most effective barrier configuration is 3,721 square feet per benefited receiver. PennDOT *Publication No. 24* states that the Maximum Square Footage of Abatement Per Benefited Receiver (MaxSF/BR) must be equal to or less than 2,000 square feet. Note: Multiple configurations for Barrier E -- East were evaluated in order to confirm that no other barrier height could provide feasible and reasonable noise mitigation (See Appendices 8 and 9).

Table 11 – Build without Warrendale Toll Plaza
NSA E -- Barrier E (3 barriers), Barrier E -- East
Predicted Noise Reduction dB(A)

Receiver	NAC Activity Category	Build Alternative without Barrier	Build Alternative with Barrier	Noise Reduction (IL)
E-1	B	67	67	0
E-2	B	67	67	0
E-3	B	67	67	0
E-4	B	67	67	0
E-5	B	67	67	0
E-6	B	67	67	0
E-7	B	67	66	1
E-8	B	67	66	1
E-9	B	66	66	0
E-10	B	66	66	0
E-11	B	66	65	1
E-12	B	66	66	0
E-13	B	67	66	1
E-14	B	67	66	1
E-15	B	67	66	1
E-16	B	67	66	1
E-17	B	66	65	1
E-18	B	65	64	1
E-19	B	63	62	1
E-20	B	62	61	1
E-21	B	61	60	1
E-22	B	59	59	0
E-23	B	55	54	1
E-36	B	68	63	5
E-37	B	63	63	0
E-1ii	B	56	56	0
E-2ii	B	60	60	0
E-3ii	B	61	61	0
E-3iii	B	61	61	0
E-4ii	B	61	61	0
E-5ii	B	62	62	0
E-5iii	B	59	59	0
E-6ii	B	62	62	0
E-6iii	B	58	58	0
E-7ii	B	62	62	0
E-7iii	B	58	58	0
E-8ii	B	62	62	0
E-8iii	B	57	57	0
E-9ii	B	62	62	0
E-10ii	B	59	59	0
E-10iii	B	59	59	0
E-16ii	B	60	60	0

E-17ii	B	59	59	0
E-18ii	B	57	57	0
E-19ii	B	56	56	0
E-36ii	B	65	59	6
E-36iii	B	63	55	8
E-36iv	B	58	52	6
E-36v	B	61	54	7
E-36vi	B	60	53	7
E-37ii	B	60	59	1
E-37iii	B	57	56	1
E-37iv	B	55	54	1
E-37v	B	56	56	0

Numbers highlighted in **red** approach or exceed FHWA NAC for that activity category.

The construction of Barrier E can be considered warranted. Because it could not provide a substantial reduction (>5 dBA) in noise at any site, it is not feasible and construction is not recommended as part of the Build without Warrendale Toll Plaza alternative.

The construction of Barrier -- E East can be considered warranted and feasible. However, because the square footage per benefited receiver exceeds 2,000 square feet, it is not reasonable and is not recommended as part of the Build without Warrendale Toll Plaza alternative.

10. Construction Noise

Project specific construction-related noise levels have not been predicted for the Pennsylvania Turnpike Milepost 28-31 reconstruction project. However, it can be assumed that all developed land uses and activities adjacent to the proposed project will be temporarily affected by noise generated from power-operated equipment utilized in highway construction. Such equipment may include, however is not limited to, front loaders, backhoes, bulldozers, trucks, tractors, scrapers, graders, pavers, roller compactors, slip-form equipment, concrete mixers, cranes, compressors, generators, pumps, jack hammers, pneumatic tools, saws, and vibrators. This equipment will operate intermittently and usually produces noise in the range of 70 - 98 dBA at a distance of approximately 50 feet.

To minimize these noise effects, the contractor shall use only equipment adapted to operate with the least possible noise and shall conduct his work so that annoyance to occupants of nearby property and the general public will be reduced to a minimum.

11. Conclusions

Build with Warrendale Toll Plaza Alternative

Because traffic noise impacts were predicted in NSA D and NSA E, noise mitigation was evaluated for the Build with the Warrendale Toll Plaza alternative.

NSA A
This NSA includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike (See Figure 4). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA A with either alternative.

NSA B
This NSA includes the highway oriented commercial and retail development along US 19, north of the Turnpike (See Figure 5). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA B with either alternative.

NSA C
This NSA includes the commercial and light industrial sites along Commonwealth Drive near Thorn Hill Road, south of the Turnpike (See Figure 6). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA C with either alternative.

NSA D
This NSA includes the residential area along Northgate Drive, south of the Turnpike (See Figure 7). NSA D also includes a new residential development under construction in 2014 at the western end of Northgate Drive and office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential. Some Year 2039 build peak-hour noise levels will approach or exceed FHWA NAC and are considered an impact per PennDOT *Publication No. 24* with both alternatives.

> The construction of a noise barrier for the new residential development at the western end of Northgate Drive can be considered warranted. Because not even a 20' high noise barrier along the Turnpike could provide a substantial reduction (>5 dBA) in noise at any site, noise barriers are not feasible and not recommended as part of the Build with Warrendale Toll Plaza alternative.
>
> The construction of a noise barrier for the existing residences east of Mt. Pleasant Road can be considered warranted and feasible. However, because the square footage per benefited receiver exceeds 2,000 square feet, the noise barrier is not reasonable and is not recommended as part of the Build with Warrendale Toll Plaza alternative.

NSA E
This NSA includes the existing and planned hilltop residential areas north of the Turnpike (See Figure 8). The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza. Some Year 2039 build peak-hour noise levels will approach or exceed FHWA NAC and are considered an impact per PennDOT *Publication No. 24* with both alternatives.

The construction of noise barriers for the impacted receiver sites in the western portions of NSA E overlooking I-79 can be considered warranted. Because not even a 20' high series of noise barriers along the Turnpike could provide a substantial reduction (>5 dBA) in noise at any site, noise barriers are not feasible and not recommended as part of the Build with Warrendale Toll Plaza.

Table 12 – Build with Warrendale Toll Plaza
Summary of Impacts and Mitigation Evaluation

NSA	Number of Receivers	Number of Impacted Receivers	Barrier Name	Barrier Length	Barrier Height	Barrier Sq. Feet	% Impacted Receivers > 5dB IL[1]	Receivers > 7dB IL[2]	Benefited Receivers[3]	Sq. Feet per Benefited Receiver[4]
A	1	0	n/a				n/a			
B	34	0	n/a				n/a			
C	16	0	n/a				n/a			
D	117	24	D - All	4063'	14'	56,882	13%	1	15	3,792
D	76	21	D - West	2971'	20'	59,420	0%	0	0	n/a
D	15	3	D-East	689'	12'-16'	10,407	100%	1	4	2,602
D	45	3	D-East Extended	2003'	16'	32,048	100%	1	11	2,913
E	136	17	E	2250'	20'	45,000	0%	0	0	n/a

1. – Noise barriers must reduce noise levels at least 5 decibels at 50% of the impacted receivers to be considered feasible.
2. – Noise barriers must provide a 7dB Insertion Loss for at least one receiver to be considered reasonable.
3. – Benefited Receivers = Impacted Receivers or Non-impacted Receivers w/ > 5 dB IL
4. – To consider the barrier reasonable the Maximum Square Footage of Abatement Per Benefited Receiver (MaxSF/BR) must be equal to or less than 2,000 square feet.

Note: In each NSA, multiple barrier heights were evaluated in order to confirm that no other barrier height could provide feasible and cost-effective noise mitigation (See Appendix 8).

Build Without Warrendale Toll Plaza Alternative

NSA A

This NSA includes the commercial and light industrial sites along Commonwealth Drive, south of the Turnpike (See Figure 4). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA A with either alternative.

NSA B

This NSA includes the highway oriented commercial and retail development along US 19, north of the Turnpike (See Figure 5). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA B with either alternative.

NSA C

This NSA includes the commercial and light industrial sites along Commonwealth Drive near Thorn Hill Road, south of the Turnpike (See Figure 6). No traffic noise impacts were predicted and no noise mitigation was evaluated for NSA C with either alternative.

NSA D

This NSA includes the residential area along Northgate Drive, south of the Turnpike (See Figure 9). NSA D also includes a new residential development under construction in 2014 at the western end of Northgate Drive and office buildings, restaurants, and other commercial sites west of Mt. Pleasant Road. East of Mt. Pleasant Road, NSA D is primarily residential. Some Year 2039 build peak-hour noise levels will approach or exceed FHWA NAC and are considered an impact per PennDOT *Publication No. 24* with both alternatives.

> The construction of a noise barrier for the new residential development at the western end of Northgate Drive can be considered warranted. Because not even a 20' high noise barrier along the Turnpike could provide a substantial reduction (>5 dBA) in noise at any site, noise barriers are not feasible and not recommended as part of the Build without Warrendale Toll Plaza alternative.
>
> The construction of a noise barrier for the existing residences east of Mt. Pleasant Road can be considered warranted and feasible. However, it is reasonable given that it meets the 7dB Insertion Loss Design Goal, noise levels at 100% of the impacted receivers will be reduced to the low-60-decibel range, and the square footage per benefited receiver is less than 2,000 square feet. **Therefore, the construction of Barrier D -- East is recommended as part of the Build without Warrendale Toll Plaza alternative.**

NSA E

This NSA includes the existing and planned hilltop residential areas north of the Turnpike (See Figure 10). The western portions of NSA E overlook I-79 and the eastern portions overlook the Turnpike and the Warrendale Toll Plaza. Some Year 2039 build peak-hour noise levels will approach or exceed FHWA NAC and are considered an impact per PennDOT *Publication No. 24* with both alternatives.

> The construction of noise barriers for the impacted receiver sites in the western portions of NSA E overlooking I-79 can be considered warranted. Because not even a 20' high series of noise barriers along the Turnpike could provide a substantial reduction (>5

dBA) in noise at any site, noise barriers are not feasible and not recommended as part of the Build without Warrendale Toll Plaza alternative.

The construction of a noise barrier for the existing residences west of Mt. Pleasant Road can be considered warranted and feasible. However, because the square footage per benefited receiver exceeds 2,000 square feet, the noise barrier is not reasonable and is not recommended as part of the Build without Warrendale Toll Plaza alternative.

Table 13 – Build without Warrendale Toll Plaza
Summary of Impacts and Mitigation Evaluation

NSA	Number of Receivers	Number of Impacted Receivers	Barrier Name	Barrier Length	Barrier Height	Barrier Sq. Feet	% Impacted Receivers > 5dB IL$_1$	Receivers > 7dB IL$_2$	Benefited Receivers$_3$	Sq. Feet per Benefited Receiver$_4$
A	1	0	n/a				n/a			
B	34	0	n/a				n/a			
C	16	0	n/a				n/a			
D	117	27	D - All	4063’	12’	48,755	13%	1	22	2,216
D	76	21	D - West	2971’	20’	59,425	0%	0	0	n/a
D	**15**	**4**	**D-East**	**689’**	**12’-16’**	**10,407**	**100%**	**2**	**6**	**1,735**
D	45	4	D-East Extended	2003’	12’-14’	26,663	100%	3	8	3,333
E	136	16	E	2251’	20’	45,020	0%	0	0	n/a
E	11	1	E East	1116’	20’	22,320	100%	0	6	n/a

1. – Noise barriers must reduce noise levels at least 5 decibels at 50% of the impacted receivers to be considered feasible.
2. – Noise barriers must provide a 7dB Insertion Loss for at least one receiver to be considered reasonable.
3. – Benefited Receivers = Impacted Receivers or Non-impacted Receivers w/ > 5 dB IL
4. – To consider the barrier reasonable the Maximum Square Footage of Abatement Per Benefited Receiver (MaxSF/BR) must be equal to or less than 2,000 square feet.

Note: In each NSA, multiple barrier heights were evaluated in order to confirm that no other barrier height could provide feasible and cost-effective noise mitigation (See Appendix 8).

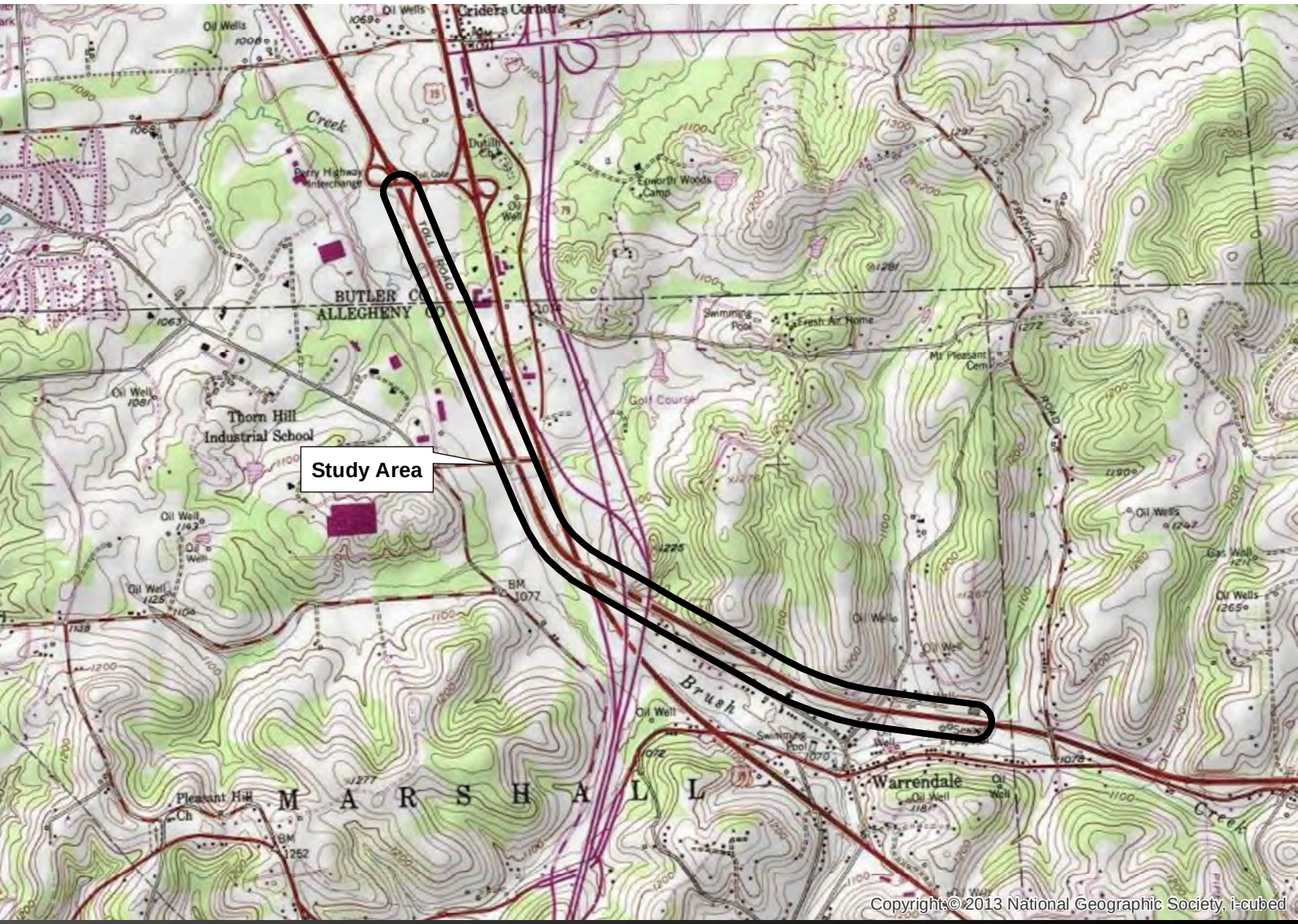
Noise barrier *Warranted, Feasible, and Reasonable Worksheets* have been prepared for the Barriers listed in Tables 12 and 13 (See Appendix 10).

12. Public Involvement

PennDOT *Publication No. 24* indicates that the public involvement relative to traffic noise should not be conducted until the Preliminary Design Noise Analysis Report has been approved by FHWA and/or the PennDOT Bureau of Design and PennDOT Central Office Environmental staff.

To date, no public involvement relative to traffic noise has been conducted for the Pennsylvania Turnpike Milepost 28-31 reconstruction project.

Figures



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Feet

Figure 1
Project Location Map

Source: USGS

Figure 2a
Build with Warrendale Toll Plaza Alternative Overview

Figure 2b
Build without Warrendale Toll Plaza Alternative Overview

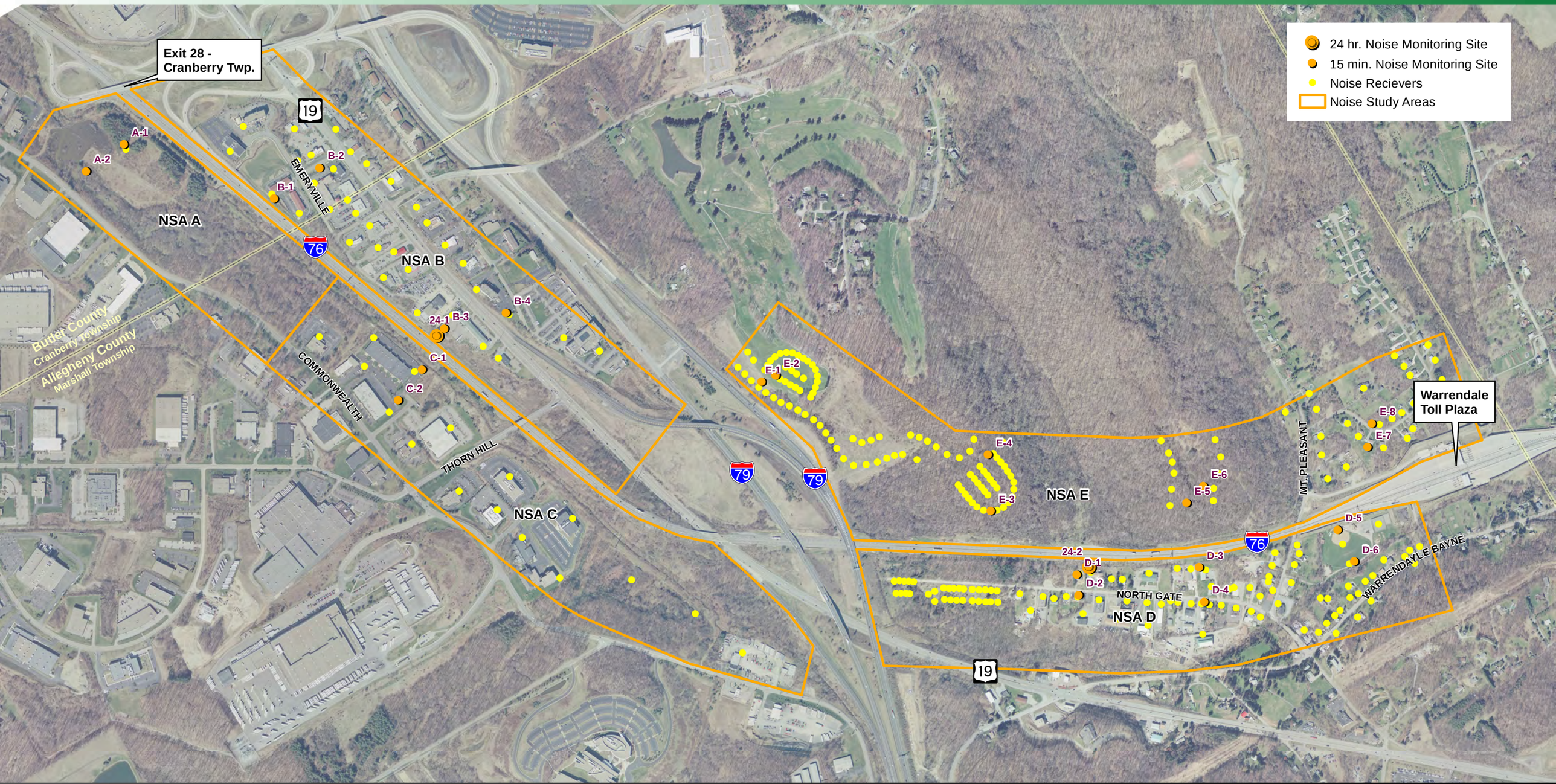
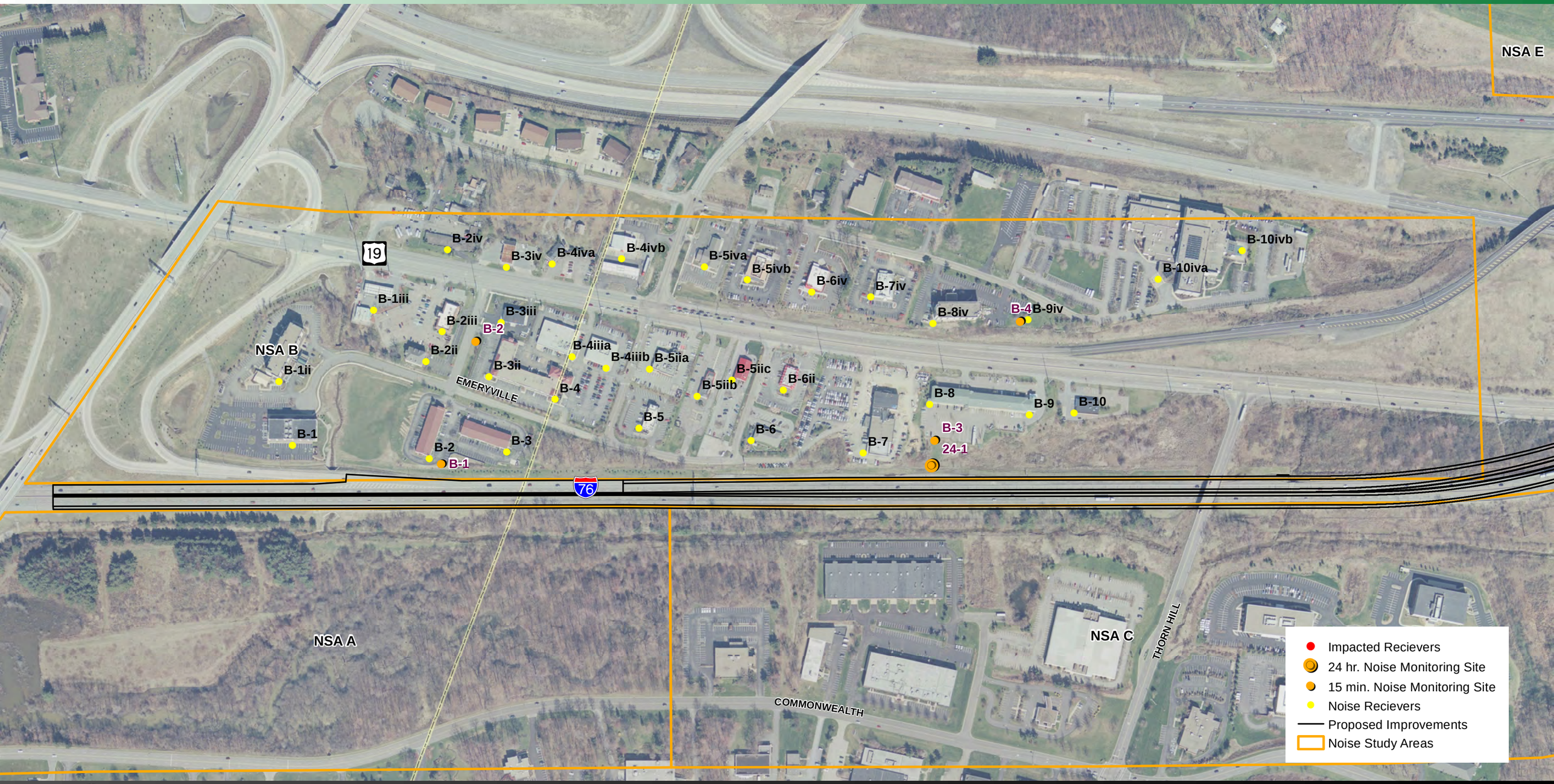


Figure 3
Noise Study Areas, Receivers and Monitoring Points

Figure 4
NSA A - Build Alternative



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Feet

Figure 5
NSA B - Build Alternative

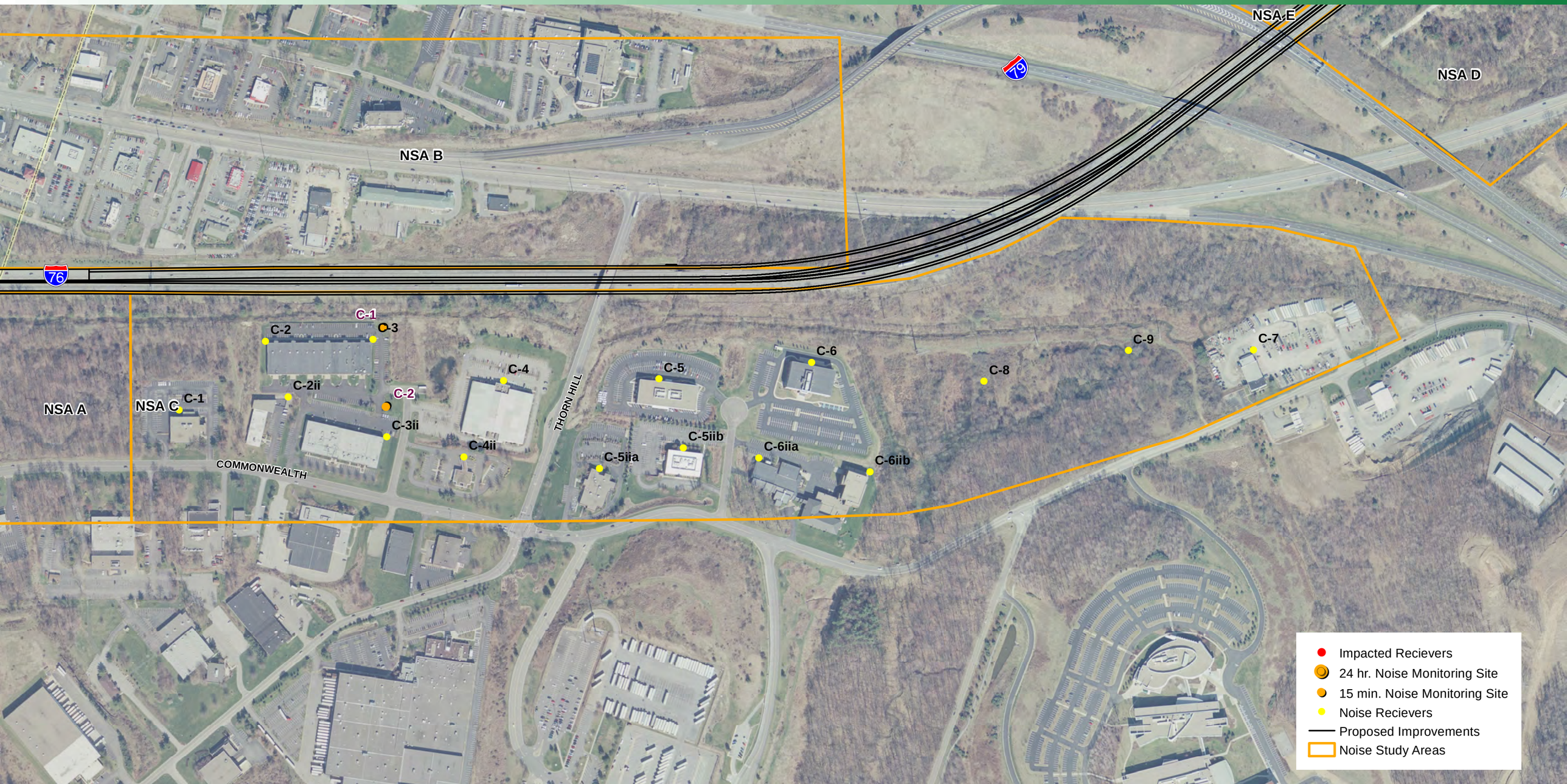


Figure 6
NSA C - Build Alternative

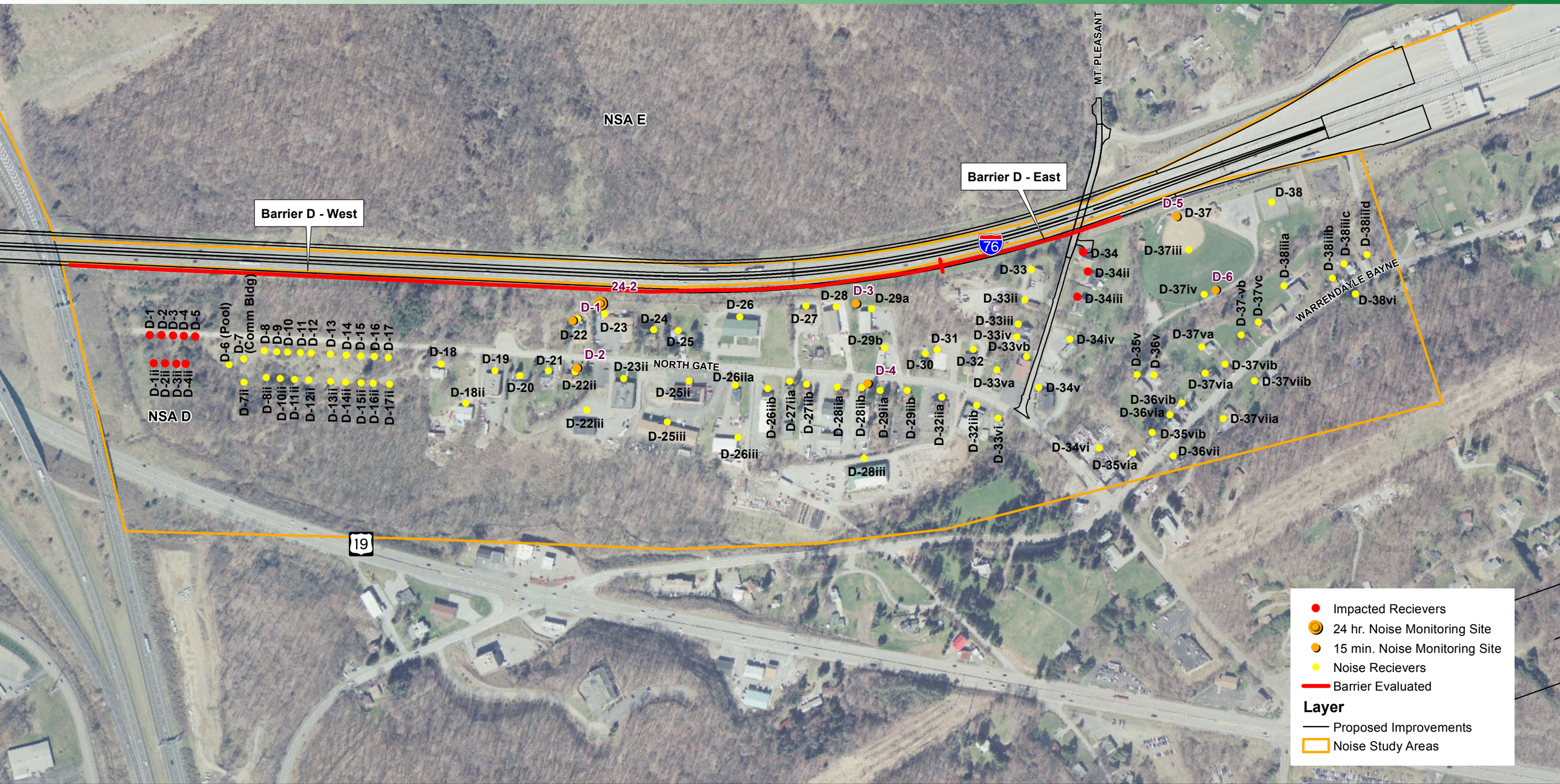


Figure 7
NSA D - Build with Warrendale Toll Plaza Alternative

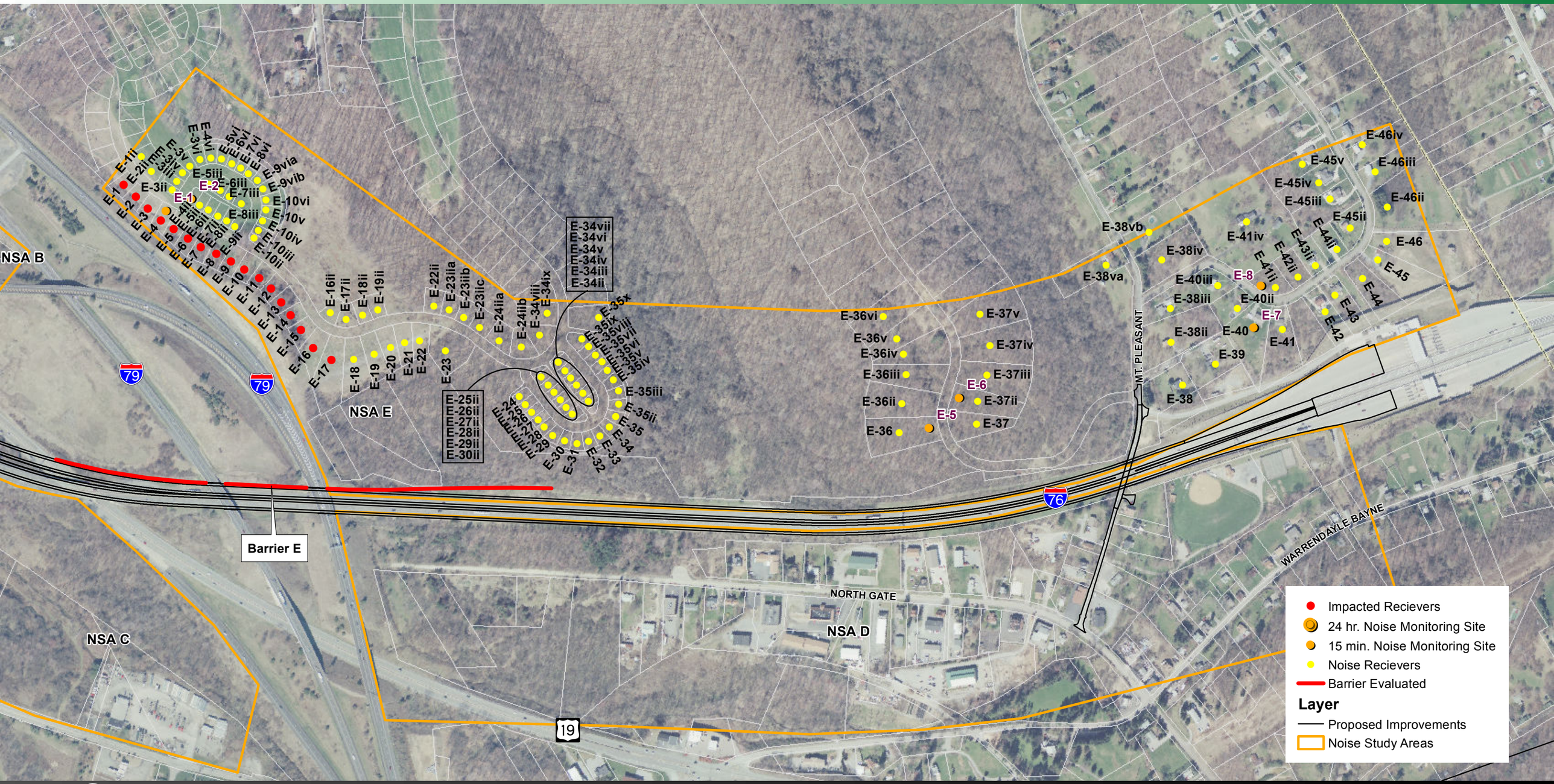


Figure 8
NSA E - Build with Warrendale Toll Plaza Alternative

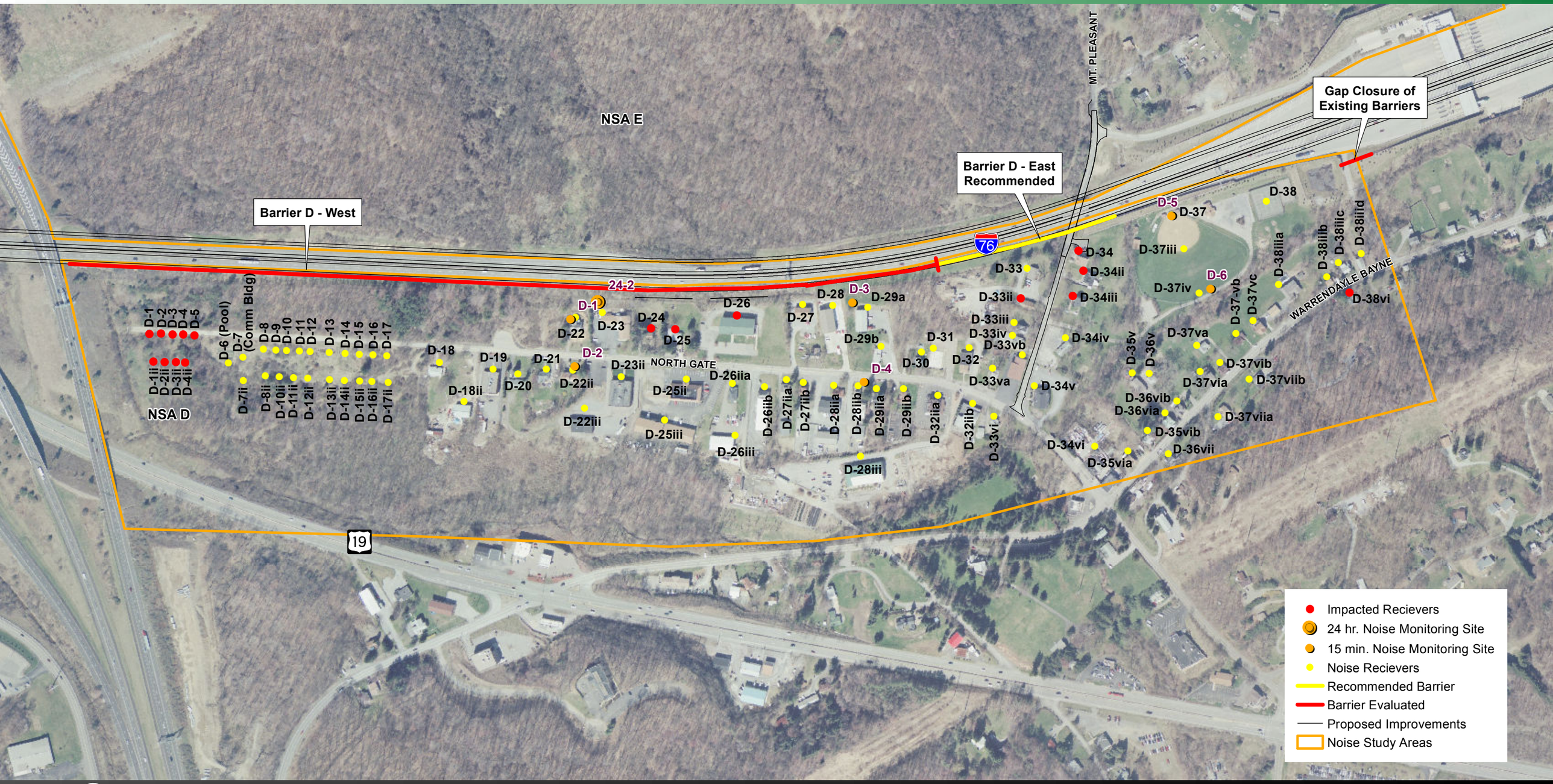


Figure 9
NSA D - Build Alternative without Warrendale Toll Plaza

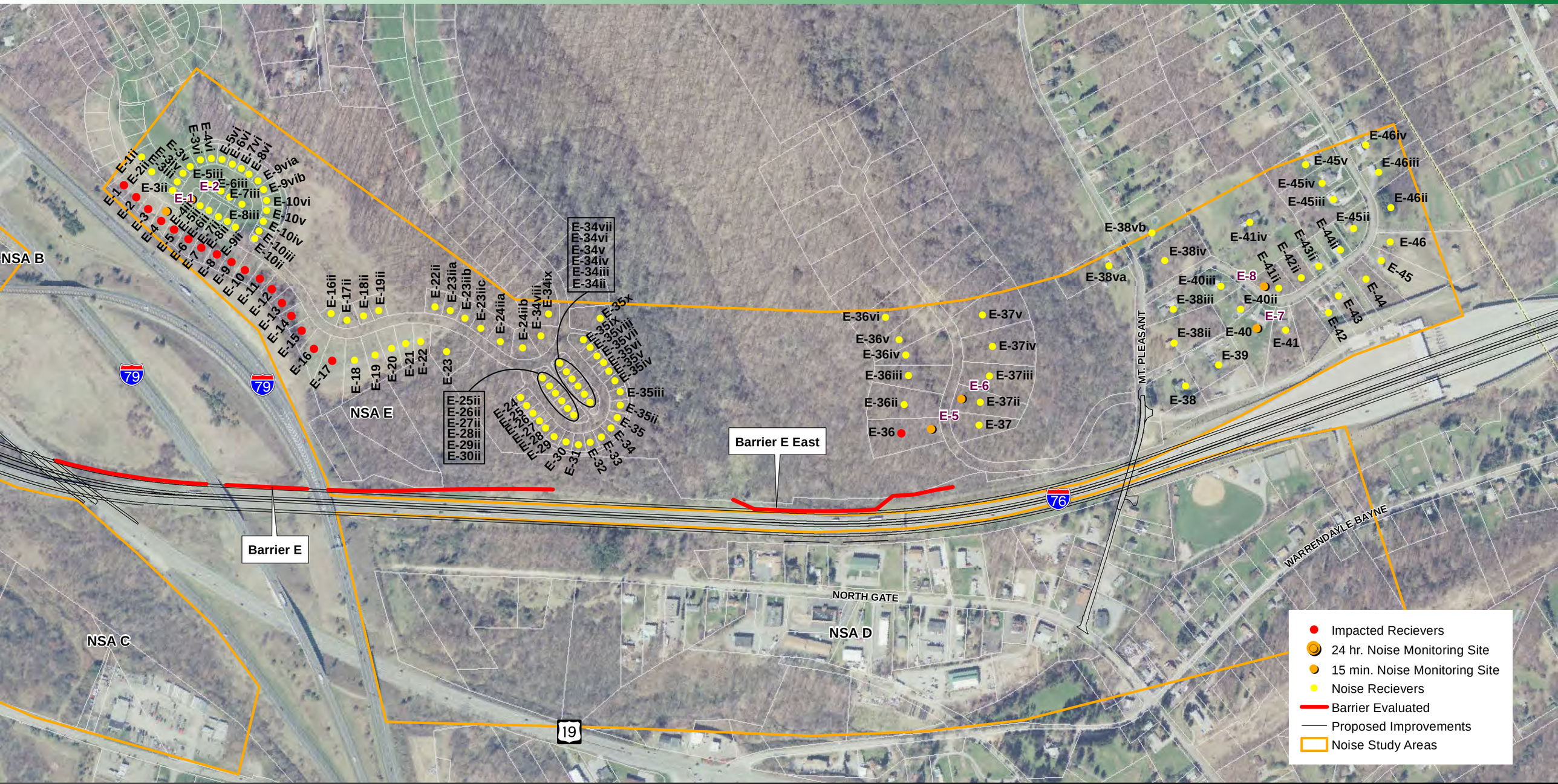
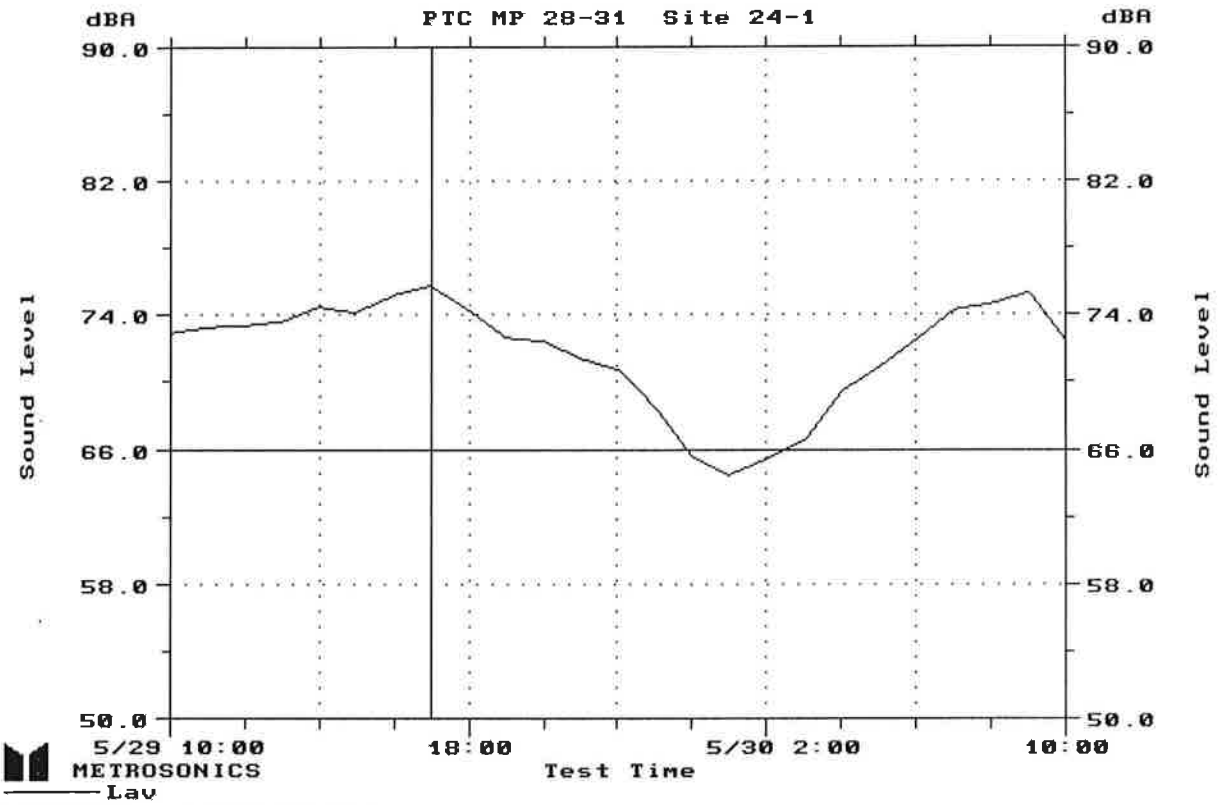


Figure 10
NSA E - Build Alternative without Warrendale Toll Plaza

Appendix 1

Long-term Noise Monitoring Data

Filename.....31001
Logger.....db-3100 SN 1977
Test Location.....PTC MP 28-31 Site 24-1
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...19025 US19 (Motel 6)
Comment Field 2...See Weather Data
Numeric Code #1... #2... #3... #4... #5...



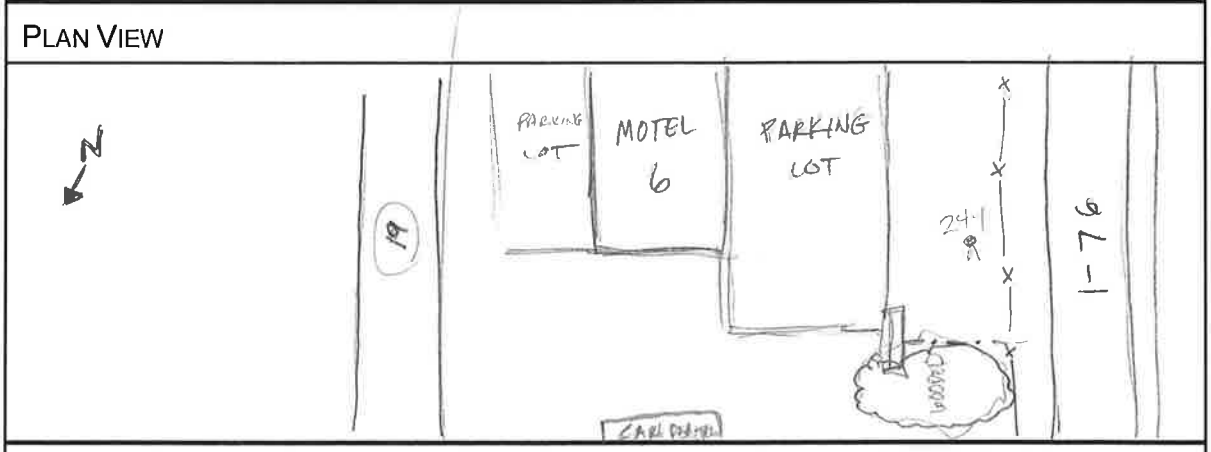
OVERALL: Lav= 72.7dB
SCAN LINE: 5/29/14 17:06:01 Lav= 75.7dB

NOISE MONITORING DATA

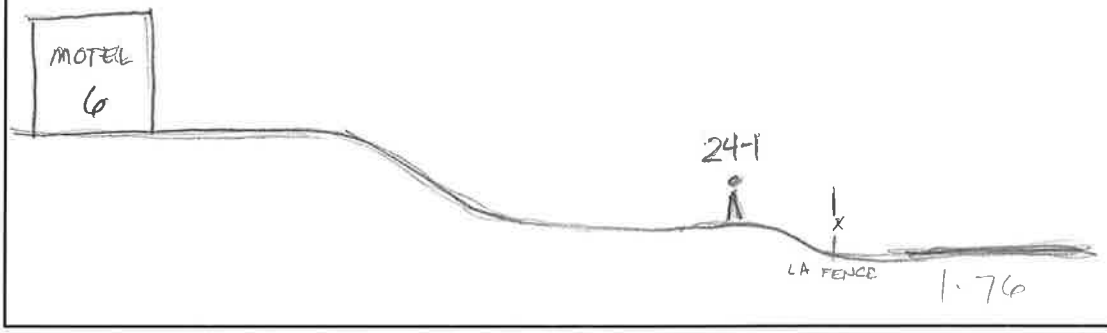
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: 24-1	Date: 5/29/14	Location: 19025 US 19 MOTEL 6	
Site Surface: BRUSH		Landmark: YELLOW POST NEAR LA FENCE	
Near Lane Direction: I-76 WB	Pavement Type: ASPHALT		
Temperature: 67°	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 10:06:00 AM		Stop Time: 5/30/14 10:06:00 AM 64°	
Noise Sources: I-76 TRAFFIC, BIRDS			

PLAN VIEW



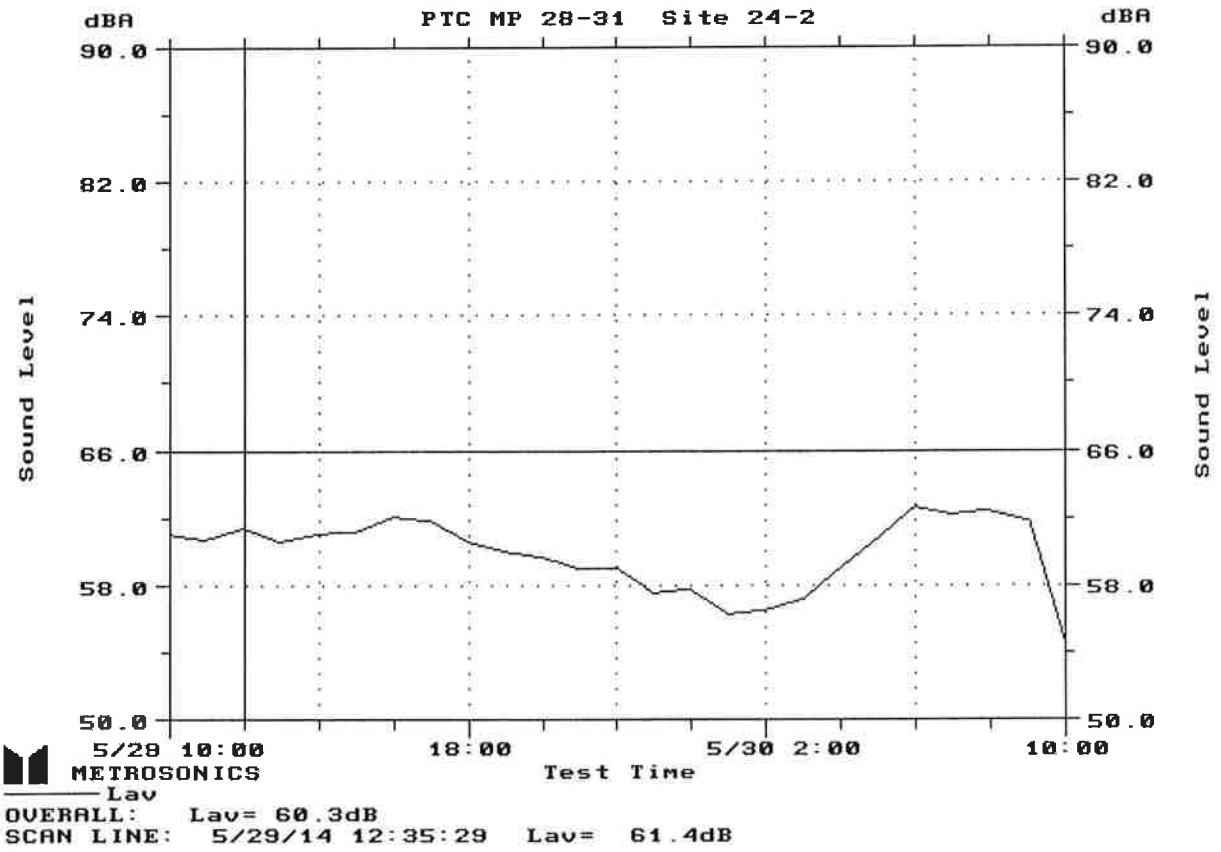
ELEVATION VIEW



Meter No: 1977

Seq. No: 1

Filename.....31002
Logger.....db-3100 SN 1976
Test Location.....PTC MP 28-31 Site 24-2
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...380 Northgate (Comm Bldg)
Comment Field 2...See Weather Data
Numeric Code #1... #2... #3... #4... #5...



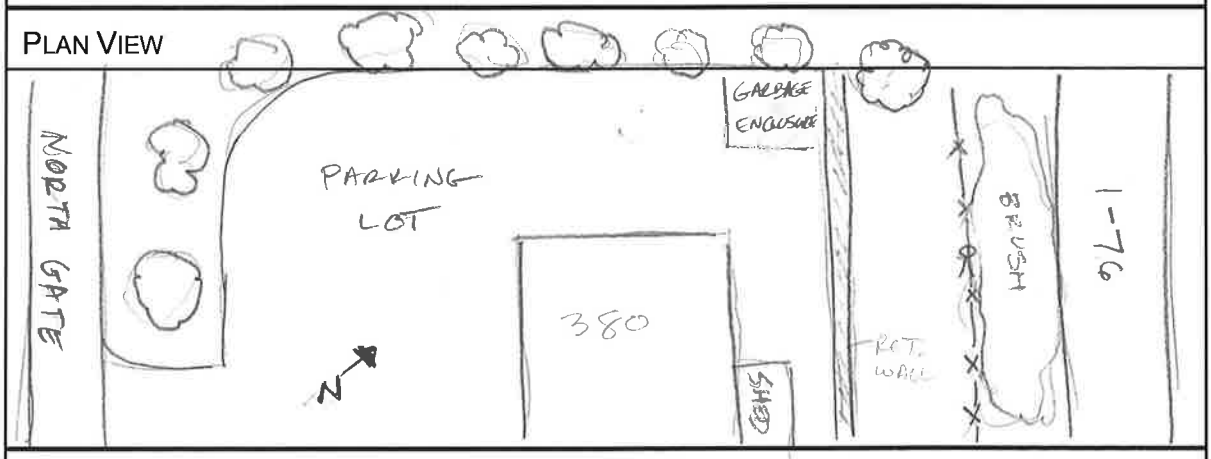
OVERALL: Lav= 60.3dB
SCAN LINE: 5/29/14 12:35:29 Lav= 61.4dB

NOISE MONITORING DATA

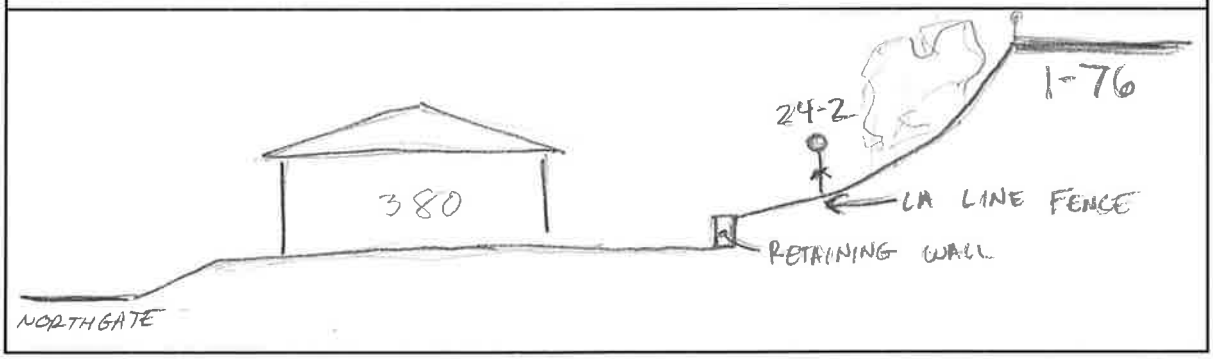
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: 24-2	Date: 5/29/14	Location: 380 NORTHGATE	
Site Surface: BRUSH		Landmark: LA FENCE POST REAR OF PROPERTY	
Near Lane Direction: I-76 EB	Pavement Type: ASPHALT		
Temperature: 67°	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 10:35", 30 AM		Stop Time: 5/30/14 10:35:30 AM	
Noise Sources: I-76 TRAFFIC, BIRDS			

PLAN VIEW



ELEVATION VIEW



Meter No: 1976

Seq. No: 1

Cranberry Twp PA US -- Personal Weather Station **MC3603**

40.691 -80.079 1190 ft

Weather History Table May 29, 2014

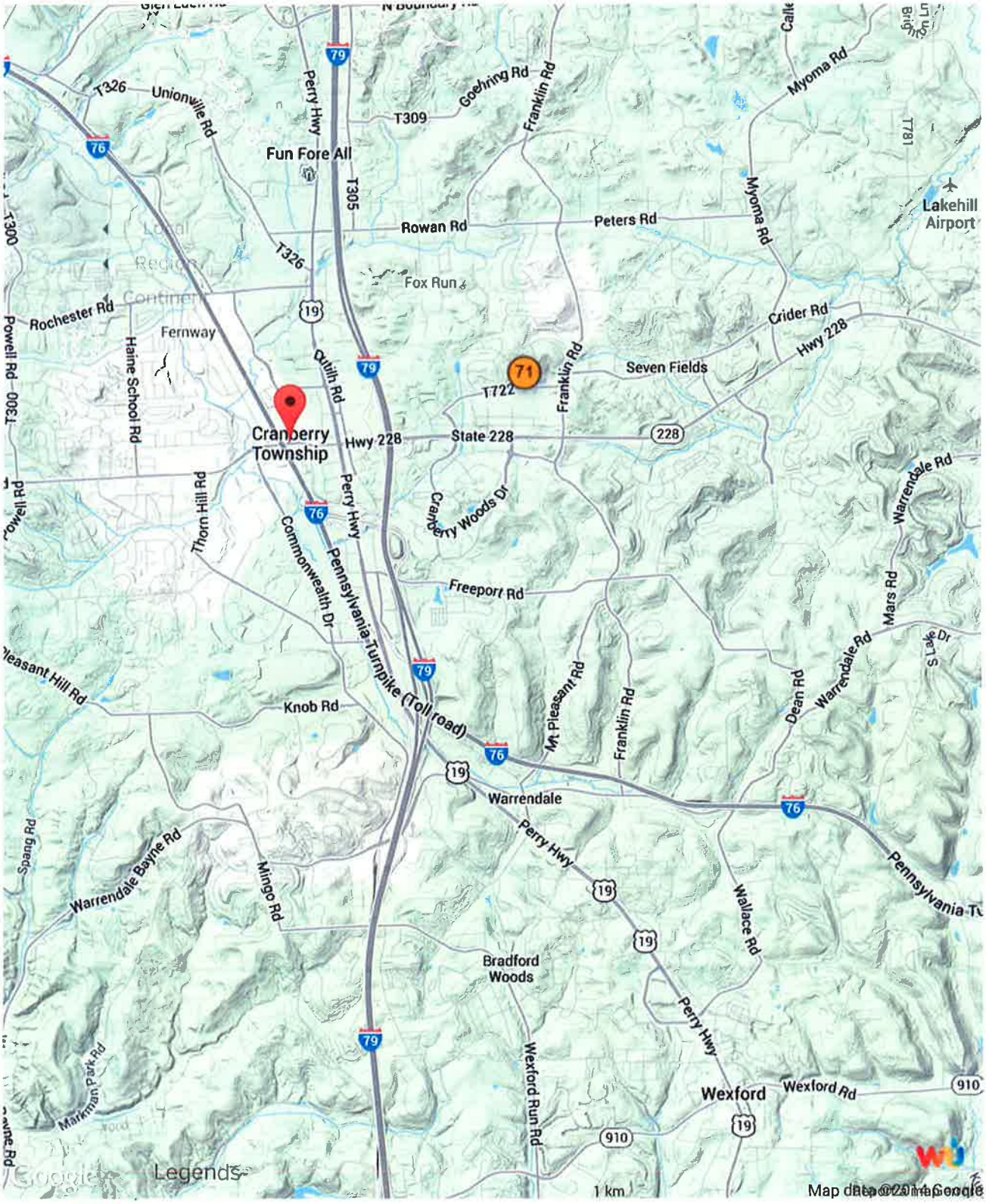
Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip.	Precip. Accum.
7:12 AM	61 °F	58 °F	91 %	SW	0 mph	0 mph	30.02 in	0 in	0 in
11:12 AM	66 °F	62 °F	86 %	WSW	1 mph	-- mph	30.06 in	-- in	-- in
12:13 PM	68 °F	62 °F	80 %	WSW	0 mph	-- mph	30.07 in	-- in	-- in
1:13 PM	71 °F	60 °F	69 %	West	0 mph	-- mph	30.07 in	-- in	-- in
2:12 PM	72 °F	60 °F	65 %	West	1 mph	-- mph	30.06 in	-- in	-- in
3:12 PM	74 °F	59 °F	60 %	West	1 mph	-- mph	30.05 in	-- in	-- in
4:12 PM	75 °F	60 °F	59 %	WNW	0 mph	-- mph	30.03 in	-- in	-- in
5:11 PM	77 °F	57 °F	51 %	WNW	1 mph	-- mph	30.02 in	-- in	-- in
7:12 PM	77 °F	54 °F	45 %	West	1 mph	-- mph	29.99 in	-- in	-- in
9:42 PM	65 °F	53 °F	64 %	NW	0 mph	-- mph	30.06 in	-- in	-- in
10:11 PM	63 °F	53 °F	69 %	NW	0 mph	-- mph	30.06 in	-- in	-- in
11:43 PM	60 °F	53 °F	79 %	NW	0 mph	-- mph	30.08 in	-- in	-- in

Weather History Table May 30, 2014

Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip.	Precip. Accum.
12:43 AM	58 °F	53 °F	84 %	NW	0 mph	-- mph	30.08 in	-- in	-- in
1:43 AM	59 °F	54 °F	83 %	NW	0 mph	-- mph	30.09 in	-- in	-- in
2:42 AM	58 °F	55 °F	90 %	NW	0 mph	-- mph	30.09 in	-- in	-- in
3:42 AM	58 °F	56 °F	93 %	NW	0 mph	-- mph	30.08 in	-- in	-- in
4:42 AM	58 °F	56 °F	94 %	NW	0 mph	-- mph	30.09 in	-- in	-- in
5:12 AM	58 °F	56 °F	94 %	NW	0 mph	-- mph	30.09 in	-- in	-- in
6:13 AM	58 °F	56 °F	94 %	NW	0 mph	-- mph	30.09 in	-- in	-- in
6:43 AM	58 °F	56 °F	94 %	NW	0 mph	-- mph	30.1 in	-- in	-- in
7:42 AM	57 °F	55 °F	94 %	NW	0 mph	-- mph	30.12 in	-- in	-- in
8:43 AM	58 °F	56 °F	93 %	NNW	0 mph	-- mph	30.15 in	-- in	-- in
9:42 AM	60 °F	56 °F	87 %	SSW	0 mph	-- mph	30.16 in	-- in	-- in
10:42 AM	64 °F	57 °F	78 %	South	0 mph	-- mph	30.17 in	-- in	-- in
11:44 AM	66 °F	54 °F	66 %	SW	0 mph	-- mph	30.17 in	-- in	-- in
11:53 AM	66 °F	54 °F	66 %	SW	0 mph	-- mph	30.17 in	-- in	-- in
12:04 PM	66 °F	54 °F	66 %	SW	0 mph	-- mph	30.17 in	-- in	-- in

- WunderMap Radar
- NEXRAD Radar

WunderMap Cranberry Township, Pennsylvania Save Prefs Share New Updates



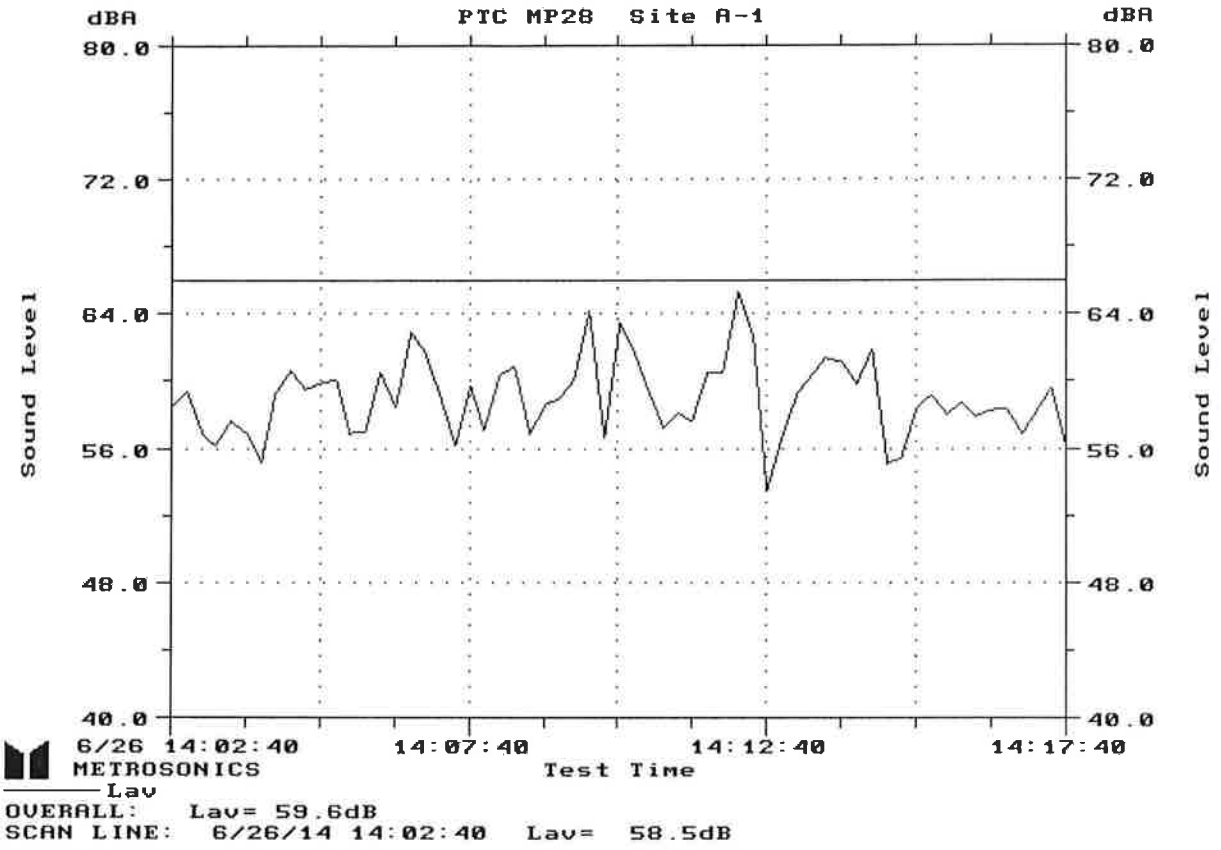
- NEXRAD Radar

Play Tx Current

Appendix 2

Short-term Noise Monitoring Data

Filename.....310018
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site A-1
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...765 Commonwealth Drive
Comment Field 2...73F P Cloudy Wind 0-5 E
Numeric Code #1... #2... #3... #4... #5...



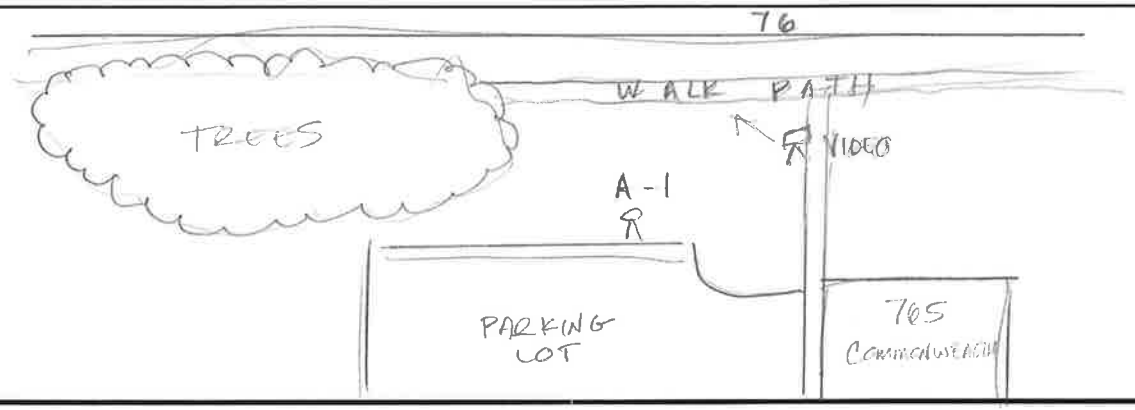
OVERALL: Lav= 59.6dB
SCAN LINE: 6/26/14 14:02:40 Lav= 58.5dB

NOISE MONITORING DATA

Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: A-1	Date: 6-26-14	Location: 765 COMMONWEALTH DR.	
Site Surface: GRASS		Landmark: GRASSY AREA NEAR PARKING LOT & TREE LINE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: PARTLY CLOUDY	Wind Speed: 0-5 MPH	Wind Direction: E
Start Time: 14:02:00		Stop Time: 14:17:00	
Noise Sources: HIGHWAY, BIRDS, JAKE BRAKE ON RAMP			

PLAN VIEW

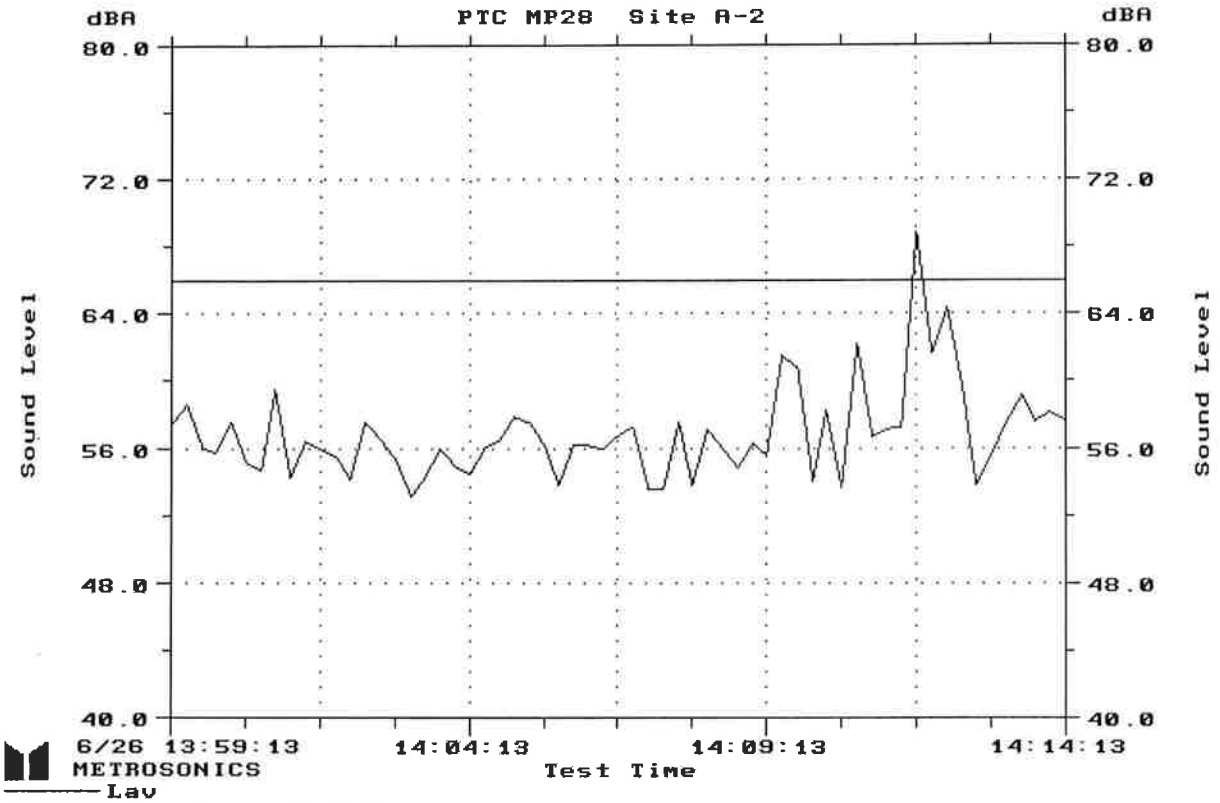


ELEVATION VIEW

Meter No: 2598

Seq. No: 7

Filename.....31008
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site A-2
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...765 Commonwealth Drive
Comment Field 2...73F P Cloudy Wind 0-5 E
Numeric Code #1... #2... #3... #4... #5...



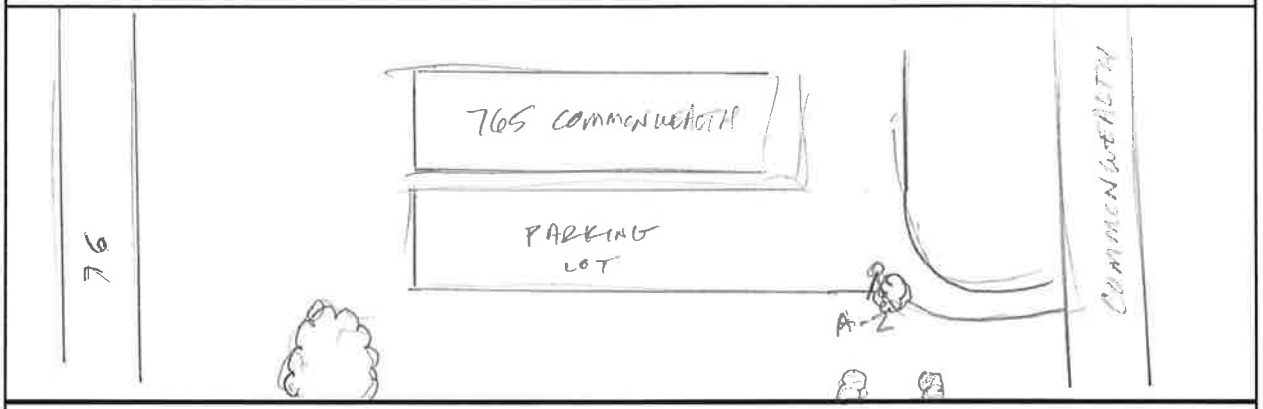
OVERALL: Lav= 58.2dB
SCAN LINE: 6/26/14 13:59:13 Lav= 57.4dB

NOISE MONITORING DATA

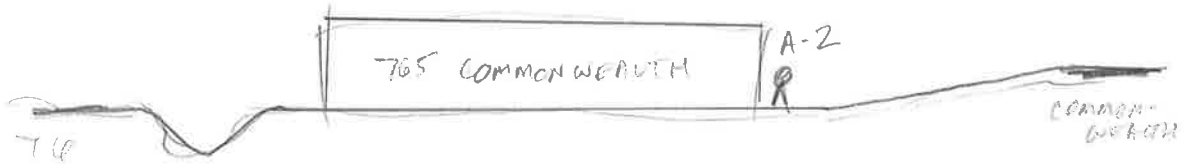
Project: PA Turnpike MP 28-31

		Observer: YRm	
Site ID: A-2	Date: 6-26-14	Location: 765 COMMONWEALTH DR.	
Site Surface: GRASS		Landmark: BACK OF PARKING LOT NEAR ENTRANCE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: PARTLY CLOUDY	Wind Speed: 0-5 MPH	Wind Direction: E
Start Time: 13:58:30		Stop Time: 14:13:30	
Noise Sources: HIGHWAY, BIRDS			

PLAN VIEW



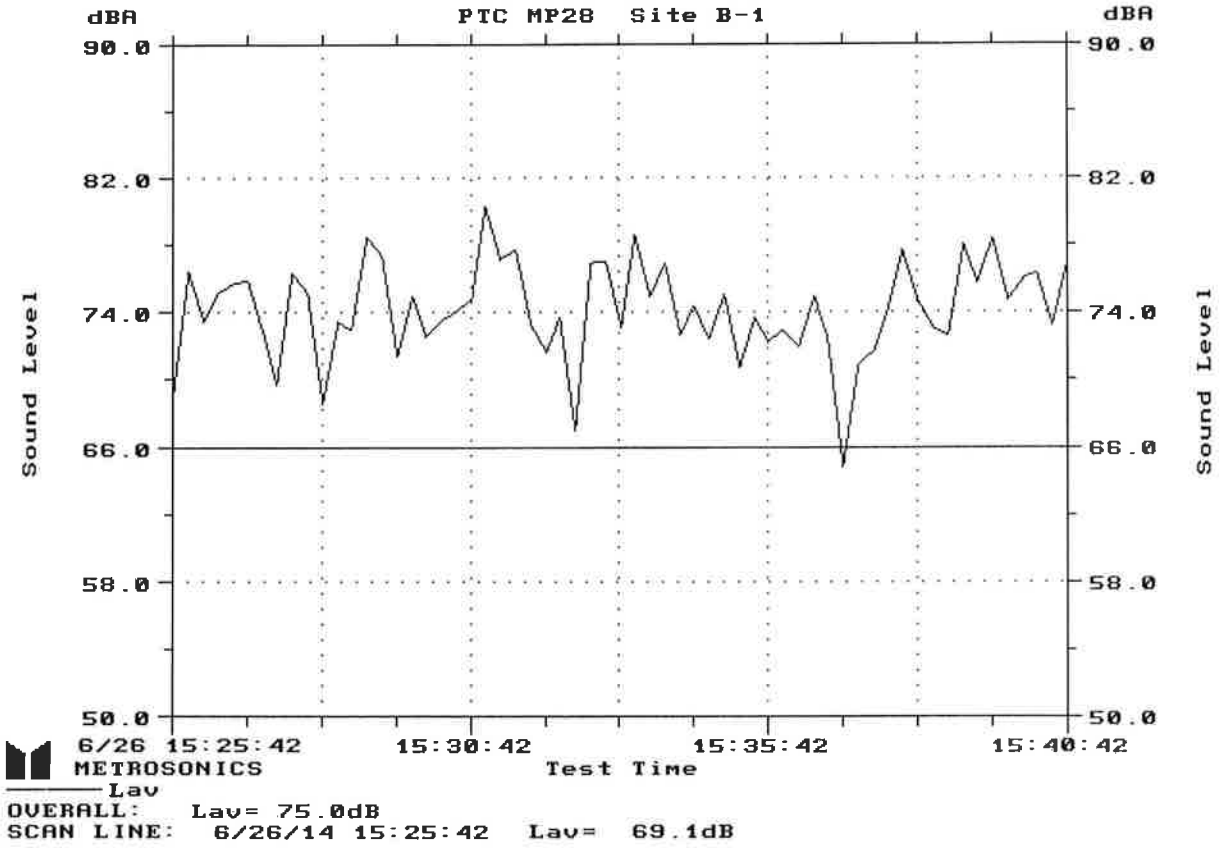
ELEVATION VIEW



Meter No: 3574

Seq. No: 8

Filename.....310011
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site B-1
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...20009 Perry Highway US19
Comment Field 2...78F Clear Wind 0-5 East
Numeric Code #1... #2... #3... #4... #5...



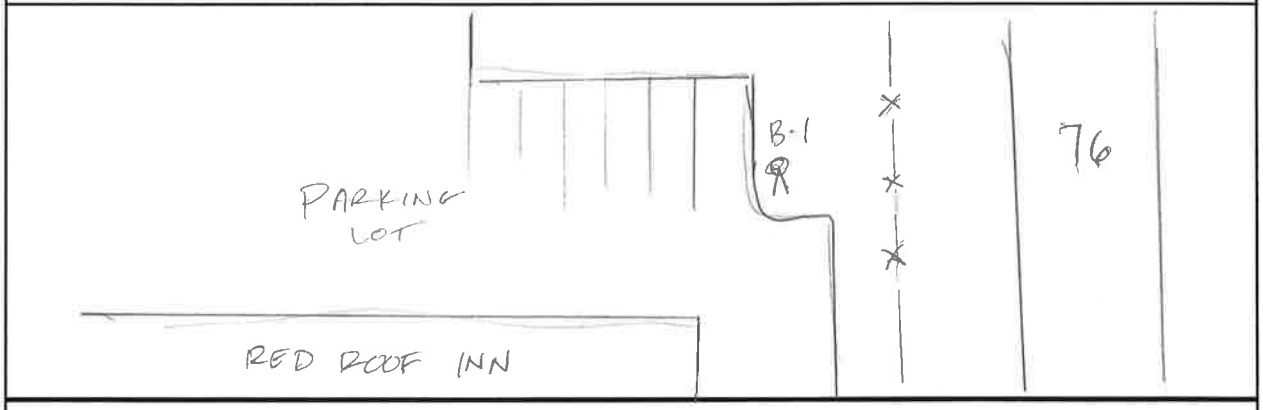
OVERALL: Lav= 75.0dB
SCAN LINE: 6/26/14 15:25:42 Lav= 69.1dB

NOISE MONITORING DATA

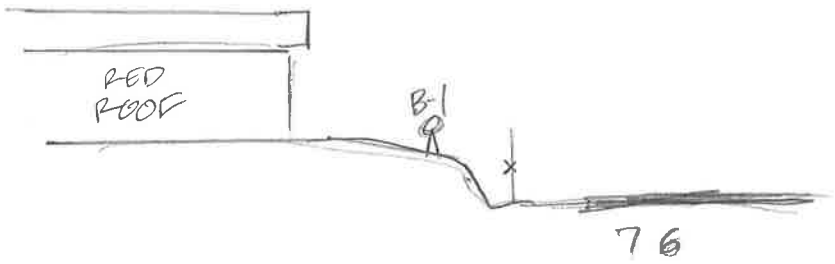
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: B-1	Date: 6-26-14	Location: 20009 US 19	
Site Surface: GRASS		Landmark: GRASS NEAR HIGHWAY & FENCE	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 78°	Cloud Cover: MOSTLY SUNNY	Wind Speed: 3-5 MPH	Wind Direction: E
Start Time: 15:25:00		Stop Time: 15:40:00	
Noise Sources: HIGHWAY			

PLAN VIEW



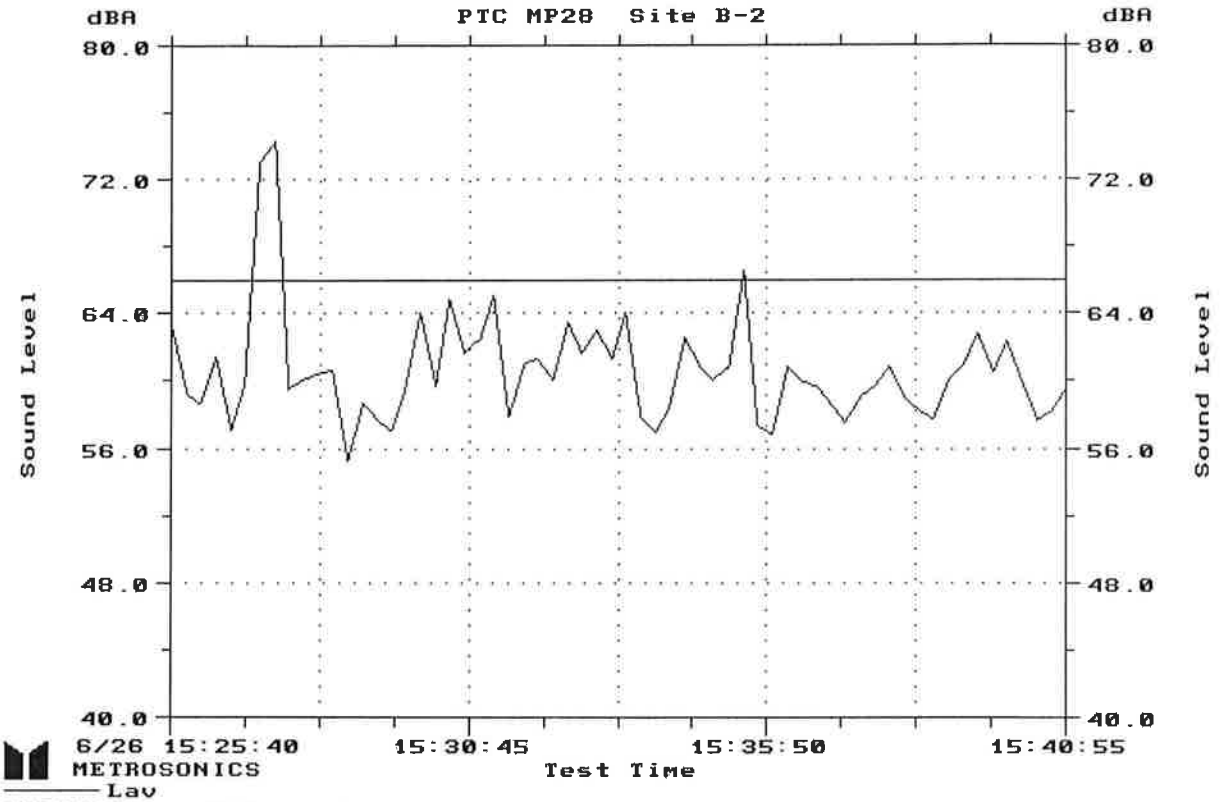
ELEVATION VIEW



Meter No: 3574

Seq. No: 11

Filename.....310020
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site B-2
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...20003 Perry Highway US19
Comment Field 2...78F Clear Wind 0-5 East
Numeric Code #1... #2... #3... #4... #5...



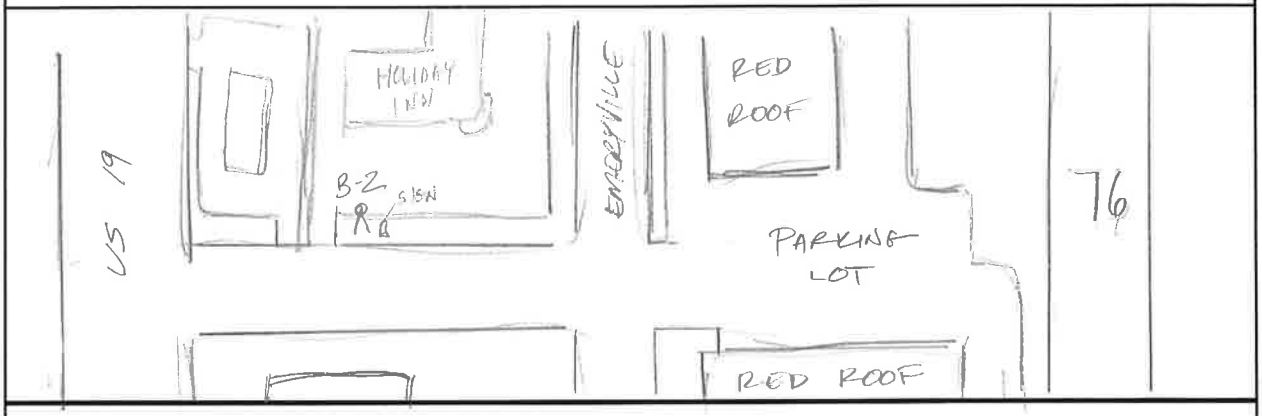
OVERALL: Lav= 62.9dB
SCAN LINE: 6/26/14 15:25:40 Lav= 63.2dB

NOISE MONITORING DATA

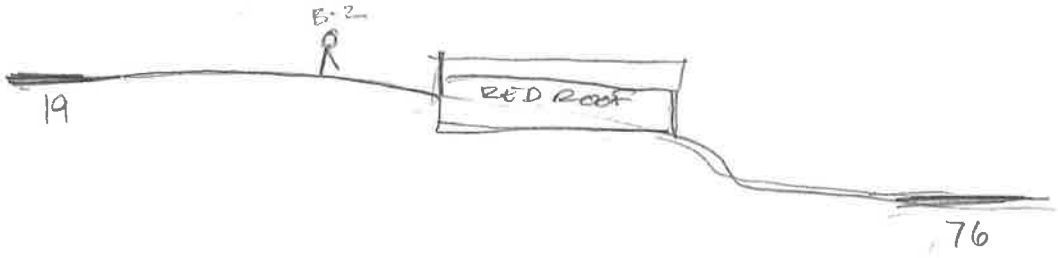
Project: PA Turnpike MP 28-31

		Observer: VRm	
Site ID: B-2	Date: 6-26-14	Location: 20003 US 19	
Site Surface: GRASS		Landmark: GRASS NEAR LITTLE SIGN	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 78°	Cloud Cover: MOSTLY SUNNY	Wind Speed: 3-5 MPH	Wind Direction: E
Start Time: 15:25:00		Stop Time: 15:40:00	
Noise Sources: HIGHWAY 15:26 - 18 WHEELER			

PLAN VIEW



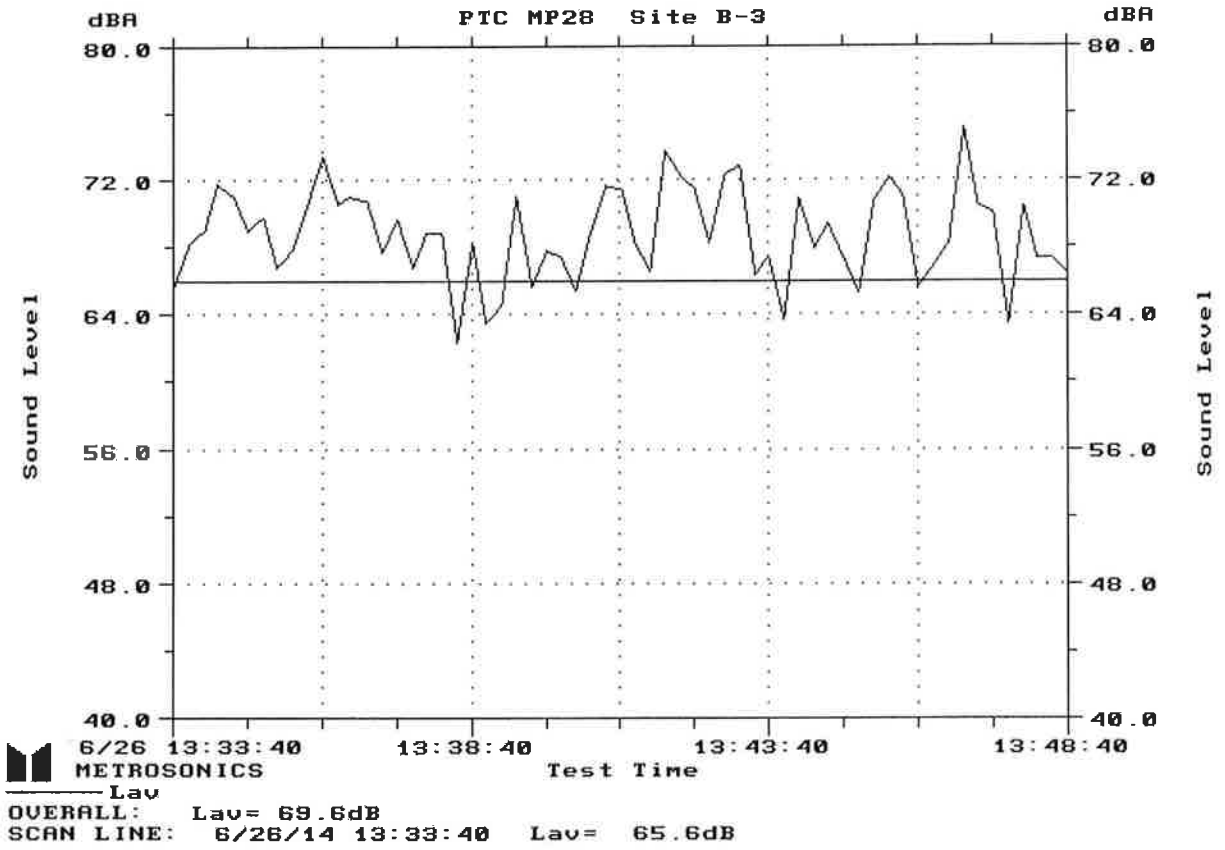
ELEVATION VIEW



Meter No: 2598

Seq. No: 9

Filename.....31007
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site B-3
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...19025 Perry Highway US19
Comment Field 2...73F P Cloudy Wind Lt Va
Numeric Code #1... #2... #3... #4... #5...



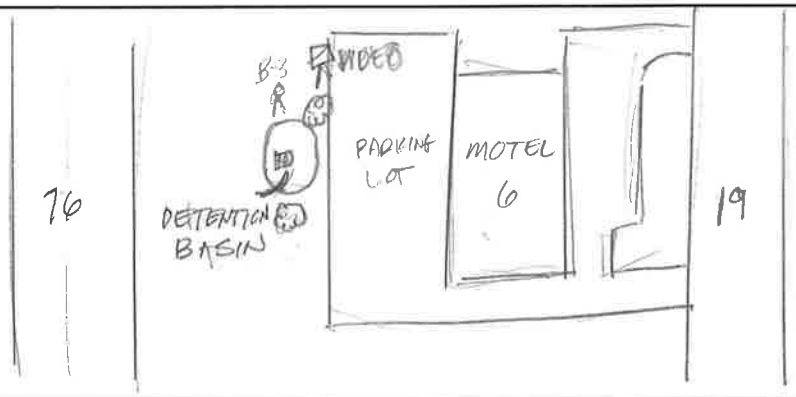
OVERALL: Lav= 69.6dB
SCAN LINE: 6/26/14 13:33:40 Lav= 65.6dB

NOISE MONITORING DATA

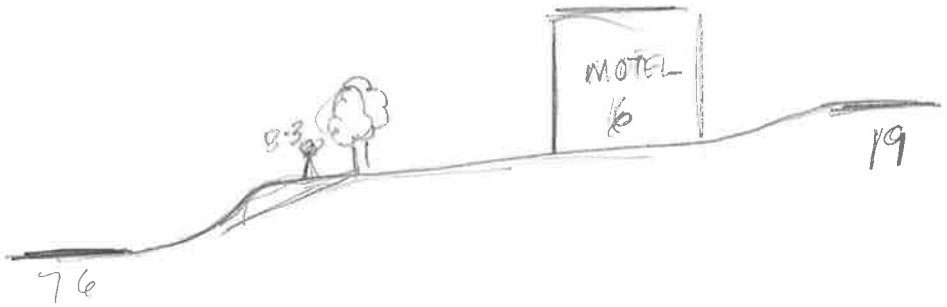
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: B-3	Date: 6-26-14	Location: 19025 PERRY HWY (US 19)	
Site Surface: GRASS		Landmark: BACK NEAR TREE & DETENTION POND	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: OVERCAST	Wind Speed: 0-5 MPH	Wind Direction: E
Start Time: 13:33:00		Stop Time: 13:48:00	
Noise Sources: HIGHWAY, BIRDS			

PLAN VIEW



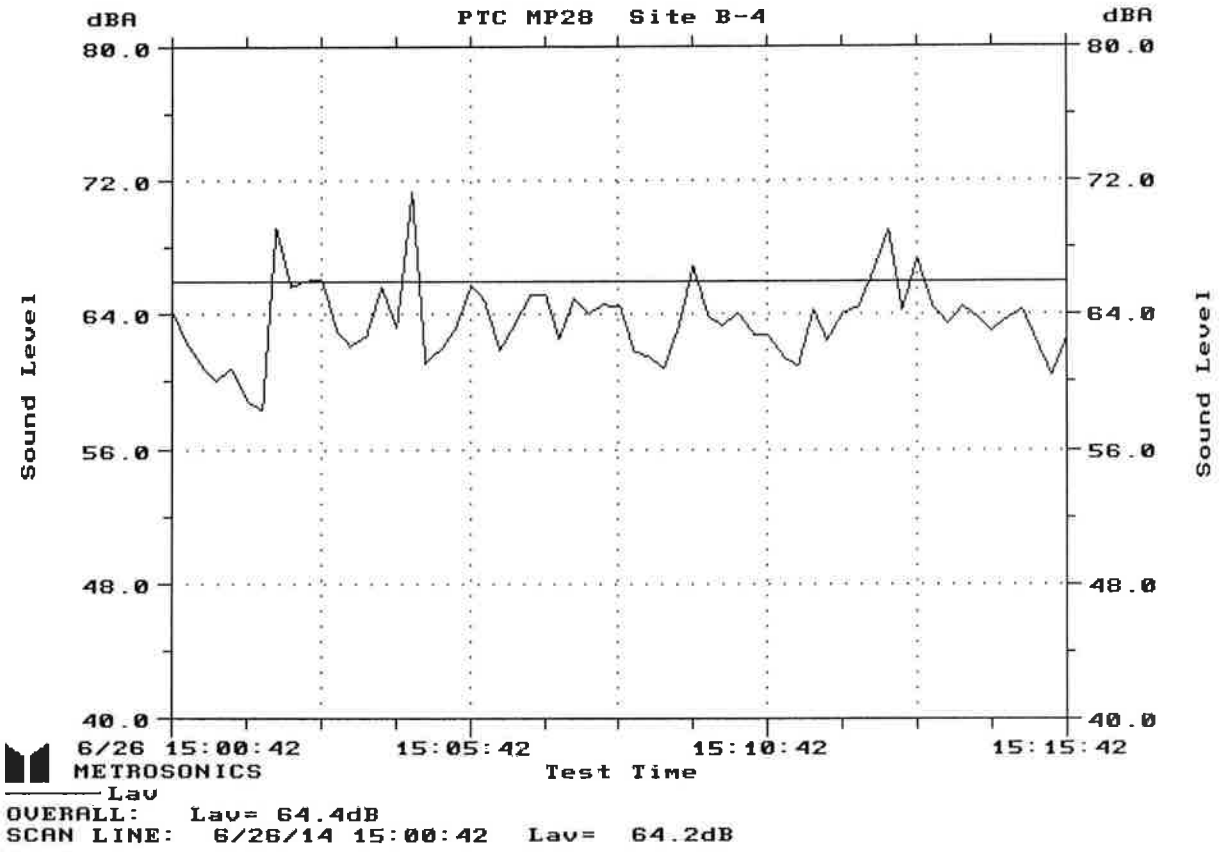
ELEVATION VIEW



Meter No: 3574

Seq. No: 7

Filename.....310010
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site B-4
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...924 Sheraton Drive
Comment Field 2...78F Clear Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



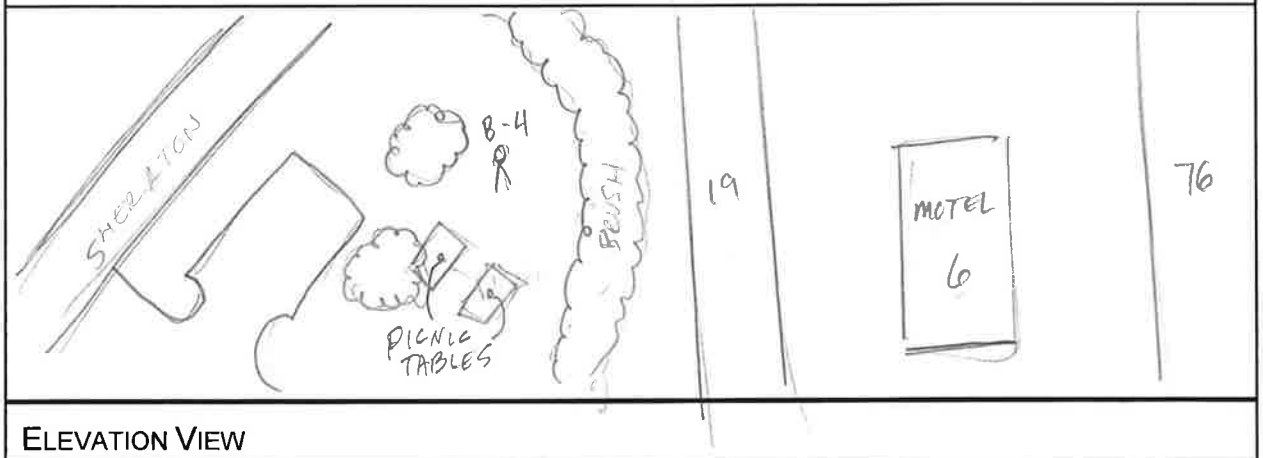
OVERALL: Lav= 64.4dB
SCAN LINE: 6/26/14 15:00:42 Lav= 64.2dB

NOISE MONITORING DATA

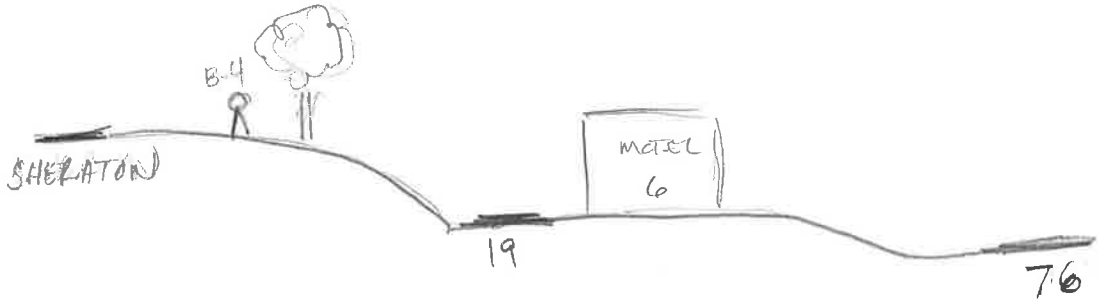
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: B-4	Date: 6-26-14	Location: 924 SHERATON DR.	
Site Surface: GRASS		Landmark: PICNIC AREA COMFORT INN	
Near Lane Direction: 19 EB	Pavement Type: ASPHALT		
Temperature: 78°	Cloud Cover: MOSTLY SUNNY	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 15:00:00		Stop Time: 15:15:00	
Noise Sources: BIRDS SR 19 NOISE 15:09, 15:12 } REVERSE ALARM ON TRUCK			

PLAN VIEW



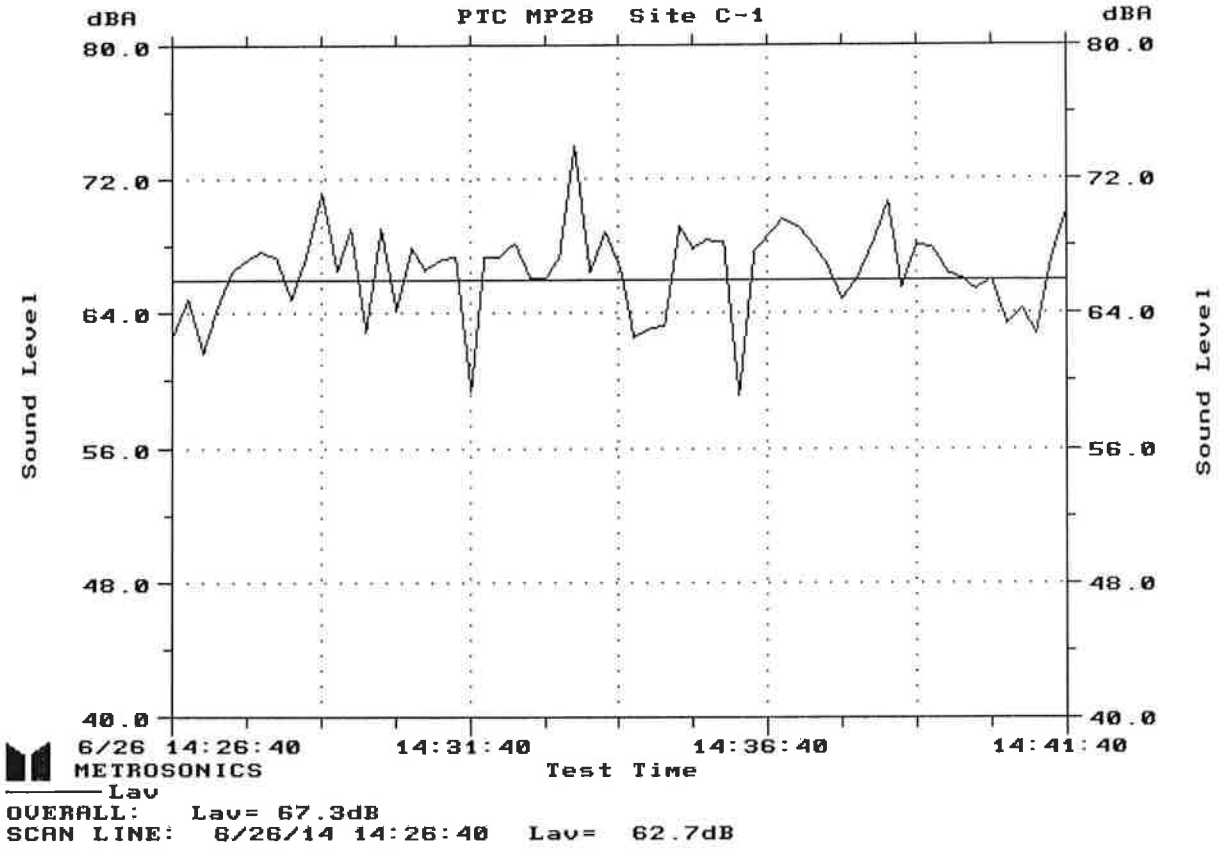
ELEVATION VIEW



Meter No: 3574

Seq. No: 10

Filename.....31009
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site C-1
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...119 Commonwealth Drive
Comment Field 2...73F P Cloudy Wind 0-5 E
Numeric Code #1... #2... #3... #4... #5...



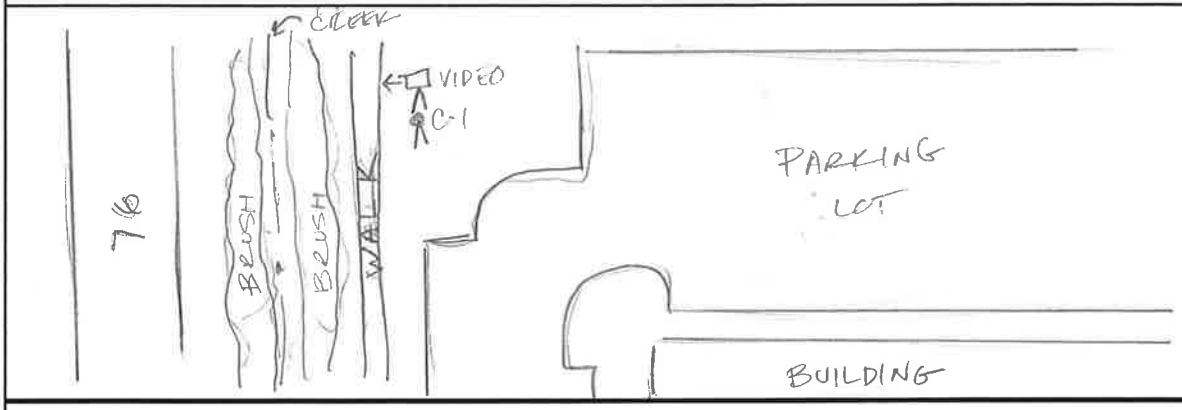
OVERALL: Lav= 67.3dB
SCAN LINE: 6/26/14 14:26:40 Lav= 62.7dB

NOISE MONITORING DATA

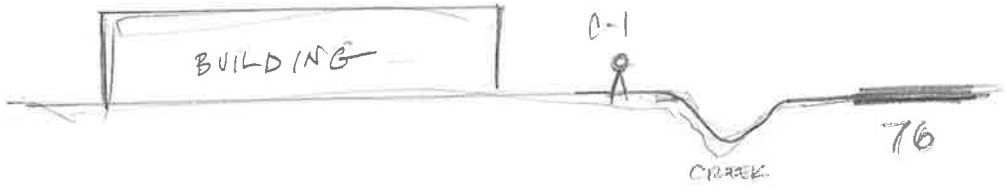
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: C-1	Date: 6-26-14	Location: 119 COMMONWEALTH DR.	
Site Surface: GRASS		Landmark: GRASSY AREA NEAR WALK PATH & DRIVE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: MOSTLY SUNNY	Wind Speed: 0-5 MPH	Wind Direction: E
Start Time: 14:26:00		Stop Time: 14:41:00	
Noise Sources: HIGHWAY, BIRDS, LEAVES			

PLAN VIEW



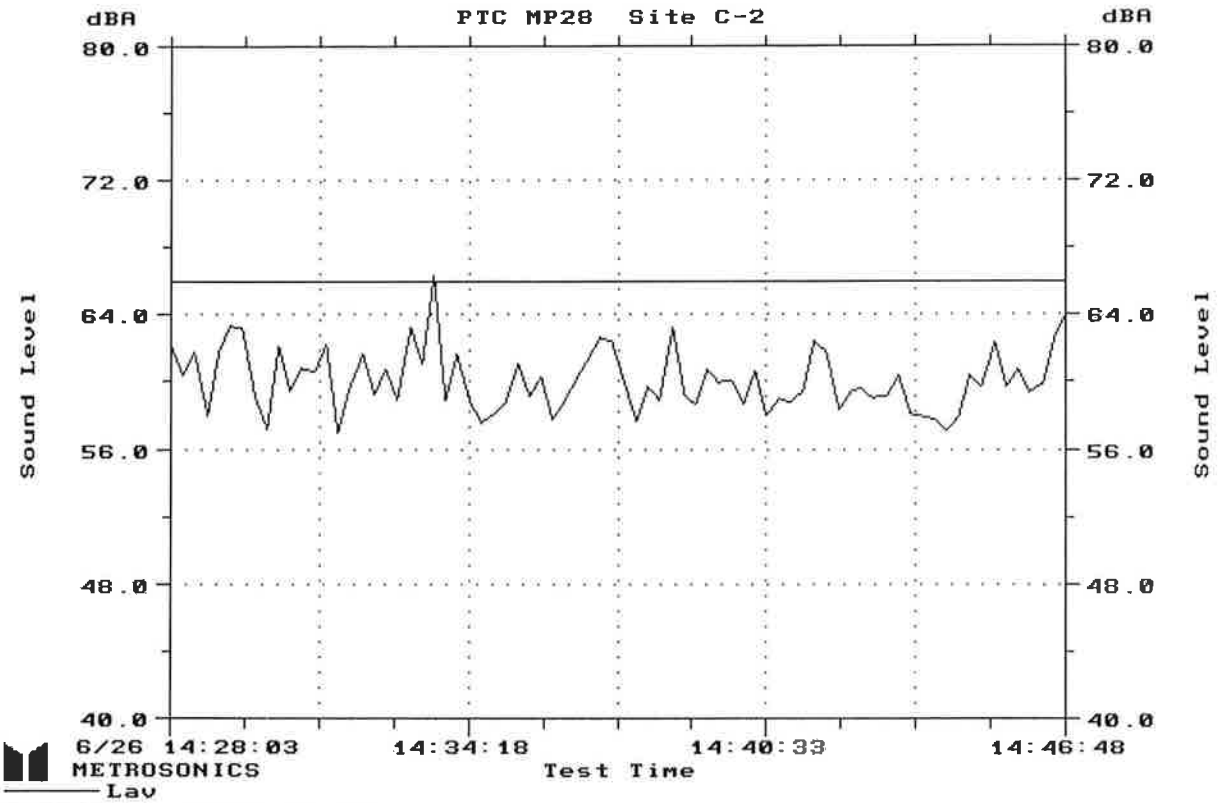
ELEVATION VIEW



Meter No: 3574

Seq. No: 9

Filename.....310019
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site C-2
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...765 Commonwealth Drive
Comment Field 2...73F P Cloudy Wind 0-5 E
Numeric Code #1... #2... #3... #4... #5...



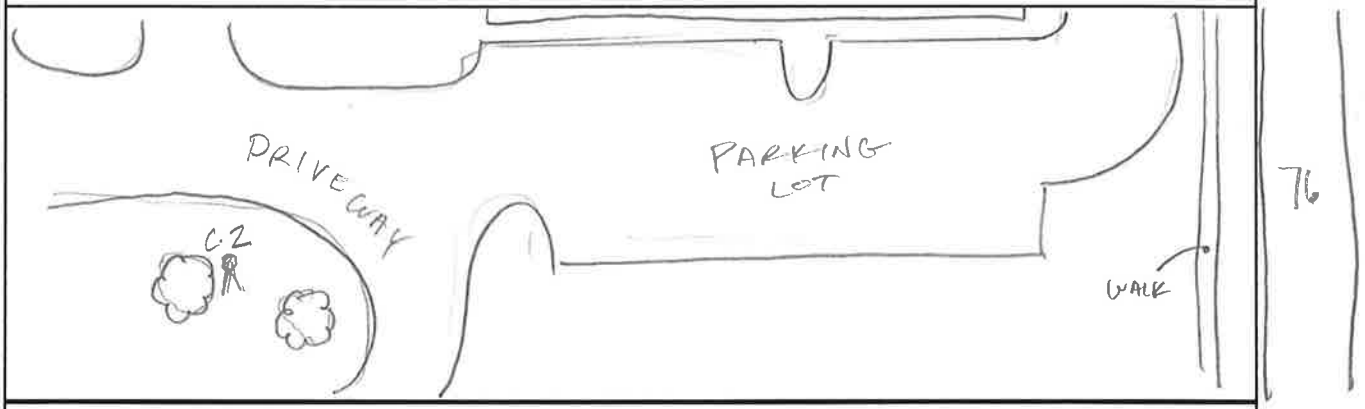
OVERALL: Lav= 60.5dB
SCAN LINE: 6/26/14 14:28:03 Lav= 62.1dB

NOISE MONITORING DATA

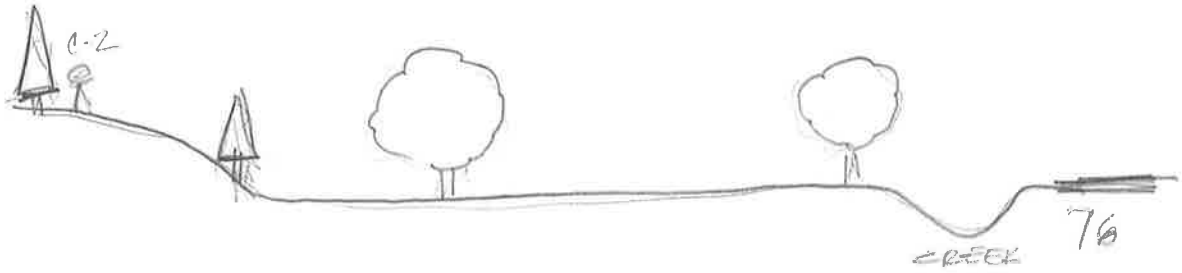
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: C-2	Date: 6-26-14	Location: 119 COMMONWEALTH DR	
Site Surface: GRASS		Landmark: GRASS KNOLL NEAR BACK BLDG & PINE TREE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: MOSTLY SUNNY	Wind Speed: 0-5 MPH	Wind Direction: E
Start Time: 14:28:00		Stop Time: 14:46:00	
Noise Sources: BIRDS, HIGHWAY			

PLAN VIEW



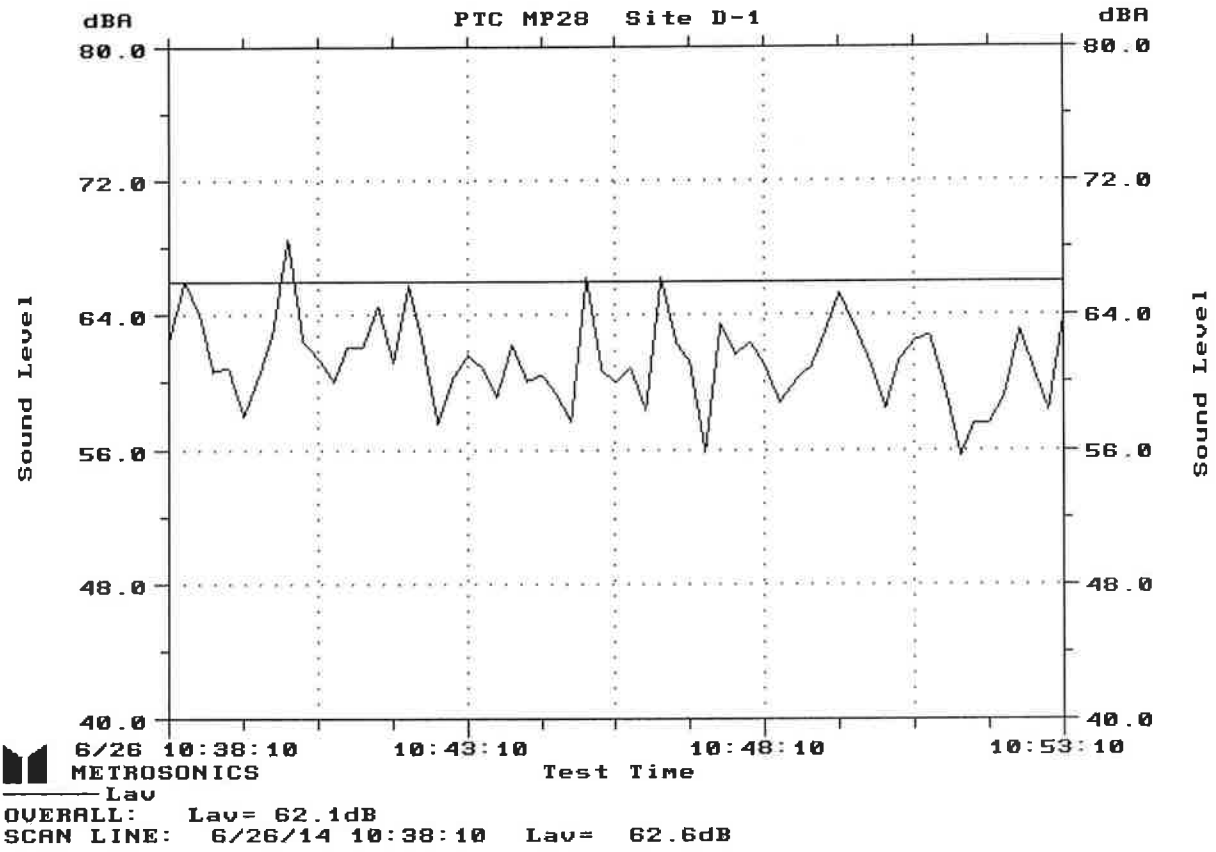
ELEVATION VIEW



Meter No: 2598

Seq. No: 8

Filename.....31003
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site D-1
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...390 Northgate
Comment Field 2...66F P Cloudy Wind Lt Va
Numeric Code #1... #2... #3... #4... #5...



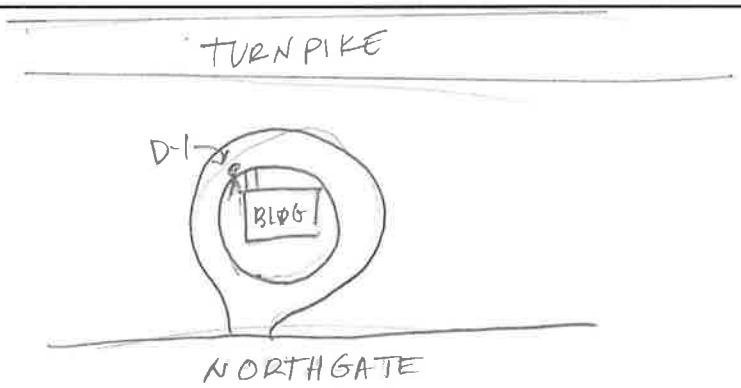
OVERALL: Lav= 62.1dB
SCAN LINE: 6/26/14 10:38:10 Lav= 62.6dB

NOISE MONITORING DATA

Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: D-1	Date: 6-26-14	Location: 390 NORTHGATE	
Site Surface: MULCH		Landmark: BACK NEAR TREE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 66° F	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 10:37:30		Stop Time: 10:52:30	
Noise Sources: BIRDS, TURN PIKE			

PLAN VIEW



ELEVATION VIEW

NORTH GATE 10:40 - 10:50

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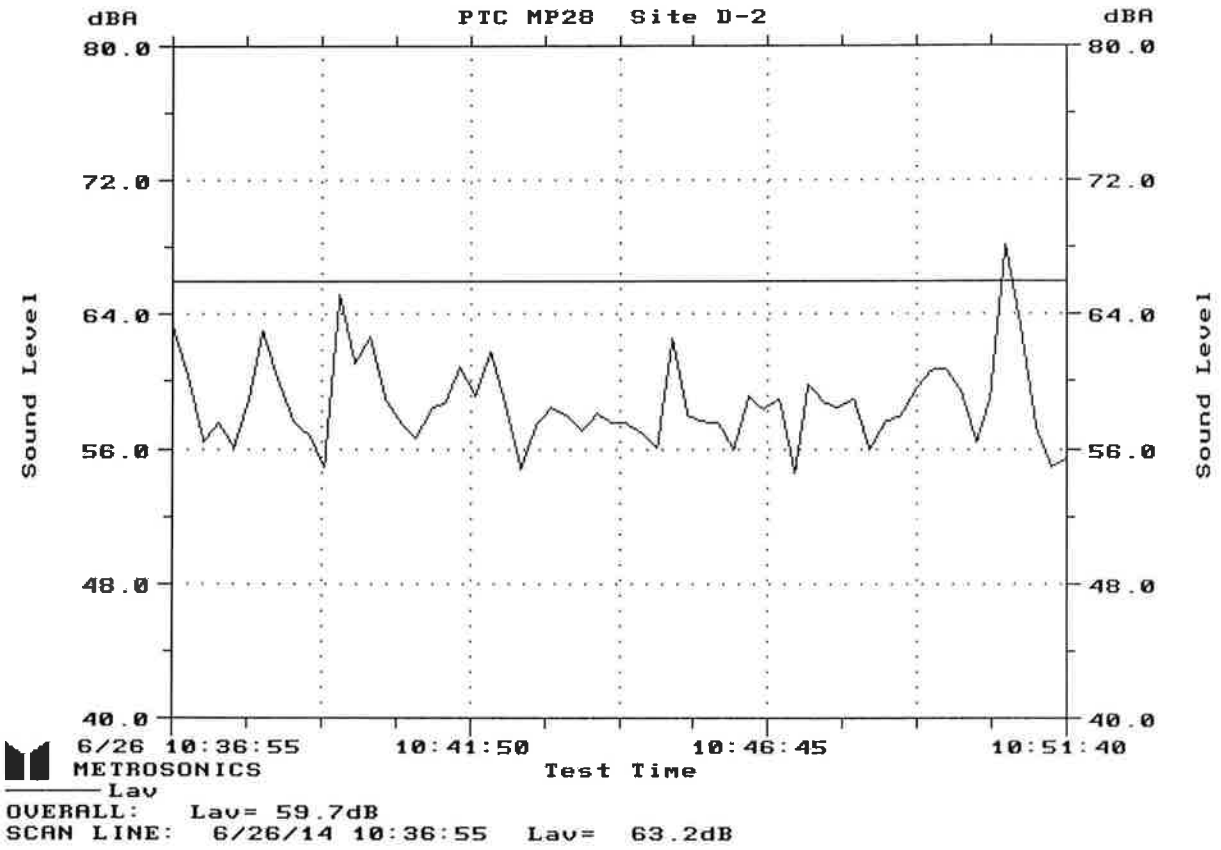
Meter No: 3574

Seq. No: 3

Filename.....310014
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site D-2
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...385 Northgate
Comment Field 2...66F P Cloudy Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



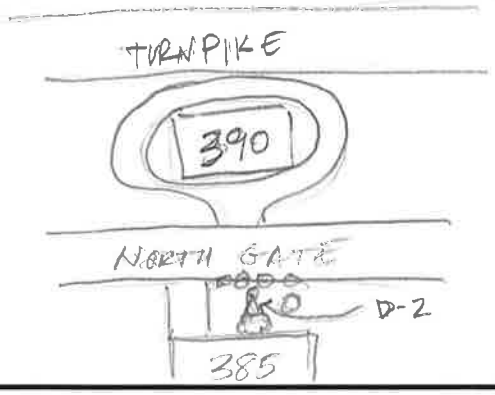
OVERALL: Lav= 59.7dB
SCAN LINE: 6/26/14 10:36:55 Lav= 63.2dB

NOISE MONITORING DATA

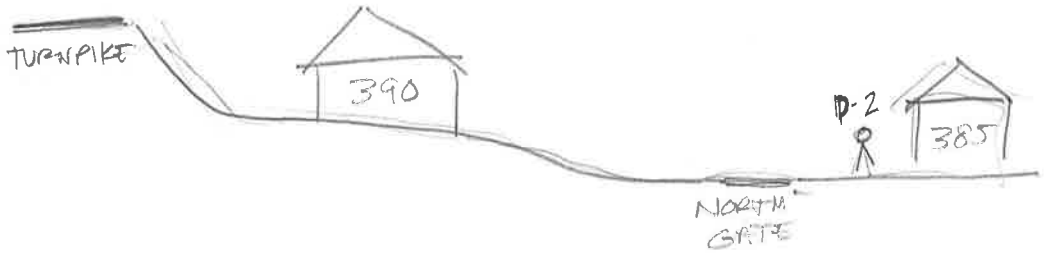
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: D-2	Date: 6-26-14	Location: 385 NORTHGATE	
Site Surface: GRASS		Landmark: FRONT YARD	
Near Lane 76 Direction: EB	Pavement Type: ASPHALT		
Temperature: 66° F	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 10:36:15		Stop Time: 10:51:15	
Noise Sources: BIRDS, TURNPIKE			

PLAN VIEW



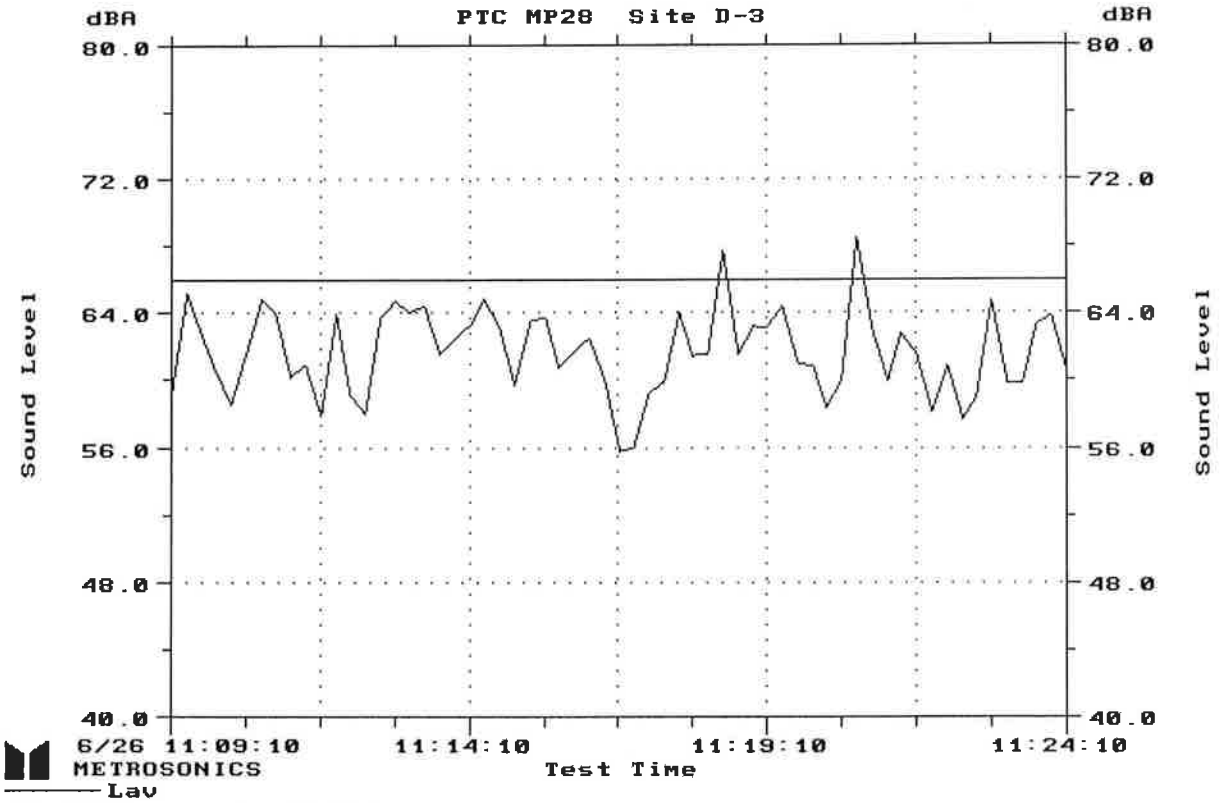
ELEVATION VIEW



Meter No: 2598

Seq. No: 3

Filename.....31004
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site D-3
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...320 Northgate
Comment Field 2...66F P Cloudy Wind Lt Va
Numeric Code #1... #2... #3... #4... #5...



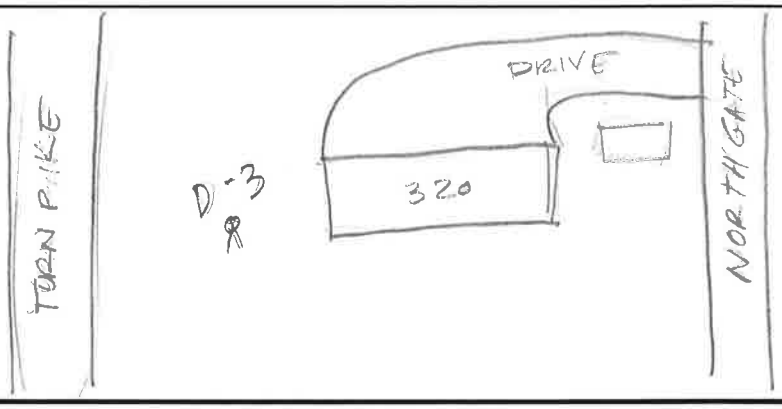
OVERALL: Lav= 62.4dB
SCAN LINE: 6/26/14 11:09:10 Lav= 59.3dB

NOISE MONITORING DATA

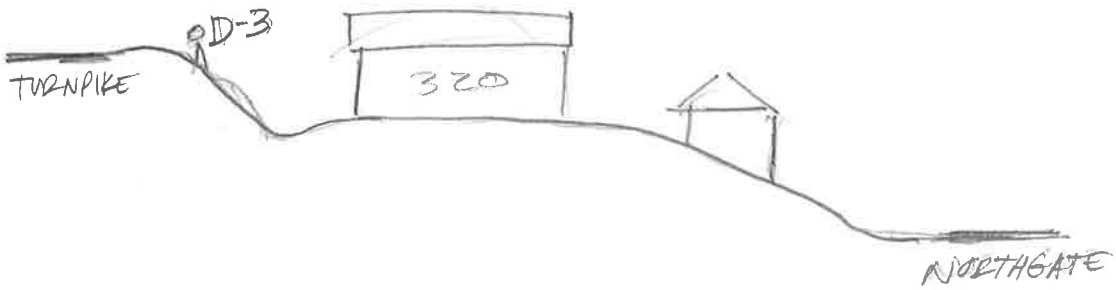
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: D-3	Date: 6-26-14	Location: 320 NORTHGATE	
Site Surface: GRASS		Landmark: BEHIND BLDG ON TOP OF HILL	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 66°F	Cloud Cover: OVER CAST	Wind Speed: 0-3	Wind Direction: CALM
Start Time: 11:08:30		Stop Time: 11:23:30	
Noise Sources: HIGHWAY, BIRDS			

PLAN VIEW



ELEVATION VIEW



NORTHGATE 11:10 - 11:20

A ||||

M ||

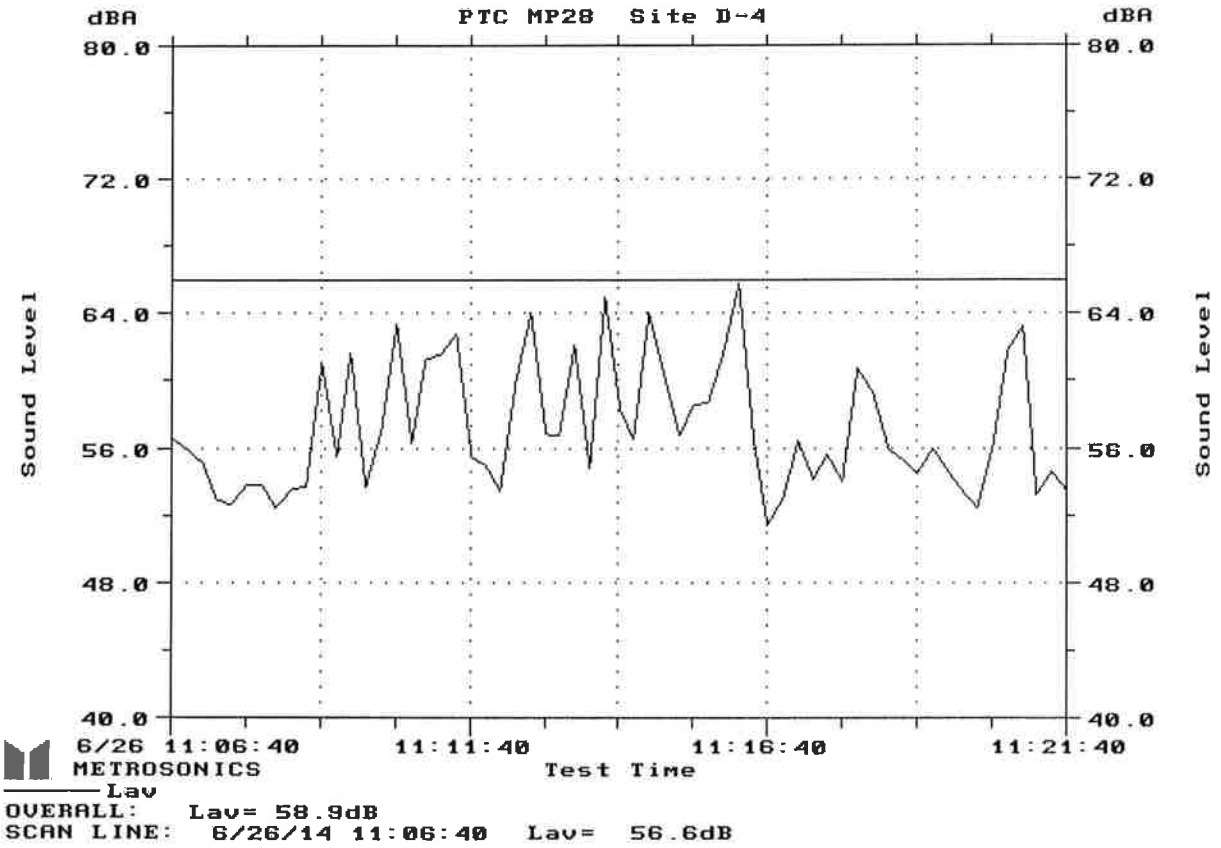
H 0

NORTHGATE 11:00 11:20:00

Meter No: 3574

Seq. No: 4

Filename.....310015
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site D-4
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...327 Northgate
Comment Field 2...66F P Cloudy Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



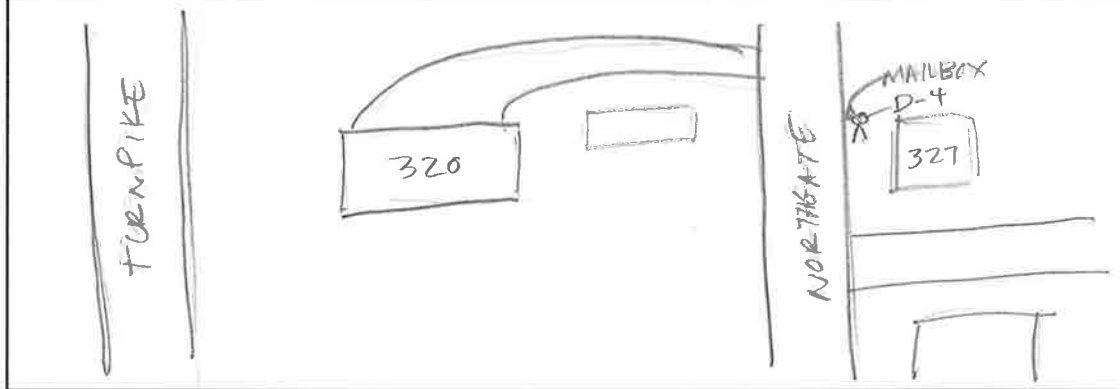
OVERALL: Lav= 58.9dB
SCAN LINE: 6/26/14 11:06:40 Lav= 56.6dB

NOISE MONITORING DATA

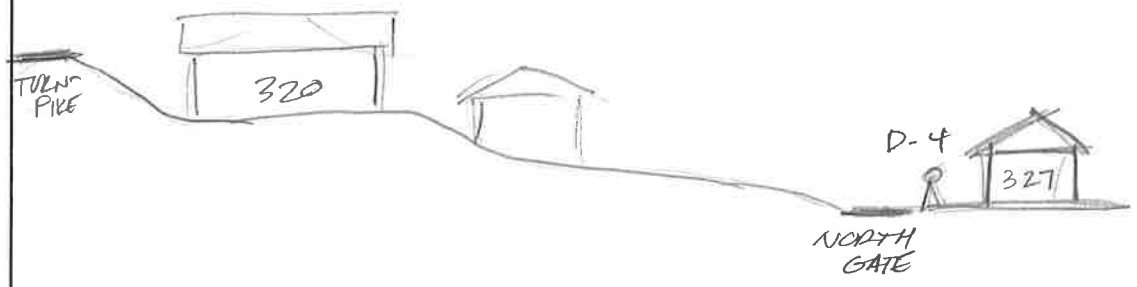
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: D-4	Date: 6-26-14	Location: 327 NORTHGATE	
Site Surface: GRASS		Landmark: FRONT YARD NEAR MAILBOX	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 66°	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 11:06:00		Stop Time: 11:21:00	
Noise Sources: HIGHWAY, AUTO SHOP NOISES, BUZZ OF AC UNIT			

PLAN VIEW



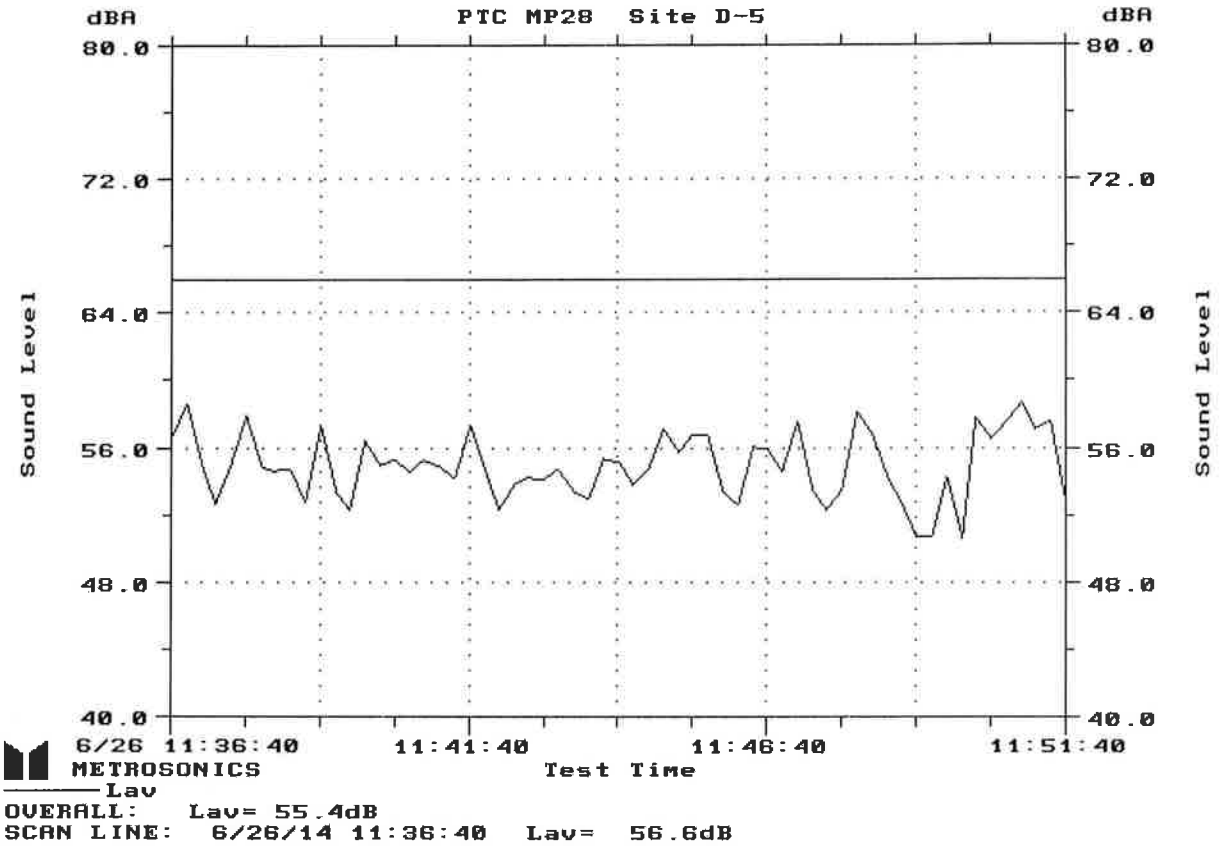
ELEVATION VIEW



Meter No: 2598

Seq. No: 4

Filename.....31005
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site D-5
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...140 Mt. Pleasent
Comment Field 2...66F P Cloudy Wind Lt Va
Numeric Code #1... #2... #3... #4... #5...



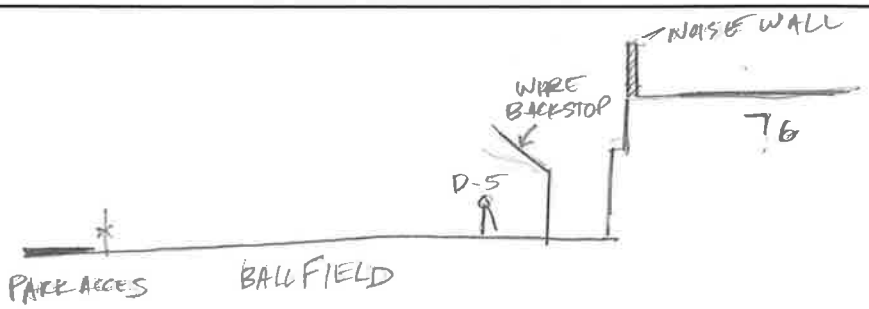
OVERALL: Lav= 55.4dB
SCAN LINE: 6/26/14 11:36:40 Lav= 56.6dB

NOISE MONITORING DATA

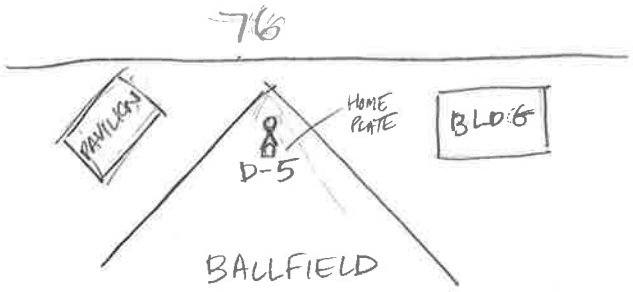
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: D-5	Date: 6-26-14	Location: 140 MT. PLEASANT WARRENDALE PARK	
Site Surface: INFIELD		Landmark: BALLFIELD HOMEPLATE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 66°	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 11:36:00		Stop Time: 11:51:00	
Noise Sources: HIGHWAY, BIRDS			

PLAN VIEW



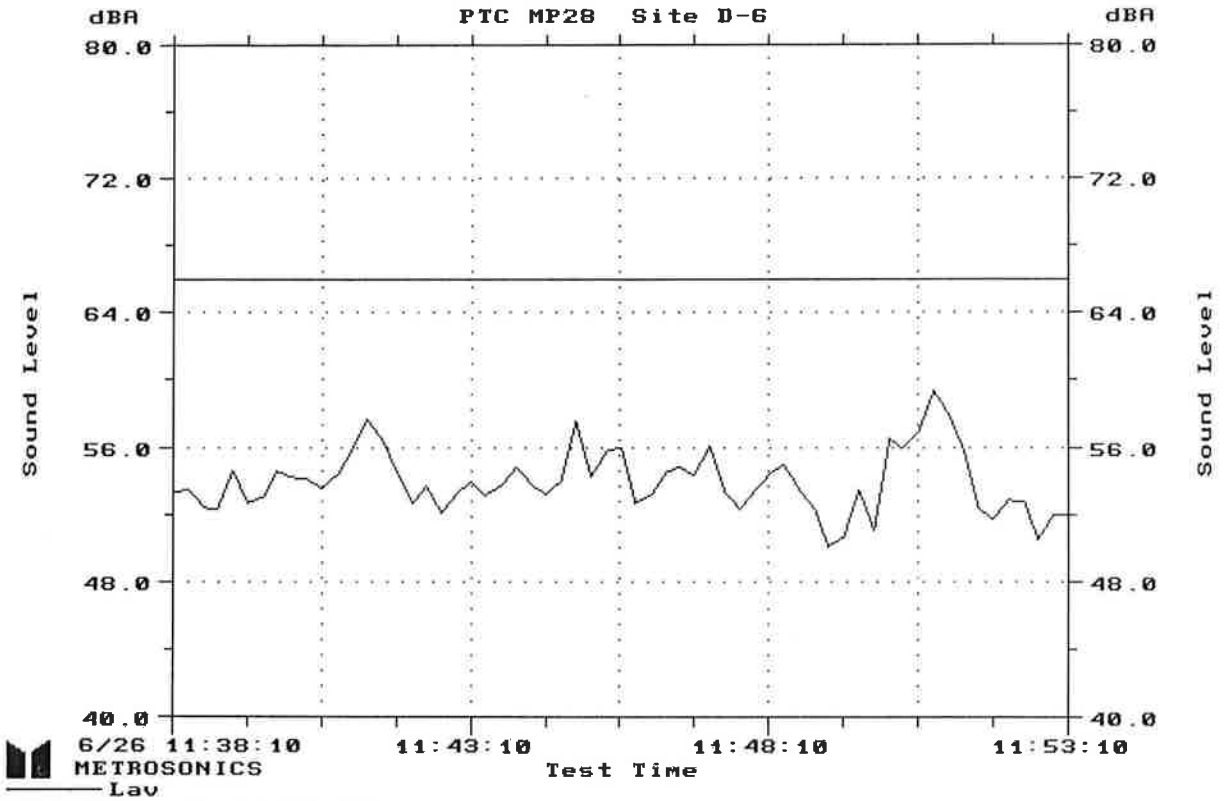
ELEVATION VIEW



Meter No: 3574

Seq. No: 5

Filename.....310016
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site D-6
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...140 Mt Pleasent
Comment Field 2...66F P Cloudy Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



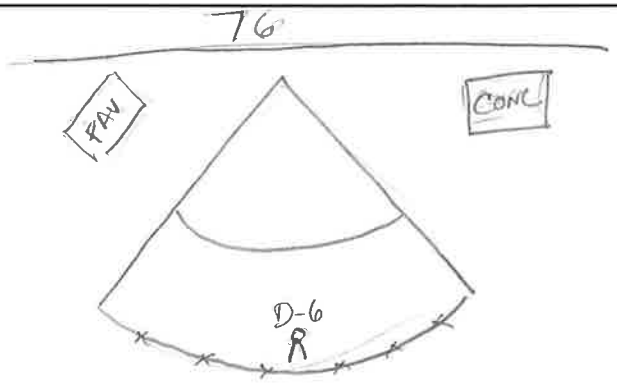
OVERALL: Lav= 54.4dB
SCAN LINE: 6/26/14 11:38:10 Lav= 53.2dB

NOISE MONITORING DATA

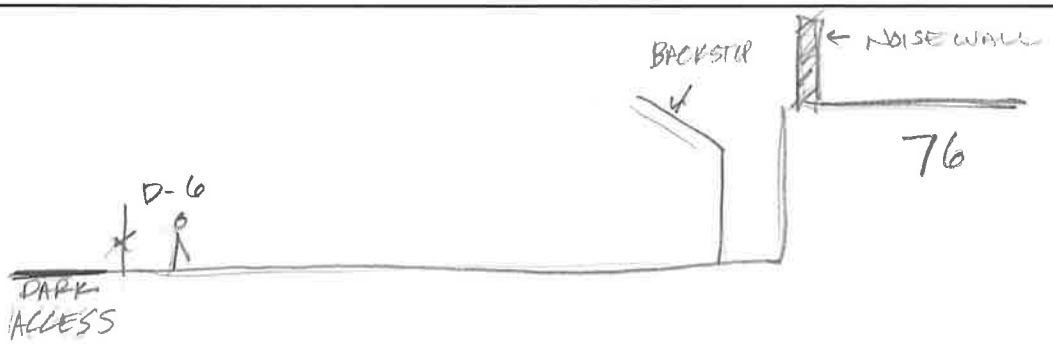
Project: PA Turnpike MP 28-31

		Observer: VPM	
Site ID: D-6	Date: 6-26-14	Location: 140 MT. PLEASANT WARRENDALE PARK	
Site Surface: GRASS		Landmark: BALLFIELD CENTERFIELD NEAR FENCE	
Near Lane Direction: 76 EB	Pavement Type: ASPHALT		
Temperature: 66°	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 11:37:30		Stop Time: 11:52:30	
Noise Sources: HIGHWAY, CREEK, BIRDS 11:40 LOUD CAR MUSIC			

PLAN VIEW



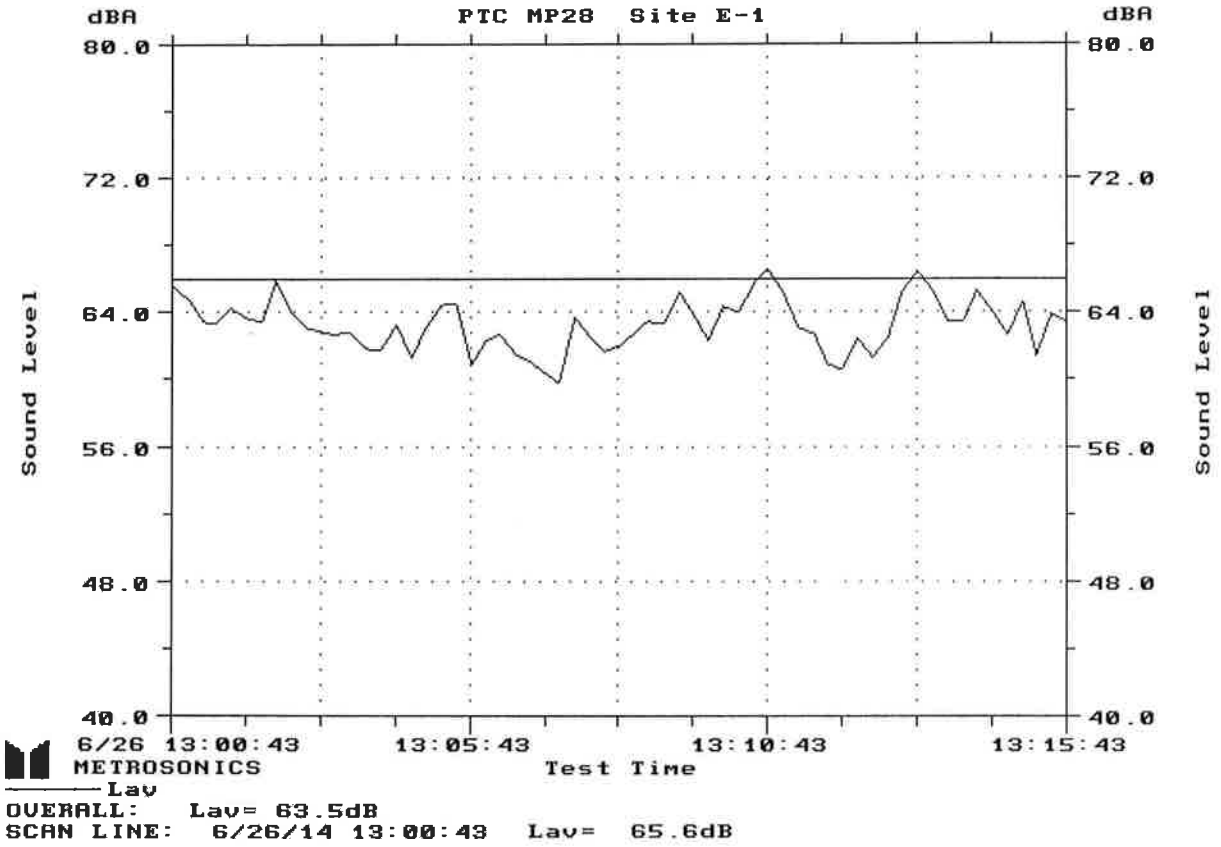
ELEVATION VIEW



Meter No: 2598

Seq. No: 5

Filename.....31006
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site E-1
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...616 Chillwack Lane
Comment Field 2...73F P Cloudy Wind Lt Va
Numeric Code #1... #2... #3... #4... #5...



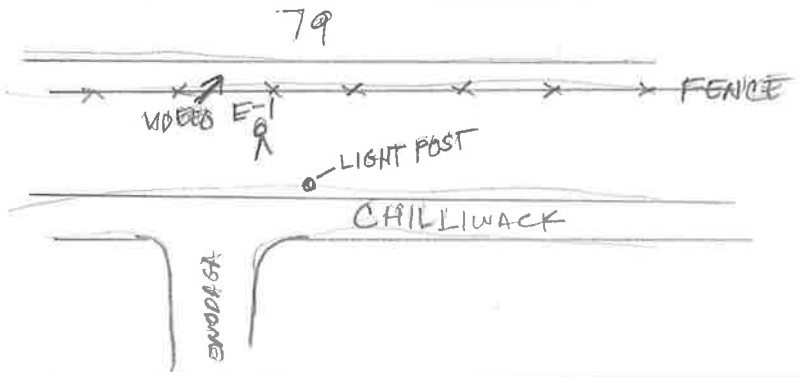
OVERALL: Lav= 63.5dB
SCAN LINE: 6/26/14 13:00:43 Lav= 65.6dB

NOISE MONITORING DATA

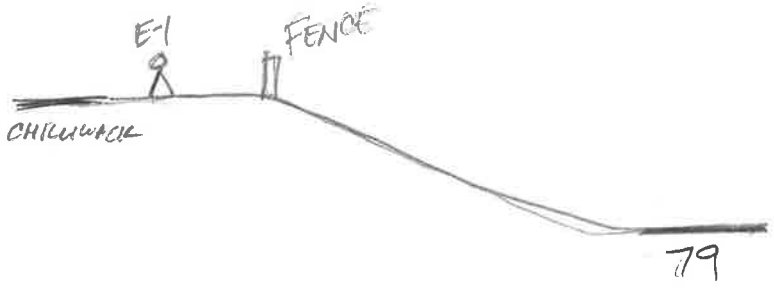
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: E-1	Date: 6-26-14	Location: 616 CHILLIWACK LN	
Site Surface: DIRT		Landmark: LOT 346 30' OFF ROAD	
Near Lane Direction: 79 WB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: OVERCAST	Wind Speed: 0-5 MPH	Wind Direction: CALM
Start Time: 13:00:00		Stop Time: 13:15:00	
Noise Sources: HIGHWAY TRAFFIC, OCCASIONAL (HAMMERING) CONSTRUCTION NOISE			

PLAN VIEW



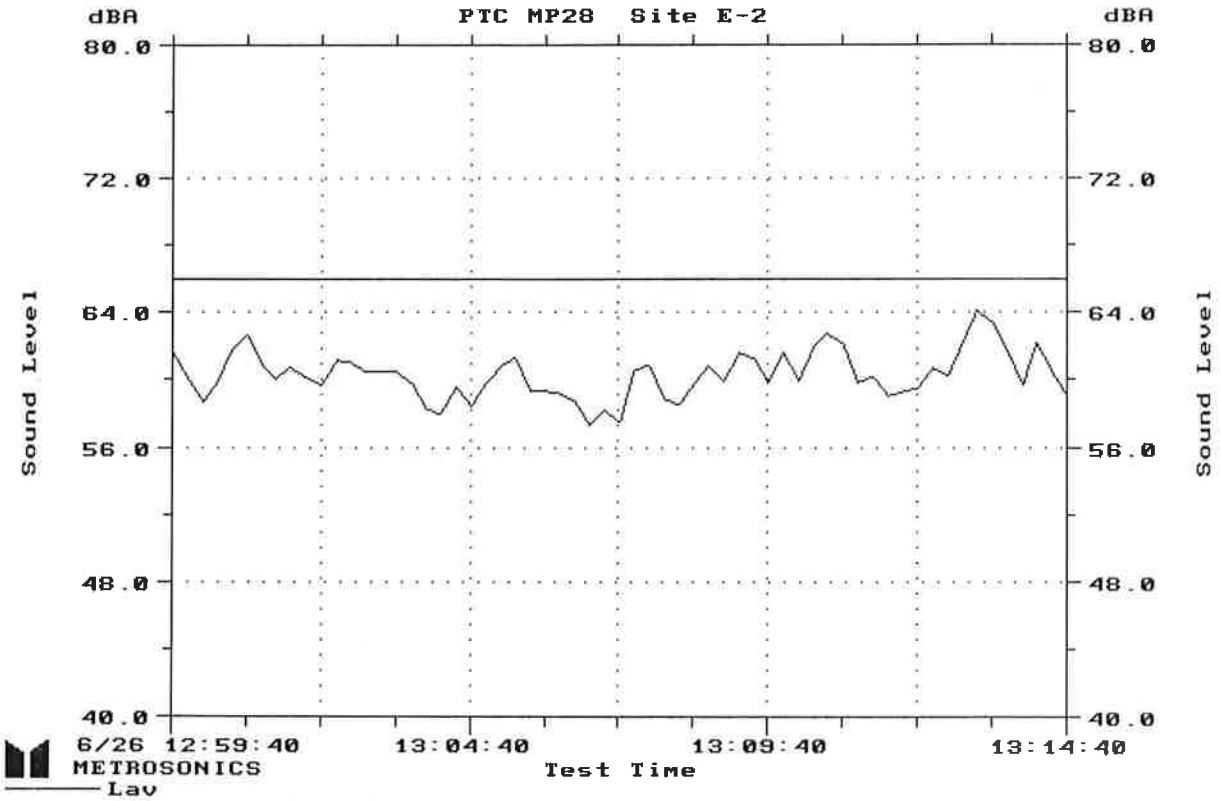
ELEVATION VIEW



Meter No: 3574

Seq. No: 6

Filename.....310017
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site E-2
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...611 Chilliwack
Comment Field 2...73F P Cloudy Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



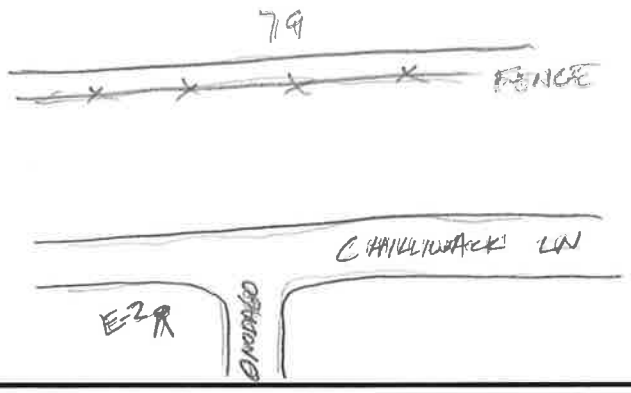
OVERALL: Lav= 60.5dB
SCAN LINE: 6/26/14 12:59:40 Lav= 61.7dB

NOISE MONITORING DATA

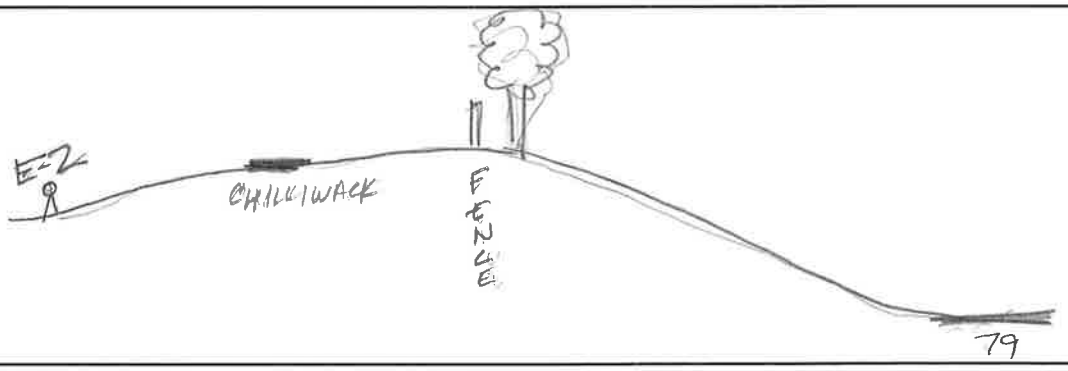
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: E-2	Date: 6-26-14	Location: 611 CHILLIWACK LN	
Site Surface: DIRT		Landmark: LOT 332	
Near Lane Direction: 79 WB	Pavement Type: ASPHALT		
Temperature: 73°	Cloud Cover: OVERCAST	Wind Speed: 0-5 MPH	Wind Direction: CALM
Start Time: 12:59:00		Stop Time: 13:14:00	
Noise Sources: HIGHWAY TRAFFIC, CONSTRUCTION NOISE (HAMMERING, SAW) IN BACKGROUND			

PLAN VIEW



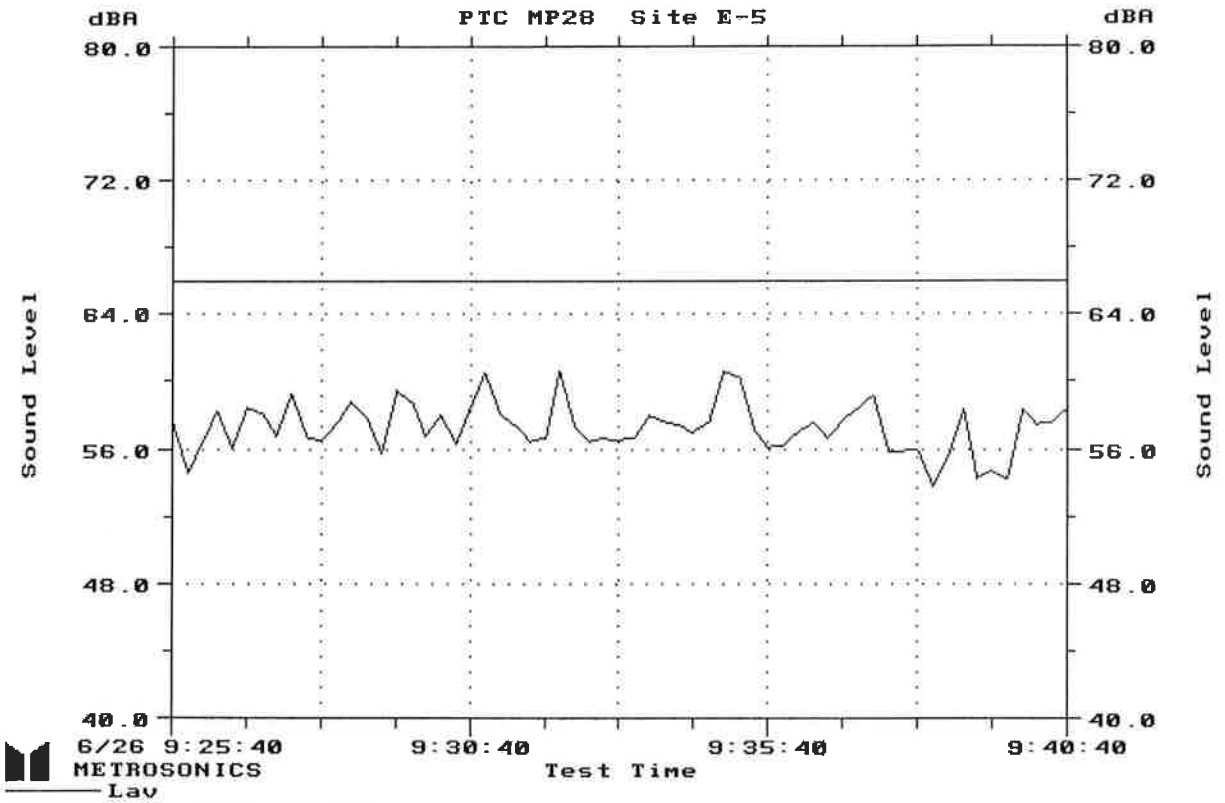
ELEVATION VIEW



Meter No: 2568

Seq. No: 6

Filename.....31001
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site E-5
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...901 Penticon Lane #449
Comment Field 2...Temp 71F Wind Lt. Var.
Numeric Code #1... #2... #3... #4... #5...



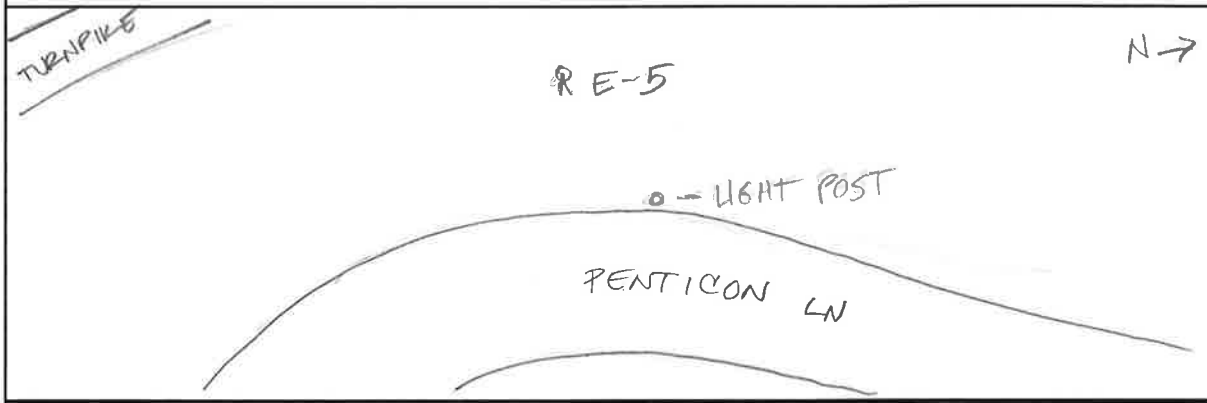
OVERALL: Lav= 57.5dB
SCAN LINE: 6/26/14 9:25:40 Lav= 57.5dB

NOISE MONITORING DATA

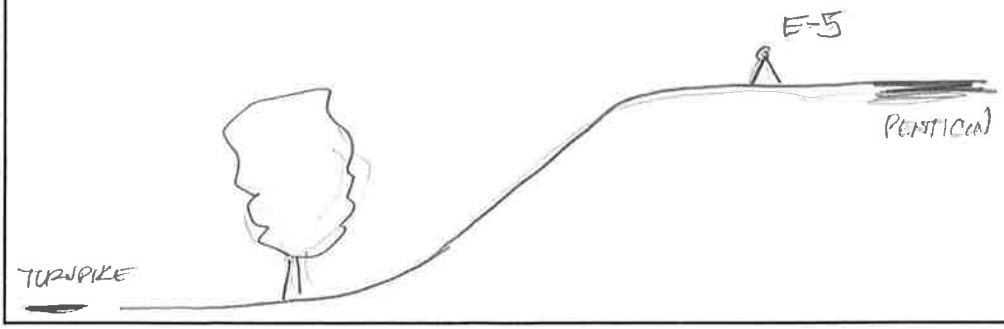
Project: PA Turnpike MP 28-31

		Observer: VRm	
Site ID: E-5	Date: 6-26-14	Location: 901 PENTICON LN LOT 449	
Site Surface: GRASS		Landmark: 50' FROM ROAD 1ST LOT 449	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 71°F	Cloud Cover: PARTLY CLOUDY	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 9:25:00		Stop Time: 9:40:00	VIBES 1150
Noise Sources: BIRDS, HIGHWAY			

PLAN VIEW



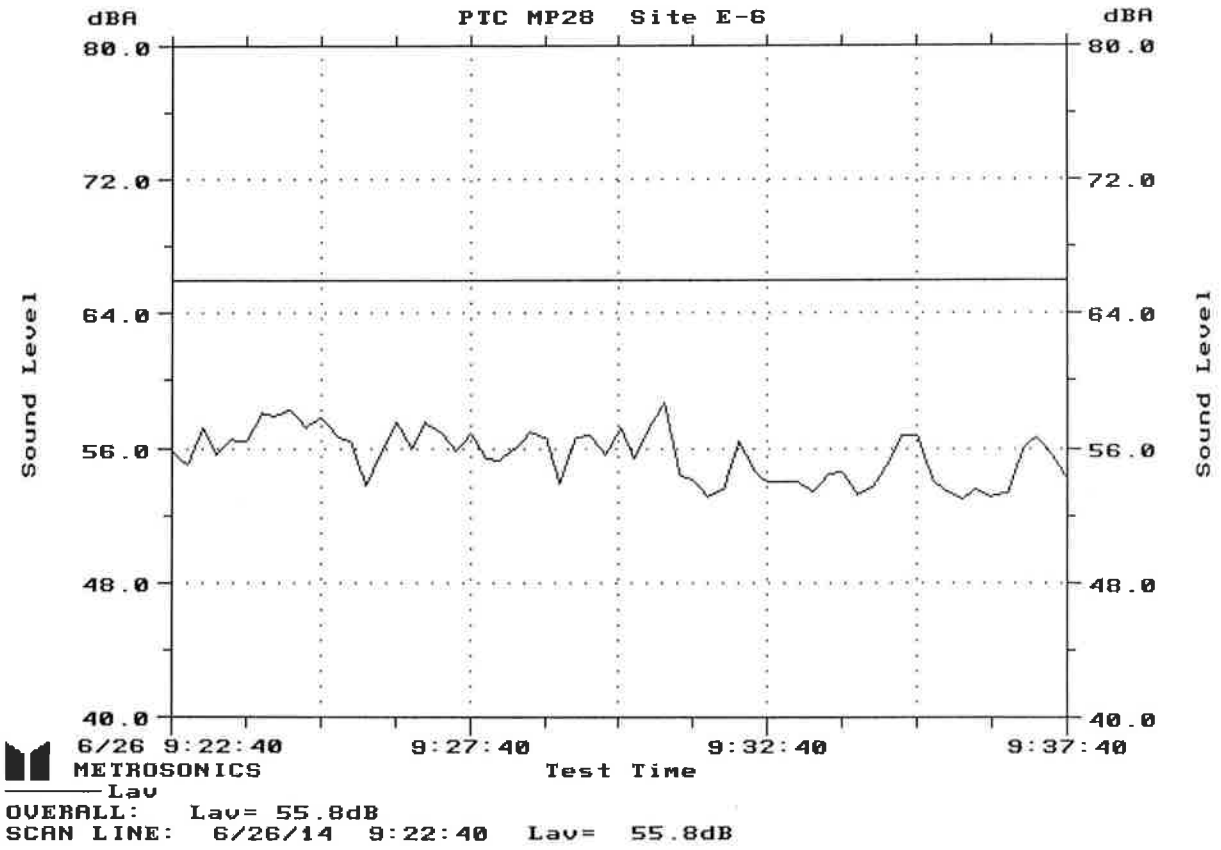
ELEVATION VIEW



Meter No: 3574

Seq. No: 1

Filename.....310012
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site E-6
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...902 Penticon Lane #472
Comment Field 2...71F P Cloudy Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



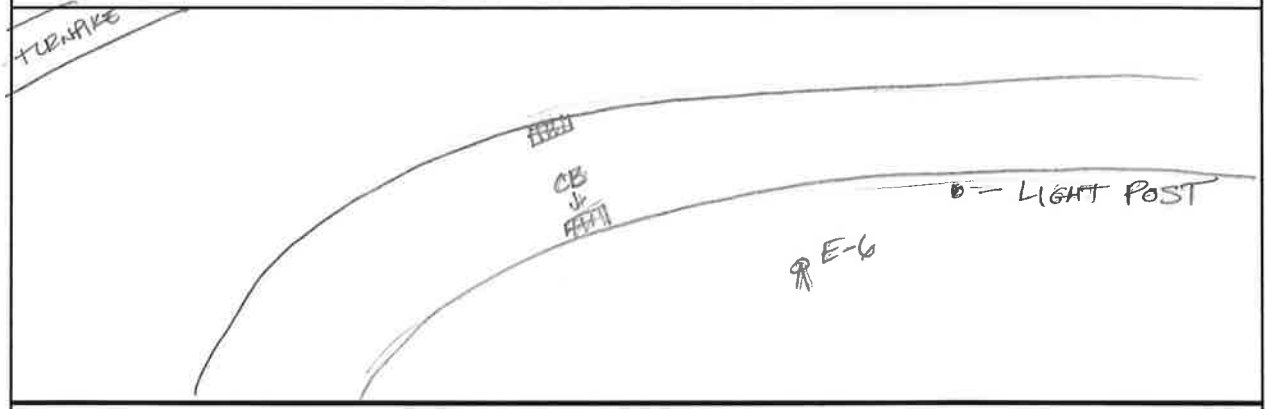
OVERALL: Lav= 55.8dB
SCAN LINE: 6/26/14 9:22:40 Lav= 55.8dB

NOISE MONITORING DATA

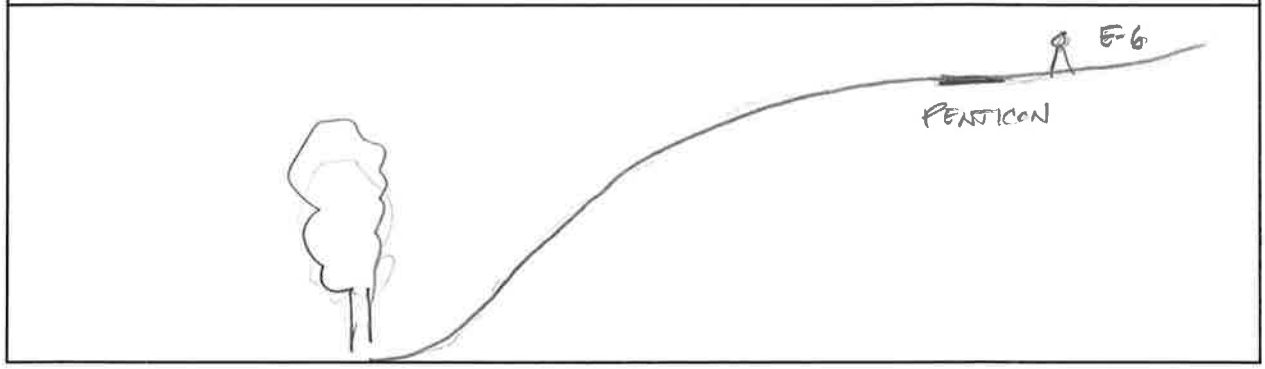
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: E-6	Date: 6-26-14	Location: 902 PENTICON LN LOT 472	
Site Surface: GRASS		Landmark: 50' OFF ROAD LOT #472	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 71°F	Cloud Cover: PARTLY CLOUDY	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 9:22:00		Stop Time: 9:37:00	
Noise Sources: BIRDS, HIGHWAY			

PLAN VIEW



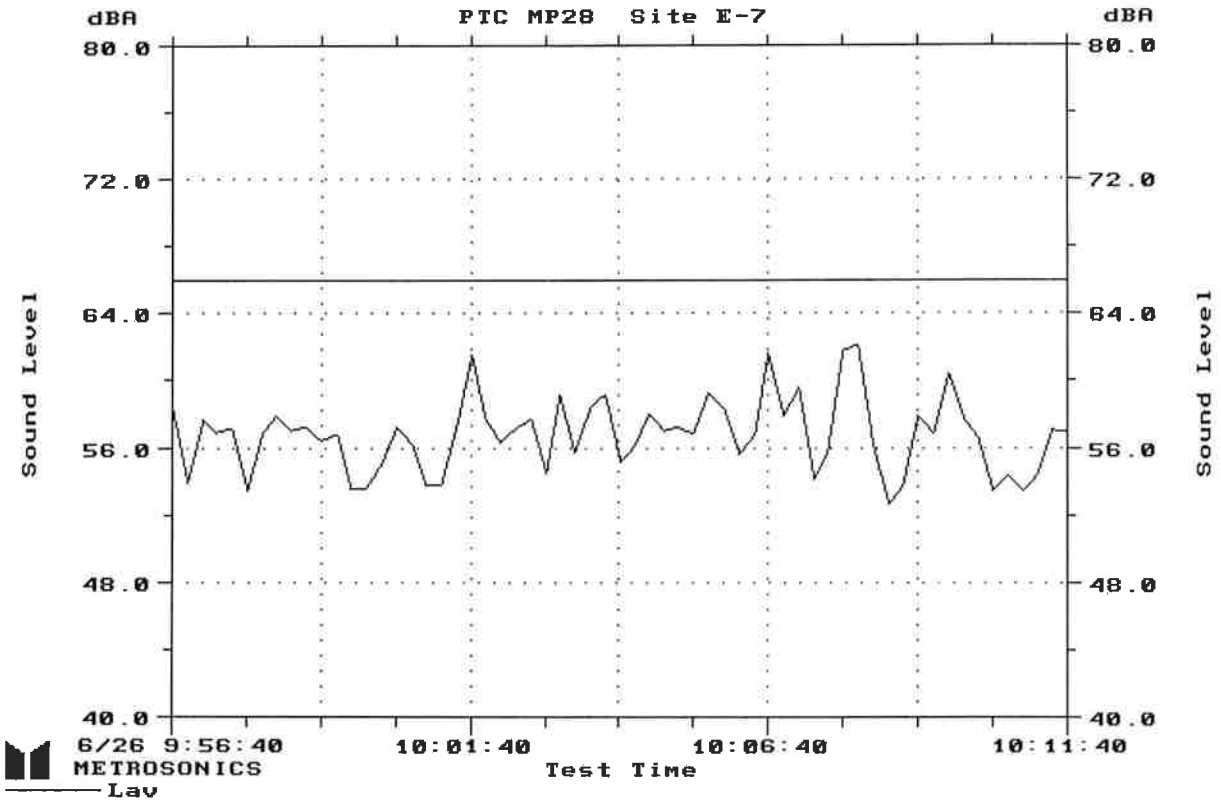
ELEVATION VIEW



Meter No: 2598

Seq. No: 1

Filename.....31002
Logger.....db-3100 SN 3574
Test Location.....PTC MP28 Site E-7
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...138 Warren Road
Comment Field 2...Temp 71F Wind Lt. Var.
Numeric Code #1... #2... #3... #4... #5...



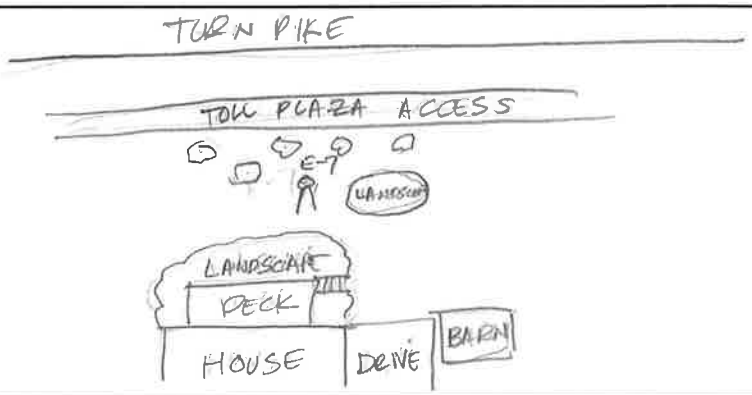
OVERALL: Lav= 57.3dB
SCAN LINE: 6/26/14 9:56:40 Lav= 58.4dB

NOISE MONITORING DATA

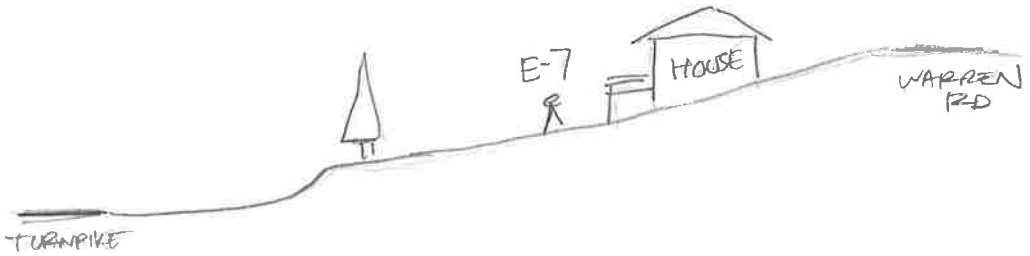
Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: E-7	Date: 6-26-14	Location: 138 WARREN RD.	
Site Surface: GRASS		Landmark: BACKYARD NEAR LANDSCAPING	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 71°F	Cloud Cover: OVERCAST	Wind Speed: 0-3MPH	Wind Direction: CALM
Start Time: 9:56:00		Stop Time: 10:11:00	
Noise Sources: BIRDS, HIGHWAY TRAFFIC			

PLAN VIEW



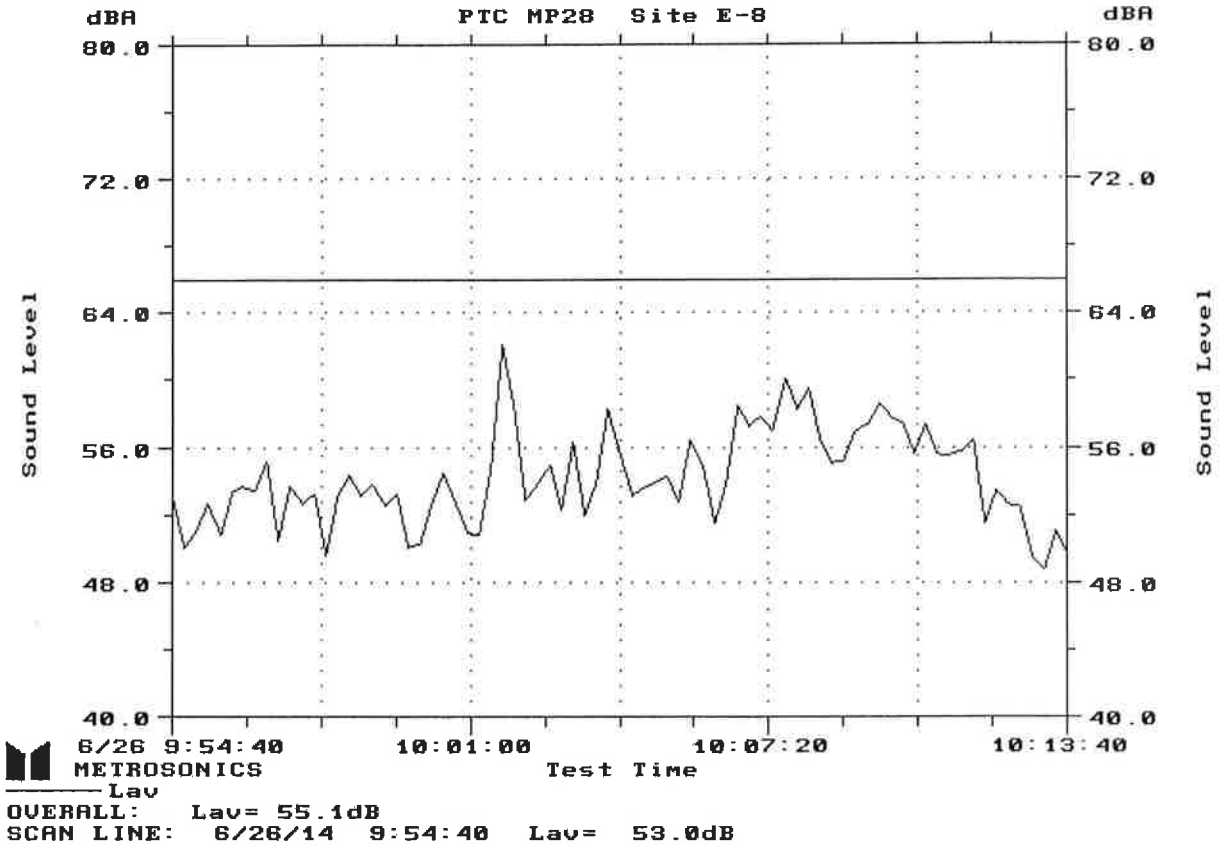
ELEVATION VIEW



Meter No: 3574

Seq. No: 2

Filename.....310013
Logger.....db-3100 SN 2600
Test Location.....PTC MP28 Site E-8
Employee Name.....VRM
Employee Number...
Department.....Environmental Assessment
Comment Field 1...XXX Warren Road
Comment Field 2...71F P Cloudy Wind Lt Var
Numeric Code #1... #2... #3... #4... #5...



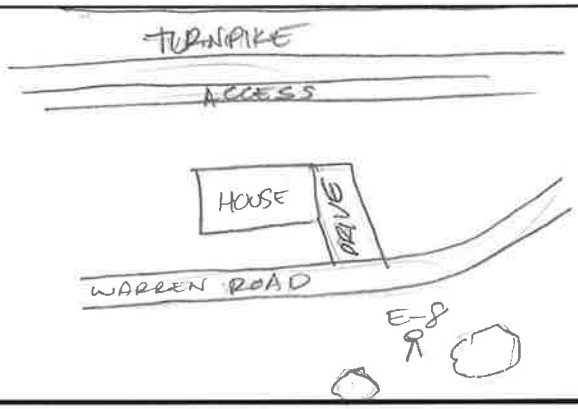
OVERALL: Lav= 55.1dB
SCAN LINE: 6/26/14 9:54:40 Lav= 53.0dB

NOISE MONITORING DATA

Project: PA Turnpike MP 28-31

		Observer: VRM	
Site ID: E-8	Date: 6-26-14	Location: 0 WARREN RD	
Site Surface: GRASS		Landmark: VACANT LOT ACROSS FROM E-8	
Near Lane Direction: 76 WB	Pavement Type: ASPHALT		
Temperature: 71°F	Cloud Cover: OVERCAST	Wind Speed: 0-3 MPH	Wind Direction: CALM
Start Time: 9:54:00		Stop Time: 10:13:00	
Noise Sources: BIRDS, HIGHWAY TRAFFIC			

PLAN VIEW



ELEVATION VIEW

Meter No: 2598

Seq. No: 2

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.31478

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **6/10/2014** *Cal Due:*	
Model:	**CL304**	*Status:*	**Received** / **Sent**
Manufacturer:	**Metrosonics**	*In tolerance:*	X / X
Serial number:	**5245**	*Out of tolerance:*	
Class (IEC 60942):	**1**	*See comments:*	
Barometer type:		*Contains non-accredited tests:* **__Yes _X_ No**	
Barometer s/n:			

Customer:	**MS Consultants, Inc.**	*Address:*	**One South Main Street, Suite 801**
Tel/Fax:	**330-258-9920 / -9921**		**Akron, OH 44308-1864**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	25747	Jul 2, 2013	Scantek, Inc./ NVLAP	Jul 2, 2014
DS-360-SRS	Function Generator	61646	Nov 20, 2012	ACR Env./ A2LA	Nov 20, 2014
34401A-Agilent Technologies	Digital Voltmeter	MY41022043	Nov 22, 2013	ACR Env. / A2LA	Nov 22, 2014
DPI 141-Druck	Pressure Indicator	790/00-04	Nov 21, 2012	ACR Env./ A2LA	Nov 21, 2014
HMP233-Vaisala Oyj	Humidity & Temp. Transmitter	V3820001	Mar 17, 2014	ACR Env./ A2LA	Sep 17, 2015
8903A-HP	Audio Analyzer	2514A05691	Dec 12, 2013	ACR Env./ A2LA	Dec 12, 2016
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	456005	Nov 13, 2013	Scantek, Inc. / NVLAP	Nov 13, 2014
1203-Norsonic	Preamplifier	14059	Jan 2, 2014	Scantek, Inc./ NVLAP	Jan 2, 2015

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Valentin Buzduga	**Authorized signatory:**	Mariana Buzduga
Signature		Signature	
Date	6/10/2014	Date	6/10/2014

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP®
NVLAP Lab Code: 200625-0

Calibration Certificate No.28541

Instrument:	**Acoustical Calibrator**	*Date Calibrated:* **4/11/2013** *Cal Due:*	
Model:	**CL304**	*Status:*	**Received** / **Sent**
Manufacturer:	**Metrosonics**	*In tolerance:*	X / X
Serial number:	**5245**	*Out of tolerance:*	
Class (IEC 60942):	**1**	*See comments:*	
Barometer type:		*Contains non-accredited tests:* **__Yes _X_ No**	
Barometer s/n:			

Customer:	**MS Consultants, Inc.**	*Address:*	**1 South Main Street Suite 801**
Tel/Fax:	**330-258-9920 / 330-258-9921**		**Akron, OH 44308-1864**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 14, 2012	Scantek, Inc./ NVLAP	Sep 14, 2013
DS-360-SRS	Function Generator	33584	Sep 9, 2011	ACR Env./ A2LA	Sep 9, 2013
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 12, 2012	ACR Env. / A2LA	Sep 12, 2013
HM30-Thommen	Meteo Station	1040170/39633	Dec 6, 2012	ACR Env./ A2LA	Dec 6, 2013
8903-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env. / A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.2	Validated March 2011	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	950698	Dec 14, 2012	Scantek, Inc. / NVLAP	Dec 14, 2013
1203-Norsonic	Preamplifier	14052	Nov 19, 2012	Scantek, Inc./ NVLAP	Nov 19, 2013

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Preston Mackin	**Authorized signatory:**	Valentin Buzduga
Signature	Preston Mackin	Signature	
Date	4-11-2013	Date	4/11/2013

Appendix 3

Traffic Data

Mount Pleasant Road					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	2,599	ADT	2,914	ADT	3,964
AM Peak	221	AM Peak	248	AM Peak	338
PM Peak	315	PM Peak	354	PM Peak	481
Daily Truck Percentage: Northbound = 6.00%, Southbound = 3.00%					
Directional Split: 52% Northbound					

2.02% Annual Linear Growth Rate from SPC

Northgate Drive					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	2,425	ADT	2,719	ADT	3,699
AM Peak	154	AM Peak	173	AM Peak	235
PM Peak	291	PM Peak	327	PM Peak	444
Daily Truck Percentage: Eastbound = 5.00%, Westbound = 3.00%					
Directional Split: 64% Eastbound					

2.02% Annual Linear Growth Rate from SPC

US Route 19					
Existing Conditions 2012		Opening Year 2019		Design Year 2039	
ADT	26,113	ADT	29,806	ADT	40,356
AM Peak	1,456	AM Peak	1,662	AM Peak	2,251
PM Peak	2,009	PM Peak	2,294	PM Peak	3,105
Daily Truck Percentage: Northbound = 4.00%, Southbound = 5.00%					
Directional Split: 44% Northbound					

2.02% Annual Linear Growth Rate from SPC

PA Turnpike (I-76)					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
Eastbound ADT	23,862	Eastbound ADT	26,092	Eastbound ADT	35,142
Westbound ADT	23,209	Westbound ADT	25,378	Westbound ADT	34,181
DHV Eastbound	2,093	DHV Eastbound	2,289	DHV Eastbound	3,083
DHV Westbound	1,762	DHV Westbound	1,927	DHV Westbound	2,595
Daily Truck Percentage: Eastbound = 8.00%, Westbound = 12.00%					
Directional Split: 51% Eastbound					

1.5% Annual Compounded Growth Rate from PTC

Interstate I-79					
Existing Conditions 2012		Opening Year 2019		Design Year 2039	
Northbound ADT	15,537	Northbound ADT	17,734	Northbound ADT	24,011
Southbound ADT	19,642	Southbound ADT	22,420	Southbound ADT	30,355
DHV Northbound	1,399	DHV Northbound	1,597	DHV Northbound	2,163
DHV Southbound	1,964	DHV Southbound	2,242	DHV Southbound	3,036
Daily Truck Percentage: Northbound = 8.00%, Southbound = 8.00%					
Directional Split: 44% Northbound					

2.02% Annual Linear Growth Rate from SPC

I-76 Eastbound On Ramp					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	9,713	ADT	10,621	ADT	14,305
AM Peak	759	AM Peak	830	AM Peak	1,118
PM Peak	1,223	PM Peak	1,338	PM Peak	1,802
Daily Truck Percentage: 12.00%					

1.5% Annual Compounded Growth Rate from PTC

I-76 Westbound On Ramp from I-79 and US 19 Northbound					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	7,332	ADT	8,018	ADT	10,798
AM Peak	394	AM Peak	431	AM Peak	581
PM Peak	708	PM Peak	775	PM Peak	1,043
Daily Truck Percentage: 16.00%					

1.5% Annual Compounded Growth Rate from PTC

I-76 Eastbound Off Ramp					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	8,679	ADT	9,490	ADT	12,782
AM Peak	845	AM Peak	924	AM Peak	1,245
PM Peak	544	PM Peak	595	PM Peak	802
Daily Truck Percentage: 19.00%					

1.5% Annual Compounded Growth Rate from PTC

I-76 Westbound Off Ramp to I-79					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	5,229	ADT	5,718	ADT	7,701
AM Peak	753	AM Peak	824	AM Peak	1,109
PM Peak	432	PM Peak	473	PM Peak	637
Daily Truck Percentage: 17.00%					

1.5% Annual Compounded Growth Rate from PTC

I-76 Westbound Off Ramp to US 19					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	3,795	ADT	4,150	ADT	5,589
AM Peak	472	AM Peak	517	AM Peak	696
PM Peak	352	PM Peak	385	PM Peak	519
Daily Truck Percentage: 18.00%					

1.5% Annual Compounded Growth Rate from PTC

I-76 Westbound On Ramp from US 19 Southbound					
Existing Conditions 2013		Opening Year 2019		Design Year 2039	
ADT	1,738	ADT	1,901	ADT	2,560
AM Peak	94	AM Peak	103	AM Peak	139
PM Peak	165	PM Peak	181	PM Peak	243
Daily Truck Percentage: 14.00%					

1.5% Annual Compounded Growth Rate from PTC

Appendix 4

TNM Validation Model

ms consultants, inc.
VRM

29 October 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Validation NSA A, B and C
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
B-1	298	1	75.0	75.2	66	0.2	10	Snd Lvl	75.2	0.0	8	-8.0
B-2	299	1	62.9	62.5	66	-0.4	10	----	62.5	0.0	8	-8.0
B-3	300	1	69.6	68.7	66	-0.9	10	Snd Lvl	68.7	0.0	8	-8.0
B-4	301	1	64.4	65.3	66	0.9	10	----	65.3	0.0	8	-8.0
A-1	303	1	59.6	60.8	66	1.2	10	----	60.8	0.0	8	-8.0
A-2	304	1	58.2	57.2	66	-1.0	10	----	57.2	0.0	8	-8.0
C-1	305	1	67.3	68.0	66	0.7	10	Snd Lvl	68.0	0.0	8	-8.0
C-2	306	1	60.5	60.3	66	-0.2	10	----	60.3	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	8	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc.
VRM

12 November 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Validation NSA D and E
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	440	1	63.5	64.7	66	1.2	10	----	64.7	0.0	8	-8.0
E-2	441	1	60.5	61.5	66	1.0	10	----	61.5	0.0	8	-8.0
E-5	442	1	57.5	58.8	66	1.3	10	----	58.8	0.0	8	-8.0
E-6	443	1	55.8	55.2	66	-0.6	10	----	55.2	0.0	8	-8.0
E-7	444	1	57.3	58.2	66	0.9	10	----	58.2	0.0	8	-8.0
E-8	445	1	55.1	54.8	66	-0.3	10	----	54.8	0.0	8	-8.0
D-1	446	1	62.1	64.9	66	2.8	10	----	64.9	0.0	8	-8.0
D-2	447	1	59.7	61.9	66	2.2	10	----	61.9	0.0	8	-8.0
D-3	448	1	62.4	64.6	66	2.2	10	----	64.6	0.0	8	-8.0
D-4	449	1	58.9	58.7	66	-0.2	10	----	58.7	0.0	8	-8.0
D-5	450	1	55.4	56.6	66	1.2	10	----	56.6	0.0	8	-8.0
D-6	451	1	54.4	56.4	66	2.0	10	----	56.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	12	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix 5

TNM Existing Conditions Model

ms consultants, inc.
VRM

29 December 2014
TNM 2.5
Calculated with TNM 2.5

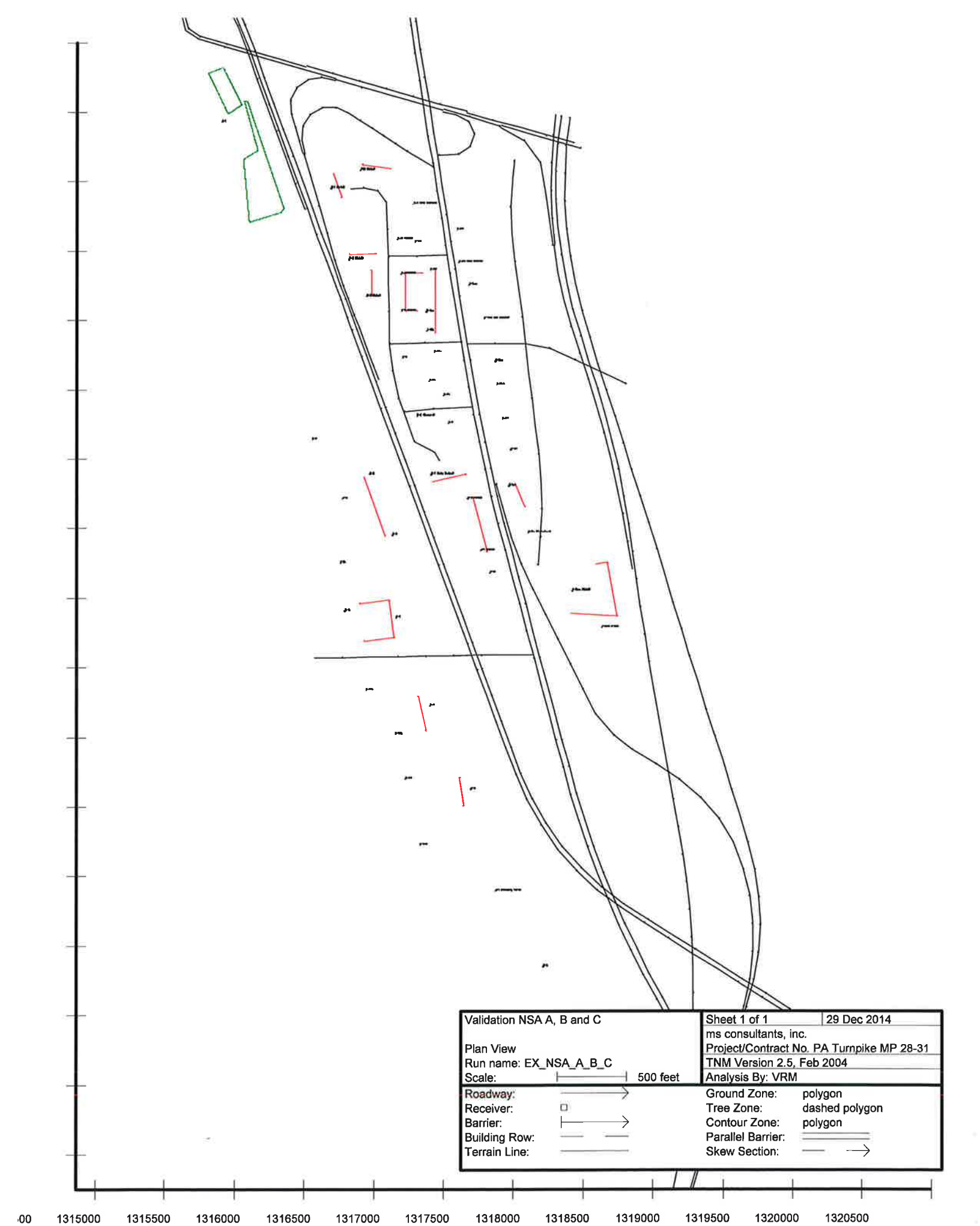
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Validation NSA A, B and C
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A-1	308	1	0.0	61.3	71	61.3	10	----	61.3	0.0	5	-5.0
B-1 (Hotel)	309	1	0.0	68.8	66	68.8	10	Snd Lvl	68.8	0.0	5	-5.0
B-2 (Hotel)	310	1	0.0	72.6	66	72.6	10	Snd Lvl	72.6	0.0	5	-5.0
B-3 (Hotel)	311	1	0.0	70.6	66	70.6	10	Snd Lvl	70.6	0.0	5	-5.0
B-4 (Hotel)	312	1	0.0	64.7	66	64.7	10	----	64.7	0.0	5	-5.0
B-5	313	1	0.0	67.0	71	67.0	10	----	67.0	0.0	5	-5.0
B-6 (Daycare)	314	1	0.0	71.2	66	71.2	10	Snd Lvl	71.2	0.0	5	-5.0
B-7 (Auto Dealer)	315	1	0.0	70.9	88	70.9	10	----	70.9	0.0	5	-5.0
B-8 (Hotel)	316	1	0.0	65.0	66	65.0	10	----	65.0	0.0	5	-5.0
B-9 (Hotel)	317	1	0.0	66.0	66	66.0	10	Snd Lvl	66.0	0.0	5	-5.0
B-10	318	1	0.0	67.1	71	67.1	10	----	67.1	0.0	5	-5.0
B-1ii (Hotel)	319	1	0.0	60.9	66	60.9	10	----	60.9	0.0	5	-5.0
B-1iii (Gas Station)	320	1	0.0	64.9	88	64.9	10	----	64.9	0.0	5	-5.0
B-2ii (Hotel)	321	1	0.0	63.3	66	63.3	10	----	63.3	0.0	5	-5.0
B-2iii	322	1	0.0	63.7	71	63.7	10	----	63.7	0.0	5	-5.0
B-2iv	323	1	0.0	70.3	71	70.3	10	----	70.3	0.0	5	-5.0
B-3ii (Hotel)	324	1	0.0	61.3	66	61.3	10	----	61.3	0.0	5	-5.0
B-3iii	325	1	0.0	63.6	71	63.6	10	----	63.6	0.0	5	-5.0
B-3iv (Gas Station)	326	1	0.0	72.5	88	72.5	10	----	72.5	0.0	5	-5.0
B-4iiia	327	1	0.0	61.6	71	61.6	10	----	61.6	0.0	5	-5.0
B-4iiib	328	1	0.0	63.1	71	63.1	10	----	63.1	0.0	5	-5.0
B-4iva	329	1	0.0	69.6	71	69.6	10	----	69.6	0.0	5	-5.0
B-4ivb (Gas Station)	330	1	0.0	65.9	88	65.9	10	----	65.9	0.0	5	-5.0
B-5iia	331	1	0.0	64.3	71	64.3	10	----	64.3	0.0	5	-5.0

B-5iib	332	1	0.0	65.2	71	65.2	10	----	65.2	0.0	5	-5.0
B-5iic	333	1	0.0	64.5	71	64.5	10	----	64.5	0.0	5	-5.0
B-5iva	334	1	0.0	63.6	71	63.6	10	----	63.6	0.0	5	-5.0
B-5ivb	335	1	0.0	63.9	71	63.9	10	----	63.9	0.0	5	-5.0
B-6ii	336	1	0.0	65.5	71	65.5	10	----	65.5	0.0	5	-5.0
B-6iv	337	1	0.0	63.4	71	63.4	10	----	63.4	0.0	5	-5.0
B-7iv	338	1	0.0	63.6	71	63.6	10	----	63.6	0.0	5	-5.0
B-8iv	339	1	0.0	66.8	71	66.8	10	----	66.8	0.0	5	-5.0
B-9iv (Picnic Area)	340	1	0.0	65.3	66	65.3	10	----	65.3	0.0	5	-5.0
B-10iva (Hotel)	341	1	0.0	60.9	66	60.9	10	----	60.9	0.0	5	-5.0
B-10ivb (Pool)	342	1	0.0	61.9	66	61.9	10	----	61.9	0.0	5	-5.0
C-1	346	1	0.0	59.6	71	59.6	10	----	59.6	0.0	5	-5.0
C-2	347	1	0.0	66.7	71	66.7	10	----	66.7	0.0	5	-5.0
C-3	348	1	0.0	66.8	71	66.8	10	----	66.8	0.0	5	-5.0
C-4	349	1	0.0	62.9	71	62.9	10	----	62.9	0.0	5	-5.0
C-5	350	1	0.0	63.2	71	63.2	10	----	63.2	0.0	5	-5.0
C-6	351	1	0.0	63.9	71	63.9	10	----	63.9	0.0	5	-5.0
C-7 (Trucking Yard)	352	1	0.0	60.1	88	60.1	10	----	60.1	0.0	5	-5.0
C-8	353	1	0.0	60.6	71	60.6	10	----	60.6	0.0	5	-5.0
C-9	354	1	0.0	59.9	71	59.9	10	----	59.9	0.0	5	-5.0
C-2ii	355	1	0.0	58.3	71	58.3	10	----	58.3	0.0	5	-5.0
C-3ii	356	1	0.0	57.4	71	57.4	10	----	57.4	0.0	5	-5.0
C-4ii	357	1	0.0	58.4	71	58.4	10	----	58.4	0.0	5	-5.0
C-5iia	358	1	0.0	58.4	71	58.4	10	----	58.4	0.0	5	-5.0
C-5iib	359	1	0.0	56.3	71	56.3	10	----	56.3	0.0	5	-5.0
C-6iia	360	1	0.0	56.7	71	56.7	10	----	56.7	0.0	5	-5.0
C-6iib	361	1	0.0	56.5	71	56.5	10	----	56.5	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	51	0.0	0.0	0.0
All Impacted	5	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0


Validation NSA A, B and C
Plan View
Run name: EX_NSA_A_B_C
Scale:
500 feet
Sheet 1 of 1
29 Dec 2014
ms consultants, inc.
Project/Contract No. PA Turnpike MP 28-31
TNM Version 2.5, Feb 2004
Analysis By: VRM
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
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1315000
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1318500
1319000
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1320500

ms consultants, inc.
VRM

29 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Existing
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

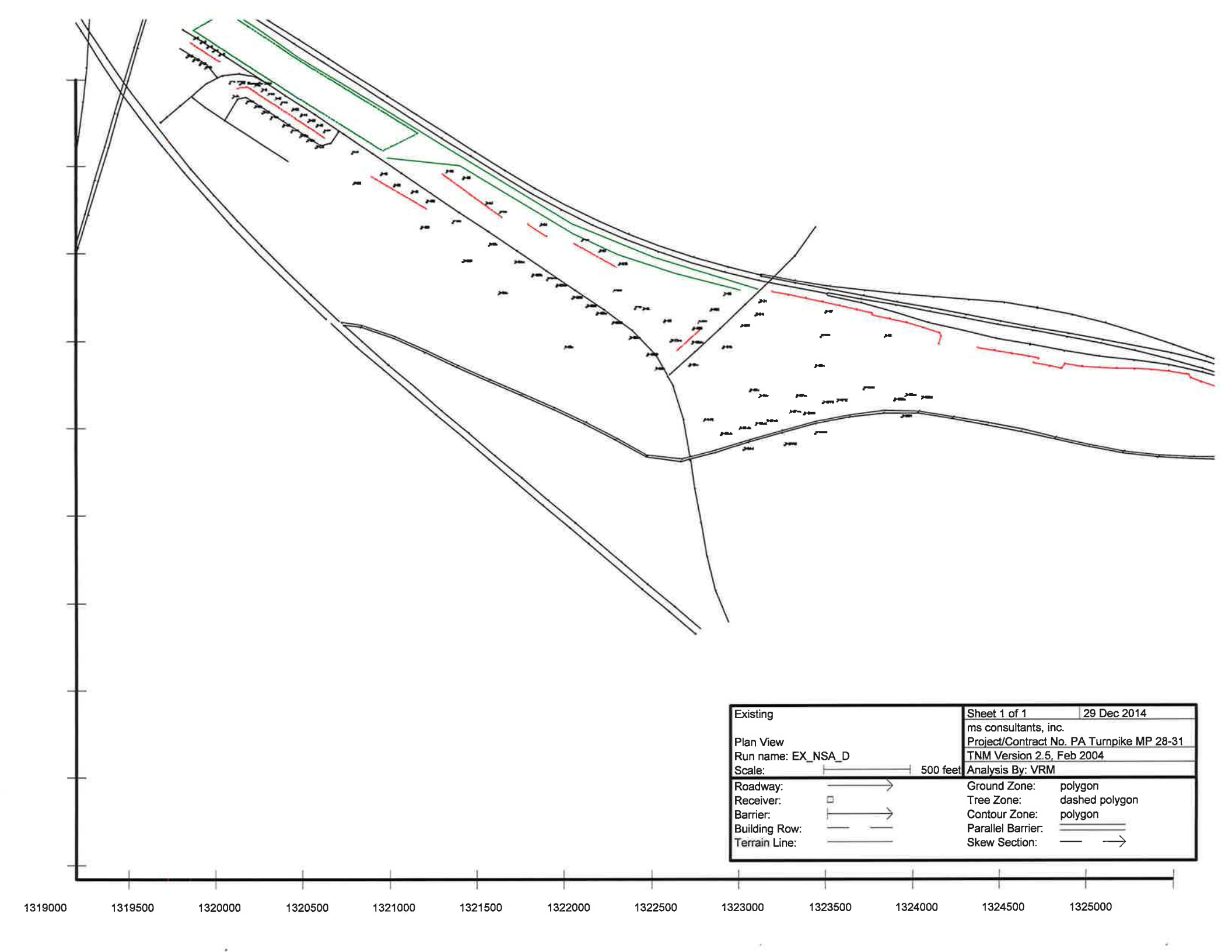
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	0.0	67.4	66	67.4	10	Snd Lvl	67.4	0.0	5	-5.0
D-2	297	3	0.0	67.3	66	67.3	10	Snd Lvl	67.3	0.0	5	-5.0
D-3	298	2	0.0	66.8	66	66.8	10	Snd Lvl	66.8	0.0	5	-5.0
D-4	299	3	0.0	66.8	66	66.8	10	Snd Lvl	66.8	0.0	5	-5.0
D-5	300	2	0.0	66.4	66	66.4	10	Snd Lvl	66.4	0.0	5	-5.0
D-6 (Pool)	301	1	0.0	63.6	66	63.6	10	----	63.6	0.0	5	-5.0
D-7 (Community Bldg)	302	1	0.0	62.9	66	62.9	10	----	62.9	0.0	5	-5.0
D-8	303	2	0.0	63.5	66	63.5	10	----	63.5	0.0	5	-5.0
D-9	304	2	0.0	63.2	66	63.2	10	----	63.2	0.0	5	-5.0
D-10	305	2	0.0	62.9	66	62.9	10	----	62.9	0.0	5	-5.0
D-11	306	2	0.0	62.7	66	62.7	10	----	62.7	0.0	5	-5.0
D-12	307	2	0.0	62.4	66	62.4	10	----	62.4	0.0	5	-5.0
D-13	308	3	0.0	62.2	66	62.2	10	----	62.2	0.0	5	-5.0
D-14	309	2	0.0	62.2	66	62.2	10	----	62.2	0.0	5	-5.0
D-15	310	3	0.0	62.1	66	62.1	10	----	62.1	0.0	5	-5.0
D-16	311	2	0.0	62.1	66	62.1	10	----	62.1	0.0	5	-5.0
D-17	312	2	0.0	62.1	66	62.1	10	----	62.1	0.0	5	-5.0
D-18	313	1	0.0	59.9	66	59.9	10	----	59.9	0.0	5	-5.0
D-19	314	1	0.0	61.0	88	61.0	10	----	61.0	0.0	5	-5.0
D-20	315	1	0.0	59.8	66	59.8	10	----	59.8	0.0	5	-5.0
D-21	316	1	0.0	61.5	66	61.5	10	----	61.5	0.0	5	-5.0
D-22	317	1	0.0	64.5	71	64.5	10	----	64.5	0.0	5	-5.0
D-23	318	1	0.0	65.0	71	65.0	10	----	65.0	0.0	5	-5.0
D-24	319	1	0.0	63.4	66	63.4	10	----	63.4	0.0	5	-5.0

D-25	320	1	0.0	62.8	66	62.8	10	----	62.8	0.0	5	-5.0
D-26	321	1	0.0	61.3	88	61.3	10	----	61.3	0.0	5	-5.0
D-27	322	1	0.0	61.7	88	61.7	10	----	61.7	0.0	5	-5.0
D-28	323	1	0.0	60.7	88	60.7	10	----	60.7	0.0	5	-5.0
D-30	324	1	0.0	59.0	66	59.0	10	----	59.0	0.0	5	-5.0
D-31	325	1	0.0	58.7	71	58.7	10	----	58.7	0.0	5	-5.0
D-32	326	1	0.0	58.8	88	58.8	10	----	58.8	0.0	5	-5.0
D-33	327	1	0.0	69.5	88	69.5	10	----	69.5	0.0	5	-5.0
D-34	328	1	0.0	68.4	66	68.4	10	Snd Lvl	68.4	0.0	5	-5.0
D-37	329	1	0.0	57.3	66	57.3	10	----	57.3	0.0	5	-5.0
D-38	330	1	0.0	56.5	66	56.5	10	----	56.5	0.0	5	-5.0
D-1ii	331	3	0.0	67.2	66	67.2	10	Snd Lvl	67.2	0.0	5	-5.0
D-2ii	332	2	0.0	66.7	66	66.7	10	Snd Lvl	66.7	0.0	5	-5.0
D-3ii	333	2	0.0	66.6	66	66.6	10	Snd Lvl	66.6	0.0	5	-5.0
D-4ii	334	2	0.0	66.4	66	66.4	10	Snd Lvl	66.4	0.0	5	-5.0
D-7ii	335	3	0.0	63.2	66	63.2	10	----	63.2	0.0	5	-5.0
D-8ii	336	3	0.0	62.6	66	62.6	10	----	62.6	0.0	5	-5.0
D-10ii	337	2	0.0	62.4	66	62.4	10	----	62.4	0.0	5	-5.0
D-11ii	338	3	0.0	62.1	66	62.1	10	----	62.1	0.0	5	-5.0
D-12ii	339	2	0.0	61.9	66	61.9	10	----	61.9	0.0	5	-5.0
D-13ii	340	3	0.0	61.6	66	61.6	10	----	61.6	0.0	5	-5.0
D-14ii	341	2	0.0	61.5	66	61.5	10	----	61.5	0.0	5	-5.0
D-15ii	342	3	0.0	61.3	66	61.3	10	----	61.3	0.0	5	-5.0
D-16ii	343	2	0.0	61.0	66	61.0	10	----	61.0	0.0	5	-5.0
D-17ii	344	3	0.0	60.5	66	60.5	10	----	60.5	0.0	5	-5.0
D-18ii	345	1	0.0	57.4	88	57.4	10	----	57.4	0.0	5	-5.0
D-22ii	346	1	0.0	62.2	88	62.2	10	----	62.2	0.0	5	-5.0
D-22iii	347	1	0.0	60.1	66	60.1	10	----	60.1	0.0	5	-5.0
D-23ii	348	1	0.0	62.7	71	62.7	10	----	62.7	0.0	5	-5.0
D-25ii	349	1	0.0	62.1	71	62.1	10	----	62.1	0.0	5	-5.0
D-25iii	350	1	0.0	59.9	71	59.9	10	----	59.9	0.0	5	-5.0
D-26iia	351	1	0.0	60.6	71	60.6	10	----	60.6	0.0	5	-5.0
D-26iib	352	1	0.0	60.2	66	60.2	10	----	60.2	0.0	5	-5.0
D-26iii	353	1	0.0	58.9	88	58.9	10	----	58.9	0.0	5	-5.0
D-27iia	354	1	0.0	61.2	66	61.2	10	----	61.2	0.0	5	-5.0
D-27iib	355	1	0.0	60.7	66	60.7	10	----	60.7	0.0	5	-5.0
D-28iia	356	1	0.0	60.3	66	60.3	10	----	60.3	0.0	5	-5.0
D-28iib	357	1	0.0	60.2	66	60.2	10	----	60.2	0.0	5	-5.0
D-28iii	358	1	0.0	56.8	71	56.8	10	----	56.8	0.0	5	-5.0
D-29a	359	1	0.0	61.6	88	61.6	10	----	61.6	0.0	5	-5.0
D-29b	360	1	0.0	59.5	71	59.5	10	----	59.5	0.0	5	-5.0
D-29iia	361	1	0.0	60.0	66	60.0	10	----	60.0	0.0	5	-5.0

D-29iib	362	1	0.0	60.3	66	60.3	10	----	60.3	0.0	5	-5.0
D-32iiia	363	1	0.0	59.7	71	59.7	10	----	59.7	0.0	5	-5.0
D-32iiib	364	1	0.0	60.3	88	60.3	10	----	60.3	0.0	5	-5.0
D-33ii	365	1	0.0	63.4	66	63.4	10	----	63.4	0.0	5	-5.0
D-33iii	366	1	0.0	61.0	66	61.0	10	----	61.0	0.0	5	-5.0
D-33iv	367	1	0.0	59.8	66	59.8	10	----	59.8	0.0	5	-5.0
D-33va	368	1	0.0	58.6	66	58.6	10	----	58.6	0.0	5	-5.0
D-33vb	369	1	0.0	62.4	88	62.4	10	----	62.4	0.0	5	-5.0
D-33vi	370	1	0.0	60.4	66	60.4	10	----	60.4	0.0	5	-5.0
D-34ii	371	1	0.0	65.4	66	65.4	10	----	65.4	0.0	5	-5.0
D-34iii	372	1	0.0	63.6	66	63.6	10	----	63.6	0.0	5	-5.0
D-34iv	373	1	0.0	61.0	88	61.0	10	----	61.0	0.0	5	-5.0
D-34v	374	1	0.0	62.4	88	62.4	10	----	62.4	0.0	5	-5.0
D-34vi	375	1	0.0	57.4	88	57.4	10	----	57.4	0.0	5	-5.0
D-35v	376	1	0.0	56.6	66	56.6	10	----	56.6	0.0	5	-5.0
D-35via	377	1	0.0	58.7	66	58.7	10	----	58.7	0.0	5	-5.0
D-35vib	378	1	0.0	58.3	66	58.3	10	----	58.3	0.0	5	-5.0
D-36v	379	1	0.0	56.3	66	56.3	10	----	56.3	0.0	5	-5.0
D-36via	380	1	0.0	58.1	66	58.1	10	----	58.1	0.0	5	-5.0
D-36vib	381	1	0.0	58.0	66	58.0	10	----	58.0	0.0	5	-5.0
D-36vii	382	1	0.0	61.7	66	61.7	10	----	61.7	0.0	5	-5.0
D-37iii	383	1	0.0	57.8	66	57.8	10	----	57.8	0.0	5	-5.0
D-37iv	384	1	0.0	56.5	66	56.5	10	----	56.5	0.0	5	-5.0
D-37va	385	1	0.0	56.4	66	56.4	10	----	56.4	0.0	5	-5.0
D-37via	386	1	0.0	57.6	66	57.6	10	----	57.6	0.0	5	-5.0
D-37vib	387	1	0.0	58.6	66	58.6	10	----	58.6	0.0	5	-5.0
D-37vb	388	1	0.0	57.4	66	57.4	10	----	57.4	0.0	5	-5.0
D-37vc	389	1	0.0	57.2	66	57.2	10	----	57.2	0.0	5	-5.0
D-37viia	390	1	0.0	59.6	66	59.6	10	----	59.6	0.0	5	-5.0
D-37viib	391	1	0.0	60.6	66	60.6	10	----	60.6	0.0	5	-5.0
D-38iiia	392	1	0.0	55.8	66	55.8	10	----	55.8	0.0	5	-5.0
D-38iiib	393	1	0.0	58.4	66	58.4	10	----	58.4	0.0	5	-5.0
D-38iiic	394	1	0.0	57.6	66	57.6	10	----	57.6	0.0	5	-5.0
D-38iiid	395	1	0.0	58.3	66	58.3	10	----	58.3	0.0	5	-5.0
D-38vi	396	1	0.0	63.2	66	63.2	10	----	63.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	141	0.0	0.0	0.0
All Impacted	22	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0


Existing
Plan View
Run name: EX_NSA_D
Scale: 500 feet
Sheet 1 of 1
29 Dec 2014
ms consultants, inc.
Project/Contract No. PA Turnpike MP 28-31
TNM Version 2.5, Feb 2004
Analysis By: VRM
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1319000
1319500
1320000
1320500
1321000
1321500
1322000
1322500
1323000
1323500
1324000
1324500
1325000

ms consultants, inc.
VRM

29 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Existing
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

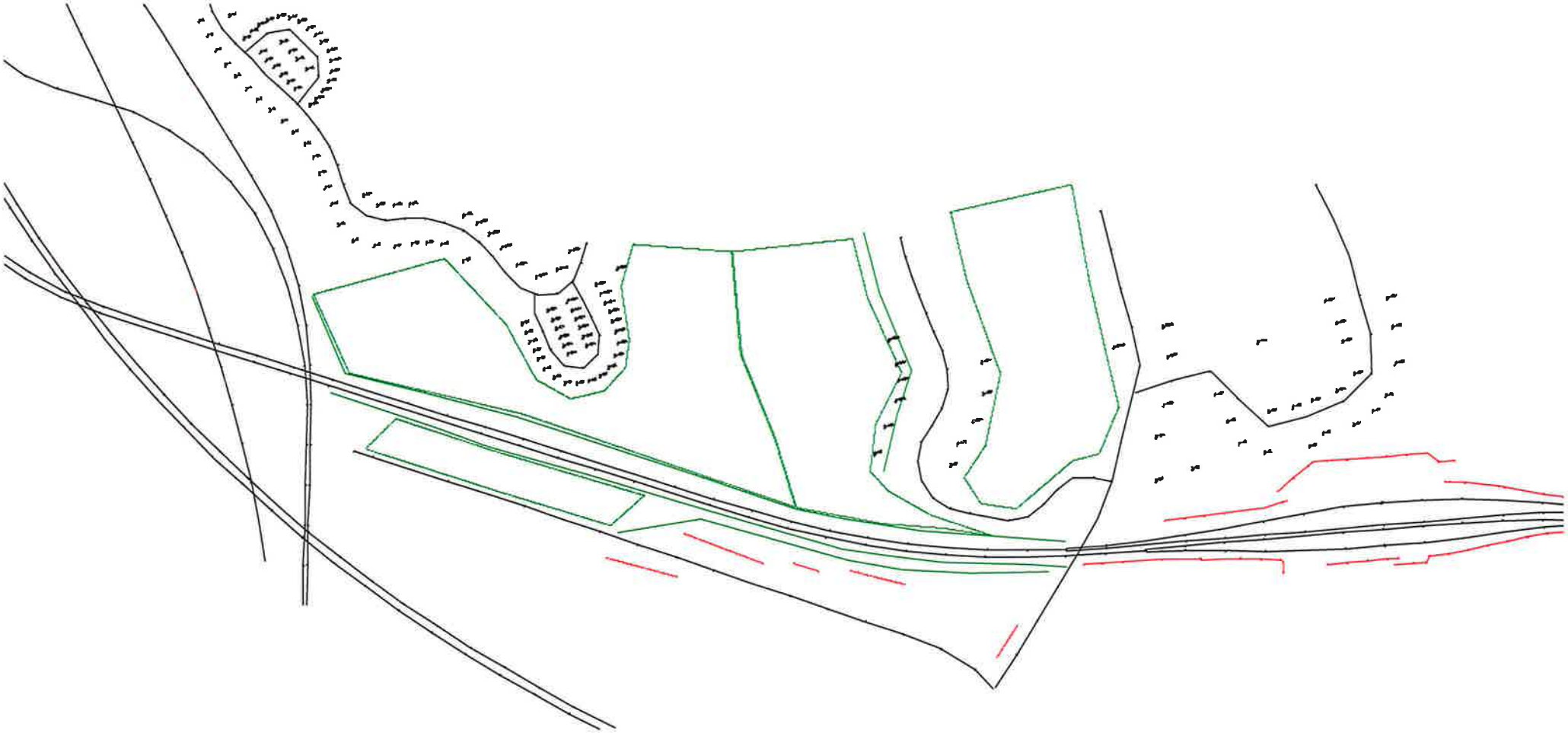
Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	301	1	0.0	65.0	66	65.0	10	----	65.0	0.0	5	-5.0
E-2	302	1	0.0	65.1	66	65.1	10	----	65.1	0.0	5	-5.0
E-3	303	1	0.0	65.3	66	65.3	10	----	65.3	0.0	5	-5.0
E-4	304	1	0.0	65.5	66	65.5	10	----	65.5	0.0	5	-5.0
E-5	305	1	0.0	65.2	66	65.2	10	----	65.2	0.0	5	-5.0
E-6	306	1	0.0	65.0	66	65.0	10	----	65.0	0.0	5	-5.0
E-7	307	1	0.0	64.7	66	64.7	10	----	64.7	0.0	5	-5.0
E-8	308	1	0.0	65.0	66	65.0	10	----	65.0	0.0	5	-5.0
E-9	309	1	0.0	64.5	66	64.5	10	----	64.5	0.0	5	-5.0
E-10	310	1	0.0	64.4	66	64.4	10	----	64.4	0.0	5	-5.0
E-11	311	1	0.0	64.2	66	64.2	10	----	64.2	0.0	5	-5.0
E-12	312	1	0.0	64.4	66	64.4	10	----	64.4	0.0	5	-5.0
E-13	313	1	0.0	64.8	66	64.8	10	----	64.8	0.0	5	-5.0
E-14	314	1	0.0	65.1	66	65.1	10	----	65.1	0.0	5	-5.0
E-15	315	1	0.0	64.8	66	64.8	10	----	64.8	0.0	5	-5.0
E-16	316	1	0.0	65.1	66	65.1	10	----	65.1	0.0	5	-5.0
E-17	317	1	0.0	64.6	66	64.6	10	----	64.6	0.0	5	-5.0
E-18	318	1	0.0	62.7	66	62.7	10	----	62.7	0.0	5	-5.0
E-19	319	1	0.0	61.1	66	61.1	10	----	61.1	0.0	5	-5.0
E-20	320	1	0.0	59.6	66	59.6	10	----	59.6	0.0	5	-5.0
E-21	321	1	0.0	58.4	66	58.4	10	----	58.4	0.0	5	-5.0
E-22	322	1	0.0	57.3	66	57.3	10	----	57.3	0.0	5	-5.0
E-23	323	1	0.0	52.9	66	52.9	10	----	52.9	0.0	5	-5.0
E-24	324	1	0.0	50.4	66	50.4	10	----	50.4	0.0	5	-5.0

E-25	325	1	0.0	51.3	66	51.3	10	----	51.3	0.0	5	-5.0
E-26	326	1	0.0	52.0	66	52.0	10	----	52.0	0.0	5	-5.0
E-27	327	1	0.0	52.3	66	52.3	10	----	52.3	0.0	5	-5.0
E-28	328	1	0.0	51.7	66	51.7	10	----	51.7	0.0	5	-5.0
E-29	329	1	0.0	51.3	66	51.3	10	----	51.3	0.0	5	-5.0
E-30	330	1	0.0	52.5	66	52.5	10	----	52.5	0.0	5	-5.0
E-31	331	1	0.0	53.0	66	53.0	10	----	53.0	0.0	5	-5.0
E-32	332	1	0.0	53.6	66	53.6	10	----	53.6	0.0	5	-5.0
E-33	333	1	0.0	52.0	66	52.0	10	----	52.0	0.0	5	-5.0
E-34	334	1	0.0	50.8	66	50.8	10	----	50.8	0.0	5	-5.0
E-35	335	1	0.0	45.3	66	45.3	10	----	45.3	0.0	5	-5.0
E-36	336	1	0.0	64.5	66	64.5	10	----	64.5	0.0	5	-5.0
E-37	337	1	0.0	59.5	66	59.5	10	----	59.5	0.0	5	-5.0
E-38	338	1	0.0	60.7	66	60.7	10	----	60.7	0.0	5	-5.0
E-39	339	1	0.0	59.0	66	59.0	10	----	59.0	0.0	5	-5.0
E-40	340	1	0.0	57.8	66	57.8	10	----	57.8	0.0	5	-5.0
E-41	341	1	0.0	58.9	66	58.9	10	----	58.9	0.0	5	-5.0
E-42	342	1	0.0	56.6	66	56.6	10	----	56.6	0.0	5	-5.0
E-43	343	1	0.0	56.9	66	56.9	10	----	56.9	0.0	5	-5.0
E-44	344	1	0.0	55.3	66	55.3	10	----	55.3	0.0	5	-5.0
E-45	345	1	0.0	57.3	66	57.3	10	----	57.3	0.0	5	-5.0
E-46	346	1	0.0	56.0	66	56.0	10	----	56.0	0.0	5	-5.0
E-1ii	347	1	0.0	54.3	66	54.3	10	----	54.3	0.0	5	-5.0
E-2ii	348	1	0.0	58.0	66	58.0	10	----	58.0	0.0	5	-5.0
E-3ii	349	1	0.0	59.8	66	59.8	10	----	59.8	0.0	5	-5.0
E-3iii	350	1	0.0	59.6	66	59.6	10	----	59.6	0.0	5	-5.0
E-3iv	351	1	0.0	58.6	66	58.6	10	----	58.6	0.0	5	-5.0
E-3v	352	1	0.0	58.7	66	58.7	10	----	58.7	0.0	5	-5.0
E-3vi	353	1	0.0	58.1	66	58.1	10	----	58.1	0.0	5	-5.0
E-4ii	354	1	0.0	59.6	66	59.6	10	----	59.6	0.0	5	-5.0
E-4vi	355	1	0.0	57.6	66	57.6	10	----	57.6	0.0	5	-5.0
E-5ii	356	1	0.0	60.2	66	60.2	10	----	60.2	0.0	5	-5.0
E-5iii	357	1	0.0	57.2	66	57.2	10	----	57.2	0.0	5	-5.0
E-5vi	358	1	0.0	56.9	66	56.9	10	----	56.9	0.0	5	-5.0
E-6ii	359	1	0.0	60.8	66	60.8	10	----	60.8	0.0	5	-5.0
E-6iii	360	1	0.0	56.5	66	56.5	10	----	56.5	0.0	5	-5.0
E-6vi	361	1	0.0	56.9	66	56.9	10	----	56.9	0.0	5	-5.0
E-7ii	362	1	0.0	60.2	66	60.2	10	----	60.2	0.0	5	-5.0
E-7iii	363	1	0.0	56.5	66	56.5	10	----	56.5	0.0	5	-5.0
E-7vi	364	1	0.0	56.4	66	56.4	10	----	56.4	0.0	5	-5.0
E-8ii	365	1	0.0	60.1	66	60.1	10	----	60.1	0.0	5	-5.0
E-8iii	366	1	0.0	55.0	66	55.0	10	----	55.0	0.0	5	-5.0

E-8vi	367	1	0.0	56.1	66	56.1	10	----	56.1	0.0	5	-5.0
E-9ii	368	1	0.0	60.1	66	60.1	10	----	60.1	0.0	5	-5.0
E-9via	369	1	0.0	55.5	66	55.5	10	----	55.5	0.0	5	-5.0
E-9vib	370	1	0.0	55.1	66	55.1	10	----	55.1	0.0	5	-5.0
E-10ii	371	1	0.0	57.5	66	57.5	10	----	57.5	0.0	5	-5.0
E-10iii	372	1	0.0	56.9	66	56.9	10	----	56.9	0.0	5	-5.0
E-10iv	373	1	0.0	55.8	66	55.8	10	----	55.8	0.0	5	-5.0
E-10v	374	1	0.0	55.6	66	55.6	10	----	55.6	0.0	5	-5.0
E-10vi	375	1	0.0	55.3	66	55.3	10	----	55.3	0.0	5	-5.0
E-16ii	376	1	0.0	59.1	66	59.1	10	----	59.1	0.0	5	-5.0
E-17ii	377	1	0.0	57.9	66	57.9	10	----	57.9	0.0	5	-5.0
E-18ii	378	1	0.0	55.7	66	55.7	10	----	55.7	0.0	5	-5.0
E-19ii	379	1	0.0	55.2	66	55.2	10	----	55.2	0.0	5	-5.0
E-22ii	380	1	0.0	54.9	66	54.9	10	----	54.9	0.0	5	-5.0
E-23iia	381	1	0.0	54.5	66	54.5	10	----	54.5	0.0	5	-5.0
E-23iib	382	1	0.0	53.7	66	53.7	10	----	53.7	0.0	5	-5.0
E-23iic	383	1	0.0	52.7	66	52.7	10	----	52.7	0.0	5	-5.0
E-24iia	384	1	0.0	51.7	66	51.7	10	----	51.7	0.0	5	-5.0
E-24iib	385	1	0.0	51.6	66	51.6	10	----	51.6	0.0	5	-5.0
E-25ii	386	1	0.0	38.8	66	38.8	10	----	38.8	0.0	5	-5.0
E-26ii	387	1	0.0	37.5	66	37.5	10	----	37.5	0.0	5	-5.0
E-27ii	388	1	0.0	36.6	66	36.6	10	----	36.6	0.0	5	-5.0
E-28ii	389	1	0.0	36.2	66	36.2	10	----	36.2	0.0	5	-5.0
E-29ii	390	1	0.0	36.2	66	36.2	10	----	36.2	0.0	5	-5.0
E-30ii	391	1	0.0	35.5	66	35.5	10	----	35.5	0.0	5	-5.0
E-34ii	392	1	0.0	35.2	66	35.2	10	----	35.2	0.0	5	-5.0
E-34iii	393	1	0.0	35.8	66	35.8	10	----	35.8	0.0	5	-5.0
E-34iv	394	1	0.0	37.0	66	37.0	10	----	37.0	0.0	5	-5.0
E-34ix	395	1	0.0	51.8	66	51.8	10	----	51.8	0.0	5	-5.0
E-34v	396	1	0.0	38.8	66	38.8	10	----	38.8	0.0	5	-5.0
E-34vi	397	1	0.0	40.8	66	40.8	10	----	40.8	0.0	5	-5.0
E-34vii	398	1	0.0	45.3	66	45.3	10	----	45.3	0.0	5	-5.0
E-34viii	399	1	0.0	51.5	66	51.5	10	----	51.5	0.0	5	-5.0
E-35ii	400	1	0.0	42.6	66	42.6	10	----	42.6	0.0	5	-5.0
E-35iii	401	1	0.0	45.5	66	45.5	10	----	45.5	0.0	5	-5.0
E-35iv	402	1	0.0	45.3	66	45.3	10	----	45.3	0.0	5	-5.0
E-35ix	403	1	0.0	43.1	66	43.1	10	----	43.1	0.0	5	-5.0
E-35v	404	1	0.0	43.9	66	43.9	10	----	43.9	0.0	5	-5.0
E-35vi	405	1	0.0	43.6	66	43.6	10	----	43.6	0.0	5	-5.0
E-35vii	406	1	0.0	43.3	66	43.3	10	----	43.3	0.0	5	-5.0
E-35viii	407	1	0.0	42.8	66	42.8	10	----	42.8	0.0	5	-5.0
E-35x	408	1	0.0	47.9	66	47.9	10	----	47.9	0.0	5	-5.0

E-36ii	409	1	0.0	61.5	66	61.5	10	----	61.5	0.0	5	-5.0
E-36iii	410	1	0.0	58.2	66	58.2	10	----	58.2	0.0	5	-5.0
E-36iv	411	1	0.0	53.9	66	53.9	10	----	53.9	0.0	5	-5.0
E-36v	412	1	0.0	56.1	66	56.1	10	----	56.1	0.0	5	-5.0
E-36vi	413	1	0.0	55.4	66	55.4	10	----	55.4	0.0	5	-5.0
E-37ii	414	1	0.0	56.4	66	56.4	10	----	56.4	0.0	5	-5.0
E-37iii	415	1	0.0	53.5	66	53.5	10	----	53.5	0.0	5	-5.0
E-37iv	416	1	0.0	51.1	66	51.1	10	----	51.1	0.0	5	-5.0
E-37v	417	1	0.0	51.1	66	51.1	10	----	51.1	0.0	5	-5.0
E-38ii	418	1	0.0	57.9	66	57.9	10	----	57.9	0.0	5	-5.0
E-38iii	419	1	0.0	57.0	66	57.0	10	----	57.0	0.0	5	-5.0
E-38iv	420	1	0.0	55.7	66	55.7	10	----	55.7	0.0	5	-5.0
E-38va	421	1	0.0	55.1	66	55.1	10	----	55.1	0.0	5	-5.0
E-38vb	422	1	0.0	55.1	66	55.1	10	----	55.1	0.0	5	-5.0
E-40ii	423	1	0.0	56.3	66	56.3	10	----	56.3	0.0	5	-5.0
E-40iii	424	1	0.0	54.4	66	54.4	10	----	54.4	0.0	5	-5.0
E-41ii	425	1	0.0	55.2	66	55.2	10	----	55.2	0.0	5	-5.0
E-41iv	426	1	0.0	54.9	66	54.9	10	----	54.9	0.0	5	-5.0
E-42ii	427	1	0.0	55.5	66	55.5	10	----	55.5	0.0	5	-5.0
E-43ii	429	1	0.0	55.7	66	55.7	10	----	55.7	0.0	5	-5.0
E-44ii	430	1	0.0	54.7	66	54.7	10	----	54.7	0.0	5	-5.0
E-45ii	431	1	0.0	55.1	66	55.1	10	----	55.1	0.0	5	-5.0
E-45iii	432	1	0.0	56.3	66	56.3	10	----	56.3	0.0	5	-5.0
E-45iv	433	1	0.0	55.5	66	55.5	10	----	55.5	0.0	5	-5.0
E-45v	434	1	0.0	54.6	66	54.6	10	----	54.6	0.0	5	-5.0
E-46ii	435	1	0.0	52.6	66	52.6	10	----	52.6	0.0	5	-5.0
E-46iii	436	1	0.0	50.1	66	50.1	10	----	50.1	0.0	5	-5.0
E-46iv	437	1	0.0	48.6	66	48.6	10	----	48.6	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	136	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0



Existing		Sheet 1 of 1	29 Dec 2014
		ms consultants, inc.	
Plan View (rotated)		Project/Contract No. PA Turnpike MP 28-31	
Run name: EX_NSA_E		TNM Version 2.5, Feb 2004	
Scale:	500 feet	Analysis By: VRM	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

Appendix 6

TNM No-Build Model

ms consultants, inc.
VRM

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: No Build 2039 - NSA A, B and C
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A-1	308	1	61.3	62.9	71	1.6	10	----	62.9	0.0	5	-5.0
B-1 (Hotel)	309	1	68.8	70.4	71	1.6	10	----	70.4	0.0	5	-5.0
B-2 (Hotel)	310	1	72.6	74.2	71	1.6	10	Snd Lvl	74.2	0.0	5	-5.0
B-3 (Hotel)	311	1	70.6	72.2	71	1.6	10	Snd Lvl	72.2	0.0	5	-5.0
B-4 (Hotel)	312	1	64.7	66.3	71	1.6	10	----	66.3	0.0	5	-5.0
B-5	313	1	67.0	68.6	71	1.6	10	----	68.6	0.0	5	-5.0
B-6 (Daycare)	314	1	71.2	72.8	66	1.6	10	Snd Lvl	72.8	0.0	5	-5.0
B-7 (Auto Dealer)	315	1	70.9	72.5	88	1.6	10	----	72.5	0.0	5	-5.0
B-8 (Hotel)	316	1	65.0	66.7	71	1.7	10	----	66.7	0.0	5	-5.0
B-9 (Hotel)	317	1	66.0	67.6	71	1.6	10	----	67.6	0.0	5	-5.0
B-10	318	1	67.1	68.8	71	1.7	10	----	68.8	0.0	5	-5.0
B-1ii (Hotel)	319	1	60.9	62.5	71	1.6	10	----	62.5	0.0	5	-5.0
B-1iii (Gas Station)	320	1	64.9	66.6	88	1.7	10	----	66.6	0.0	5	-5.0
B-2ii (Hotel)	321	1	63.3	64.9	71	1.6	10	----	64.9	0.0	5	-5.0
B-2iii	322	1	63.7	65.4	71	1.7	10	----	65.4	0.0	5	-5.0
B-2iv	323	1	70.3	72.0	71	1.7	10	Snd Lvl	72.0	0.0	5	-5.0
B-3ii (Hotel)	324	1	61.3	62.9	71	1.6	10	----	62.9	0.0	5	-5.0
B-3iii	325	1	63.6	65.3	71	1.7	10	----	65.3	0.0	5	-5.0
B-3iv (Gas Station)	326	1	72.5	74.2	88	1.7	10	----	74.2	0.0	5	-5.0
B-4iiia	327	1	61.6	63.4	71	1.8	10	----	63.4	0.0	5	-5.0
B-4iiib	328	1	63.1	64.8	71	1.7	10	----	64.8	0.0	5	-5.0
B-4iva	329	1	69.6	71.3	71	1.7	10	Snd Lvl	71.3	0.0	5	-5.0
B-4ivb (Gas Station)	330	1	65.9	67.7	88	1.8	10	----	67.7	0.0	5	-5.0

B-5iia	331	1	64.3	66.0	71	1.7	10	----	66.0	0.0	5	-5.0
B-5iib	332	1	65.2	66.8	71	1.6	10	----	66.8	0.0	5	-5.0
B-5iic	333	1	64.5	66.2	71	1.7	10	----	66.2	0.0	5	-5.0
B-5iva	334	1	63.6	65.2	71	1.6	10	----	65.2	0.0	5	-5.0
B-5ivb	335	1	63.9	65.5	71	1.6	10	----	65.5	0.0	5	-5.0
B-6ii	336	1	65.5	67.2	71	1.7	10	----	67.2	0.0	5	-5.0
B-6iv	337	1	63.4	65.1	71	1.7	10	----	65.1	0.0	5	-5.0
B-7iv	338	1	63.6	65.4	71	1.8	10	----	65.4	0.0	5	-5.0
B-8iv	339	1	66.8	69.6	71	2.8	10	----	69.6	0.0	5	-5.0
B-9iv (Picnic Area)	340	1	65.3	67.4	66	2.1	10	Snd Lvl	67.4	0.0	5	-5.0
B-10iva (Hotel)	341	1	60.9	62.7	71	1.8	10	----	62.7	0.0	5	-5.0
B-10ivb (Pool)	342	1	61.9	63.6	66	1.7	10	----	63.6	0.0	5	-5.0
C-1	346	1	59.6	61.3	71	1.7	10	----	61.3	0.0	5	-5.0
C-2	347	1	66.7	68.3	71	1.6	10	----	68.3	0.0	5	-5.0
C-3	348	1	66.8	68.4	71	1.6	10	----	68.4	0.0	5	-5.0
C-4	349	1	62.9	64.5	71	1.6	10	----	64.5	0.0	5	-5.0
C-5	350	1	63.2	64.9	71	1.7	10	----	64.9	0.0	5	-5.0
C-6	351	1	63.9	65.6	71	1.7	10	----	65.6	0.0	5	-5.0
C-7 (Trucking Yard)	352	1	60.1	61.7	88	1.6	10	----	61.7	0.0	5	-5.0
C-8	353	1	60.6	62.3	71	1.7	10	----	62.3	0.0	5	-5.0
C-9	354	1	59.9	61.6	71	1.7	10	----	61.6	0.0	5	-5.0
C-2ii	355	1	58.3	59.9	71	1.6	10	----	59.9	0.0	5	-5.0
C-3ii	356	1	57.4	59.1	71	1.7	10	----	59.1	0.0	5	-5.0
C-4ii	357	1	58.4	60.0	71	1.6	10	----	60.0	0.0	5	-5.0
C-5iia	358	1	58.4	60.1	71	1.7	10	----	60.1	0.0	5	-5.0
C-5iib	359	1	56.3	58.0	71	1.7	10	----	58.0	0.0	5	-5.0
C-6iia	360	1	56.7	58.4	71	1.7	10	----	58.4	0.0	5	-5.0
C-6iib	361	1	56.5	58.2	71	1.7	10	----	58.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	51	0.0	0.0	0.0
All Impacted	6	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc.
VRM

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: No Build 2039 - NSA D
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	69.3	66	1.9	10	Snd Lvl	69.3	0.0	5	-5.0
D-2	297	3	67.3	69.2	66	1.9	10	Snd Lvl	69.2	0.0	5	-5.0
D-3	298	2	66.8	68.7	66	1.9	10	Snd Lvl	68.7	0.0	5	-5.0
D-4	299	3	66.8	68.7	66	1.9	10	Snd Lvl	68.7	0.0	5	-5.0
D-5	300	2	66.4	68.2	66	1.8	10	Snd Lvl	68.2	0.0	5	-5.0
D-6 (Pool)	301	1	63.6	65.5	66	1.9	10	----	65.5	0.0	5	-5.0
D-7 (Community Bldg)	302	1	62.9	64.7	66	1.8	10	----	64.7	0.0	5	-5.0
D-8	303	2	63.5	65.4	66	1.9	10	----	65.4	0.0	5	-5.0
D-9	304	2	63.2	65.1	66	1.9	10	----	65.1	0.0	5	-5.0
D-10	305	2	62.9	64.7	66	1.8	10	----	64.7	0.0	5	-5.0
D-11	306	2	62.7	64.5	66	1.8	10	----	64.5	0.0	5	-5.0
D-12	307	2	62.4	64.3	66	1.9	10	----	64.3	0.0	5	-5.0
D-13	308	3	62.2	64.1	66	1.9	10	----	64.1	0.0	5	-5.0
D-14	309	2	62.2	64.0	66	1.8	10	----	64.0	0.0	5	-5.0
D-15	310	3	62.1	63.9	66	1.8	10	----	63.9	0.0	5	-5.0
D-16	311	2	62.1	63.9	66	1.8	10	----	63.9	0.0	5	-5.0
D-17	312	2	62.1	63.9	66	1.8	10	----	63.9	0.0	5	-5.0
D-18	313	1	59.9	61.7	66	1.8	10	----	61.7	0.0	5	-5.0
D-19	314	1	61.0	62.7	88	1.7	10	----	62.7	0.0	5	-5.0
D-20	315	1	59.8	61.4	66	1.6	10	----	61.4	0.0	5	-5.0
D-21	316	1	61.5	63.2	66	1.7	10	----	63.2	0.0	5	-5.0
D-22	317	1	64.5	66.1	71	1.6	10	----	66.1	0.0	5	-5.0
D-23	318	1	65.0	66.6	71	1.6	10	----	66.6	0.0	5	-5.0

D-24	319	1	63.4	65.1	66	1.7	10	----	65.1	0.0	5	-5.0
D-25	320	1	62.8	64.5	66	1.7	10	----	64.5	0.0	5	-5.0
D-26	321	1	61.3	62.9	88	1.6	10	----	62.9	0.0	5	-5.0
D-27	322	1	61.7	63.3	88	1.6	10	----	63.3	0.0	5	-5.0
D-28	323	1	60.7	62.4	88	1.7	10	----	62.4	0.0	5	-5.0
D-30	324	1	59.0	60.7	66	1.7	10	----	60.7	0.0	5	-5.0
D-31	325	1	58.7	60.4	71	1.7	10	----	60.4	0.0	5	-5.0
D-32	326	1	58.8	60.4	88	1.6	10	----	60.4	0.0	5	-5.0
D-33	327	1	69.5	71.1	88	1.6	10	----	71.1	0.0	5	-5.0
D-34	328	1	68.4	70.0	66	1.6	10	Snd Lvl	70.0	0.0	5	-5.0
D-37	329	1	57.3	58.9	66	1.6	10	----	58.9	0.0	5	-5.0
D-38	330	1	56.5	58.1	66	1.6	10	----	58.1	0.0	5	-5.0
D-1ii	331	3	67.2	69.1	66	1.9	10	Snd Lvl	69.1	0.0	5	-5.0
D-2ii	332	2	66.7	68.6	66	1.9	10	Snd Lvl	68.6	0.0	5	-5.0
D-3ii	333	2	66.6	68.5	66	1.9	10	Snd Lvl	68.5	0.0	5	-5.0
D-4ii	334	2	66.4	68.2	66	1.8	10	Snd Lvl	68.2	0.0	5	-5.0
D-7ii	335	3	63.2	65.0	66	1.8	10	----	65.0	0.0	5	-5.0
D-8ii	336	3	62.6	64.4	66	1.8	10	----	64.4	0.0	5	-5.0
D-10ii	337	2	62.4	64.2	66	1.8	10	----	64.2	0.0	5	-5.0
D-11ii	338	3	62.1	64.0	66	1.9	10	----	64.0	0.0	5	-5.0
D-12ii	339	2	61.9	63.7	66	1.8	10	----	63.7	0.0	5	-5.0
D-13ii	340	3	61.6	63.4	66	1.8	10	----	63.4	0.0	5	-5.0
D-14ii	341	2	61.5	63.3	66	1.8	10	----	63.3	0.0	5	-5.0
D-15ii	342	3	61.3	63.1	66	1.8	10	----	63.1	0.0	5	-5.0
D-16ii	343	2	61.0	62.8	66	1.8	10	----	62.8	0.0	5	-5.0
D-17ii	344	3	60.5	62.3	66	1.8	10	----	62.3	0.0	5	-5.0
D-18ii	345	1	57.4	59.2	88	1.8	10	----	59.2	0.0	5	-5.0
D-22ii	346	1	62.2	63.9	88	1.7	10	----	63.9	0.0	5	-5.0
D-22iii	347	1	60.1	61.8	66	1.7	10	----	61.8	0.0	5	-5.0
D-23ii	348	1	62.7	64.4	71	1.7	10	----	64.4	0.0	5	-5.0
D-25ii	349	1	62.1	63.7	71	1.6	10	----	63.7	0.0	5	-5.0
D-25iii	350	1	59.9	61.6	71	1.7	10	----	61.6	0.0	5	-5.0
D-26iia	351	1	60.6	62.3	71	1.7	10	----	62.3	0.0	5	-5.0
D-26iib	352	1	60.2	61.9	66	1.7	10	----	61.9	0.0	5	-5.0
D-26iii	353	1	58.9	60.5	88	1.6	10	----	60.5	0.0	5	-5.0
D-27iia	354	1	61.2	62.8	66	1.6	10	----	62.8	0.0	5	-5.0
D-27iib	355	1	60.7	62.4	66	1.7	10	----	62.4	0.0	5	-5.0
D-28iia	356	1	60.3	61.9	66	1.6	10	----	61.9	0.0	5	-5.0
D-28iib	357	1	60.2	61.9	66	1.7	10	----	61.9	0.0	5	-5.0
D-28iii	358	1	56.8	58.5	71	1.7	10	----	58.5	0.0	5	-5.0

D-29a	359	1	61.6	63.2	88	1.6	10	----	63.2	0.0	5	-5.0
D-29b	360	1	59.5	61.2	10	1.7	10	----	61.2	0.0	5	-5.0
D-29iia	361	1	60.0	61.6	66	1.6	10	----	61.6	0.0	5	-5.0
D-29iib	362	1	60.3	62.0	66	1.7	10	----	62.0	0.0	5	-5.0
D-32iiia	363	1	59.7	61.4	71	1.7	10	----	61.4	0.0	5	-5.0
D-32iiib	364	1	60.3	62.0	88	1.7	10	----	62.0	0.0	5	-5.0
D-33ii	365	1	63.4	65.0	66	1.6	10	----	65.0	0.0	5	-5.0
D-33iii	366	1	61.0	62.6	66	1.6	10	----	62.6	0.0	5	-5.0
D-33iv	367	1	59.8	61.4	66	1.6	10	----	61.4	0.0	5	-5.0
D-33va	368	1	58.6	60.2	66	1.6	10	----	60.2	0.0	5	-5.0
D-33vb	369	1	62.4	64.1	88	1.7	10	----	64.1	0.0	5	-5.0
D-33vi	370	1	60.4	62.1	66	1.7	10	----	62.1	0.0	5	-5.0
D-34ii	371	1	65.4	67.0	66	1.6	10	Snd Lvl	67.0	0.0	5	-5.0
D-34iii	372	1	63.6	65.3	66	1.7	10	----	65.3	0.0	5	-5.0
D-34iv	373	1	61.0	62.7	88	1.7	10	----	62.7	0.0	5	-5.0
D-34v	374	1	62.4	64.1	88	1.7	10	----	64.1	0.0	5	-5.0
D-34vi	375	1	57.4	59.0	88	1.6	10	----	59.0	0.0	5	-5.0
D-35v	376	1	56.6	58.2	66	1.6	10	----	58.2	0.0	5	-5.0
D-35via	377	1	58.7	60.3	66	1.6	10	----	60.3	0.0	5	-5.0
D-35vib	378	1	58.3	59.9	66	1.6	10	----	59.9	0.0	5	-5.0
D-36v	379	1	56.3	57.9	66	1.6	10	----	57.9	0.0	5	-5.0
D-36via	380	1	58.1	59.7	66	1.6	10	----	59.7	0.0	5	-5.0
D-36vib	381	1	58.0	59.5	66	1.5	10	----	59.5	0.0	5	-5.0
D-36vii	382	1	61.7	63.4	66	1.7	10	----	63.4	0.0	5	-5.0
D-37iii	383	1	57.8	59.4	66	1.6	10	----	59.4	0.0	5	-5.0
D-37iv	384	1	56.5	58.1	66	1.6	10	----	58.1	0.0	5	-5.0
D-37va	385	1	56.4	57.9	66	1.5	10	----	57.9	0.0	5	-5.0
D-37via	386	1	57.6	59.2	66	1.6	10	----	59.2	0.0	5	-5.0
D-37vib	387	1	58.6	60.1	66	1.5	10	----	60.1	0.0	5	-5.0
D-37vb	388	1	57.4	58.9	66	1.5	10	----	58.9	0.0	5	-5.0
D-37vc	389	1	57.2	58.7	66	1.5	10	----	58.7	0.0	5	-5.0
D-37viia	390	1	59.6	61.2	66	1.6	10	----	61.2	0.0	5	-5.0
D-37viib	391	1	60.6	62.3	66	1.7	10	----	62.3	0.0	5	-5.0
D-38iiia	392	1	55.8	57.3	66	1.5	10	----	57.3	0.0	5	-5.0
D-38iiib	393	1	58.4	59.9	66	1.5	10	----	59.9	0.0	5	-5.0
D-38iiic	394	1	57.6	59.1	66	1.5	10	----	59.1	0.0	5	-5.0
D-38iiid	395	1	58.3	59.8	66	1.5	10	----	59.8	0.0	5	-5.0
D-38vi	396	1	63.2	64.9	66	1.7	10	----	64.9	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max

		dB	dB	dB
All Selected	141	0.0	0.0	0.0
All Impacted	23	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc.
VRM

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: No Build 2039 - NSA E
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		LAeq1h	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	301	1	65.0	66.8	66	1.8	10	Snd Lvl	66.8	0.0	5	-5.0
E-2	302	1	65.1	66.9	66	1.8	10	Snd Lvl	66.9	0.0	5	-5.0
E-3	303	1	65.3	67.1	66	1.8	10	Snd Lvl	67.1	0.0	5	-5.0
E-4	304	1	65.5	67.2	66	1.7	10	Snd Lvl	67.2	0.0	5	-5.0
E-5	305	1	65.2	67.0	66	1.8	10	Snd Lvl	67.0	0.0	5	-5.0
E-6	306	1	65.0	66.7	66	1.7	10	Snd Lvl	66.7	0.0	5	-5.0
E-7	307	1	64.7	66.4	66	1.7	10	Snd Lvl	66.4	0.0	5	-5.0
E-8	308	1	65.0	66.7	66	1.7	10	Snd Lvl	66.7	0.0	5	-5.0
E-9	309	1	64.5	66.2	66	1.7	10	Snd Lvl	66.2	0.0	5	-5.0
E-10	310	1	64.4	66.1	66	1.7	10	Snd Lvl	66.1	0.0	5	-5.0
E-11	311	1	64.2	65.9	66	1.7	10	----	65.9	0.0	5	-5.0
E-12	312	1	64.4	66.1	66	1.7	10	Snd Lvl	66.1	0.0	5	-5.0
E-13	313	1	64.8	66.6	66	1.8	10	Snd Lvl	66.6	0.0	5	-5.0
E-14	314	1	65.1	66.8	66	1.7	10	Snd Lvl	66.8	0.0	5	-5.0
E-15	315	1	64.8	66.5	66	1.7	10	Snd Lvl	66.5	0.0	5	-5.0
E-16	316	1	65.1	66.8	66	1.7	10	Snd Lvl	66.8	0.0	5	-5.0
E-17	317	1	64.6	66.3	66	1.7	10	Snd Lvl	66.3	0.0	5	-5.0
E-18	318	1	62.7	64.4	66	1.7	10	----	64.4	0.0	5	-5.0
E-19	319	1	61.1	62.8	66	1.7	10	----	62.8	0.0	5	-5.0
E-20	320	1	59.6	61.3	66	1.7	10	----	61.3	0.0	5	-5.0
E-21	321	1	58.4	60.1	66	1.7	10	----	60.1	0.0	5	-5.0
E-22	322	1	57.3	59.0	66	1.7	10	----	59.0	0.0	5	-5.0
E-23	323	1	52.9	54.6	66	1.7	10	----	54.6	0.0	5	-5.0

E-24	324	1	50.4	52.1	66	1.7	10	----	52.1	0.0	5	-5.0
E-25	325	1	51.3	52.9	66	1.6	10	----	52.9	0.0	5	-5.0
E-26	326	1	52.0	53.7	66	1.7	10	----	53.7	0.0	5	-5.0
E-27	327	1	52.3	53.9	66	1.6	10	----	53.9	0.0	5	-5.0
E-28	328	1	51.7	53.4	66	1.7	10	----	53.4	0.0	5	-5.0
E-29	329	1	51.3	53.0	66	1.7	10	----	53.0	0.0	5	-5.0
E-30	330	1	52.5	54.2	66	1.7	10	----	54.2	0.0	5	-5.0
E-31	331	1	53.0	54.6	66	1.6	10	----	54.6	0.0	5	-5.0
E-32	332	1	53.6	55.3	66	1.7	10	----	55.3	0.0	5	-5.0
E-33	333	1	52.0	53.6	66	1.6	10	----	53.6	0.0	5	-5.0
E-34	334	1	50.8	52.4	66	1.6	10	----	52.4	0.0	5	-5.0
E-35	335	1	45.3	46.9	66	1.6	10	----	46.9	0.0	5	-5.0
E-36	336	1	64.5	66.2	66	1.7	10	Snd Lvl	66.2	0.0	5	-5.0
E-37	337	1	59.5	61.1	66	1.6	10	----	61.1	0.0	5	-5.0
E-38	338	1	60.7	62.3	66	1.6	10	----	62.3	0.0	5	-5.0
E-39	339	1	59.0	60.6	66	1.6	10	----	60.6	0.0	5	-5.0
E-40	340	1	57.8	59.4	66	1.6	10	----	59.4	0.0	5	-5.0
E-41	341	1	58.9	60.6	66	1.7	10	----	60.6	0.0	5	-5.0
E-42	342	1	56.6	58.2	66	1.6	10	----	58.2	0.0	5	-5.0
E-43	343	1	56.9	58.5	66	1.6	10	----	58.5	0.0	5	-5.0
E-44	344	1	55.3	56.9	66	1.6	10	----	56.9	0.0	5	-5.0
E-45	345	1	57.3	58.9	66	1.6	10	----	58.9	0.0	5	-5.0
E-46	346	1	56.0	57.6	66	1.6	10	----	57.6	0.0	5	-5.0
E-1ii	347	1	54.3	56.1	66	1.8	10	----	56.1	0.0	5	-5.0
E-2ii	348	1	58.0	59.8	66	1.8	10	----	59.8	0.0	5	-5.0
E-3ii	349	1	59.8	61.5	66	1.7	10	----	61.5	0.0	5	-5.0
E-3iii	350	1	59.6	61.4	66	1.8	10	----	61.4	0.0	5	-5.0
E-3iv	351	1	58.6	60.3	66	1.7	10	----	60.3	0.0	5	-5.0
E-3v	352	1	58.7	60.4	66	1.7	10	----	60.4	0.0	5	-5.0
E-3vi	353	1	58.1	59.9	66	1.8	10	----	59.9	0.0	5	-5.0
E-4ii	354	1	59.6	61.4	66	1.8	10	----	61.4	0.0	5	-5.0
E-4vi	355	1	57.6	59.3	66	1.7	10	----	59.3	0.0	5	-5.0
E-5ii	356	1	60.2	61.9	66	1.7	10	----	61.9	0.0	5	-5.0
E-5iii	357	1	57.2	58.9	66	1.7	10	----	58.9	0.0	5	-5.0
E-5vi	358	1	56.9	58.7	66	1.8	10	----	58.7	0.0	5	-5.0
E-6ii	359	1	60.8	62.6	66	1.8	10	----	62.6	0.0	5	-5.0
E-6iii	360	1	56.5	58.3	66	1.8	10	----	58.3	0.0	5	-5.0
E-6vi	361	1	56.9	58.7	66	1.8	10	----	58.7	0.0	5	-5.0
E-7ii	362	1	60.2	62.0	66	1.8	10	----	62.0	0.0	5	-5.0
E-7iii	363	1	56.5	58.2	66	1.7	10	----	58.2	0.0	5	-5.0

E-7vi	364	1	56.4	58.2	66	1.8	10	----	58.2	0.0	5	-5.0
E-8ii	365	1	60.1	61.8	66	1.7	10	----	61.8	0.0	5	-5.0
E-8iii	366	1	55.0	56.7	66	1.7	10	----	56.7	0.0	5	-5.0
E-8vi	367	1	56.1	57.9	66	1.8	10	----	57.9	0.0	5	-5.0
E-9ii	368	1	60.1	61.8	66	1.7	10	----	61.8	0.0	5	-5.0
E-9via	369	1	55.5	57.2	66	1.7	10	----	57.2	0.0	5	-5.0
E-9vib	370	1	55.1	56.9	66	1.8	10	----	56.9	0.0	5	-5.0
E-10ii	371	1	57.5	59.3	66	1.8	10	----	59.3	0.0	5	-5.0
E-10iii	372	1	56.9	58.6	66	1.7	10	----	58.6	0.0	5	-5.0
E-10iv	373	1	55.8	57.6	66	1.8	10	----	57.6	0.0	5	-5.0
E-10v	374	1	55.6	57.4	66	1.8	10	----	57.4	0.0	5	-5.0
E-10vi	375	1	55.3	57.1	66	1.8	10	----	57.1	0.0	5	-5.0
E-16ii	376	1	59.1	60.8	66	1.7	10	----	60.8	0.0	5	-5.0
E-17ii	377	1	57.9	59.6	66	1.7	10	----	59.6	0.0	5	-5.0
E-18ii	378	1	55.7	57.4	66	1.7	10	----	57.4	0.0	5	-5.0
E-19ii	379	1	55.2	56.9	66	1.7	10	----	56.9	0.0	5	-5.0
E-22ii	380	1	54.9	56.7	66	1.8	10	----	56.7	0.0	5	-5.0
E-23iia	381	1	54.5	56.2	66	1.7	10	----	56.2	0.0	5	-5.0
E-23iib	382	1	53.7	55.4	66	1.7	10	----	55.4	0.0	5	-5.0
E-23iic	383	1	52.7	54.4	66	1.7	10	----	54.4	0.0	5	-5.0
E-24iia	384	1	51.7	53.4	66	1.7	10	----	53.4	0.0	5	-5.0
E-24iib	385	1	51.6	53.3	66	1.7	10	----	53.3	0.0	5	-5.0
E-25ii	386	1	38.8	40.5	66	1.7	10	----	40.5	0.0	5	-5.0
E-26ii	387	1	37.5	39.2	66	1.7	10	----	39.2	0.0	5	-5.0
E-27ii	388	1	36.6	38.3	66	1.7	10	----	38.3	0.0	5	-5.0
E-28ii	389	1	36.2	37.8	66	1.6	10	----	37.8	0.0	5	-5.0
E-29ii	390	1	36.2	37.8	66	1.6	10	----	37.8	0.0	5	-5.0
E-30ii	391	1	35.5	37.1	66	1.6	10	----	37.1	0.0	5	-5.0
E-34ii	392	1	35.2	36.9	66	1.7	10	----	36.9	0.0	5	-5.0
E-34iii	393	1	35.8	37.5	66	1.7	10	----	37.5	0.0	5	-5.0
E-34iv	394	1	37.0	38.7	66	1.7	10	----	38.7	0.0	5	-5.0
E-34ix	395	1	51.8	53.5	66	1.7	10	----	53.5	0.0	5	-5.0
E-34v	396	1	38.8	40.6	66	1.8	10	----	40.6	0.0	5	-5.0
E-34vi	397	1	40.8	42.5	66	1.7	10	----	42.5	0.0	5	-5.0
E-34vii	398	1	45.3	47.0	66	1.7	10	----	47.0	0.0	5	-5.0
E-34viii	399	1	51.5	53.2	66	1.7	10	----	53.2	0.0	5	-5.0
E-35ii	400	1	42.6	44.3	66	1.7	10	----	44.3	0.0	5	-5.0
E-35iii	401	1	45.5	47.1	66	1.6	10	----	47.1	0.0	5	-5.0
E-35iv	402	1	45.3	46.9	66	1.6	10	----	46.9	0.0	5	-5.0
E-35ix	403	1	43.1	44.7	66	1.6	10	----	44.7	0.0	5	-5.0

E-35v	404	1	43.9	45.6	66	1.7	10	----	45.6	0.0	5	-5.0
E-35vi	405	1	43.6	45.3	66	1.7	10	----	45.3	0.0	5	-5.0
E-35vii	406	1	43.3	44.9	66	1.6	10	----	44.9	0.0	5	-5.0
E-35viii	407	1	42.8	44.4	66	1.6	10	----	44.4	0.0	5	-5.0
E-35x	408	1	47.9	49.5	66	1.6	10	----	49.5	0.0	5	-5.0
E-36ii	409	1	61.5	63.1	66	1.6	10	----	63.1	0.0	5	-5.0
E-36iii	410	1	58.2	59.9	66	1.7	10	----	59.9	0.0	5	-5.0
E-36iv	411	1	53.9	55.5	66	1.6	10	----	55.5	0.0	5	-5.0
E-36v	412	1	56.1	57.7	66	1.6	10	----	57.7	0.0	5	-5.0
E-36vi	413	1	55.4	57.1	66	1.7	10	----	57.1	0.0	5	-5.0
E-37ii	414	1	56.4	58.0	66	1.6	10	----	58.0	0.0	5	-5.0
E-37iii	415	1	53.5	55.1	66	1.6	10	----	55.1	0.0	5	-5.0
E-37iv	416	1	51.1	52.7	66	1.6	10	----	52.7	0.0	5	-5.0
E-37v	417	1	51.1	52.7	66	1.6	10	----	52.7	0.0	5	-5.0
E-38ii	418	1	57.9	59.6	66	1.7	10	----	59.6	0.0	5	-5.0
E-38iii	419	1	57.0	58.7	66	1.7	10	----	58.7	0.0	5	-5.0
E-38iv	420	1	55.7	57.5	66	1.8	10	----	57.5	0.0	5	-5.0
E-38va	421	1	55.1	56.9	66	1.8	10	----	56.9	0.0	5	-5.0
E-38vb	422	1	55.1	56.8	66	1.7	10	----	56.8	0.0	5	-5.0
E-40ii	423	1	56.3	57.9	66	1.6	10	----	57.9	0.0	5	-5.0
E-40iii	424	1	54.4	56.0	66	1.6	10	----	56.0	0.0	5	-5.0
E-41ii	425	1	55.2	56.9	66	1.7	10	----	56.9	0.0	5	-5.0
E-41iv	426	1	54.9	56.5	66	1.6	10	----	56.5	0.0	5	-5.0
E-42ii	427	1	55.5	57.1	66	1.6	10	----	57.1	0.0	5	-5.0
E-43ii	429	1	55.7	57.3	66	1.6	10	----	57.3	0.0	5	-5.0
E-44ii	430	1	54.7	56.3	66	1.6	10	----	56.3	0.0	5	-5.0
E-45ii	431	1	55.1	56.8	66	1.7	10	----	56.8	0.0	5	-5.0
E-45iii	432	1	56.3	57.9	66	1.6	10	----	57.9	0.0	5	-5.0
E-45iv	433	1	55.5	57.1	66	1.6	10	----	57.1	0.0	5	-5.0
E-45v	434	1	54.6	56.2	66	1.6	10	----	56.2	0.0	5	-5.0
E-46ii	435	1	52.6	54.2	66	1.6	10	----	54.2	0.0	5	-5.0
E-46iii	436	1	50.1	51.7	66	1.6	10	----	51.7	0.0	5	-5.0
E-46iv	437	1	48.6	50.2	66	1.6	10	----	50.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	136	0.0	0.0	0.0
All Impacted	17	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix 7

TNM Build with Warrendale Toll Plaza Model

ms consultants, inc.
VRM

15 July 2015
TNM 2.5
Calculated with TNM 2.5

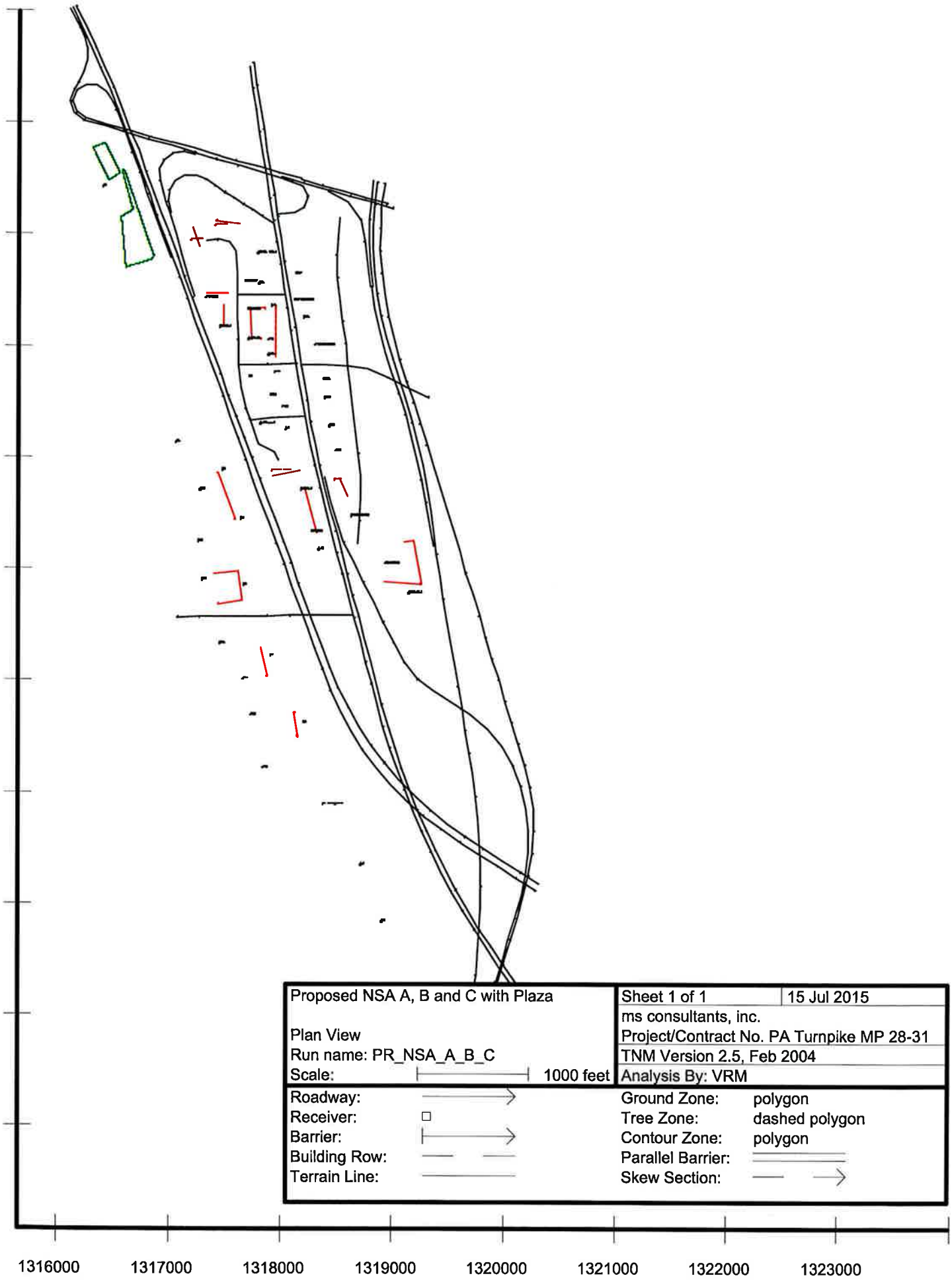
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Proposed NSA A, B and C with Plaza
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A-1	308	1	61.3	62.1	71	0.8	10	----	62.1	0.0	5	-5.0
B-1 (Hotel)	309	1	68.8	70.8	71	2.0	10	----	70.8	0.0	5	-5.0
B-2 (Hotel)	310	1	72.6	75.5	71	2.9	10	Snd Lvl	75.5	0.0	5	-5.0
B-3 (Hotel)	311	1	70.6	74.4	71	3.8	10	Snd Lvl	74.4	0.0	5	-5.0
B-4 (Hotel)	312	1	64.7	66.5	71	1.8	10	----	66.5	0.0	5	-5.0
B-5	313	1	67.0	69.3	71	2.3	10	----	69.3	0.0	5	-5.0
B-6 (Daycare)	314	1	71.2	73.8	66	2.6	10	Snd Lvl	73.8	0.0	5	-5.0
B-7 (Auto Dealer)	315	1	70.9	75.0	88	4.1	10	----	75.0	0.0	5	-5.0
B-8 (Hotel)	316	1	65.0	66.1	71	1.1	10	----	66.1	0.0	5	-5.0
B-9 (Hotel)	317	1	66.0	67.8	71	1.8	10	----	67.8	0.0	5	-5.0
B-10	318	1	67.1	68.8	71	1.7	10	----	68.8	0.0	5	-5.0
B-1ii (Hotel)	319	1	60.9	62.3	71	1.4	10	----	62.3	0.0	5	-5.0
B-1iii (Gas Station)	320	1	64.9	66.5	88	1.6	10	----	66.5	0.0	5	-5.0
B-2ii (Hotel)	321	1	63.3	64.9	71	1.6	10	----	64.9	0.0	5	-5.0
B-2iii	322	1	63.7	65.4	71	1.7	10	----	65.4	0.0	5	-5.0
B-2iv	323	1	70.3	70.6	71	0.3	10	----	70.6	0.0	5	-5.0
B-3ii (Hotel)	324	1	61.3	63.1	71	1.8	10	----	63.1	0.0	5	-5.0
B-3iii	325	1	63.6	65.4	71	1.8	10	----	65.4	0.0	5	-5.0
B-3iv (Gas Station)	326	1	72.5	74.2	88	1.7	10	----	74.2	0.0	5	-5.0
B-4iiia	327	1	61.6	63.8	71	2.2	10	----	63.8	0.0	5	-5.0
B-4iiib	328	1	63.1	65.2	71	2.1	10	----	65.2	0.0	5	-5.0
B-4iva	329	1	69.6	70.8	71	1.2	10	----	70.8	0.0	5	-5.0
B-4ivb (Gas Station)	330	1	65.9	67.7	88	1.8	10	----	67.7	0.0	5	-5.0

B-5iia	331	1	64.3	66.3	71	2.0	10	----	66.3	0.0	5	-5.0
B-5iib	332	1	65.2	66.8	71	1.6	10	----	66.8	0.0	5	-5.0
B-5iic	333	1	64.5	66.6	71	2.1	10	----	66.6	0.0	5	-5.0
B-5iva	334	1	63.6	65.2	71	1.6	10	----	65.2	0.0	5	-5.0
B-5ivb	335	1	63.9	65.6	71	1.7	10	----	65.6	0.0	5	-5.0
B-6ii	336	1	65.5	67.3	71	1.8	10	----	67.3	0.0	5	-5.0
B-6iv	337	1	63.4	65.1	71	1.7	10	----	65.1	0.0	5	-5.0
B-7iv	338	1	63.6	65.3	71	1.7	10	----	65.3	0.0	5	-5.0
B-8iv	339	1	66.8	68.4	71	1.6	10	----	68.4	0.0	5	-5.0
B-9iv (Picnic Area)	340	1	65.3	65.7	66	0.4	10	----	65.7	0.0	5	-5.0
B-10iva (Hotel)	341	1	60.9	63.0	71	2.1	10	----	63.0	0.0	5	-5.0
B-10ivb (Pool)	342	1	61.9	63.9	66	2.0	10	----	63.9	0.0	5	-5.0
C-1	346	1	59.6	61.5	71	1.9	10	----	61.5	0.0	5	-5.0
C-2	347	1	66.7	68.8	71	2.1	10	----	68.8	0.0	5	-5.0
C-3	348	1	66.8	68.9	71	2.1	10	----	68.9	0.0	5	-5.0
C-4	349	1	62.9	64.3	71	1.4	10	----	64.3	0.0	5	-5.0
C-5	350	1	63.2	64.5	71	1.3	10	----	64.5	0.0	5	-5.0
C-6	351	1	63.9	64.1	71	0.2	10	----	64.1	0.0	5	-5.0
C-7 (Trucking Yard)	352	1	60.1	61.9	88	1.8	10	----	61.9	0.0	5	-5.0
C-8	353	1	60.6	62.4	71	1.8	10	----	62.4	0.0	5	-5.0
C-9	354	1	59.9	61.7	71	1.8	10	----	61.7	0.0	5	-5.0
C-2ii	355	1	58.3	60.2	71	1.9	10	----	60.2	0.0	5	-5.0
C-3ii	356	1	57.4	60.1	71	2.7	10	----	60.1	0.0	5	-5.0
C-4ii	357	1	58.4	61.0	71	2.6	10	----	61.0	0.0	5	-5.0
C-5iia	358	1	58.4	60.4	71	2.0	10	----	60.4	0.0	5	-5.0
C-5iib	359	1	56.3	58.3	71	2.0	10	----	58.3	0.0	5	-5.0
C-6iia	360	1	56.7	58.8	71	2.1	10	----	58.8	0.0	5	-5.0
C-6iib	361	1	56.5	58.2	71	1.7	10	----	58.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	51	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0


Proposed NSA A, B and C with Plaza
Plan View
Run name: PR_NSA_A_B_C
Scale: 1000 feet
Sheet 1 of 1
15 Jul 2015
ms consultants, inc.
Project/Contract No. PA Turnpike MP 28-31
TNM Version 2.5, Feb 2004
Analysis By: VRM
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
5000
1316000
1317000
1318000
1319000
1320000
1321000
1322000
1323000

ms consultants, inc.
KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

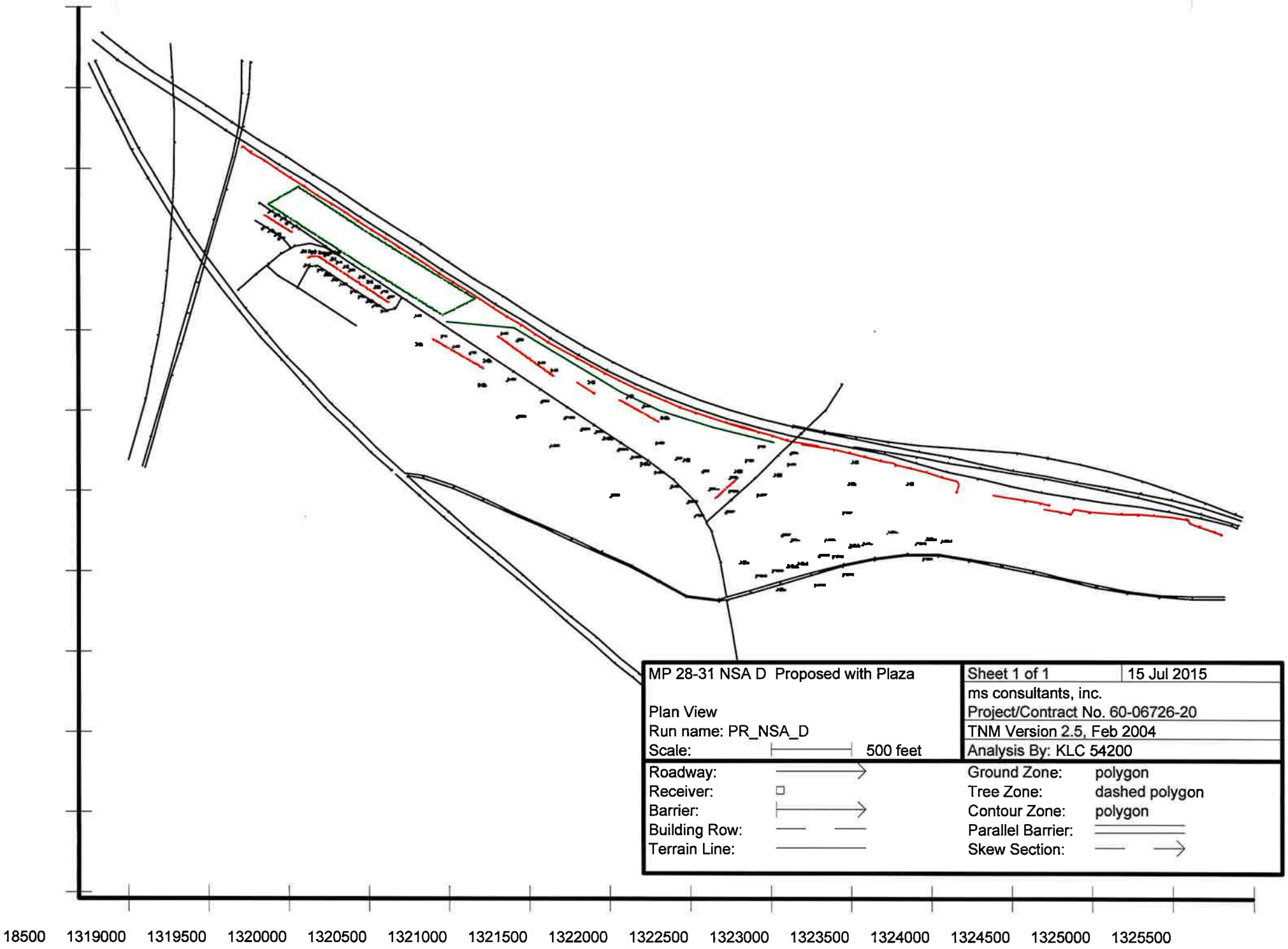
Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.7	66	1.3	10	Snd Lvl	68.2	0.5	5	-4.5
D-2	297	3	67.3	68.1	66	0.8	10	Snd Lvl	67.8	0.3	5	-4.7
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-4	299	3	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-5	300	2	66.4	67.1	66	0.7	10	Snd Lvl	66.7	0.4	5	-4.6
D-6 (Pool)	301	1	63.6	64.9	66	1.3	10	----	64.3	0.6	5	-4.4
D-7 (Community Bldg)	302	1	62.9	64.2	66	1.3	10	----	63.5	0.7	5	-4.3
D-8	303	2	63.5	64.3	66	0.8	10	----	63.5	0.8	5	-4.2
D-9	304	2	63.2	63.5	66	0.3	10	----	62.7	0.8	5	-4.2
D-10	305	2	62.9	62.9	66	0.0	10	----	62.0	0.9	5	-4.1
D-11	306	2	62.7	62.5	66	-0.2	10	----	61.7	0.8	5	-4.2
D-12	307	2	62.4	62.3	66	-0.1	10	----	61.4	0.9	5	-4.1
D-13	308	3	62.2	62.2	66	0.0	10	----	61.2	1.0	5	-4.0
D-14	309	2	62.2	62.3	66	0.1	10	----	61.1	1.2	5	-3.8
D-15	310	3	62.1	62.1	66	0.0	10	----	60.9	1.2	5	-3.8
D-16	311	2	62.1	62.2	66	0.1	10	----	60.9	1.3	5	-3.7
D-17	312	2	62.1	62.3	66	0.2	10	----	60.8	1.5	5	-3.5
D-18	313	1	59.9	61.5	66	1.6	10	----	59.6	1.9	5	-3.1
D-19	314	1	61.0	62.7	88	1.7	10	----	59.6	3.1	5	-1.9
D-20	315	1	59.8	61.5	66	1.7	10	----	57.5	4.0	5	-1.0
D-21	316	1	61.5	63.2	66	1.7	10	----	59.5	3.7	5	-1.3
D-22	317	1	64.5	64.6	71	0.1	10	----	58.9	5.7	5	0.7
D-23	318	1	65.0	65.1	71	0.1	10	----	58.7	6.4	5	1.4

D-24	319	1	63.4	64.8	66	1.4	10	----	58.1	6.7	5	1.7
D-25	320	1	62.8	64.8	66	2.0	10	----	58.0	6.8	5	1.8
D-26	321	1	61.3	64.9	88	3.6	10	----	57.7	7.2	5	2.2
D-27	322	1	61.7	66.8	88	5.1	10	----	59.0	7.8	5	2.8
D-28	323	1	60.7	65.5	88	4.8	10	----	58.4	7.1	5	2.1
D-30	324	1	59.0	61.2	66	2.2	10	----	57.8	3.4	5	-1.6
D-31	325	1	58.7	61.0	71	2.3	10	----	57.2	3.8	5	-1.2
D-32	326	1	58.8	60.9	88	2.1	10	----	56.7	4.2	5	-0.8
D-33	327	1	69.5	71.2	88	1.7	10	----	61.4	9.8	5	4.8
D-34	328	1	68.4	68.7	66	0.3	10	Snd Lvl	63.9	4.8	5	-0.2
D-37	329	1	57.3	59.7	66	2.4	10	----	58.6	1.1	5	-3.9
D-38	330	1	56.5	58.2	66	1.7	10	----	57.8	0.4	5	-4.6
D-1ii	331	3	67.2	68.2	66	1.0	10	Snd Lvl	67.6	0.6	5	-4.4
D-2ii	332	2	66.7	67.5	66	0.8	10	Snd Lvl	66.9	0.6	5	-4.4
D-3ii	333	2	66.6	67.0	66	0.4	10	Snd Lvl	66.4	0.6	5	-4.4
D-4ii	334	2	66.4	66.6	66	0.2	10	Snd Lvl	66.1	0.5	5	-4.5
D-7ii	335	3	63.2	64.1	66	0.9	10	----	63.4	0.7	5	-4.3
D-8ii	336	3	62.6	62.9	66	0.3	10	----	62.1	0.8	5	-4.2
D-10ii	337	2	62.4	62.6	66	0.2	10	----	61.8	0.8	5	-4.2
D-11ii	338	3	62.1	62.4	66	0.3	10	----	61.5	0.9	5	-4.1
D-12ii	339	2	61.9	61.9	66	0.0	10	----	60.9	1.0	5	-4.0
D-13ii	340	3	61.6	61.6	66	0.0	10	----	60.5	1.1	5	-3.9
D-14ii	341	2	61.5	61.4	66	-0.1	10	----	60.3	1.1	5	-3.9
D-15ii	342	3	61.3	61.0	66	-0.3	10	----	59.9	1.1	5	-3.9
D-16ii	343	2	61.0	61.1	66	0.1	10	----	59.7	1.4	5	-3.6
D-17ii	344	3	60.5	61.3	66	0.8	10	----	59.6	1.7	5	-3.3
D-18ii	345	1	57.4	59.3	88	1.9	10	----	57.1	2.2	5	-2.8
D-22ii	346	1	62.2	63.7	88	1.5	10	----	59.8	3.9	5	-1.1
D-22iii	347	1	60.1	61.6	66	1.5	10	----	56.5	5.1	5	0.1
D-23ii	348	1	62.7	64.1	71	1.4	10	----	59.6	4.5	5	-0.5
D-25ii	349	1	62.1	64.4	71	2.3	10	----	59.7	4.7	5	-0.3
D-25iii	350	1	59.9	62.2	71	2.3	10	----	56.2	6.0	5	1.0
D-26iia	351	1	60.6	63.5	71	2.9	10	----	59.3	4.2	5	-0.8
D-26iib	352	1	60.2	62.7	66	2.5	10	----	59.0	3.7	5	-1.3
D-26iii	353	1	58.9	62.1	88	3.2	10	----	55.9	6.2	5	1.2
D-27iia	354	1	61.2	63.4	66	2.2	10	----	60.9	2.5	5	-2.5
D-27iib	355	1	60.7	62.9	66	2.2	10	----	60.3	2.6	5	-2.4
D-28iia	356	1	60.3	62.3	66	2.0	10	----	60.0	2.3	5	-2.7
D-28iib	357	1	60.2	62.2	66	2.0	10	----	60.2	2.0	5	-3.0
D-28iii	358	1	56.8	59.1	71	2.3	10	----	55.1	4.0	5	-1.0

D-29a	359	1	61.6	64.7	88	3.1	10	----	58.4	6.3	5	1.3
D-29b	360	1	59.5	61.7	71	2.2	10	----	57.8	3.9	5	-1.1
D-29iia	361	1	60.0	61.9	66	1.9	10	----	59.9	2.0	5	-3.0
D-29iib	362	1	60.3	62.1	66	1.8	10	----	60.6	1.5	5	-3.5
D-32iiia	363	1	59.7	61.6	71	1.9	10	----	59.9	1.7	5	-3.3
D-32iiib	364	1	60.3	62.5	88	2.2	10	----	60.9	1.6	5	-3.4
D-33ii	365	1	63.4	65.8	66	2.4	10	----	59.9	5.9	5	0.9
D-33iii	366	1	61.0	63.6	66	2.6	10	----	58.7	4.9	5	-0.1
D-33iv	367	1	59.8	62.3	66	2.5	10	----	57.3	5.0	5	0.0
D-33va	368	1	58.6	60.9	66	2.3	10	----	57.6	3.3	5	-1.7
D-33vb	369	1	62.4	64.2	88	1.8	10	----	63.1	1.1	5	-3.9
D-33vi	370	1	60.4	62.4	66	2.0	10	----	61.1	1.3	5	-3.7
D-34ii	371	1	65.4	68.0	66	2.6	10	Snd Lvl	61.5	6.5	5	1.5
D-34iii	372	1	63.6	66.0	66	2.4	10	Snd Lvl	61.3	4.7	5	-0.3
D-34iv	373	1	61.0	63.1	88	2.1	10	----	59.8	3.3	5	-1.7
D-34v	374	1	62.4	64.4	88	2.0	10	----	63.4	1.0	5	-4.0
D-34vi	375	1	57.4	59.5	88	2.1	10	----	57.2	2.3	5	-2.7
D-35v	376	1	56.6	58.7	66	2.1	10	----	54.9	3.8	5	-1.2
D-35via	377	1	58.7	60.5	66	1.8	10	----	59.1	1.4	5	-3.6
D-35vib	378	1	58.3	60.1	66	1.8	10	----	58.6	1.5	5	-3.5
D-36v	379	1	56.3	58.5	66	2.2	10	----	54.8	3.7	5	-1.3
D-36via	380	1	58.1	59.8	66	1.7	10	----	58.2	1.6	5	-3.4
D-36vib	381	1	58.0	59.6	66	1.6	10	----	57.9	1.7	5	-3.3
D-36vii	382	1	61.7	63.5	66	1.8	10	----	62.9	0.6	5	-4.4
D-37iii	383	1	57.8	59.9	66	2.1	10	----	57.5	2.4	5	-2.6
D-37iv	384	1	56.5	58.8	66	2.3	10	----	56.0	2.8	5	-2.2
D-37va	385	1	56.4	58.5	66	2.1	10	----	55.8	2.7	5	-2.3
D-37via	386	1	57.6	59.3	66	1.7	10	----	57.5	1.8	5	-3.2
D-37vib	387	1	58.6	60.3	66	1.7	10	----	58.9	1.4	5	-3.6
D-37vb	388	1	57.4	58.9	66	1.5	10	----	57.4	1.5	5	-3.5
D-37vc	389	1	57.2	58.7	66	1.5	10	----	57.3	1.4	5	-3.6
D-37viia	390	1	59.6	61.6	66	2.0	10	----	59.9	1.7	5	-3.3
D-37viib	391	1	60.6	62.6	66	2.0	10	----	61.4	1.2	5	-3.8
D-38iiia	392	1	55.8	57.7	66	1.9	10	----	56.6	1.1	5	-3.9
D-38iiib	393	1	58.4	60.3	66	1.9	10	----	59.4	0.9	5	-4.1
D-38iiic	394	1	57.6	59.3	66	1.7	10	----	58.6	0.7	5	-4.3
D-38iiid	395	1	58.3	60.2	66	1.9	10	----	59.4	0.8	5	-4.2
D-38vi	396	1	63.2	65.0	66	1.8	10	----	64.7	0.3	5	-4.7

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max

		dB	dB	dB
All Selected	141	0.3	2.6	9.8
All Impacted	24	0.3	1.7	6.5
All that meet NR Goal	15	5.0	6.6	9.8


MP 28-31 NSA D Proposed with Plaza
Plan View
Run name: PR_NSA_D
Scale: 500 feet
Sheet 1 of 1
15 Jul 2015
ms consultants, inc.
Project/Contract No. 60-06726-20
TNM Version 2.5, Feb 2004
Analysis By: KLC 54200
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
18500
1319000
1319500
1320000
1320500
1321000
1321500
1322000
1322500
1323000
1323500
1324000
1324500
1325000
1325500

ms consultants, inc.
KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed with Plaza
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

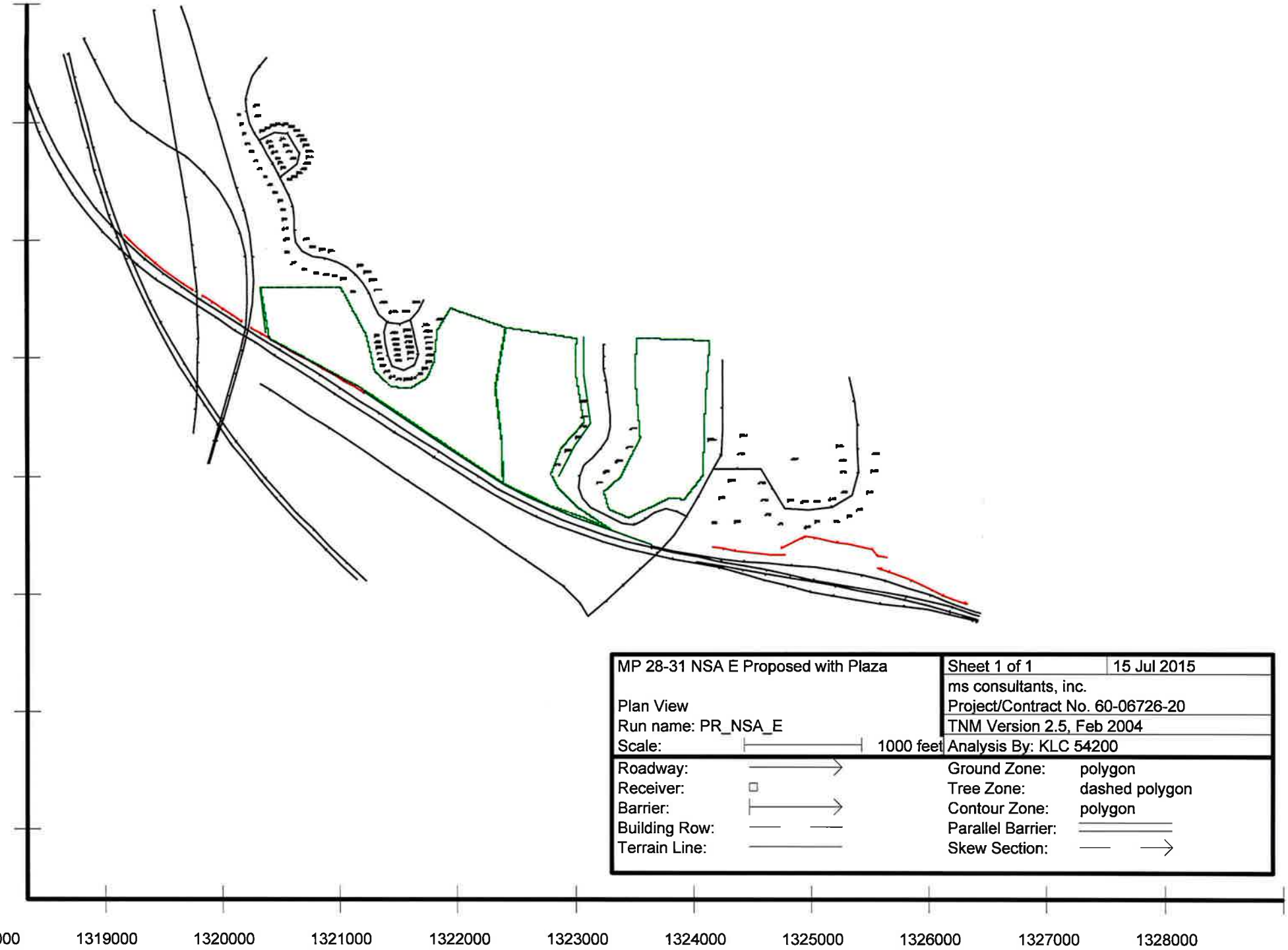
Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	301	1	65.0	66.9	66	1.9	10	Snd Lvl	66.8	0.1	5	-4.9
E-2	302	1	65.1	66.9	66	1.8	10	Snd Lvl	66.9	0.0	5	-5.0
E-3	303	1	65.3	67.1	66	1.8	10	Snd Lvl	67.1	0.0	5	-5.0
E-4	304	1	65.5	67.3	66	1.8	10	Snd Lvl	67.2	0.1	5	-4.9
E-5	305	1	65.2	67.0	66	1.8	10	Snd Lvl	66.9	0.1	5	-4.9
E-6	306	1	65.0	66.8	66	1.8	10	Snd Lvl	66.7	0.1	5	-4.9
E-7	307	1	64.7	66.5	66	1.8	10	Snd Lvl	66.4	0.1	5	-4.9
E-8	308	1	65.0	66.7	66	1.7	10	Snd Lvl	66.5	0.2	5	-4.8
E-9	309	1	64.5	66.2	66	1.7	10	Snd Lvl	65.9	0.3	5	-4.7
E-10	310	1	64.4	66.0	66	1.6	10	Snd Lvl	65.7	0.3	5	-4.7
E-11	311	1	64.2	65.9	66	1.7	10	----	65.5	0.4	5	-4.6
E-12	312	1	64.4	66.1	66	1.7	10	Snd Lvl	65.6	0.5	5	-4.5
E-13	313	1	64.8	66.6	66	1.8	10	Snd Lvl	66.1	0.5	5	-4.5
E-14	314	1	65.1	66.7	66	1.6	10	Snd Lvl	66.2	0.5	5	-4.5
E-15	315	1	64.8	66.5	66	1.7	10	Snd Lvl	65.9	0.6	5	-4.4
E-16	316	1	65.1	66.7	66	1.6	10	Snd Lvl	66.2	0.5	5	-4.5
E-17	317	1	64.6	66.2	66	1.6	10	Snd Lvl	65.6	0.6	5	-4.4
E-18	318	1	62.7	64.5	66	1.8	10	----	63.9	0.6	5	-4.4
E-19	319	1	61.1	63.0	66	1.9	10	----	62.5	0.5	5	-4.5
E-20	320	1	59.6	61.5	66	1.9	10	----	61.0	0.5	5	-4.5
E-21	321	1	58.4	60.5	66	2.1	10	----	60.1	0.4	5	-4.6
E-22	322	1	57.3	59.4	66	2.1	10	----	59.0	0.4	5	-4.6
E-23	323	1	52.9	54.9	66	2.0	10	----	54.4	0.5	5	-4.5

E-24	324	1	50.4	52.4	66	2.0	10	----	51.8	0.6	5	-4.4
E-25	325	1	51.3	52.9	66	1.6	10	----	52.1	0.8	5	-4.2
E-26	326	1	52.0	53.5	66	1.5	10	----	52.6	0.9	5	-4.1
E-27	327	1	52.3	53.9	66	1.6	10	----	52.8	1.1	5	-3.9
E-28	328	1	51.7	53.6	66	1.9	10	----	52.8	0.8	5	-4.2
E-29	329	1	51.3	53.5	66	2.2	10	----	52.8	0.7	5	-4.3
E-30	330	1	52.5	55.8	66	3.3	10	----	55.5	0.3	5	-4.7
E-31	331	1	53.0	56.2	66	3.2	10	----	56.0	0.2	5	-4.8
E-32	332	1	53.6	57.9	66	4.3	10	----	57.8	0.1	5	-4.9
E-33	333	1	52.0	55.7	66	3.7	10	----	55.6	0.1	5	-4.9
E-34	334	1	50.8	53.3	66	2.5	10	----	53.3	0.0	5	-5.0
E-35	335	1	45.3	47.3	66	2.0	10	----	47.2	0.1	5	-4.9
E-36	336	1	64.5	66.4	66	1.9	10	Snd Lvl	66.4	0.0	5	-5.0
E-37	337	1	59.5	62.2	66	2.7	10	----	62.2	0.0	5	-5.0
E-38	338	1	60.7	62.3	66	1.6	10	----	62.3	0.0	5	-5.0
E-39	339	1	59.0	60.7	66	1.7	10	----	60.7	0.0	5	-5.0
E-40	340	1	57.8	59.5	66	1.7	10	----	59.5	0.0	5	-5.0
E-41	341	1	58.9	60.8	66	1.9	10	----	60.8	0.0	5	-5.0
E-42	342	1	56.6	58.3	66	1.7	10	----	58.3	0.0	5	-5.0
E-43	343	1	56.9	58.5	66	1.6	10	----	58.5	0.0	5	-5.0
E-44	344	1	55.3	56.9	66	1.6	10	----	56.9	0.0	5	-5.0
E-45	345	1	57.3	59.0	66	1.7	10	----	59.0	0.0	5	-5.0
E-46	346	1	56.0	57.6	66	1.6	10	----	57.6	0.0	5	-5.0
E-1ii	347	1	54.3	56.1	66	1.8	10	----	55.9	0.2	5	-4.8
E-2ii	348	1	58.0	59.9	66	1.9	10	----	59.7	0.2	5	-4.8
E-3ii	349	1	59.8	61.6	66	1.8	10	----	61.4	0.2	5	-4.8
E-3iii	350	1	59.6	61.4	66	1.8	10	----	61.1	0.3	5	-4.7
E-3iv	351	1	58.6	60.3	66	1.7	10	----	60.1	0.2	5	-4.8
E-3v	352	1	58.7	60.4	66	1.7	10	----	60.1	0.3	5	-4.7
E-3vi	353	1	58.1	59.8	66	1.7	10	----	59.7	0.1	5	-4.9
E-4ii	354	1	59.6	61.4	66	1.8	10	----	61.2	0.2	5	-4.8
E-4vi	355	1	57.6	59.2	66	1.6	10	----	59.1	0.1	5	-4.9
E-5ii	356	1	60.2	62.0	66	1.8	10	----	61.8	0.2	5	-4.8
E-5iii	357	1	57.2	59.0	66	1.8	10	----	58.9	0.1	5	-4.9
E-5vi	358	1	56.9	58.8	66	1.9	10	----	58.6	0.2	5	-4.8
E-6ii	359	1	60.8	62.5	66	1.7	10	----	62.4	0.1	5	-4.9
E-6iii	360	1	56.5	58.4	66	1.9	10	----	58.3	0.1	5	-4.9
E-6vi	361	1	56.9	58.8	66	1.9	10	----	58.7	0.1	5	-4.9
E-7ii	362	1	60.2	61.9	66	1.7	10	----	61.8	0.1	5	-4.9
E-7iii	363	1	56.5	58.3	66	1.8	10	----	58.2	0.1	5	-4.9

E-7vi	364	1	56.4	58.3	66	1.9	10	----	58.2	0.1	5	-4.9
E-8ii	365	1	60.1	61.9	66	1.8	10	----	61.7	0.2	5	-4.8
E-8iii	366	1	55.0	56.9	66	1.9	10	----	56.8	0.1	5	-4.9
E-8vi	367	1	56.1	58.0	66	1.9	10	----	57.9	0.1	5	-4.9
E-9ii	368	1	60.1	61.9	66	1.8	10	----	61.7	0.2	5	-4.8
E-9via	369	1	55.5	57.4	66	1.9	10	----	57.3	0.1	5	-4.9
E-9vib	370	1	55.1	57.1	66	2.0	10	----	57.0	0.1	5	-4.9
E-10ii	371	1	57.5	59.4	66	1.9	10	----	59.2	0.2	5	-4.8
E-10iii	372	1	56.9	58.8	66	1.9	10	----	58.7	0.1	5	-4.9
E-10iv	373	1	55.8	57.7	66	1.9	10	----	57.6	0.1	5	-4.9
E-10v	374	1	55.6	57.6	66	2.0	10	----	57.5	0.1	5	-4.9
E-10vi	375	1	55.3	57.3	66	2.0	10	----	57.2	0.1	5	-4.9
E-16ii	376	1	59.1	60.7	66	1.6	10	----	60.4	0.3	5	-4.7
E-17ii	377	1	57.9	59.3	66	1.4	10	----	59.0	0.3	5	-4.7
E-18ii	378	1	55.7	57.0	66	1.3	10	----	56.5	0.5	5	-4.5
E-19ii	379	1	55.2	56.4	66	1.2	10	----	56.0	0.4	5	-4.6
E-22ii	380	1	54.9	56.9	66	2.0	10	----	56.5	0.4	5	-4.6
E-23iia	381	1	54.5	56.6	66	2.1	10	----	56.2	0.4	5	-4.6
E-23iib	382	1	53.7	55.8	66	2.1	10	----	55.4	0.4	5	-4.6
E-23iic	383	1	52.7	55.0	66	2.3	10	----	54.4	0.6	5	-4.4
E-24iia	384	1	51.7	54.1	66	2.4	10	----	53.6	0.5	5	-4.5
E-24iib	385	1	51.6	53.8	66	2.2	10	----	53.4	0.4	5	-4.6
E-25ii	386	1	38.8	40.6	66	1.8	10	----	40.6	0.0	5	-5.0
E-26ii	387	1	37.5	39.2	66	1.7	10	----	39.3	-0.1	5	-5.1
E-27ii	388	1	36.6	38.3	66	1.7	10	----	38.5	-0.2	5	-5.2
E-28ii	389	1	36.2	37.8	66	1.6	10	----	38.1	-0.3	5	-5.3
E-29ii	390	1	36.2	37.9	66	1.7	10	----	38.2	-0.3	5	-5.3
E-30ii	391	1	35.5	37.2	66	1.7	10	----	37.9	-0.7	5	-5.7
E-34ii	392	1	35.2	37.0	66	1.8	10	----	37.1	-0.1	5	-5.1
E-34iii	393	1	35.8	37.6	66	1.8	10	----	37.6	0.0	5	-5.0
E-34iv	394	1	37.0	38.7	66	1.7	10	----	38.7	0.0	5	-5.0
E-34ix	395	1	51.8	54.0	66	2.2	10	----	53.3	0.7	5	-4.3
E-34v	396	1	38.8	40.6	66	1.8	10	----	40.5	0.1	5	-4.9
E-34vi	397	1	40.8	42.6	66	1.8	10	----	42.6	0.0	5	-5.0
E-34vii	398	1	45.3	47.3	66	2.0	10	----	47.3	0.0	5	-5.0
E-34viii	399	1	51.5	54.0	66	2.5	10	----	53.5	0.5	5	-4.5
E-35ii	400	1	42.6	44.4	66	1.8	10	----	44.3	0.1	5	-4.9
E-35iii	401	1	45.5	47.5	66	2.0	10	----	47.5	0.0	5	-5.0
E-35iv	402	1	45.3	47.6	66	2.3	10	----	47.6	0.0	5	-5.0
E-35ix	403	1	43.1	45.2	66	2.1	10	----	45.1	0.1	5	-4.9

E-35v	404	1	43.9	46.1	66	2.2	10	----	46.1	0.0	5	-5.0
E-35vi	405	1	43.6	45.7	66	2.1	10	----	45.7	0.0	5	-5.0
E-35vii	406	1	43.3	45.3	66	2.0	10	----	45.3	0.0	5	-5.0
E-35viii	407	1	42.8	44.9	66	2.1	10	----	44.9	0.0	5	-5.0
E-35x	408	1	47.9	49.9	66	2.0	10	----	49.8	0.1	5	-4.9
E-36ii	409	1	61.5	63.6	66	2.1	10	----	63.6	0.0	5	-5.0
E-36iii	410	1	58.2	61.4	66	3.2	10	----	61.4	0.0	5	-5.0
E-36iv	411	1	53.9	56.7	66	2.8	10	----	56.7	0.0	5	-5.0
E-36v	412	1	56.1	58.6	66	2.5	10	----	58.6	0.0	5	-5.0
E-36vi	413	1	55.4	58.2	66	2.8	10	----	58.2	0.0	5	-5.0
E-37ii	414	1	56.4	58.7	66	2.3	10	----	58.6	0.1	5	-4.9
E-37iii	415	1	53.5	55.6	66	2.1	10	----	55.6	0.0	5	-5.0
E-37iv	416	1	51.1	53.0	66	1.9	10	----	53.0	0.0	5	-5.0
E-37v	417	1	51.1	53.0	66	1.9	10	----	53.0	0.0	5	-5.0
E-38ii	418	1	57.9	60.0	66	2.1	10	----	60.0	0.0	5	-5.0
E-38iii	419	1	57.0	58.9	66	1.9	10	----	58.9	0.0	5	-5.0
E-38iv	420	1	55.7	57.8	66	2.1	10	----	57.8	0.0	5	-5.0
E-38va	421	1	55.1	56.9	66	1.8	10	----	56.9	0.0	5	-5.0
E-38vb	422	1	55.1	57.1	66	2.0	10	----	57.1	0.0	5	-5.0
E-40ii	423	1	56.3	57.9	66	1.6	10	----	57.9	0.0	5	-5.0
E-40iii	424	1	54.4	56.5	66	2.1	10	----	56.5	0.0	5	-5.0
E-41ii	425	1	55.2	56.8	66	1.6	10	----	56.8	0.0	5	-5.0
E-41iv	426	1	54.9	57.0	66	2.1	10	----	57.0	0.0	5	-5.0
E-42ii	427	1	55.5	57.4	66	1.9	10	----	57.4	0.0	5	-5.0
E-43ii	429	1	55.7	57.5	66	1.8	10	----	57.5	0.0	5	-5.0
E-44ii	430	1	54.7	56.4	66	1.7	10	----	56.4	0.0	5	-5.0
E-45ii	431	1	55.1	56.9	66	1.8	10	----	56.9	0.0	5	-5.0
E-45iii	432	1	56.3	58.3	66	2.0	10	----	58.3	0.0	5	-5.0
E-45iv	433	1	55.5	57.5	66	2.0	10	----	57.5	0.0	5	-5.0
E-45v	434	1	54.6	56.7	66	2.1	10	----	56.7	0.0	5	-5.0
E-46ii	435	1	52.6	54.2	66	1.6	10	----	54.2	0.0	5	-5.0
E-46iii	436	1	50.1	51.7	66	1.6	10	----	51.7	0.0	5	-5.0
E-46iv	437	1	48.6	50.2	66	1.6	10	----	50.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	136	-0.7	0.2	1.1
All Impacted	17	0.0	0.3	0.6
All that meet NR Goal	0	0.0	0.0	0.0


MP 28-31 NSA E Proposed with Plaza
Plan View
Run name: PR_NSA_E
Scale: 1000 feet
Sheet 1 of 1
15 Jul 2015
ms consultants, inc.
Project/Contract No. 60-06726-20
TNM Version 2.5, Feb 2004
Analysis By: KLC 54200
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1318000
1319000
1320000
1321000
1322000
1323000
1324000
1325000
1326000
1327000
1328000

ms consultants, inc.
KLC 54200

18 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D All
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.7	66	1.3	10	Snd Lvl	68.3	0.4	5	-4.6
D-2	297	3	67.3	68.1	66	0.8	10	Snd Lvl	67.8	0.3	5	-4.7
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-4	299	3	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-5	300	2	66.4	67.1	66	0.7	10	Snd Lvl	66.7	0.4	5	-4.6
D-6 (Pool)	301	1	63.6	64.9	66	1.3	10	----	64.3	0.6	5	-4.4
D-7 (Community Bldg)	302	1	62.9	64.2	66	1.3	10	----	63.5	0.7	5	-4.3
D-8	303	2	63.5	64.3	66	0.8	10	----	63.6	0.7	5	-4.3
D-9	304	2	63.2	63.5	66	0.3	10	----	62.8	0.7	5	-4.3
D-10	305	2	62.9	62.9	66	0.0	10	----	62.1	0.8	5	-4.2
D-11	306	2	62.7	62.5	66	-0.2	10	----	61.8	0.7	5	-4.3
D-12	307	2	62.4	62.3	66	-0.1	10	----	61.5	0.8	5	-4.2
D-13	308	3	62.2	62.2	66	0.0	10	----	61.2	1.0	5	-4.0
D-14	309	2	62.2	62.3	66	0.1	10	----	61.2	1.1	5	-3.9
D-15	310	3	62.1	62.1	66	0.0	10	----	61.1	1.0	5	-4.0
D-16	311	2	62.1	62.2	66	0.1	10	----	61.0	1.2	5	-3.8
D-17	312	2	62.1	62.3	66	0.2	10	----	60.9	1.4	5	-3.6
D-18	313	1	59.9	61.5	66	1.6	10	----	59.7	1.8	5	-3.2
D-19	314	1	61.0	62.7	88	1.7	10	----	59.8	2.9	5	-2.1
D-20	315	1	59.8	61.5	66	1.7	10	----	57.8	3.7	5	-1.3
D-21	316	1	61.5	63.2	66	1.7	10	----	59.8	3.4	5	-1.6
D-22	317	1	64.5	64.6	71	0.1	10	----	59.5	5.1	5	0.1
D-23	318	1	65.0	65.1	71	0.1	10	----	59.3	5.8	5	0.8
D-24	319	1	63.4	64.8	66	1.4	10	----	58.7	6.1	5	1.1

D-25	320	1	62.8	64.8	66	2.0	10	----	58.6	6.2	5	1.2
D-26	321	1	61.3	64.9	88	3.6	10	----	58.2	6.7	5	1.7
D-27	322	1	61.7	66.8	88	5.1	10	----	59.5	7.3	5	2.3
D-28	323	1	60.7	65.5	88	4.8	10	----	58.9	6.6	5	1.6
D-30	324	1	59.0	61.2	66	2.2	10	----	58.0	3.2	5	-1.8
D-31	325	1	58.7	61.0	71	2.3	10	----	57.4	3.6	5	-1.4
D-32	326	1	58.8	60.9	88	2.1	10	----	57.0	3.9	5	-1.1
D-33	327	1	69.5	71.2	88	1.7	10	----	62.2	9.0	5	4.0
D-34	328	1	68.4	68.7	66	0.3	10	Snd Lvl	64.1	4.6	5	-0.4
D-1ii	331	3	67.2	68.2	66	1.0	10	Snd Lvl	67.6	0.6	5	-4.4
D-2ii	332	2	66.7	67.5	66	0.8	10	Snd Lvl	67.0	0.5	5	-4.5
D-3ii	333	2	66.6	67.0	66	0.4	10	Snd Lvl	66.4	0.6	5	-4.4
D-4ii	334	2	66.4	66.6	66	0.2	10	Snd Lvl	66.1	0.5	5	-4.5
D-7ii	335	3	63.2	64.1	66	0.9	10	----	63.4	0.7	5	-4.3
D-8ii	336	3	62.6	62.9	66	0.3	10	----	62.1	0.8	5	-4.2
D-10ii	337	2	62.4	62.6	66	0.2	10	----	61.8	0.8	5	-4.2
D-11ii	338	3	62.1	62.4	66	0.3	10	----	61.5	0.9	5	-4.1
D-12ii	339	2	61.9	61.9	66	0.0	10	----	61.0	0.9	5	-4.1
D-13ii	340	3	61.6	61.6	66	0.0	10	----	60.6	1.0	5	-4.0
D-14ii	341	2	61.5	61.4	66	-0.1	10	----	60.4	1.0	5	-4.0
D-15ii	342	3	61.3	61.0	66	-0.3	10	----	60.0	1.0	5	-4.0
D-16ii	343	2	61.0	61.1	66	0.1	10	----	59.8	1.3	5	-3.7
D-17ii	344	3	60.5	61.3	66	0.8	10	----	59.7	1.6	5	-3.4
D-18ii	345	1	57.4	59.3	88	1.9	10	----	57.3	2.0	5	-3.0
D-22ii	346	1	62.2	63.7	88	1.5	10	----	60.1	3.6	5	-1.4
D-22iii	347	1	60.1	61.6	66	1.5	10	----	56.9	4.7	5	-0.3
D-23ii	348	1	62.7	64.1	71	1.4	10	----	59.9	4.2	5	-0.8
D-25ii	349	1	62.1	64.4	71	2.3	10	----	59.9	4.5	5	-0.5
D-25iii	350	1	59.9	62.2	71	2.3	10	----	56.6	5.6	5	0.6
D-26iia	351	1	60.6	63.5	71	2.9	10	----	59.6	3.9	5	-1.1
D-26iib	352	1	60.2	62.7	66	2.5	10	----	59.3	3.4	5	-1.6
D-26iii	353	1	58.9	62.1	88	3.2	10	----	56.2	5.9	5	0.9
D-27iia	354	1	61.2	63.4	66	2.2	10	----	61.1	2.3	5	-2.7
D-27iib	355	1	60.7	62.9	66	2.2	10	----	60.5	2.4	5	-2.6
D-28iia	356	1	60.3	62.3	66	2.0	10	----	60.2	2.1	5	-2.9
D-28iib	357	1	60.2	62.2	66	2.0	10	----	60.3	1.9	5	-3.1
D-28iii	358	1	56.8	59.1	71	2.3	10	----	55.4	3.7	5	-1.3
D-29a	359	1	61.6	64.7	88	3.1	10	----	58.9	5.8	5	0.8
D-29b	360	1	59.5	61.7	71	2.2	10	----	58.0	3.7	5	-1.3
D-29iia	361	1	60.0	61.9	66	1.9	10	----	60.0	1.9	5	-3.1
D-29iib	362	1	60.3	62.1	66	1.8	10	----	60.7	1.4	5	-3.6
D-32iiia	363	1	59.7	61.6	71	1.9	10	----	60.0	1.6	5	-3.4

D-32iiib	364	1	60.3	62.5	88	2.2	10	----	60.9	1.6	5	-3.4
D-33ii	365	1	63.4	65.8	66	2.4	10	----	60.4	5.4	5	0.4
D-33iii	366	1	61.0	63.6	66	2.6	10	----	59.1	4.5	5	-0.5
D-33iv	367	1	59.8	62.3	66	2.5	10	----	57.7	4.6	5	-0.4
D-33va	368	1	58.6	60.9	66	2.3	10	----	57.8	3.1	5	-1.9
D-33vb	369	1	62.4	64.2	88	1.8	10	----	63.2	1.0	5	-4.0
D-33vi	370	1	60.4	62.4	66	2.0	10	----	61.2	1.2	5	-3.8
D-34ii	371	1	65.4	68.0	66	2.6	10	Snd Lvl	61.8	6.2	5	1.2
D-34iii	372	1	63.6	66.0	66	2.4	10	Snd Lvl	61.6	4.4	5	-0.6
D-34iv	373	1	61.0	63.1	88	2.1	10	----	60.0	3.1	5	-1.9
D-34v	374	1	62.4	64.4	88	2.0	10	----	63.4	1.0	5	-4.0

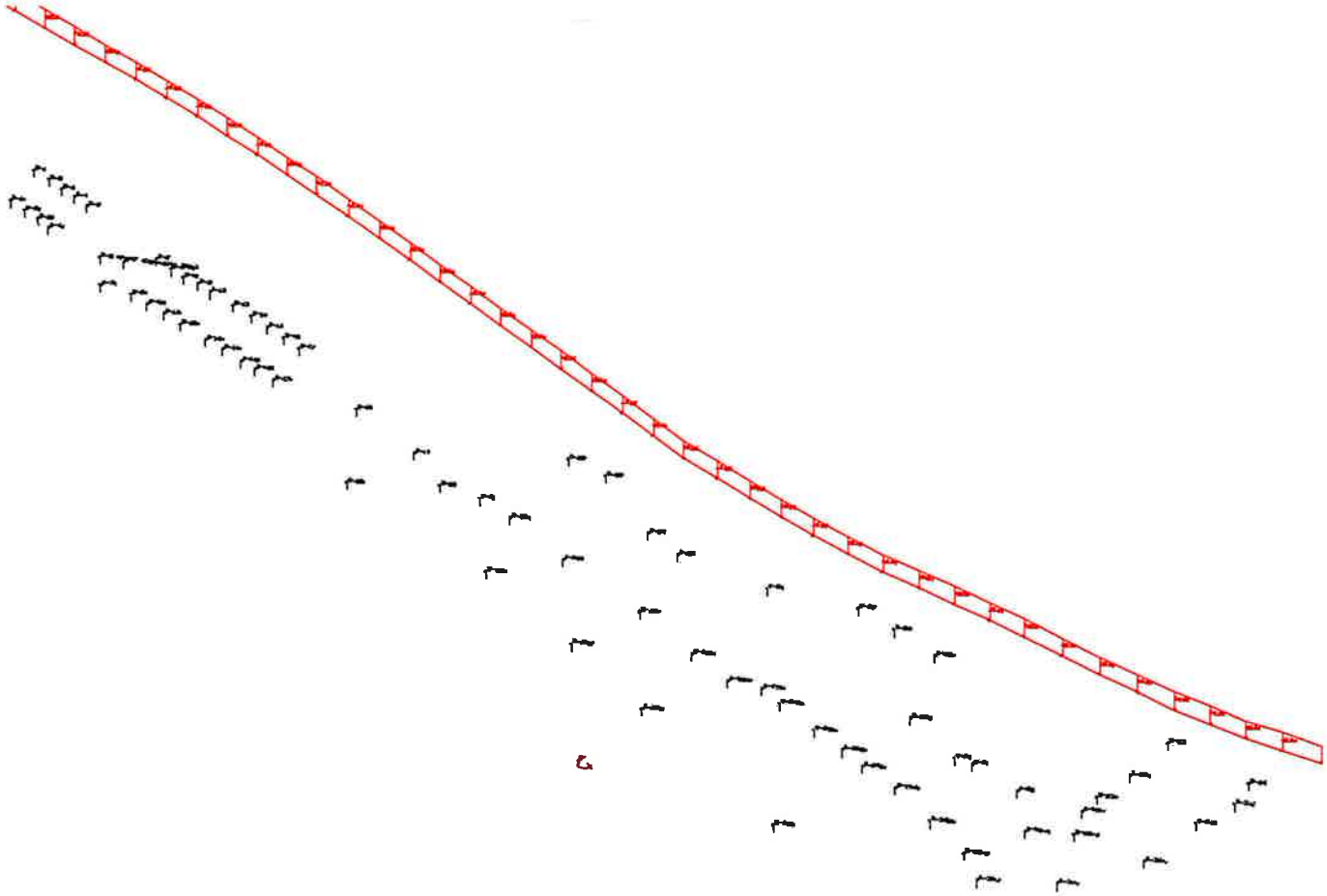
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	117	0.3	2.7	9.0
All Impacted	24	0.3	1.6	6.2
All that meet NR Goal	13	5.1	6.3	9.0

ms consultants, inc. 18 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D All

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	12.00	12.00	12.00	4063	48755				0
									Total Cost:	0



MP 28-31 NSA D Proposed with Plaza		Sheet 1 of 1	18 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D All		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	═══
Terrain Line:	———	Skew Section:	—→

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18 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D West Final
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.7	66	1.3	10	Snd Lvl	68.2	0.5	5	-4.5
D-2	297	3	67.3	68.1	66	0.8	10	Snd Lvl	67.7	0.4	5	-4.6
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-4	299	3	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-5	300	2	66.4	67.1	66	0.7	10	Snd Lvl	66.7	0.4	5	-4.6
D-6 (Pool)	301	1	63.6	64.9	66	1.3	10	----	64.2	0.7	5	-4.3
D-7 (Community Bldg)	302	1	62.9	64.2	66	1.3	10	----	63.4	0.8	5	-4.2
D-8	303	2	63.5	64.3	66	0.8	10	----	63.5	0.8	5	-4.2
D-9	304	2	63.2	63.5	66	0.3	10	----	62.6	0.9	5	-4.1
D-10	305	2	62.9	62.9	66	0.0	10	----	62.0	0.9	5	-4.1
D-11	306	2	62.7	62.5	66	-0.2	10	----	61.6	0.9	5	-4.1
D-12	307	2	62.4	62.3	66	-0.1	10	----	61.3	1.0	5	-4.0
D-13	308	3	62.2	62.2	66	0.0	10	----	61.0	1.2	5	-3.8
D-14	309	2	62.2	62.3	66	0.1	10	----	61.0	1.3	5	-3.7
D-15	310	3	62.1	62.1	66	0.0	10	----	60.8	1.3	5	-3.7
D-16	311	2	62.1	62.2	66	0.1	10	----	60.7	1.5	5	-3.5
D-17	312	2	62.1	62.3	66	0.2	10	----	60.6	1.7	5	-3.3
D-18	313	1	59.9	61.5	66	1.6	10	----	59.4	2.1	5	-2.9
D-19	314	1	61.0	62.7	88	1.7	10	----	59.3	3.4	5	-1.6
D-20	315	1	59.8	61.5	66	1.7	10	----	57.1	4.4	5	-0.6
D-21	316	1	61.5	63.2	66	1.7	10	----	59.3	3.9	5	-1.1
D-1ii	331	3	67.2	68.2	66	1.0	10	Snd Lvl	67.6	0.6	5	-4.4
D-2ii	332	2	66.7	67.5	66	0.8	10	Snd Lvl	66.9	0.6	5	-4.4
D-3ii	333	2	66.6	67.0	66	0.4	10	Snd Lvl	66.4	0.6	5	-4.4

D-4ii	334	2	66.4	66.6	66	0.2	10	Snd Lvl	66.0	0.6	5	-4.4
D-7ii	335	3	63.2	64.1	66	0.9	10	----	63.3	0.8	5	-4.2
D-8ii	336	3	62.6	62.9	66	0.3	10	----	62.0	0.9	5	-4.1
D-10ii	337	2	62.4	62.6	66	0.2	10	----	61.7	0.9	5	-4.1
D-11ii	338	3	62.1	62.4	66	0.3	10	----	61.4	1.0	5	-4.0
D-12ii	339	2	61.9	61.9	66	0.0	10	----	60.8	1.1	5	-3.9
D-13ii	340	3	61.6	61.6	66	0.0	10	----	60.4	1.2	5	-3.8
D-14ii	341	2	61.5	61.4	66	-0.1	10	----	60.2	1.2	5	-3.8
D-15ii	342	3	61.3	61.0	66	-0.3	10	----	59.8	1.2	5	-3.8
D-16ii	343	2	61.0	61.1	66	0.1	10	----	59.6	1.5	5	-3.5
D-17ii	344	3	60.5	61.3	66	0.8	10	----	59.4	1.9	5	-3.1
D-18ii	345	1	57.4	59.3	88	1.9	10	----	56.9	2.4	5	-2.6

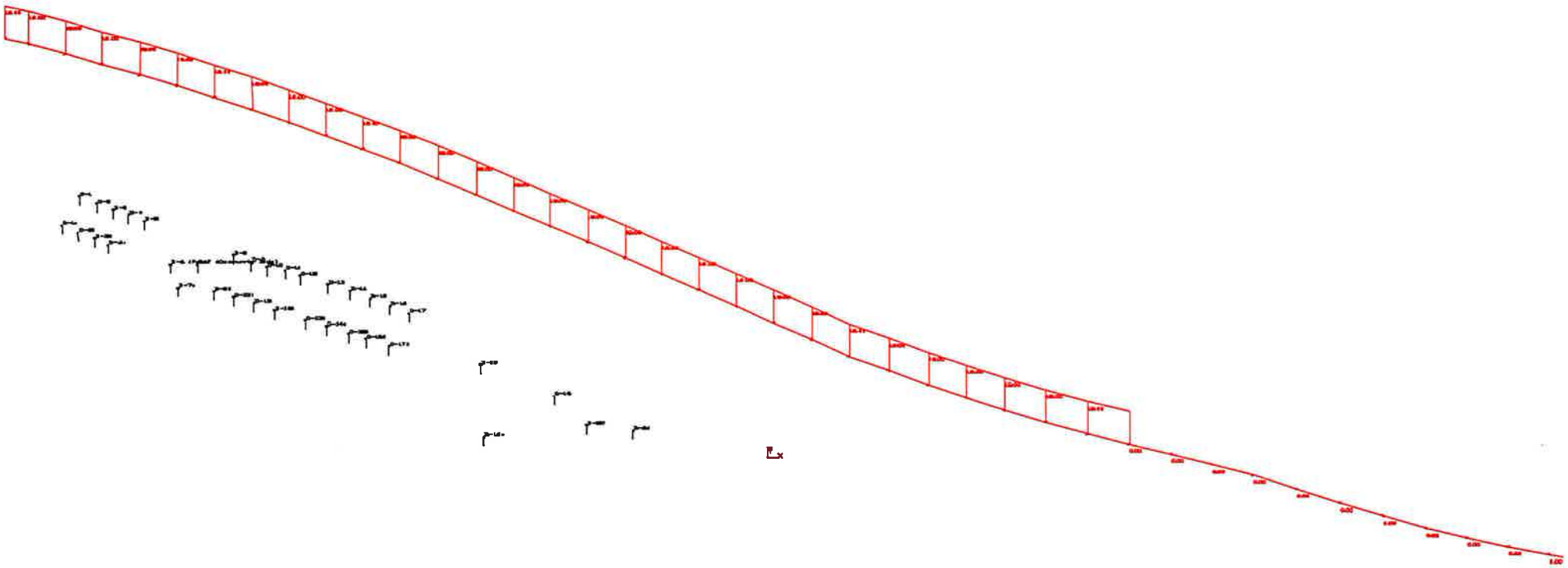
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	76	0.4	1.3	4.4
All Impacted	21	0.4	0.5	0.6
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc. 18 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D West Final

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	18.00	18.00	18.00	2971	53483				0
									Total Cost:	0



MP 28-31 NSA D Proposed with Plaza		Sheet 1 of 1	18 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D West Final		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	= =
Terrain Line:	———	Skew Section:	—→

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KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D East Final
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-33	327	1	69.5	71.2	88	1.7	10	----	61.3	9.9	5	4.9
D-32	326	1	58.8	60.9	88	2.1	10	----	58.4	2.5	5	-2.5
D-34	328	1	68.4	68.7	66	0.3	10	Snd Lvl	63.7	5.0	5	0.0
D-32iiia	363	1	59.7	61.6	71	1.9	10	----	60.9	0.7	5	-4.3
D-32iiib	364	1	60.3	62.5	88	2.2	10	----	61.5	1.0	5	-4.0
D-33ii	365	1	63.4	65.8	66	2.4	10	----	60.5	5.3	5	0.3
D-33iii	366	1	61.0	63.6	66	2.6	10	----	59.5	4.1	5	-0.9
D-33iv	367	1	59.8	62.3	66	2.5	10	----	58.2	4.1	5	-0.9
D-33va	368	1	58.6	60.9	66	2.3	10	----	58.5	2.4	5	-2.6
D-33vb	369	1	62.4	64.2	88	1.8	10	----	63.2	1.0	5	-4.0
D-33vi	370	1	60.4	62.4	66	2.0	10	----	61.6	0.8	5	-4.2
D-34ii	371	1	65.4	68.0	66	2.6	10	Snd Lvl	61.4	6.6	5	1.6
D-34iii	372	1	63.6	66.0	66	2.4	10	Snd Lvl	61.4	4.6	5	-0.4
D-34iv	373	1	61.0	63.1	88	2.1	10	----	60.2	2.9	5	-2.1
D-34v	374	1	62.4	64.4	88	2.0	10	----	63.5	0.9	5	-4.1

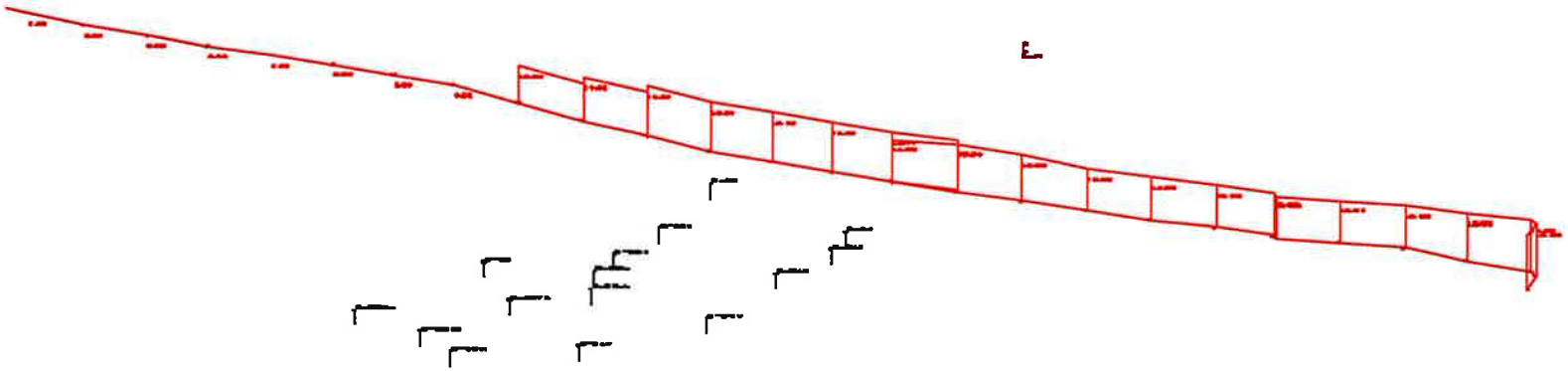
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	15	0.7	3.5	9.9
All Impacted	3	4.6	5.4	6.6
All that meet NR Goal	3	5.3	7.3	9.9

ms consultants, inc. 15 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D East Final

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	12.00	15.11	16.00	689	10407				0
SB-4A	W	13.50	14.44	17.50	1070	15455				0
									Total Cost:	0



MP 28-31 NSA D Proposed with Plaza		Sheet 1 of 1	15 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D East Final		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

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KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D East Extended
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.7	66	1.3	10	Snd Lvl	68.7	0.0	5	-5.0
D-2	297	3	67.3	68.1	66	0.8	10	Snd Lvl	68.1	0.0	5	-5.0
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.5	0.0	5	-5.0
D-4	299	3	66.8	67.5	66	0.7	10	Snd Lvl	67.5	0.0	5	-5.0
D-5	300	2	66.4	67.1	66	0.7	10	Snd Lvl	67.1	0.0	5	-5.0
D-6 (Pool)	301	1	63.6	64.9	66	1.3	10	----	64.9	0.0	5	-5.0
D-7 (Community Bldg)	302	1	62.9	64.2	66	1.3	10	----	64.2	0.0	5	-5.0
D-8	303	2	63.5	64.3	66	0.8	10	----	64.3	0.0	5	-5.0
D-9	304	2	63.2	63.5	66	0.3	10	----	63.5	0.0	5	-5.0
D-10	305	2	62.9	62.9	66	0.0	10	----	62.9	0.0	5	-5.0
D-11	306	2	62.7	62.5	66	-0.2	10	----	62.5	0.0	5	-5.0
D-12	307	2	62.4	62.3	66	-0.1	10	----	62.3	0.0	5	-5.0
D-13	308	3	62.2	62.2	66	0.0	10	----	62.2	0.0	5	-5.0
D-14	309	2	62.2	62.3	66	0.1	10	----	62.2	0.1	5	-4.9
D-15	310	3	62.1	62.1	66	0.0	10	----	62.1	0.0	5	-5.0
D-16	311	2	62.1	62.2	66	0.1	10	----	62.2	0.0	5	-5.0
D-17	312	2	62.1	62.3	66	0.2	10	----	62.2	0.1	5	-4.9
D-18	313	1	59.9	61.5	66	1.6	10	----	61.3	0.2	5	-4.8
D-19	314	1	61.0	62.7	88	1.7	10	----	62.2	0.5	5	-4.5
D-20	315	1	59.8	61.5	66	1.7	10	----	60.7	0.8	5	-4.2
D-21	316	1	61.5	63.2	66	1.7	10	----	62.2	1.0	5	-4.0
D-22	317	1	64.5	64.6	71	0.1	10	----	63.4	1.2	5	-3.8
D-23	318	1	65.0	65.1	71	0.1	10	----	62.2	2.9	5	-2.1

D-24	319	1	63.4	64.8	66	1.4	10	----	59.7	5.1	5	0.1
D-25	320	1	62.8	64.8	66	2.0	10	----	59.1	5.7	5	0.7
D-26	321	1	61.3	64.9	88	3.6	10	----	58.1	6.8	5	1.8
D-27	322	1	61.7	66.8	88	5.1	10	----	59.2	7.6	5	2.6
D-28	323	1	60.7	65.5	88	4.8	10	----	58.5	7.0	5	2.0
D-30	324	1	59.0	61.2	66	2.2	10	----	57.9	3.3	5	-1.7
D-31	325	1	58.7	61.0	71	2.3	10	----	57.2	3.8	5	-1.2
D-32	326	1	58.8	60.9	88	2.1	10	----	56.7	4.2	5	-0.8
D-33	327	1	69.5	71.2	88	1.7	10	----	61.4	9.8	5	4.8
D-34	328	1	68.4	68.7	66	0.3	10	Snd Lvl	63.9	4.8	5	-0.2
D-1ii	331	3	67.2	68.2	66	1.0	10	Snd Lvl	68.2	0.0	5	-5.0
D-2ii	332	2	66.7	67.5	66	0.8	10	Snd Lvl	67.5	0.0	5	-5.0
D-3ii	333	2	66.6	67.0	66	0.4	10	Snd Lvl	67.0	0.0	5	-5.0
D-4ii	334	2	66.4	66.6	66	0.2	10	Snd Lvl	66.6	0.0	5	-5.0
D-7ii	335	3	63.2	64.1	66	0.9	10	----	64.1	0.0	5	-5.0
D-8ii	336	3	62.6	62.9	66	0.3	10	----	62.8	0.1	5	-4.9
D-10ii	337	2	62.4	62.6	66	0.2	10	----	62.6	0.0	5	-5.0
D-11ii	338	3	62.1	62.4	66	0.3	10	----	62.3	0.1	5	-4.9
D-12ii	339	2	61.9	61.9	66	0.0	10	----	61.9	0.0	5	-5.0
D-13ii	340	3	61.6	61.6	66	0.0	10	----	61.5	0.1	5	-4.9
D-14ii	341	2	61.5	61.4	66	-0.1	10	----	61.3	0.1	5	-4.9
D-15ii	342	3	61.3	61.0	66	-0.3	10	----	60.9	0.1	5	-4.9
D-16ii	343	2	61.0	61.1	66	0.1	10	----	60.9	0.2	5	-4.8
D-17ii	344	3	60.5	61.3	66	0.8	10	----	61.1	0.2	5	-4.8
D-18ii	345	1	57.4	59.3	88	1.9	10	----	59.0	0.3	5	-4.7
D-22ii	346	1	62.2	63.7	88	1.5	10	----	62.3	1.4	5	-3.6
D-22iii	347	1	60.1	61.6	66	1.5	10	----	59.6	2.0	5	-3.0
D-23ii	348	1	62.7	64.1	71	1.4	10	----	61.6	2.5	5	-2.5
D-25ii	349	1	62.1	64.4	71	2.3	10	----	61.0	3.4	5	-1.6
D-25iii	350	1	59.9	62.2	71	2.3	10	----	58.7	3.5	5	-1.5
D-26iia	351	1	60.6	63.5	71	2.9	10	----	60.4	3.1	5	-1.9
D-26iib	352	1	60.2	62.7	66	2.5	10	----	60.0	2.7	5	-2.3
D-26iii	353	1	58.9	62.1	88	3.2	10	----	58.4	3.7	5	-1.3
D-27iia	354	1	61.2	63.4	66	2.2	10	----	61.3	2.1	5	-2.9
D-27iib	355	1	60.7	62.9	66	2.2	10	----	60.6	2.3	5	-2.7
D-28iia	356	1	60.3	62.3	66	2.0	10	----	60.2	2.1	5	-2.9
D-28iib	357	1	60.2	62.2	66	2.0	10	----	60.3	1.9	5	-3.1
D-28iii	358	1	56.8	59.1	71	2.3	10	----	55.9	3.2	5	-1.8
D-29a	359	1	61.6	64.7	88	3.1	10	----	58.5	6.2	5	1.2
D-29b	360	1	59.5	61.7	71	2.2	10	----	57.9	3.8	5	-1.2

D-29iia	361	1	60.0	61.9	66	1.9	10	----	60.0	1.9	5	-3.1
D-29iib	362	1	60.3	62.1	66	1.8	10	----	60.7	1.4	5	-3.6
D-32iiia	363	1	59.7	61.6	71	1.9	10	----	60.0	1.6	5	-3.4
D-32iiib	364	1	60.3	62.5	88	2.2	10	----	60.9	1.6	5	-3.4
D-33ii	365	1	63.4	65.8	66	2.4	10	----	59.9	5.9	5	0.9
D-33iii	366	1	61.0	63.6	66	2.6	10	----	58.7	4.9	5	-0.1
D-33iv	367	1	59.8	62.3	66	2.5	10	----	57.4	4.9	5	-0.1
D-33va	368	1	58.6	60.9	66	2.3	10	----	57.7	3.2	5	-1.8
D-33vb	369	1	62.4	64.2	88	1.8	10	----	63.1	1.1	5	-3.9
D-33vi	370	1	60.4	62.4	66	2.0	10	----	61.1	1.3	5	-3.7
D-34ii	371	1	65.4	68.0	66	2.6	10	Snd Lvl	61.5	6.5	5	1.5
D-34iii	372	1	63.6	66.0	66	2.4	10	Snd Lvl	61.3	4.7	5	-0.3
D-34iv	373	1	61.0	63.1	88	2.1	10	----	59.8	3.3	5	-1.7
D-34v	374	1	62.4	64.4	88	2.0	10	----	63.4	1.0	5	-4.0

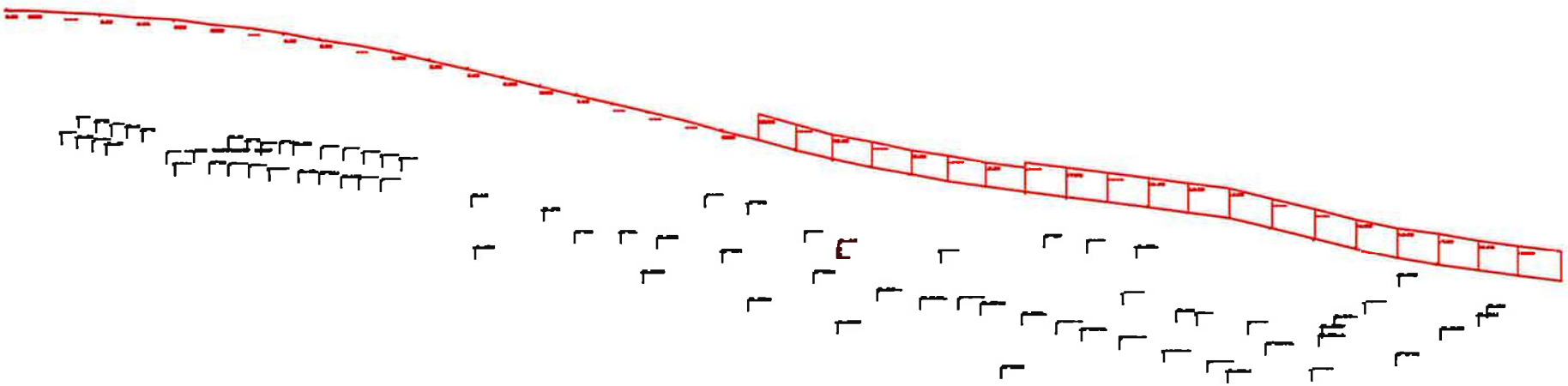
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	117	0.0	2.0	9.8
All Impacted	24	0.0	1.3	6.5
All that meet NR Goal	9	5.1	6.7	9.8

ms consultants, inc. 15 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed with Plaza
BARRIER DESIGN: Barr D East Extended

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	12.00	13.30	14.00	2003	26633				0
									Total Cost:	0



MP 28-31 NSA D Proposed with Plaza		Sheet 1 of 1	15 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D East Extended		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

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15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed with Plaza
BARRIER DESIGN: Barrier E Final

ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	301	1	65.0	66.9	66	1.9	10	Snd Lvl	66.8	0.1	5	-4.9
E-2	302	1	65.1	66.9	66	1.8	10	Snd Lvl	66.9	0.0	5	-5.0
E-3	303	1	65.3	67.1	66	1.8	10	Snd Lvl	67.1	0.0	5	-5.0
E-4	304	1	65.5	67.3	66	1.8	10	Snd Lvl	67.2	0.1	5	-4.9
E-5	305	1	65.2	67.0	66	1.8	10	Snd Lvl	66.9	0.1	5	-4.9
E-6	306	1	65.0	66.8	66	1.8	10	Snd Lvl	66.7	0.1	5	-4.9
E-7	307	1	64.7	66.5	66	1.8	10	Snd Lvl	66.4	0.1	5	-4.9
E-8	308	1	65.0	66.7	66	1.7	10	Snd Lvl	66.4	0.3	5	-4.7
E-9	309	1	64.5	66.2	66	1.7	10	Snd Lvl	65.8	0.4	5	-4.6
E-10	310	1	64.4	66.0	66	1.6	10	Snd Lvl	65.6	0.4	5	-4.6
E-11	311	1	64.2	65.9	66	1.7	10	----	65.4	0.5	5	-4.5
E-12	312	1	64.4	66.1	66	1.7	10	Snd Lvl	65.5	0.6	5	-4.4
E-13	313	1	64.8	66.6	66	1.8	10	Snd Lvl	65.9	0.7	5	-4.3
E-14	314	1	65.1	66.7	66	1.6	10	Snd Lvl	66.0	0.7	5	-4.3
E-15	315	1	64.8	66.5	66	1.7	10	Snd Lvl	65.7	0.8	5	-4.2
E-16	316	1	65.1	66.7	66	1.6	10	Snd Lvl	65.9	0.8	5	-4.2
E-17	317	1	64.6	66.2	66	1.6	10	Snd Lvl	65.3	0.9	5	-4.1
E-18	318	1	62.7	64.5	66	1.8	10	----	63.6	0.9	5	-4.1
E-19	319	1	61.1	63.0	66	1.9	10	----	62.1	0.9	5	-4.1
E-20	320	1	59.6	61.5	66	1.9	10	----	60.7	0.8	5	-4.2
E-21	321	1	58.4	60.5	66	2.1	10	----	59.8	0.7	5	-4.3
E-22	322	1	57.3	59.4	66	2.1	10	----	58.8	0.6	5	-4.4
E-23	323	1	52.9	54.9	66	2.0	10	----	54.2	0.7	5	-4.3

E-1ii	347	1	54.3	56.1	66	1.8	10	----	55.9	0.2	5	-4.8
E-2ii	348	1	58.0	59.9	66	1.9	10	----	59.7	0.2	5	-4.8
E-3ii	349	1	59.8	61.6	66	1.8	10	----	61.4	0.2	5	-4.8
E-3iii	350	1	59.6	61.4	66	1.8	10	----	61.1	0.3	5	-4.7
E-3iv	351	1	58.6	60.3	66	1.7	10	----	60.1	0.2	5	-4.8
E-3v	352	1	58.7	60.4	66	1.7	10	----	60.1	0.3	5	-4.7
E-3vi	353	1	58.1	59.8	66	1.7	10	----	59.7	0.1	5	-4.9
E-4ii	354	1	59.6	61.4	66	1.8	10	----	61.2	0.2	5	-4.8
E-4vi	355	1	57.6	59.2	66	1.6	10	----	59.1	0.1	5	-4.9
E-5ii	356	1	60.2	62.0	66	1.8	10	----	61.8	0.2	5	-4.8
E-5iii	357	1	57.2	59.0	66	1.8	10	----	58.9	0.1	5	-4.9
E-5vi	358	1	56.9	58.8	66	1.9	10	----	58.6	0.2	5	-4.8
E-6ii	359	1	60.8	62.5	66	1.7	10	----	62.4	0.1	5	-4.9
E-6iii	360	1	56.5	58.4	66	1.9	10	----	58.3	0.1	5	-4.9
E-6vi	361	1	56.9	58.8	66	1.9	10	----	58.7	0.1	5	-4.9
E-7ii	362	1	60.2	61.9	66	1.7	10	----	61.7	0.2	5	-4.8
E-7iii	363	1	56.5	58.3	66	1.8	10	----	58.2	0.1	5	-4.9
E-7vi	364	1	56.4	58.3	66	1.9	10	----	58.1	0.2	5	-4.8
E-8ii	365	1	60.1	61.9	66	1.8	10	----	61.7	0.2	5	-4.8
E-8iii	366	1	55.0	56.9	66	1.9	10	----	56.7	0.2	5	-4.8
E-8vi	367	1	56.1	58.0	66	1.9	10	----	57.9	0.1	5	-4.9
E-9ii	368	1	60.1	61.9	66	1.8	10	----	61.6	0.3	5	-4.7
E-9via	369	1	55.5	57.4	66	1.9	10	----	57.2	0.2	5	-4.8
E-9vib	370	1	55.1	57.1	66	2.0	10	----	56.9	0.2	5	-4.8
E-10ii	371	1	57.5	59.4	66	1.9	10	----	59.2	0.2	5	-4.8
E-10iii	372	1	56.9	58.8	66	1.9	10	----	58.6	0.2	5	-4.8
E-10iv	373	1	55.8	57.7	66	1.9	10	----	57.6	0.1	5	-4.9
E-10v	374	1	55.6	57.6	66	2.0	10	----	57.4	0.2	5	-4.8
E-10vi	375	1	55.3	57.3	66	2.0	10	----	57.2	0.1	5	-4.9
E-16ii	376	1	59.1	60.7	66	1.6	10	----	60.1	0.6	5	-4.4
E-17ii	377	1	57.9	59.3	66	1.4	10	----	58.6	0.7	5	-4.3
E-18ii	378	1	55.7	57.0	66	1.3	10	----	56.2	0.8	5	-4.2
E-19ii	379	1	55.2	56.4	66	1.2	10	----	55.6	0.8	5	-4.2
E-22ii	380	1	54.9	56.9	66	2.0	10	----	56.2	0.7	5	-4.3
E-23iia	381	1	54.5	56.6	66	2.1	10	----	55.9	0.7	5	-4.3
E-23iib	382	1	53.7	55.8	66	2.1	10	----	55.0	0.8	5	-4.2
E-23iic	383	1	52.7	55.0	66	2.3	10	----	53.9	1.1	5	-3.9

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB

All Selected	60	0.0	0.4	1.1
All Impacted	16	0.0	0.4	0.9
All that meet NR Goal	0	0.0	0.0	0.0

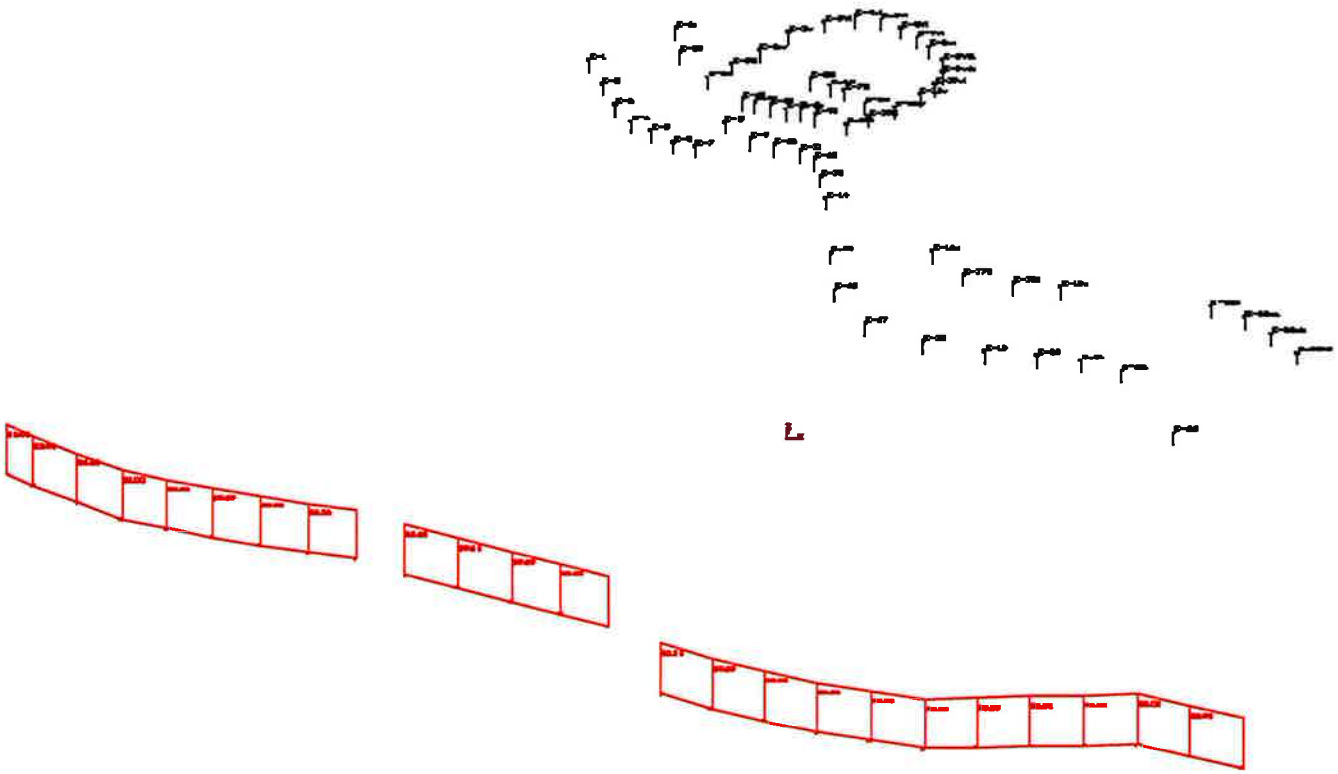
ms consultants, inc.
KLC 54200

15 July 2015
TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed with Plaza
BARRIER DESIGN: Barrier E Final

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier E West	W	20.00	20.00	20.00	746	14926				0
Barrier E Center	W	20.00	20.00	20.00	400	7993				0
Barrier E	W	20.00	20.00	20.00	1105	22107				0
									Total Cost:	0



MP 28-31 NSA E Proposed with Plaza		Sheet 1 of 1	15 Jul 2015
		ms consultants, inc.	
Barrier View-Barrier E Final		Project/Contract No. 60-06726-20	
Run name: PR_NSA_E		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	═══
Terrain Line:	———	Skew Section:	—→

Appendix 8

TNM Build without Warrendale Toll Plaza Model

ms consultants, inc.
VRM

15 July 2015
TNM 2.5
Calculated with TNM 2.5

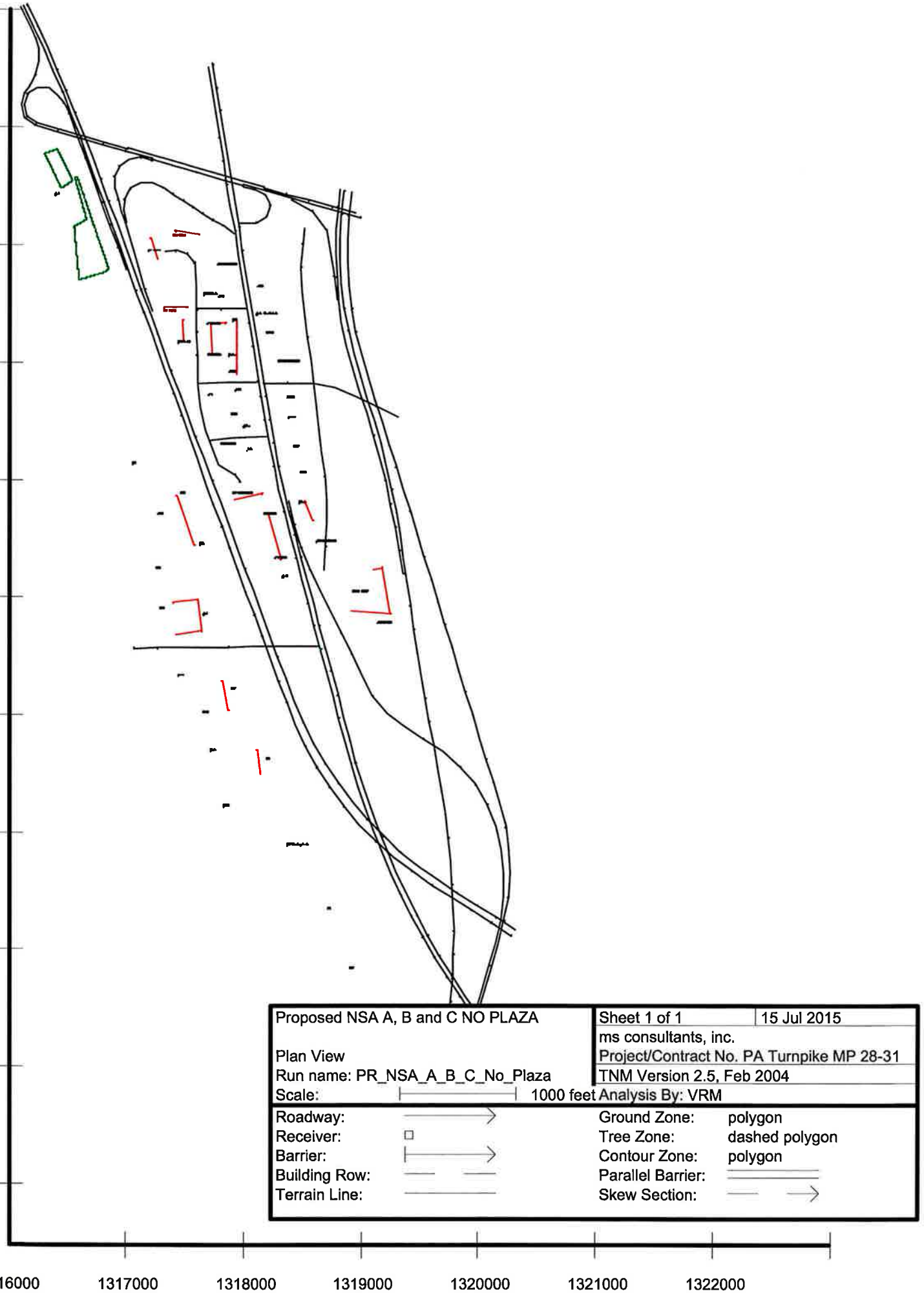
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: PA Turnpike MP 28-31
RUN: Proposed NSA A, B and C NO PLAZA
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
A-1	308	1	61.3	62.1	71	0.8	10	----	62.1	0.0	5	-5.0
B-1 (Hotel)	309	1	68.8	70.8	71	2.0	10	----	70.8	0.0	5	-5.0
B-2 (Hotel)	310	1	72.6	75.5	71	2.9	10	Snd Lvl	75.5	0.0	5	-5.0
B-3 (Hotel)	311	1	70.6	74.4	71	3.8	10	Snd Lvl	74.4	0.0	5	-5.0
B-4 (Hotel)	312	1	64.7	66.5	71	1.8	10	----	66.5	0.0	5	-5.0
B-5	313	1	67.0	69.3	71	2.3	10	----	69.3	0.0	5	-5.0
B-6 (Daycare)	314	1	71.2	73.8	66	2.6	10	Snd Lvl	73.8	0.0	5	-5.0
B-7 (Auto Dealer)	315	1	70.9	75.0	88	4.1	10	----	75.0	0.0	5	-5.0
B-8 (Hotel)	316	1	65.0	66.1	71	1.1	10	----	66.1	0.0	5	-5.0
B-9 (Hotel)	317	1	66.0	67.8	71	1.8	10	----	67.8	0.0	5	-5.0
B-10	318	1	67.1	68.8	71	1.7	10	----	68.8	0.0	5	-5.0
B-1ii (Hotel)	319	1	60.9	62.3	71	1.4	10	----	62.3	0.0	5	-5.0
B-1iii (Gas Station)	320	1	64.9	66.5	88	1.6	10	----	66.5	0.0	5	-5.0
B-2ii (Hotel)	321	1	63.3	64.9	71	1.6	10	----	64.9	0.0	5	-5.0
B-2iii	322	1	63.7	65.4	71	1.7	10	----	65.4	0.0	5	-5.0
B-2iv	323	1	70.3	70.6	71	0.3	10	----	70.6	0.0	5	-5.0
B-3ii (Hotel)	324	1	61.3	63.1	71	1.8	10	----	63.1	0.0	5	-5.0
B-3iii	325	1	63.6	65.4	71	1.8	10	----	65.4	0.0	5	-5.0
B-3iv (Gas Station)	326	1	72.5	74.2	88	1.7	10	----	74.2	0.0	5	-5.0
B-4iiia	327	1	61.6	63.8	71	2.2	10	----	63.8	0.0	5	-5.0
B-4iiib	328	1	63.1	65.2	71	2.1	10	----	65.2	0.0	5	-5.0
B-4iva	329	1	69.6	70.8	71	1.2	10	----	70.8	0.0	5	-5.0
B-4ivb (Gas Station)	330	1	65.9	67.7	88	1.8	10	----	67.7	0.0	5	-5.0

B-5iia	331	1	64.3	66.3	71	2.0	10	----	66.3	0.0	5	-5.0
B-5iib	332	1	65.2	66.8	71	1.6	10	----	66.8	0.0	5	-5.0
B-5iic	333	1	64.5	66.6	71	2.1	10	----	66.6	0.0	5	-5.0
B-5iva	334	1	63.6	65.2	71	1.6	10	----	65.2	0.0	5	-5.0
B-5ivb	335	1	63.9	65.6	71	1.7	10	----	65.6	0.0	5	-5.0
B-6ii	336	1	65.5	67.3	71	1.8	10	----	67.3	0.0	5	-5.0
B-6iv	337	1	63.4	65.1	71	1.7	10	----	65.1	0.0	5	-5.0
B-7iv	338	1	63.6	65.3	71	1.7	10	----	65.3	0.0	5	-5.0
B-8iv	339	1	66.8	68.4	71	1.6	10	----	68.4	0.0	5	-5.0
B-9iv (Picnic Area)	340	1	65.3	65.7	66	0.4	10	----	65.7	0.0	5	-5.0
B-10iva (Hotel)	341	1	60.9	63.0	71	2.1	10	----	63.0	0.0	5	-5.0
B-10ivb (Pool)	342	1	61.9	63.9	66	2.0	10	----	63.9	0.0	5	-5.0
C-1	346	1	59.6	61.5	71	1.9	10	----	61.5	0.0	5	-5.0
C-2	347	1	66.7	68.8	71	2.1	10	----	68.8	0.0	5	-5.0
C-3	348	1	66.8	68.9	71	2.1	10	----	68.9	0.0	5	-5.0
C-4	349	1	62.9	64.3	71	1.4	10	----	64.3	0.0	5	-5.0
C-5	350	1	63.2	64.5	71	1.3	10	----	64.5	0.0	5	-5.0
C-6	351	1	63.9	64.1	71	0.2	10	----	64.1	0.0	5	-5.0
C-7 (Trucking Yard)	352	1	60.1	61.9	88	1.8	10	----	61.9	0.0	5	-5.0
C-8	353	1	60.6	62.4	71	1.8	10	----	62.4	0.0	5	-5.0
C-9	354	1	59.9	61.7	71	1.8	10	----	61.7	0.0	5	-5.0
C-2ii	355	1	58.3	60.2	71	1.9	10	----	60.2	0.0	5	-5.0
C-3ii	356	1	57.4	60.1	71	2.7	10	----	60.1	0.0	5	-5.0
C-4ii	357	1	58.4	61.0	71	2.6	10	----	61.0	0.0	5	-5.0
C-5iia	358	1	58.4	60.4	71	2.0	10	----	60.4	0.0	5	-5.0
C-5iib	359	1	56.3	58.3	71	2.0	10	----	58.3	0.0	5	-5.0
C-6iia	360	1	56.7	58.8	71	2.1	10	----	58.8	0.0	5	-5.0
C-6iib	361	1	56.5	58.2	71	1.7	10	----	58.2	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	51	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0



Proposed NSA A, B and C NO PLAZA		Sheet 1 of 1	15 Jul 2015
		ms consultants, inc.	
Plan View		Project/Contract No. PA Turnpike MP 28-31	
Run name: PR_NSA_A_B_C_No_Plaza		TNM Version 2.5, Feb 2004	
Scale:	1000 feet	Analysis By: VRM	

Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

ms consultants, inc.
KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

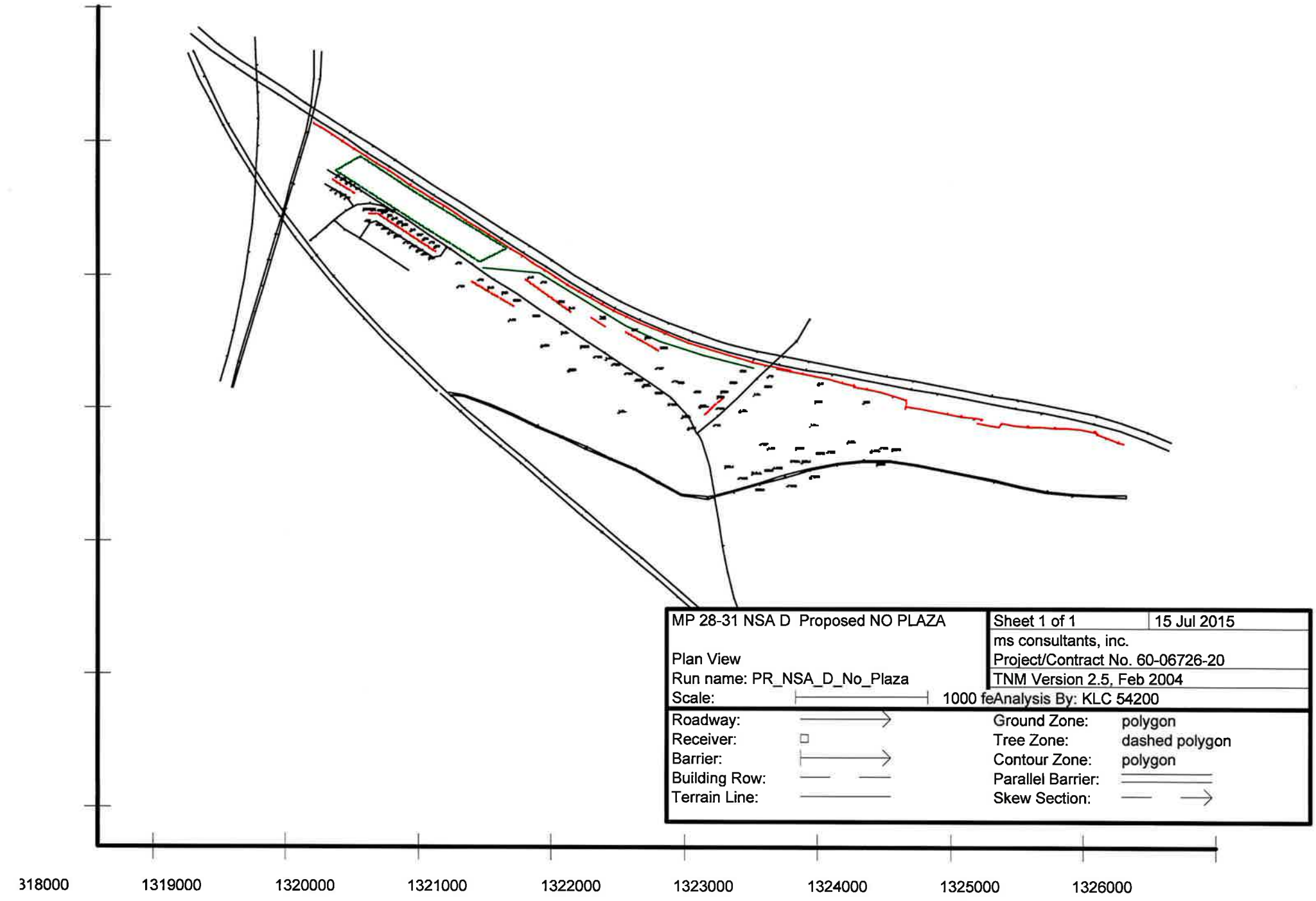
Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.8	66	1.4	10	Snd Lvl	68.3	0.5	5	-4.5
D-2	297	3	67.3	68.2	66	0.9	10	Snd Lvl	67.8	0.4	5	-4.6
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-4	299	3	66.8	67.6	66	0.8	10	Snd Lvl	67.1	0.5	5	-4.5
D-5	300	2	66.4	67.2	66	0.8	10	Snd Lvl	66.7	0.5	5	-4.5
D-6 (Pool)	301	1	63.6	65.0	66	1.4	10	----	64.3	0.7	5	-4.3
D-7 (Community Bldg)	302	1	62.9	64.3	66	1.4	10	----	63.5	0.8	5	-4.2
D-8	303	2	63.5	64.5	66	1.0	10	----	63.6	0.9	5	-4.1
D-9	304	2	63.2	63.7	66	0.5	10	----	62.7	1.0	5	-4.0
D-10	305	2	62.9	63.1	66	0.2	10	----	62.1	1.0	5	-4.0
D-11	306	2	62.7	62.7	66	0.0	10	----	61.7	1.0	5	-4.0
D-12	307	2	62.4	62.5	66	0.1	10	----	61.5	1.0	5	-4.0
D-13	308	3	62.2	62.5	66	0.3	10	----	61.2	1.3	5	-3.7
D-14	309	2	62.2	62.5	66	0.3	10	----	61.2	1.3	5	-3.7
D-15	310	3	62.1	62.4	66	0.3	10	----	61.0	1.4	5	-3.6
D-16	311	2	62.1	62.5	66	0.4	10	----	61.0	1.5	5	-3.5
D-17	312	2	62.1	62.7	66	0.6	10	----	60.9	1.8	5	-3.2
D-18	313	1	59.9	61.9	66	2.0	10	----	59.7	2.2	5	-2.8
D-19	314	1	61.0	63.3	88	2.3	10	----	59.8	3.5	5	-1.5
D-20	315	1	59.8	62.1	66	2.3	10	----	57.7	4.4	5	-0.6
D-21	316	1	61.5	63.8	66	2.3	10	----	59.7	4.1	5	-0.9
D-22	317	1	64.5	65.3	71	0.8	10	----	59.5	5.8	5	0.8
D-23	318	1	65.0	65.7	71	0.7	10	----	59.4	6.3	5	1.3

D-24	319	1	63.4	65.6	66	2.2	10	----	58.6	7.0	5	2.0
D-25	320	1	62.8	65.5	66	2.7	10	----	58.5	7.0	5	2.0
D-26	321	1	61.3	65.5	88	4.2	10	----	58.2	7.3	5	2.3
D-27	322	1	61.7	67.4	88	5.7	10	----	59.6	7.8	5	2.8
D-28	323	1	60.7	66.1	88	5.4	10	----	59.0	7.1	5	2.1
D-30	324	1	59.0	62.0	66	3.0	10	----	58.1	3.9	5	-1.1
D-31	325	1	58.7	61.9	71	3.2	10	----	57.5	4.4	5	-0.6
D-32	326	1	58.8	62.1	88	3.3	10	----	57.2	4.9	5	-0.1
D-33	327	1	69.5	72.3	88	2.8	10	----	62.2	10.1	5	5.1
D-34	328	1	68.4	71.6	66	3.2	10	Snd Lvl	63.9	7.7	5	2.7
D-37	329	1	57.3	61.2	66	3.9	10	----	60.3	0.9	5	-4.1
D-38	330	1	56.5	60.5	66	4.0	10	----	60.1	0.4	5	-4.6
D-1ii	331	3	67.2	68.3	66	1.1	10	Snd Lvl	67.6	0.7	5	-4.3
D-2ii	332	2	66.7	67.6	66	0.9	10	Snd Lvl	67.0	0.6	5	-4.4
D-3ii	333	2	66.6	67.1	66	0.5	10	Snd Lvl	66.4	0.7	5	-4.3
D-4ii	334	2	66.4	66.8	66	0.4	10	Snd Lvl	66.1	0.7	5	-4.3
D-7ii	335	3	63.2	64.3	66	1.1	10	----	63.4	0.9	5	-4.1
D-8ii	336	3	62.6	63.0	66	0.4	10	----	62.1	0.9	5	-4.1
D-10ii	337	2	62.4	62.8	66	0.4	10	----	61.8	1.0	5	-4.0
D-11ii	338	3	62.1	62.6	66	0.5	10	----	61.5	1.1	5	-3.9
D-12ii	339	2	61.9	62.1	66	0.2	10	----	61.0	1.1	5	-3.9
D-13ii	340	3	61.6	61.8	66	0.2	10	----	60.6	1.2	5	-3.8
D-14ii	341	2	61.5	61.6	66	0.1	10	----	60.4	1.2	5	-3.8
D-15ii	342	3	61.3	61.2	66	-0.1	10	----	60.0	1.2	5	-3.8
D-16ii	343	2	61.0	61.3	66	0.3	10	----	59.8	1.5	5	-3.5
D-17ii	344	3	60.5	61.7	66	1.2	10	----	59.7	2.0	5	-3.0
D-18ii	345	1	57.4	59.8	88	2.4	10	----	57.3	2.5	5	-2.5
D-22ii	346	1	62.2	64.4	88	2.2	10	----	60.0	4.4	5	-0.6
D-22iii	347	1	60.1	62.5	66	2.4	10	----	56.7	5.8	5	0.8
D-23ii	348	1	62.7	64.8	71	2.1	10	----	59.8	5.0	5	0.0
D-25ii	349	1	62.1	65.2	71	3.1	10	----	59.9	5.3	5	0.3
D-25iii	350	1	59.9	63.0	71	3.1	10	----	56.5	6.5	5	1.5
D-26iia	351	1	60.6	64.2	71	3.6	10	----	59.5	4.7	5	-0.3
D-26iib	352	1	60.2	63.2	66	3.0	10	----	59.2	4.0	5	-1.0
D-26iii	353	1	58.9	63.0	88	4.1	10	----	56.1	6.9	5	1.9
D-27iia	354	1	61.2	63.8	66	2.6	10	----	61.0	2.8	5	-2.2
D-27iib	355	1	60.7	63.3	66	2.6	10	----	60.4	2.9	5	-2.1
D-28iia	356	1	60.3	62.7	66	2.4	10	----	60.2	2.5	5	-2.5
D-28iib	357	1	60.2	62.6	66	2.4	10	----	60.2	2.4	5	-2.6
D-28iii	358	1	56.8	59.7	71	2.9	10	----	55.4	4.3	5	-0.7

D-29a	359	1	61.6	65.3	88	3.7	10	----	59.1	6.2	5	1.2
D-29b	360	1	59.5	62.3	71	2.8	10	----	58.1	4.2	5	-0.8
D-29iia	361	1	60.0	62.2	66	2.2	10	----	60.0	2.2	5	-2.8
D-29iib	362	1	60.3	62.5	66	2.2	10	----	61.0	1.5	5	-3.5
D-32iiia	363	1	59.7	62.0	71	2.3	10	----	60.2	1.8	5	-3.2
D-32iiib	364	1	60.3	62.8	88	2.5	10	----	61.0	1.8	5	-3.2
D-33ii	365	1	63.4	67.1	66	3.7	10	Snd Lvl	60.5	6.6	5	1.6
D-33iii	366	1	61.0	64.6	66	3.6	10	----	59.2	5.4	5	0.4
D-33iv	367	1	59.8	63.3	66	3.5	10	----	57.7	5.6	5	0.6
D-33va	368	1	58.6	61.6	66	3.0	10	----	57.8	3.8	5	-1.2
D-33vb	369	1	62.4	64.9	88	2.5	10	----	63.2	1.7	5	-3.3
D-33vi	370	1	60.4	62.8	66	2.4	10	----	61.2	1.6	5	-3.4
D-34ii	371	1	65.4	68.4	66	3.0	10	Snd Lvl	61.7	6.7	5	1.7
D-34iii	372	1	63.6	66.5	66	2.9	10	Snd Lvl	61.6	4.9	5	-0.1
D-34iv	373	1	61.0	64.2	88	3.2	10	----	60.0	4.2	5	-0.8
D-34v	374	1	62.4	64.7	88	2.3	10	----	63.4	1.3	5	-3.7
D-34vi	375	1	57.4	60.3	88	2.9	10	----	57.4	2.9	5	-2.1
D-35v	376	1	56.6	60.1	66	3.5	10	----	55.2	4.9	5	-0.1
D-35via	377	1	58.7	61.2	66	2.5	10	----	59.2	2.0	5	-3.0
D-35vib	378	1	58.3	60.9	66	2.6	10	----	58.7	2.2	5	-2.8
D-36v	379	1	56.3	61.3	66	5.0	10	----	58.5	2.8	5	-2.2
D-36via	380	1	58.1	60.7	66	2.6	10	----	58.4	2.3	5	-2.7
D-36vib	381	1	58.0	60.7	66	2.7	10	----	58.2	2.5	5	-2.5
D-36vii	382	1	61.7	63.7	66	2.0	10	----	63.0	0.7	5	-4.3
D-37iii	383	1	57.8	61.4	66	3.6	10	----	58.8	2.6	5	-2.4
D-37iv	384	1	56.5	60.0	66	3.5	10	----	57.0	3.0	5	-2.0
D-37va	385	1	56.4	60.0	66	3.6	10	----	56.5	3.5	5	-1.5
D-37via	386	1	57.6	60.5	66	2.9	10	----	57.9	2.6	5	-2.4
D-37vib	387	1	58.6	61.3	66	2.7	10	----	59.5	1.8	5	-3.2
D-37vb	388	1	57.4	60.4	66	3.0	10	----	58.0	2.4	5	-2.6
D-37vc	389	1	57.2	60.5	66	3.3	10	----	58.4	2.1	5	-2.9
D-37viia	390	1	59.6	62.7	66	3.1	10	----	60.7	2.0	5	-3.0
D-37viib	391	1	60.6	63.7	66	3.1	10	----	62.4	1.3	5	-3.7
D-38iiia	392	1	55.8	59.4	66	3.6	10	----	57.7	1.7	5	-3.3
D-38iiib	393	1	58.4	62.1	66	3.7	10	----	60.7	1.4	5	-3.6
D-38iiic	394	1	57.6	61.7	66	4.1	10	----	60.0	1.7	5	-3.3
D-38iiid	395	1	58.3	62.6	66	4.3	10	----	60.7	1.9	5	-3.1
D-38vi	396	1	63.2	66.0	66	2.8	10	Snd Lvl	65.5	0.5	5	-4.5

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max

		dB	dB	dB
All Selected	141	0.4	2.9	10.1
All Impacted	26	0.4	2.2	7.7
All that meet NR Goal	19	5.0	6.6	10.1


MP 28-31 NSA D Proposed NO PLAZA
Plan View
Run name: PR_NSA_D_No_Plaza
Scale: 1000 feAnalysis By: KLC 54200
Sheet 1 of 1
15 Jul 2015
ms consultants, inc.
Project/Contract No. 60-06726-20
TNM Version 2.5, Feb 2004
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
318000
1319000
1320000
1321000
1322000
1323000
1324000
1325000
1326000

ms consultants, inc.
KLC 54200

14 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed NO PLAZA
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

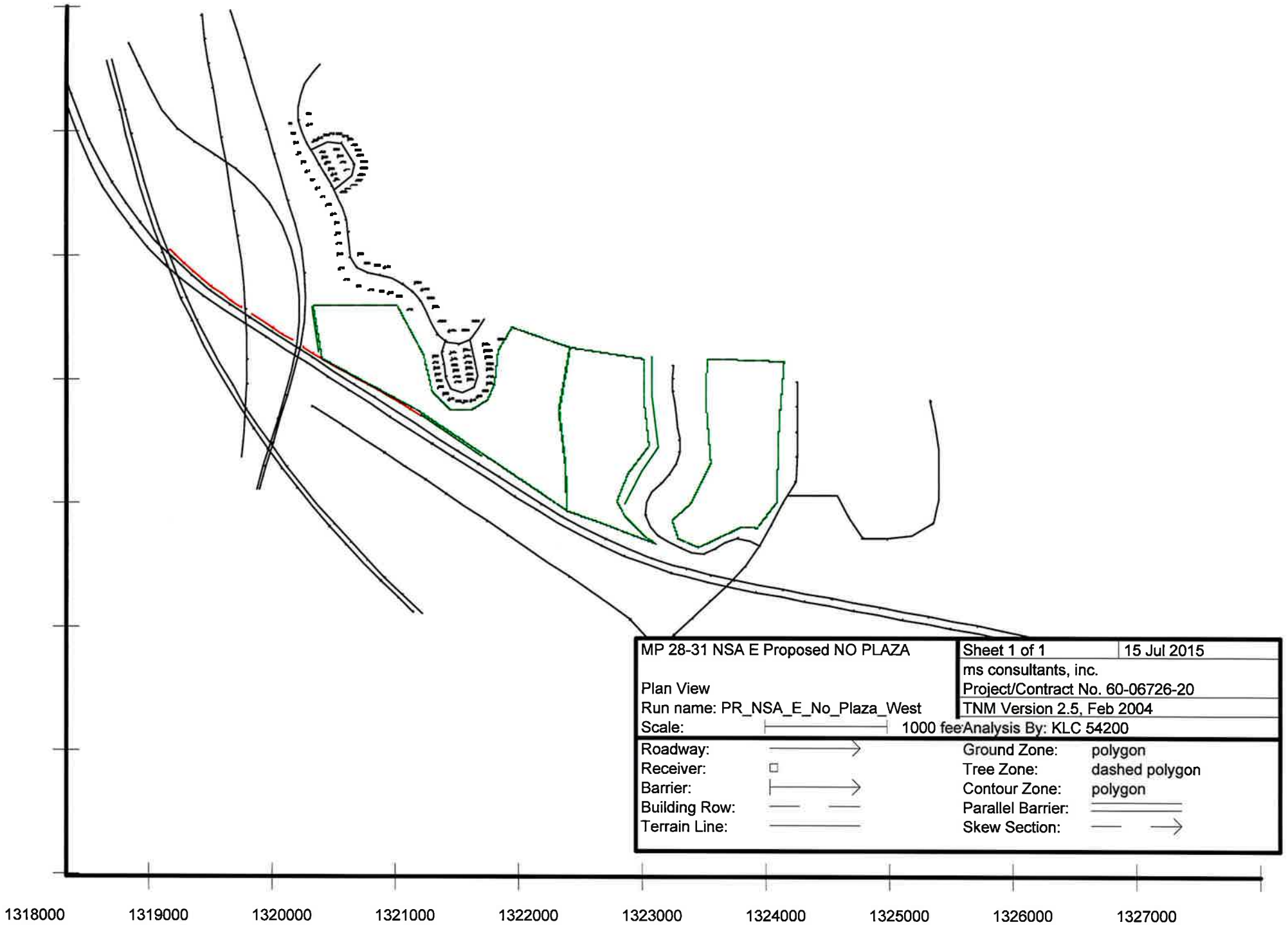
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	301	1	65.0	66.9	66	1.9	10	Snd Lvl	66.9	0.0	5	-5.0
E-2	302	1	65.1	67.0	66	1.9	10	Snd Lvl	67.0	0.0	5	-5.0
E-3	303	1	65.3	67.2	66	1.9	10	Snd Lvl	67.1	0.1	5	-4.9
E-4	304	1	65.5	67.3	66	1.8	10	Snd Lvl	67.3	0.0	5	-5.0
E-5	305	1	65.2	67.1	66	1.9	10	Snd Lvl	67.0	0.1	5	-4.9
E-6	306	1	65.0	66.9	66	1.9	10	Snd Lvl	66.7	0.2	5	-4.8
E-7	307	1	64.7	66.6	66	1.9	10	Snd Lvl	66.4	0.2	5	-4.8
E-8	308	1	65.0	66.9	66	1.9	10	Snd Lvl	66.6	0.3	5	-4.7
E-9	309	1	64.5	66.4	66	1.9	10	Snd Lvl	66.0	0.4	5	-4.6
E-10	310	1	64.4	66.2	66	1.8	10	Snd Lvl	65.9	0.3	5	-4.7
E-11	311	1	64.2	66.2	66	2.0	10	Snd Lvl	65.7	0.5	5	-4.5
E-12	312	1	64.4	66.4	66	2.0	10	Snd Lvl	65.8	0.6	5	-4.4
E-13	313	1	64.8	66.9	66	2.1	10	Snd Lvl	66.3	0.6	5	-4.4
E-14	314	1	65.1	67.1	66	2.0	10	Snd Lvl	66.4	0.7	5	-4.3
E-15	315	1	64.8	66.8	66	2.0	10	Snd Lvl	66.2	0.6	5	-4.4
E-16	316	1	65.1	66.9	66	1.8	10	Snd Lvl	66.3	0.6	5	-4.4
E-17	317	1	64.6	66.5	66	1.9	10	Snd Lvl	65.9	0.6	5	-4.4
E-18	318	1	62.7	64.9	66	2.2	10	----	64.1	0.8	5	-4.2
E-19	319	1	61.1	63.3	66	2.2	10	----	62.7	0.6	5	-4.4
E-20	320	1	59.6	61.8	66	2.2	10	----	61.3	0.5	5	-4.5
E-21	321	1	58.4	60.8	66	2.4	10	----	60.2	0.6	5	-4.4
E-22	322	1	57.3	59.7	66	2.4	10	----	59.2	0.5	5	-4.5
E-23	323	1	52.9	55.2	66	2.3	10	----	54.6	0.6	5	-4.4
E-24	324	1	50.4	52.9	66	2.5	10	----	52.2	0.7	5	-4.3

E-25	325	1	51.3	53.5	66	2.2	10	----	52.6	0.9	5	-4.1
E-26	326	1	52.0	54.2	66	2.2	10	----	53.2	1.0	5	-4.0
E-27	327	1	52.3	54.6	66	2.3	10	----	53.4	1.2	5	-3.8
E-28	328	1	51.7	54.4	66	2.7	10	----	53.5	0.9	5	-4.1
E-29	329	1	51.3	54.1	66	2.8	10	----	53.3	0.8	5	-4.2
E-30	330	1	52.5	56.2	66	3.7	10	----	55.9	0.3	5	-4.7
E-31	331	1	53.0	56.7	66	3.7	10	----	56.5	0.2	5	-4.8
E-32	332	1	53.6	58.1	66	4.5	10	----	58.1	0.0	5	-5.0
E-33	333	1	52.0	56.0	66	4.0	10	----	56.0	0.0	5	-5.0
E-34	334	1	50.8	53.9	66	3.1	10	----	53.8	0.1	5	-4.9
E-35	335	1	45.3	47.9	66	2.6	10	----	47.8	0.1	5	-4.9
E-1ii	347	1	54.3	56.2	66	1.9	10	----	56.0	0.2	5	-4.8
E-2ii	348	1	58.0	59.9	66	1.9	10	----	59.8	0.1	5	-4.9
E-3ii	349	1	59.8	61.7	66	1.9	10	----	61.5	0.2	5	-4.8
E-3iii	350	1	59.6	61.5	66	1.9	10	----	61.2	0.3	5	-4.7
E-3iv	351	1	58.6	60.5	66	1.9	10	----	60.2	0.3	5	-4.7
E-3v	352	1	58.7	60.6	66	1.9	10	----	60.2	0.4	5	-4.6
E-3vi	353	1	58.1	60.0	66	1.9	10	----	59.8	0.2	5	-4.8
E-4ii	354	1	59.6	61.5	66	1.9	10	----	61.3	0.2	5	-4.8
E-4vi	355	1	57.6	59.4	66	1.8	10	----	59.2	0.2	5	-4.8
E-5ii	356	1	60.2	62.0	66	1.8	10	----	61.9	0.1	5	-4.9
E-5iii	357	1	57.2	59.1	66	1.9	10	----	59.0	0.1	5	-4.9
E-5vi	358	1	56.9	58.9	66	2.0	10	----	58.8	0.1	5	-4.9
E-6ii	359	1	60.8	62.6	66	1.8	10	----	62.5	0.1	5	-4.9
E-6iii	360	1	56.5	58.5	66	2.0	10	----	58.4	0.1	5	-4.9
E-6vi	361	1	56.9	59.0	66	2.1	10	----	58.8	0.2	5	-4.8
E-7ii	362	1	60.2	62.0	66	1.8	10	----	61.8	0.2	5	-4.8
E-7iii	363	1	56.5	58.5	66	2.0	10	----	58.3	0.2	5	-4.8
E-7vi	364	1	56.4	58.5	66	2.1	10	----	58.3	0.2	5	-4.8
E-8ii	365	1	60.1	62.0	66	1.9	10	----	61.8	0.2	5	-4.8
E-8iii	366	1	55.0	57.0	66	2.0	10	----	56.9	0.1	5	-4.9
E-8vi	367	1	56.1	58.2	66	2.1	10	----	58.1	0.1	5	-4.9
E-9ii	368	1	60.1	62.0	66	1.9	10	----	61.8	0.2	5	-4.8
E-9via	369	1	55.5	57.6	66	2.1	10	----	57.4	0.2	5	-4.8
E-9vib	370	1	55.1	57.3	66	2.2	10	----	57.2	0.1	5	-4.9
E-10ii	371	1	57.5	59.6	66	2.1	10	----	59.4	0.2	5	-4.8
E-10iii	372	1	56.9	59.0	66	2.1	10	----	58.8	0.2	5	-4.8
E-10iv	373	1	55.8	57.9	66	2.1	10	----	57.8	0.1	5	-4.9
E-10v	374	1	55.6	57.8	66	2.2	10	----	57.7	0.1	5	-4.9
E-10vi	375	1	55.3	57.5	66	2.2	10	----	57.4	0.1	5	-4.9
E-16ii	376	1	59.1	61.0	66	1.9	10	----	60.7	0.3	5	-4.7
E-17ii	377	1	57.9	59.6	66	1.7	10	----	59.2	0.4	5	-4.6

E-18ii	378	1	55.7	57.2	66	1.5	10	----	56.7	0.5	5	-4.5
E-19ii	379	1	55.2	56.7	66	1.5	10	----	56.1	0.6	5	-4.4
E-22ii	380	1	54.9	57.1	66	2.2	10	----	56.6	0.5	5	-4.5
E-23iia	381	1	54.5	56.8	66	2.3	10	----	56.4	0.4	5	-4.6
E-23iib	382	1	53.7	56.1	66	2.4	10	----	55.6	0.5	5	-4.5
E-23iic	383	1	52.7	55.4	66	2.7	10	----	54.6	0.8	5	-4.2
E-24iia	384	1	51.7	54.6	66	2.9	10	----	53.9	0.7	5	-4.3
E-24iib	385	1	51.6	54.3	66	2.7	10	----	53.8	0.5	5	-4.5
E-25ii	386	1	38.8	41.0	66	2.2	10	----	41.0	0.0	5	-5.0
E-26ii	387	1	37.5	39.6	66	2.1	10	----	39.7	-0.1	5	-5.1
E-27ii	388	1	36.6	38.7	66	2.1	10	----	38.9	-0.2	5	-5.2
E-28ii	389	1	36.2	38.3	66	2.1	10	----	38.5	-0.2	5	-5.2
E-29ii	390	1	36.2	38.4	66	2.2	10	----	38.7	-0.3	5	-5.3
E-30ii	391	1	35.5	37.7	66	2.2	10	----	38.4	-0.7	5	-5.7
E-34ii	392	1	35.2	37.4	66	2.2	10	----	37.5	-0.1	5	-5.1
E-34iii	393	1	35.8	38.0	66	2.2	10	----	37.9	0.1	5	-4.9
E-34iv	394	1	37.0	39.1	66	2.1	10	----	39.0	0.1	5	-4.9
E-34ix	395	1	51.8	54.5	66	2.7	10	----	53.7	0.8	5	-4.2
E-34v	396	1	38.8	40.9	66	2.1	10	----	40.8	0.1	5	-4.9
E-34vi	397	1	40.8	42.8	66	2.0	10	----	42.8	0.0	5	-5.0
E-34vii	398	1	45.3	47.7	66	2.4	10	----	47.6	0.1	5	-4.9
E-34viii	399	1	51.5	54.5	66	3.0	10	----	54.0	0.5	5	-4.5
E-35ii	400	1	42.6	45.0	66	2.4	10	----	44.9	0.1	5	-4.9
E-35iii	401	1	45.5	48.2	66	2.7	10	----	48.2	0.0	5	-5.0
E-35iv	402	1	45.3	48.4	66	3.1	10	----	48.5	-0.1	5	-5.1
E-35ix	403	1	43.1	46.2	66	3.1	10	----	46.1	0.1	5	-4.9
E-35v	404	1	43.9	47.0	66	3.1	10	----	47.0	0.0	5	-5.0
E-35vi	405	1	43.6	46.8	66	3.2	10	----	46.8	0.0	5	-5.0
E-35vii	406	1	43.3	46.4	66	3.1	10	----	46.4	0.0	5	-5.0
E-35viii	407	1	42.8	46.0	66	3.2	10	----	46.0	0.0	5	-5.0
E-35x	408	1	47.9	51.1	66	3.2	10	----	51.1	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	97	-0.7	0.3	1.2
All Impacted	17	0.0	0.3	0.7
All that meet NR Goal	0	0.0	0.0	0.0


MP 28-31 NSA E Proposed NO PLAZA
Sheet 1 of 1
15 Jul 2015
ms consultants, inc.
Plan View
Project/Contract No. 60-06726-20
Run name: PR_NSA_E_No_Plaza_West
TNM Version 2.5, Feb 2004
Scale:
1000 fee
Analysis By: KLC 54200
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1318000
1319000
1320000
1321000
1322000
1323000
1324000
1325000
1326000
1327000

ms consultants, inc.
KLC 54200

14 July 2015
TNM 2.5
Calculated with TNM 2.5

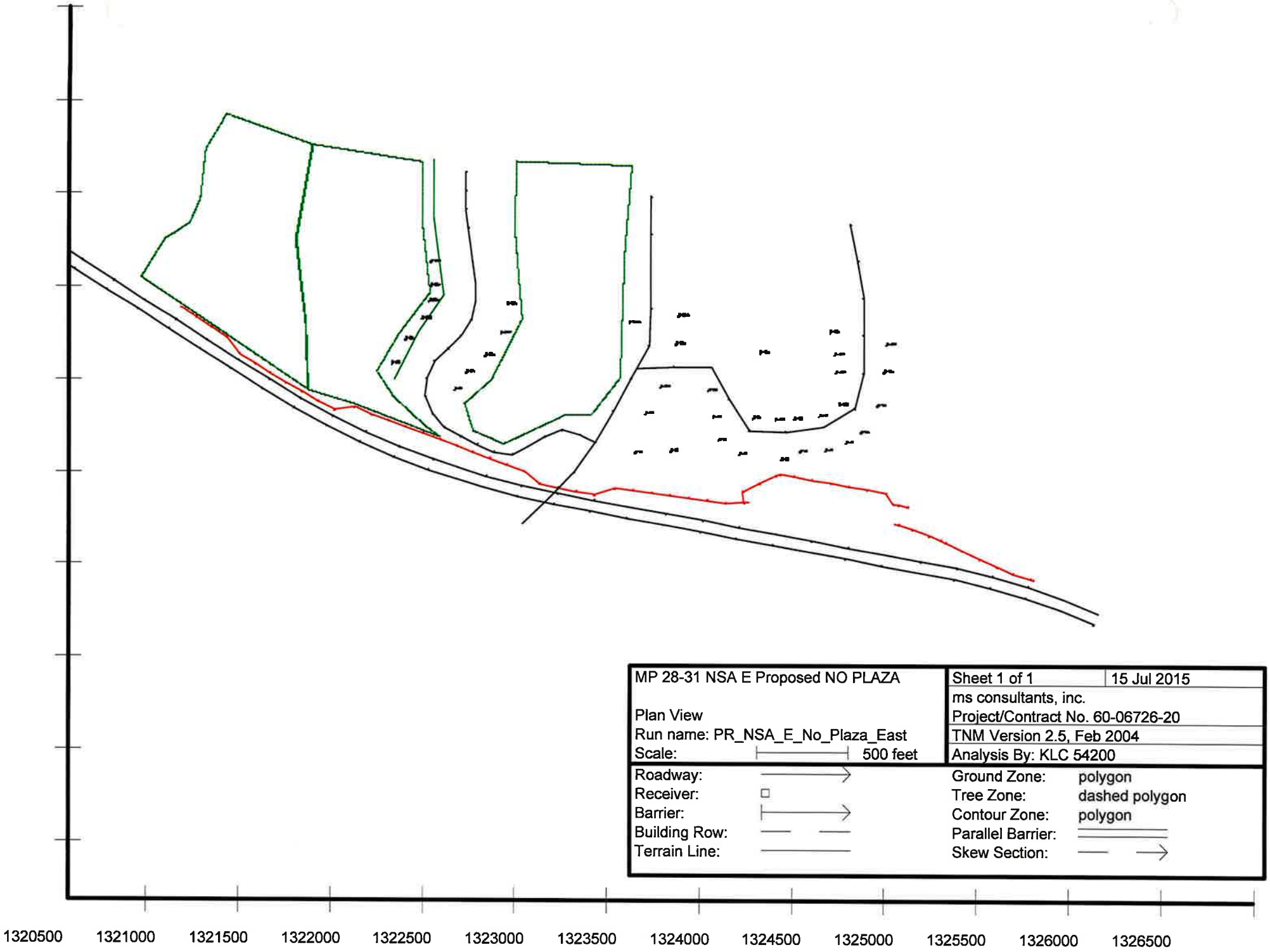
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed NO PLAZA
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-36	440	1	64.5	68.1	66	3.6	10	Snd Lvl	65.7	2.4	5	-2.6
E-37	441	1	59.5	63.3	66	3.8	10	----	61.0	2.3	5	-2.7
E-38	442	1	60.7	64.1	66	3.4	10	----	60.0	4.1	5	-0.9
E-39	443	1	59.0	63.3	66	4.3	10	----	60.1	3.2	5	-1.8
E-40	444	1	57.8	62.7	66	4.9	10	----	61.7	1.0	5	-4.0
E-41	445	1	58.9	64.6	66	5.7	10	----	64.1	0.5	5	-4.5
E-42	446	1	56.6	62.2	66	5.6	10	----	61.5	0.7	5	-4.3
E-43	447	1	56.9	62.1	66	5.2	10	----	61.6	0.5	5	-4.5
E-44	448	1	55.3	60.4	66	5.1	10	----	60.0	0.4	5	-4.6
E-45	449	1	57.3	63.8	66	6.5	10	----	63.7	0.1	5	-4.9
E-46	450	1	56.0	62.2	66	6.2	10	----	62.1	0.1	5	-4.9
E-36ii	451	1	61.5	65.0	66	3.5	10	----	62.6	2.4	5	-2.6
E-36iii	452	1	58.2	62.6	66	4.4	10	----	59.6	3.0	5	-2.0
E-36iv	453	1	53.9	58.2	66	4.3	10	----	56.1	2.1	5	-2.9
E-36v	454	1	56.1	60.9	66	4.8	10	----	58.3	2.6	5	-2.4
E-36vi	455	1	55.4	59.7	66	4.3	10	----	56.4	3.3	5	-1.7
E-37ii	456	1	56.4	59.8	66	3.4	10	----	58.3	1.5	5	-3.5
E-37iii	457	1	53.5	56.9	66	3.4	10	----	55.6	1.3	5	-3.7
E-37iv	458	1	51.1	54.6	66	3.5	10	----	52.9	1.7	5	-3.3
E-37v	459	1	51.1	56.3	66	5.2	10	----	55.8	0.5	5	-4.5
E-38ii	460	1	57.9	61.8	66	3.9	10	----	58.8	3.0	5	-2.0
E-38iii	461	1	57.0	60.0	66	3.0	10	----	57.8	2.2	5	-2.8
E-38iv	462	1	55.7	58.8	66	3.1	10	----	57.2	1.6	5	-3.4
E-38va	463	1	55.1	57.4	66	2.3	10	----	56.7	0.7	5	-4.3

E-38vb	464	1	55.1	58.4	66	3.3	10	----	56.8	1.6	5	-3.4
E-40ii	465	1	56.3	60.5	66	4.2	10	----	59.2	1.3	5	-3.7
E-40iii	466	1	54.4	58.4	66	4.0	10	----	56.8	1.6	5	-3.4
E-41ii	467	1	55.2	60.2	66	5.0	10	----	59.4	0.8	5	-4.2
E-41iv	468	1	54.9	60.0	66	5.1	10	----	58.5	1.5	5	-3.5
E-42ii	469	1	55.5	60.7	66	5.2	10	----	59.7	1.0	5	-4.0
E-43ii	470	1	55.7	61.2	66	5.5	10	----	60.4	0.8	5	-4.2
E-44ii	471	1	54.7	60.3	66	5.6	10	----	59.8	0.5	5	-4.5
E-45ii	472	1	55.1	60.5	66	5.4	10	----	60.0	0.5	5	-4.5
E-45iii	473	1	56.3	62.2	66	5.9	10	----	61.7	0.5	5	-4.5
E-45iv	474	1	55.5	61.2	66	5.7	10	----	60.6	0.6	5	-4.4
E-45v	475	1	54.6	60.2	66	5.6	10	----	59.3	0.9	5	-4.1
E-46ii	476	1	52.6	58.6	66	6.0	10	----	58.6	0.0	5	-5.0
E-46iii	477	1	50.1	56.2	66	6.1	10	----	56.1	0.1	5	-4.9
E-46iv	478	1	48.6	54.3	66	5.7	10	----	54.3	0.0	5	-5.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	39	0.0	1.4	4.1
All Impacted	1	2.4	2.4	2.4
All that meet NR Goal	0	0.0	0.0	0.0


MP 28-31 NSA E Proposed NO PLAZA
Plan View
Run name: PR_NSA_E_No_Plaza_East
Scale: 500 feet
Sheet 1 of 1
15 Jul 2015
ms consultants, inc.
Project/Contract No. 60-06726-20
TNM Version 2.5, Feb 2004
Analysis By: KLC 54200
Roadway:
Receiver:
Barrier:
Building Row:
Terrain Line:
Ground Zone: polygon
Tree Zone: dashed polygon
Contour Zone: polygon
Parallel Barrier:
Skew Section:
1320500
1321000
1321500
1322000
1322500
1323000
1323500
1324000
1324500
1325000
1325500
1326000
1326500

ms consultants, inc.
KLC 54200

18 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D All
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.8	66	1.4	10	Snd Lvl	68.3	0.5	5	-4.5
D-2	297	3	67.3	68.2	66	0.9	10	Snd Lvl	67.8	0.4	5	-4.6
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-4	299	3	66.8	67.6	66	0.8	10	Snd Lvl	67.2	0.4	5	-4.6
D-5	300	2	66.4	67.2	66	0.8	10	Snd Lvl	66.8	0.4	5	-4.6
D-6 (Pool)	301	1	63.6	65.0	66	1.4	10	----	64.3	0.7	5	-4.3
D-7 (Community Bldg)	302	1	62.9	64.3	66	1.4	10	----	63.6	0.7	5	-4.3
D-8	303	2	63.5	64.5	66	1.0	10	----	63.6	0.9	5	-4.1
D-9	304	2	63.2	63.7	66	0.5	10	----	62.8	0.9	5	-4.1
D-10	305	2	62.9	63.1	66	0.2	10	----	62.2	0.9	5	-4.1
D-11	306	2	62.7	62.7	66	0.0	10	----	61.8	0.9	5	-4.1
D-12	307	2	62.4	62.5	66	0.1	10	----	61.6	0.9	5	-4.1
D-13	308	3	62.2	62.5	66	0.3	10	----	61.3	1.2	5	-3.8
D-14	309	2	62.2	62.5	66	0.3	10	----	61.3	1.2	5	-3.8
D-15	310	3	62.1	62.4	66	0.3	10	----	61.1	1.3	5	-3.7
D-16	311	2	62.1	62.5	66	0.4	10	----	61.1	1.4	5	-3.6
D-17	312	2	62.1	62.7	66	0.6	10	----	61.0	1.7	5	-3.3
D-18	313	1	59.9	61.9	66	2.0	10	----	59.9	2.0	5	-3.0
D-19	314	1	61.0	63.3	88	2.3	10	----	60.1	3.2	5	-1.8
D-20	315	1	59.8	62.1	66	2.3	10	----	58.1	4.0	5	-1.0
D-21	316	1	61.5	63.8	66	2.3	10	----	60.0	3.8	5	-1.2
D-22	317	1	64.5	65.3	71	0.8	10	----	60.0	5.3	5	0.3
D-23	318	1	65.0	65.7	71	0.7	10	----	60.0	5.7	5	0.7
D-24	319	1	63.4	65.6	66	2.2	10	----	59.3	6.3	5	1.3

D-25	320	1	62.8	65.5	66	2.7	10	----	59.1	6.4	5	1.4
D-26	321	1	61.3	65.5	88	4.2	10	----	58.8	6.7	5	1.7
D-27	322	1	61.7	67.4	88	5.7	10	----	60.1	7.3	5	2.3
D-28	323	1	60.7	66.1	88	5.4	10	----	59.4	6.7	5	1.7
D-30	324	1	59.0	62.0	66	3.0	10	----	58.3	3.7	5	-1.3
D-31	325	1	58.7	61.9	71	3.2	10	----	57.8	4.1	5	-0.9
D-32	326	1	58.8	62.1	88	3.3	10	----	57.6	4.5	5	-0.5
D-33	327	1	69.5	72.3	88	2.8	10	----	63.1	9.2	5	4.2
D-34	328	1	68.4	71.6	66	3.2	10	Snd Lvl	64.3	7.3	5	2.3
D-1ii	331	3	67.2	68.3	66	1.1	10	Snd Lvl	67.7	0.6	5	-4.4
D-2ii	332	2	66.7	67.6	66	0.9	10	Snd Lvl	67.0	0.6	5	-4.4
D-3ii	333	2	66.6	67.1	66	0.5	10	Snd Lvl	66.4	0.7	5	-4.3
D-4ii	334	2	66.4	66.8	66	0.4	10	Snd Lvl	66.1	0.7	5	-4.3
D-7ii	335	3	63.2	64.3	66	1.1	10	----	63.4	0.9	5	-4.1
D-8ii	336	3	62.6	63.0	66	0.4	10	----	62.2	0.8	5	-4.2
D-10ii	337	2	62.4	62.8	66	0.4	10	----	61.9	0.9	5	-4.1
D-11ii	338	3	62.1	62.6	66	0.5	10	----	61.6	1.0	5	-4.0
D-12ii	339	2	61.9	62.1	66	0.2	10	----	61.1	1.0	5	-4.0
D-13ii	340	3	61.6	61.8	66	0.2	10	----	60.7	1.1	5	-3.9
D-14ii	341	2	61.5	61.6	66	0.1	10	----	60.5	1.1	5	-3.9
D-15ii	342	3	61.3	61.2	66	-0.1	10	----	60.0	1.2	5	-3.8
D-16ii	343	2	61.0	61.3	66	0.3	10	----	60.0	1.3	5	-3.7
D-17ii	344	3	60.5	61.7	66	1.2	10	----	59.9	1.8	5	-3.2
D-18ii	345	1	57.4	59.8	88	2.4	10	----	57.5	2.3	5	-2.7
D-22ii	346	1	62.2	64.4	88	2.2	10	----	60.3	4.1	5	-0.9
D-22iii	347	1	60.1	62.5	66	2.4	10	----	57.1	5.4	5	0.4
D-23ii	348	1	62.7	64.8	71	2.1	10	----	60.1	4.7	5	-0.3
D-25ii	349	1	62.1	65.2	71	3.1	10	----	60.1	5.1	5	0.1
D-25iii	350	1	59.9	63.0	71	3.1	10	----	56.9	6.1	5	1.1
D-26iia	351	1	60.6	64.2	71	3.6	10	----	59.8	4.4	5	-0.6
D-26iib	352	1	60.2	63.2	66	3.0	10	----	59.4	3.8	5	-1.2
D-26iii	353	1	58.9	63.0	88	4.1	10	----	56.5	6.5	5	1.5
D-27iia	354	1	61.2	63.8	66	2.6	10	----	61.2	2.6	5	-2.4
D-27iib	355	1	60.7	63.3	66	2.6	10	----	60.6	2.7	5	-2.3
D-28iia	356	1	60.3	62.7	66	2.4	10	----	60.4	2.3	5	-2.7
D-28iib	357	1	60.2	62.6	66	2.4	10	----	60.4	2.2	5	-2.8
D-28iii	358	1	56.8	59.7	71	2.9	10	----	55.7	4.0	5	-1.0
D-29a	359	1	61.6	65.3	88	3.7	10	----	59.5	5.8	5	0.8
D-29b	360	1	59.5	62.3	71	2.8	10	----	58.4	3.9	5	-1.1
D-29iia	361	1	60.0	62.2	66	2.2	10	----	60.1	2.1	5	-2.9
D-29iib	362	1	60.3	62.5	66	2.2	10	----	61.1	1.4	5	-3.6
D-32iiia	363	1	59.7	62.0	71	2.3	10	----	60.3	1.7	5	-3.3

D-32iiib	364	1	60.3	62.8	88	2.5	10	----	61.1	1.7	5	-3.3
D-33ii	365	1	63.4	67.1	66	3.7	10	Snd Lvl	61.0	6.1	5	1.1
D-33iii	366	1	61.0	64.6	66	3.6	10	----	59.7	4.9	5	-0.1
D-33iv	367	1	59.8	63.3	66	3.5	10	----	58.2	5.1	5	0.1
D-33va	368	1	58.6	61.6	66	3.0	10	----	58.0	3.6	5	-1.4
D-33vb	369	1	62.4	64.9	88	2.5	10	----	63.3	1.6	5	-3.4
D-33vi	370	1	60.4	62.8	66	2.4	10	----	61.4	1.4	5	-3.6
D-34ii	371	1	65.4	68.4	66	3.0	10	Snd Lvl	62.2	6.2	5	1.2
D-34iii	372	1	63.6	66.5	66	2.9	10	Snd Lvl	62.0	4.5	5	-0.5
D-34iv	373	1	61.0	64.2	88	3.2	10	----	60.3	3.9	5	-1.1
D-34v	374	1	62.4	64.7	88	2.3	10	----	63.5	1.2	5	-3.8

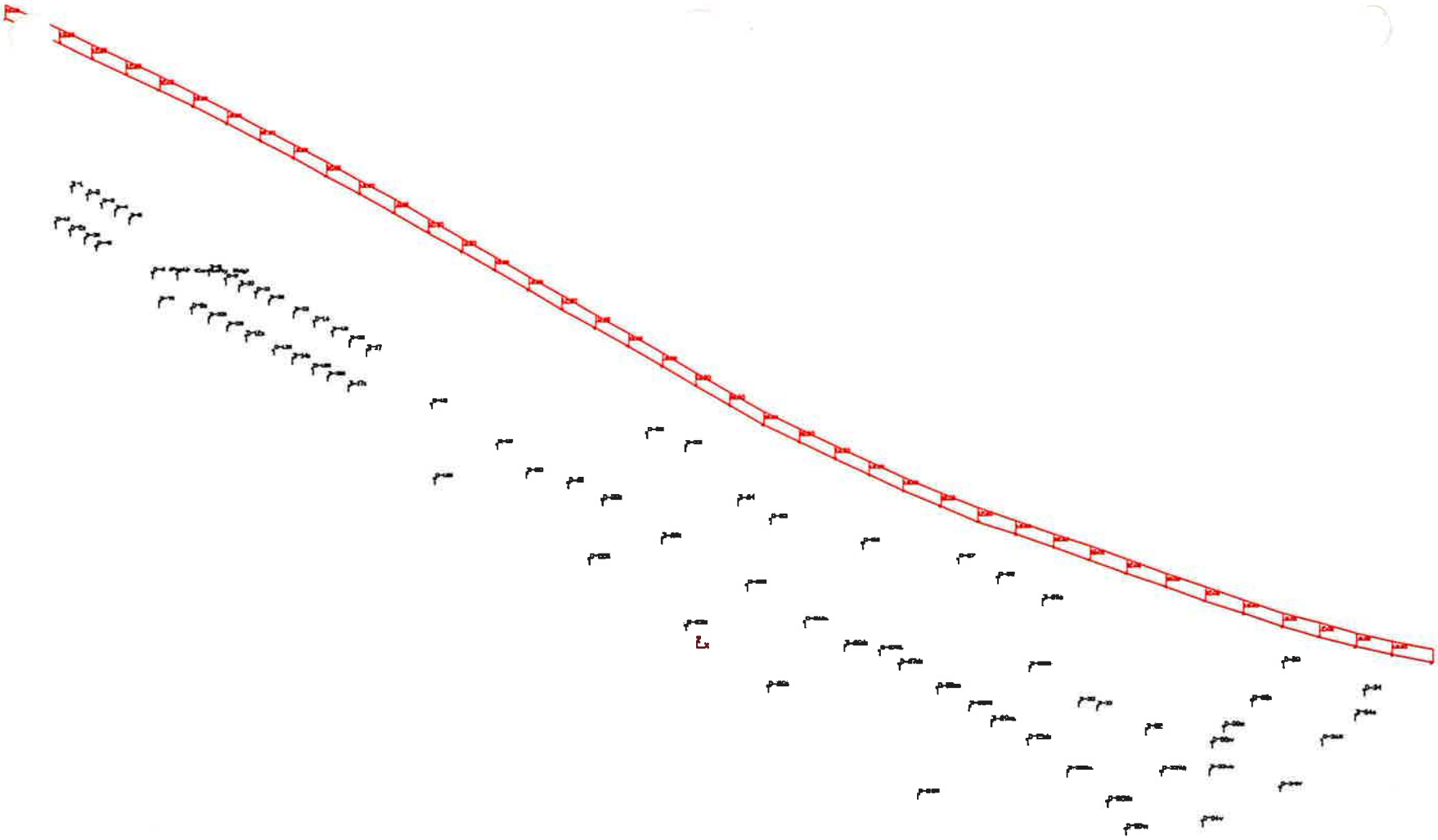
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	117	0.4	2.9	9.2
All Impacted	25	0.4	2.2	7.3
All that meet NR Goal	17	5.1	6.3	9.2

ms consultants, inc. 18 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D All

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	12.00	12.00	12.00	4063	48755				0
									Total Cost:	0



MP 28-31 NSA D Proposed NO PLAZA		Sheet 1 of 1	18 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D All		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D_No_Plaza		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	= =
Terrain Line:	———	Skew Section:	—→

ms consultants, inc.
KLC 54200

18 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D West Final
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.8	66	1.4	10	Snd Lvl	68.3	0.5	5	-4.5
D-2	297	3	67.3	68.2	66	0.9	10	Snd Lvl	67.8	0.4	5	-4.6
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.1	0.4	5	-4.6
D-4	299	3	66.8	67.6	66	0.8	10	Snd Lvl	67.1	0.5	5	-4.5
D-5	300	2	66.4	67.2	66	0.8	10	Snd Lvl	66.7	0.5	5	-4.5
D-6 (Pool)	301	1	63.6	65.0	66	1.4	10	----	64.2	0.8	5	-4.2
D-7 (Community Bldg)	302	1	62.9	64.3	66	1.4	10	----	63.4	0.9	5	-4.1
D-8	303	2	63.5	64.5	66	1.0	10	----	63.5	1.0	5	-4.0
D-9	304	2	63.2	63.7	66	0.5	10	----	62.7	1.0	5	-4.0
D-10	305	2	62.9	63.1	66	0.2	10	----	62.0	1.1	5	-3.9
D-11	306	2	62.7	62.7	66	0.0	10	----	61.6	1.1	5	-3.9
D-12	307	2	62.4	62.5	66	0.1	10	----	61.3	1.2	5	-3.8
D-13	308	3	62.2	62.5	66	0.3	10	----	61.1	1.4	5	-3.6
D-14	309	2	62.2	62.5	66	0.3	10	----	61.0	1.5	5	-3.5
D-15	310	3	62.1	62.4	66	0.3	10	----	60.9	1.5	5	-3.5
D-16	311	2	62.1	62.5	66	0.4	10	----	60.8	1.7	5	-3.3
D-17	312	2	62.1	62.7	66	0.6	10	----	60.7	2.0	5	-3.0
D-18	313	1	59.9	61.9	66	2.0	10	----	59.5	2.4	5	-2.6
D-19	314	1	61.0	63.3	88	2.3	10	----	59.5	3.8	5	-1.2
D-20	315	1	59.8	62.1	66	2.3	10	----	57.3	4.8	5	-0.2
D-21	316	1	61.5	63.8	66	2.3	10	----	59.4	4.4	5	-0.6
D-1ii	331	3	67.2	68.3	66	1.1	10	Snd Lvl	67.6	0.7	5	-4.3
D-2ii	332	2	66.7	67.6	66	0.9	10	Snd Lvl	66.9	0.7	5	-4.3
D-3ii	333	2	66.6	67.1	66	0.5	10	Snd Lvl	66.4	0.7	5	-4.3

D-4ii	334	2	66.4	66.8	66	0.4	10	Snd Lvl	66.0	0.8	5	-4.2
D-7ii	335	3	63.2	64.3	66	1.1	10	----	63.3	1.0	5	-4.0
D-8ii	336	3	62.6	63.0	66	0.4	10	----	62.0	1.0	5	-4.0
D-10ii	337	2	62.4	62.8	66	0.4	10	----	61.7	1.1	5	-3.9
D-11ii	338	3	62.1	62.6	66	0.5	10	----	61.4	1.2	5	-3.8
D-12ii	339	2	61.9	62.1	66	0.2	10	----	60.9	1.2	5	-3.8
D-13ii	340	3	61.6	61.8	66	0.2	10	----	60.5	1.3	5	-3.7
D-14ii	341	2	61.5	61.6	66	0.1	10	----	60.2	1.4	5	-3.6
D-15ii	342	3	61.3	61.2	66	-0.1	10	----	59.8	1.4	5	-3.6
D-16ii	343	2	61.0	61.3	66	0.3	10	----	59.7	1.6	5	-3.4
D-17ii	344	3	60.5	61.7	66	1.2	10	----	59.5	2.2	5	-2.8
D-18ii	345	1	57.4	59.8	88	2.4	10	----	57.0	2.8	5	-2.2

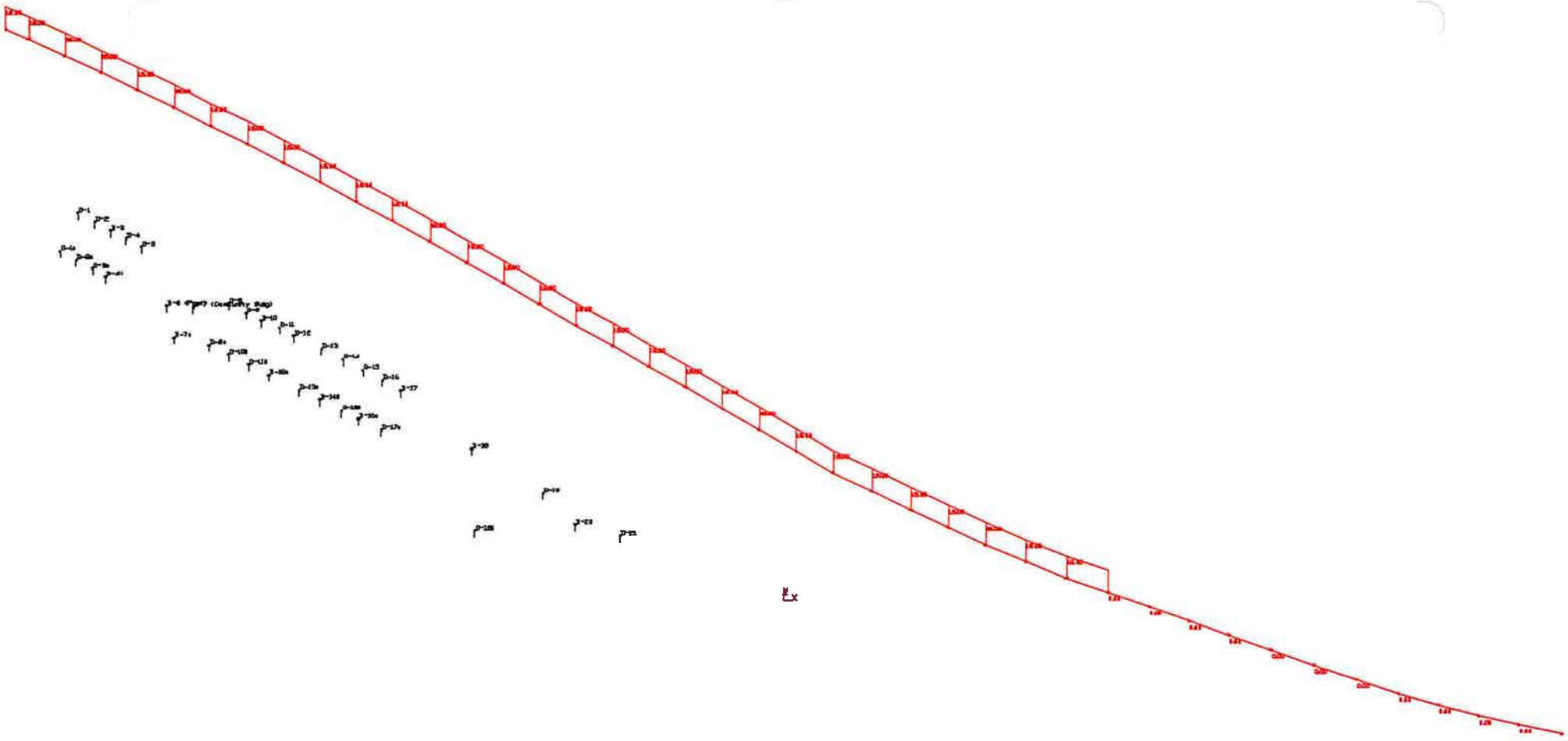
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	76	0.4	1.4	4.8
All Impacted	21	0.4	0.6	0.8
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc. 18 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D West Final

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	18.00	18.00	18.00	2971	53483				0
									Total Cost:	0



MP 28-31 NSA D Proposed NO PLAZA		Sheet 1 of 1	18 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D West Final		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D_No_Plaza		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	═══
Terrain Line:	———	Skew Section:	—→

ms consultants, inc.
KLC 54200

18 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D East Final
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-33	327	1	69.5	72.3	88	2.8	10	----	62.0	10.3	5	5.3
D-32	326	1	58.8	62.1	88	3.3	10	----	58.8	3.3	5	-1.7
D-34	328	1	68.4	71.6	66	3.2	10	Snd Lvl	63.7	7.9	5	2.9
D-32iiia	363	1	59.7	62.0	71	2.3	10	----	61.2	0.8	5	-4.2
D-32iiib	364	1	60.3	62.8	88	2.5	10	----	61.6	1.2	5	-3.8
D-33ii	365	1	63.4	67.1	66	3.7	10	Snd Lvl	61.0	6.1	5	1.1
D-33iii	366	1	61.0	64.6	66	3.6	10	----	60.0	4.6	5	-0.4
D-33iv	367	1	59.8	63.3	66	3.5	10	----	58.5	4.8	5	-0.2
D-33va	368	1	58.6	61.6	66	3.0	10	----	58.8	2.8	5	-2.2
D-33vb	369	1	62.4	64.9	88	2.5	10	----	63.4	1.5	5	-3.5
D-33vi	370	1	60.4	62.8	66	2.4	10	----	61.8	1.0	5	-4.0
D-34ii	371	1	65.4	68.4	66	3.0	10	Snd Lvl	61.6	6.8	5	1.8
D-34iii	372	1	63.6	66.5	66	2.9	10	Snd Lvl	61.7	4.8	5	-0.2
D-34iv	373	1	61.0	64.2	88	3.2	10	----	60.5	3.7	5	-1.3
D-34v	374	1	62.4	64.7	88	2.3	10	----	63.6	1.1	5	-3.9

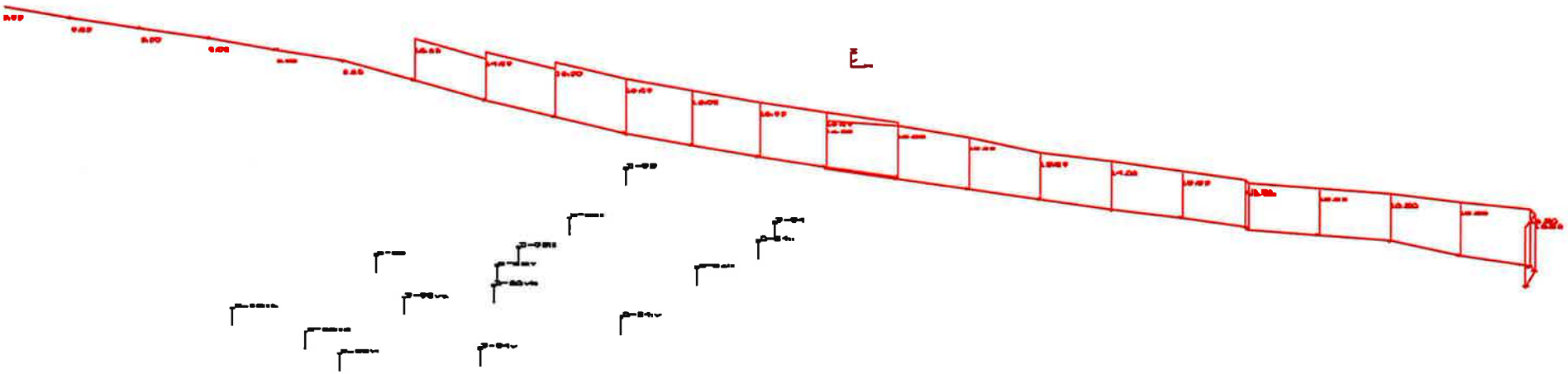
Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	15	0.8	4.0	10.3
All Impacted	4	4.8	6.4	7.9
All that meet NR Goal	4	6.1	7.8	10.3

ms consultants, inc. 15 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D East Final

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	12.00	15.11	16.00	689	10407				0
SB-4A	W	13.50	14.44	17.50	1070	15455				0
									Total Cost:	0



MP 28-31 NSA D Proposed NO PLAZA	Sheet 1 of 1 | 15 Jul 2015
	ms consultants, inc.
Barrier View-Barr D East Final	Project/Contract No. 60-06726-20
Run name: PR_NSA_D_No_Plaza	TNM Version 2.5, Feb 2004
Scale: <DNA - due to perspective>	Analysis By: KLC 54200

Roadway:	——→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢——→	Contour Zone:	polygon
Building Row:	—— ——	Parallel Barrier:	═══
Terrain Line:	———	Skew Section:	—→

ms consultants, inc.
KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D East Extended
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier					With Barrier			
				LAeq1h		Increase over existing		Type Impact	Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-1	296	2	67.4	68.8	66	1.4	10	Snd Lvl	68.8	0.0	5	-5.0
D-2	297	3	67.3	68.2	66	0.9	10	Snd Lvl	68.2	0.0	5	-5.0
D-3	298	2	66.8	67.5	66	0.7	10	Snd Lvl	67.5	0.0	5	-5.0
D-4	299	3	66.8	67.6	66	0.8	10	Snd Lvl	67.6	0.0	5	-5.0
D-5	300	2	66.4	67.2	66	0.8	10	Snd Lvl	67.2	0.0	5	-5.0
D-6 (Pool)	301	1	63.6	65.0	66	1.4	10	----	65.0	0.0	5	-5.0
D-7 (Community Bldg)	302	1	62.9	64.3	66	1.4	10	----	64.3	0.0	5	-5.0
D-8	303	2	63.5	64.5	66	1.0	10	----	64.5	0.0	5	-5.0
D-9	304	2	63.2	63.7	66	0.5	10	----	63.7	0.0	5	-5.0
D-10	305	2	62.9	63.1	66	0.2	10	----	63.0	0.1	5	-4.9
D-11	306	2	62.7	62.7	66	0.0	10	----	62.7	0.0	5	-5.0
D-12	307	2	62.4	62.5	66	0.1	10	----	62.5	0.0	5	-5.0
D-13	308	3	62.2	62.5	66	0.3	10	----	62.4	0.1	5	-4.9
D-14	309	2	62.2	62.5	66	0.3	10	----	62.5	0.0	5	-5.0
D-15	310	3	62.1	62.4	66	0.3	10	----	62.3	0.1	5	-4.9
D-16	311	2	62.1	62.5	66	0.4	10	----	62.5	0.0	5	-5.0
D-17	312	2	62.1	62.7	66	0.6	10	----	62.6	0.1	5	-4.9
D-18	313	1	59.9	61.9	66	2.0	10	----	61.7	0.2	5	-4.8
D-19	314	1	61.0	63.3	88	2.3	10	----	62.7	0.6	5	-4.4
D-20	315	1	59.8	62.1	66	2.3	10	----	61.3	0.8	5	-4.2
D-21	316	1	61.5	63.8	66	2.3	10	----	62.8	1.0	5	-4.0
D-22	317	1	64.5	65.3	71	0.8	10	----	64.1	1.2	5	-3.8
D-23	318	1	65.0	65.7	71	0.7	10	----	62.9	2.8	5	-2.2

D-24	319	1	63.4	65.6	66	2.2	10	----	60.3	5.3	5	0.3
D-25	320	1	62.8	65.5	66	2.7	10	----	59.7	5.8	5	0.8
D-26	321	1	61.3	65.5	88	4.2	10	----	58.7	6.8	5	1.8
D-27	322	1	61.7	67.4	88	5.7	10	----	59.8	7.6	5	2.6
D-28	323	1	60.7	66.1	88	5.4	10	----	59.1	7.0	5	2.0
D-30	324	1	59.0	62.0	66	3.0	10	----	58.2	3.8	5	-1.2
D-31	325	1	58.7	61.9	71	3.2	10	----	57.6	4.3	5	-0.7
D-32	326	1	58.8	62.1	88	3.3	10	----	57.2	4.9	5	-0.1
D-33	327	1	69.5	72.3	88	2.8	10	----	62.2	10.1	5	5.1
D-34	328	1	68.4	71.6	66	3.2	10	Snd Lvl	63.9	7.7	5	2.7
D-1ii	331	3	67.2	68.3	66	1.1	10	Snd Lvl	68.3	0.0	5	-5.0
D-2ii	332	2	66.7	67.6	66	0.9	10	Snd Lvl	67.6	0.0	5	-5.0
D-3ii	333	2	66.6	67.1	66	0.5	10	Snd Lvl	67.1	0.0	5	-5.0
D-4ii	334	2	66.4	66.8	66	0.4	10	Snd Lvl	66.7	0.1	5	-4.9
D-7ii	335	3	63.2	64.3	66	1.1	10	----	64.2	0.1	5	-4.9
D-8ii	336	3	62.6	63.0	66	0.4	10	----	63.0	0.0	5	-5.0
D-10ii	337	2	62.4	62.8	66	0.4	10	----	62.8	0.0	5	-5.0
D-11ii	338	3	62.1	62.6	66	0.5	10	----	62.5	0.1	5	-4.9
D-12ii	339	2	61.9	62.1	66	0.2	10	----	62.1	0.0	5	-5.0
D-13ii	340	3	61.6	61.8	66	0.2	10	----	61.7	0.1	5	-4.9
D-14ii	341	2	61.5	61.6	66	0.1	10	----	61.5	0.1	5	-4.9
D-15ii	342	3	61.3	61.2	66	-0.1	10	----	61.1	0.1	5	-4.9
D-16ii	343	2	61.0	61.3	66	0.3	10	----	61.2	0.1	5	-4.9
D-17ii	344	3	60.5	61.7	66	1.2	10	----	61.4	0.3	5	-4.7
D-18ii	345	1	57.4	59.8	88	2.4	10	----	59.4	0.4	5	-4.6
D-22ii	346	1	62.2	64.4	88	2.2	10	----	62.9	1.5	5	-3.5
D-22iii	347	1	60.1	62.5	66	2.4	10	----	60.2	2.3	5	-2.7
D-23ii	348	1	62.7	64.8	71	2.1	10	----	62.1	2.7	5	-2.3
D-25ii	349	1	62.1	65.2	71	3.1	10	----	61.5	3.7	5	-1.3
D-25iii	350	1	59.9	63.0	71	3.1	10	----	59.3	3.7	5	-1.3
D-26iia	351	1	60.6	64.2	71	3.6	10	----	60.8	3.4	5	-1.6
D-26iib	352	1	60.2	63.2	66	3.0	10	----	60.3	2.9	5	-2.1
D-26iii	353	1	58.9	63.0	88	4.1	10	----	59.1	3.9	5	-1.1
D-27iia	354	1	61.2	63.8	66	2.6	10	----	61.4	2.4	5	-2.6
D-27iib	355	1	60.7	63.3	66	2.6	10	----	60.8	2.5	5	-2.5
D-28iia	356	1	60.3	62.7	66	2.4	10	----	60.4	2.3	5	-2.7
D-28iib	357	1	60.2	62.6	66	2.4	10	----	60.4	2.2	5	-2.8
D-28iii	358	1	56.8	59.7	71	2.9	10	----	56.3	3.4	5	-1.6
D-29a	359	1	61.6	65.3	88	3.7	10	----	59.2	6.1	5	1.1
D-29b	360	1	59.5	62.3	71	2.8	10	----	58.3	4.0	5	-1.0

D-29iia	361	1	60.0	62.2	66	2.2	10	----	60.1	2.1	5	-2.9
D-29iib	362	1	60.3	62.5	66	2.2	10	----	61.1	1.4	5	-3.6
D-32iiia	363	1	59.7	62.0	71	2.3	10	----	60.3	1.7	5	-3.3
D-32iiib	364	1	60.3	62.8	88	2.5	10	----	61.0	1.8	5	-3.2
D-33ii	365	1	63.4	67.1	66	3.7	10	Snd Lvl	60.5	6.6	5	1.6
D-33iii	366	1	61.0	64.6	66	3.6	10	----	59.3	5.3	5	0.3
D-33iv	367	1	59.8	63.3	66	3.5	10	----	57.8	5.5	5	0.5
D-33va	368	1	58.6	61.6	66	3.0	10	----	57.8	3.8	5	-1.2
D-33vb	369	1	62.4	64.9	88	2.5	10	----	63.2	1.7	5	-3.3
D-33vi	370	1	60.4	62.8	66	2.4	10	----	61.3	1.5	5	-3.5
D-34ii	371	1	65.4	68.4	66	3.0	10	Snd Lvl	61.7	6.7	5	1.7
D-34iii	372	1	63.6	66.5	66	2.9	10	Snd Lvl	61.6	4.9	5	-0.1
D-34iv	373	1	61.0	64.2	88	3.2	10	----	60.0	4.2	5	-0.8
D-34v	374	1	62.4	64.7	88	2.3	10	----	63.5	1.2	5	-3.8

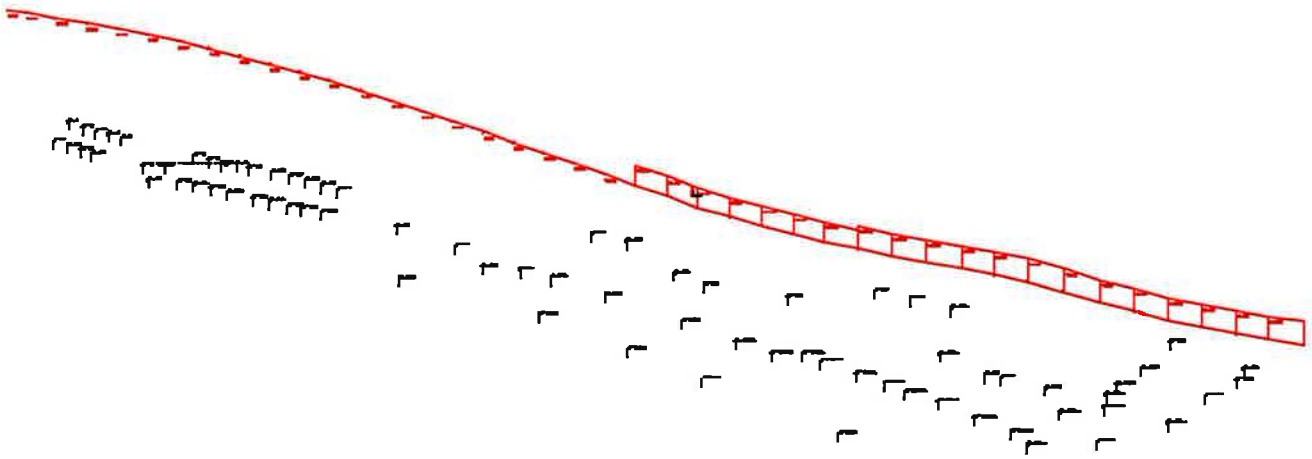
Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	117	0.0	2.2	10.1
All Impacted	25	0.0	2.0	7.7
All that meet NR Goal	12	5.3	6.7	10.1

ms consultants, inc. 15 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: Barr D East Extended

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier D	W	12.00	13.30	14.00	2003	26633				0
									Total Cost:	0



MP 28-31 NSA D Proposed NO PLAZA		Sheet 1 of 1	15 Jul 2015
		ms consultants, inc.	
Barrier View-Barr D East Extended		Project/Contract No. 60-06726-20	
Run name: PR_NSA_D_No_Plaza		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

ms consultants, inc.
KLC 54200

15 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA D Proposed NO PLAZA
BARRIER DESIGN: D Gap Close - 20ft
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
D-34v	374	1	62.4	64.7	88	2.3	10	----	64.7	0.0	5	-5.0
D-34iv	373	1	61.0	64.2	88	3.2	10	----	64.2	0.0	5	-5.0
D-34iii	372	1	63.6	66.5	66	2.9	10	Snd Lvl	66.5	0.0	5	-5.0
D-34ii	371	1	65.4	68.4	66	3.0	10	Snd Lvl	68.4	0.0	5	-5.0
D-34	328	1	68.4	71.6	66	3.2	10	Snd Lvl	71.6	0.0	5	-5.0
D-37	329	1	57.3	61.2	66	3.9	10	----	61.2	0.0	5	-5.0
D-38	330	1	56.5	60.5	66	4.0	10	----	60.5	0.0	5	-5.0
D-37iii	383	1	57.8	61.4	66	3.6	10	----	61.4	0.0	5	-5.0
D-37iv	384	1	56.5	60.0	66	3.5	10	----	60.0	0.0	5	-5.0
D-34vi	375	1	57.4	60.3	88	2.9	10	----	60.3	0.0	5	-5.0
D-35v	376	1	56.6	60.1	66	3.5	10	----	60.1	0.0	5	-5.0
D-35via	377	1	58.7	61.2	66	2.5	10	----	61.1	0.1	5	-4.9
D-35vib	378	1	58.3	60.9	66	2.6	10	----	60.8	0.1	5	-4.9
D-36v	379	1	56.3	61.3	66	5.0	10	----	61.3	0.0	5	-5.0
D-36via	380	1	58.1	60.7	66	2.6	10	----	60.7	0.0	5	-5.0
D-36vib	381	1	58.0	60.7	66	2.7	10	----	60.6	0.1	5	-4.9
D-36vii	382	1	61.7	63.7	66	2.0	10	----	63.7	0.0	5	-5.0
D-37va	385	1	56.4	60.0	66	3.6	10	----	59.9	0.1	5	-4.9
D-37via	386	1	57.6	60.5	66	2.9	10	----	60.4	0.1	5	-4.9
D-37vib	387	1	58.6	61.3	66	2.7	10	----	61.2	0.1	5	-4.9
D-37vb	388	1	57.4	60.4	66	3.0	10	----	60.2	0.2	5	-4.8
D-37vc	389	1	57.2	60.5	66	3.3	10	----	60.2	0.3	5	-4.7
D-37viia	390	1	59.6	62.7	66	3.1	10	----	62.7	0.0	5	-5.0

D-37viib	391	1	60.6	63.7	66	3.1	10	----	63.6	0.1	5	-4.9
D-38iiia	392	1	55.8	59.4	66	3.6	10	----	59.0	0.4	5	-4.6
D-38iiib	393	1	58.4	62.1	66	3.7	10	----	61.5	0.6	5	-4.4
D-38iiic	394	1	57.6	61.7	66	4.1	10	----	60.6	1.1	5	-3.9
D-38iiid	395	1	58.3	62.6	66	4.3	10	----	61.3	1.3	5	-3.7
D-38vi	396	1	63.2	66.0	66	2.8	10	Snd Lvl	65.7	0.3	5	-4.7

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	29	0.0	0.2	1.3
All Impacted	4	0.0	0.1	0.3
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc.
KLC 54200

14 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed NO PLAZA
BARRIER DESIGN: Barrier E Final
ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-1	301	1	65.0	66.9	66	1.9	10	Snd Lvl	66.9	0.0	5	-5.0
E-2	302	1	65.1	67.0	66	1.9	10	Snd Lvl	67.0	0.0	5	-5.0
E-3	303	1	65.3	67.2	66	1.9	10	Snd Lvl	67.1	0.1	5	-4.9
E-4	304	1	65.5	67.3	66	1.8	10	Snd Lvl	67.3	0.0	5	-5.0
E-5	305	1	65.2	67.1	66	1.9	10	Snd Lvl	67.0	0.1	5	-4.9
E-6	306	1	65.0	66.9	66	1.9	10	Snd Lvl	66.7	0.2	5	-4.8
E-7	307	1	64.7	66.6	66	1.9	10	Snd Lvl	66.4	0.2	5	-4.8
E-8	308	1	65.0	66.9	66	1.9	10	Snd Lvl	66.5	0.4	5	-4.6
E-9	309	1	64.5	66.4	66	1.9	10	Snd Lvl	66.0	0.4	5	-4.6
E-10	310	1	64.4	66.2	66	1.8	10	Snd Lvl	65.8	0.4	5	-4.6
E-11	311	1	64.2	66.2	66	2.0	10	Snd Lvl	65.6	0.6	5	-4.4
E-12	312	1	64.4	66.4	66	2.0	10	Snd Lvl	65.7	0.7	5	-4.3
E-13	313	1	64.8	66.9	66	2.1	10	Snd Lvl	66.1	0.8	5	-4.2
E-14	314	1	65.1	67.1	66	2.0	10	Snd Lvl	66.2	0.9	5	-4.1
E-15	315	1	64.8	66.8	66	2.0	10	Snd Lvl	65.9	0.9	5	-4.1
E-16	316	1	65.1	66.9	66	1.8	10	Snd Lvl	66.0	0.9	5	-4.1
E-17	317	1	64.6	66.5	66	1.9	10	Snd Lvl	65.5	1.0	5	-4.0
E-18	318	1	62.7	64.9	66	2.2	10	----	63.8	1.1	5	-3.9
E-19	319	1	61.1	63.3	66	2.2	10	----	62.3	1.0	5	-4.0
E-20	320	1	59.6	61.8	66	2.2	10	----	60.9	0.9	5	-4.1
E-21	321	1	58.4	60.8	66	2.4	10	----	59.9	0.9	5	-4.1
E-22	322	1	57.3	59.7	66	2.4	10	----	58.9	0.8	5	-4.2
E-23	323	1	52.9	55.2	66	2.3	10	----	54.3	0.9	5	-4.1
E-1ii	347	1	54.3	56.2	66	1.9	10	----	56.0	0.2	5	-4.8

E-2ii	348	1	58.0	59.9	66	1.9	10	----	59.8	0.1	5	-4.9
E-3ii	349	1	59.8	61.7	66	1.9	10	----	61.4	0.3	5	-4.7
E-3iii	350	1	59.6	61.5	66	1.9	10	----	61.2	0.3	5	-4.7
E-3iv	351	1	58.6	60.5	66	1.9	10	----	60.2	0.3	5	-4.7
E-3v	352	1	58.7	60.6	66	1.9	10	----	60.2	0.4	5	-4.6
E-3vi	353	1	58.1	60.0	66	1.9	10	----	59.8	0.2	5	-4.8
E-4ii	354	1	59.6	61.5	66	1.9	10	----	61.2	0.3	5	-4.7
E-4vi	355	1	57.6	59.4	66	1.8	10	----	59.2	0.2	5	-4.8
E-5ii	356	1	60.2	62.0	66	1.8	10	----	61.9	0.1	5	-4.9
E-5iii	357	1	57.2	59.1	66	1.9	10	----	59.0	0.1	5	-4.9
E-5vi	358	1	56.9	58.9	66	2.0	10	----	58.7	0.2	5	-4.8
E-6ii	359	1	60.8	62.6	66	1.8	10	----	62.5	0.1	5	-4.9
E-6iii	360	1	56.5	58.5	66	2.0	10	----	58.4	0.1	5	-4.9
E-6vi	361	1	56.9	59.0	66	2.1	10	----	58.8	0.2	5	-4.8
E-7ii	362	1	60.2	62.0	66	1.8	10	----	61.8	0.2	5	-4.8
E-7iii	363	1	56.5	58.5	66	2.0	10	----	58.3	0.2	5	-4.8
E-7vi	364	1	56.4	58.5	66	2.1	10	----	58.3	0.2	5	-4.8
E-8ii	365	1	60.1	62.0	66	1.9	10	----	61.8	0.2	5	-4.8
E-8iii	366	1	55.0	57.0	66	2.0	10	----	56.9	0.1	5	-4.9
E-8vi	367	1	56.1	58.2	66	2.1	10	----	58.0	0.2	5	-4.8
E-9ii	368	1	60.1	62.0	66	1.9	10	----	61.7	0.3	5	-4.7
E-9via	369	1	55.5	57.6	66	2.1	10	----	57.4	0.2	5	-4.8
E-9vib	370	1	55.1	57.3	66	2.2	10	----	57.1	0.2	5	-4.8
E-10ii	371	1	57.5	59.6	66	2.1	10	----	59.4	0.2	5	-4.8
E-10iii	372	1	56.9	59.0	66	2.1	10	----	58.8	0.2	5	-4.8
E-10iv	373	1	55.8	57.9	66	2.1	10	----	57.8	0.1	5	-4.9
E-10v	374	1	55.6	57.8	66	2.2	10	----	57.6	0.2	5	-4.8
E-10vi	375	1	55.3	57.5	66	2.2	10	----	57.4	0.1	5	-4.9
E-16ii	376	1	59.1	61.0	66	1.9	10	----	60.3	0.7	5	-4.3
E-17ii	377	1	57.9	59.6	66	1.7	10	----	58.8	0.8	5	-4.2
E-18ii	378	1	55.7	57.2	66	1.5	10	----	56.4	0.8	5	-4.2
E-19ii	379	1	55.2	56.7	66	1.5	10	----	55.8	0.9	5	-4.1
E-22ii	380	1	54.9	57.1	66	2.2	10	----	56.4	0.7	5	-4.3
E-23iia	381	1	54.5	56.8	66	2.3	10	----	56.1	0.7	5	-4.3
E-23iib	382	1	53.7	56.1	66	2.4	10	----	55.2	0.9	5	-4.1
E-23iic	383	1	52.7	55.4	66	2.7	10	----	54.1	1.3	5	-3.7

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	60	0.0	0.4	1.3
All Impacted	17	0.0	0.4	1.0

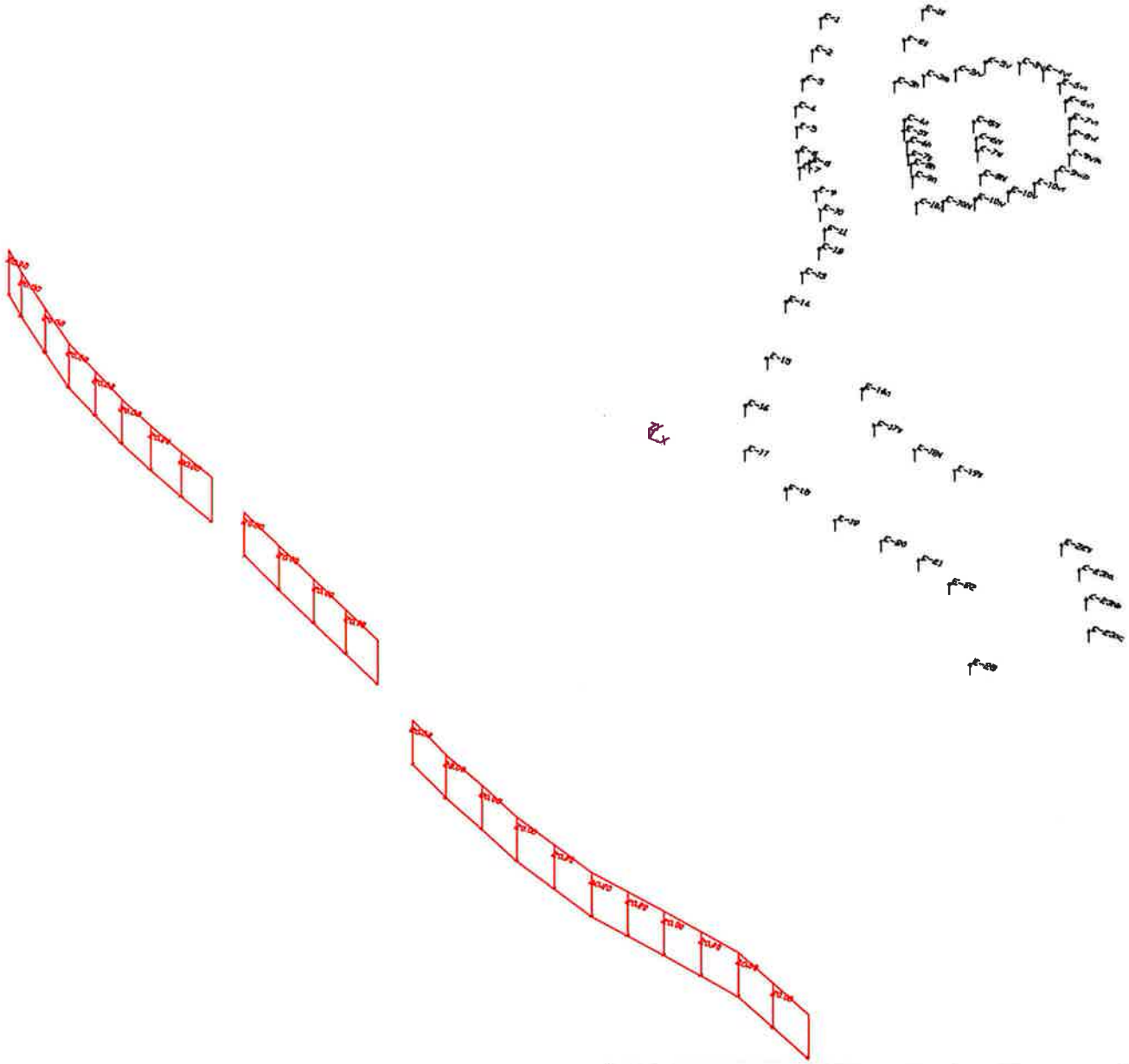
All that meet NR Goal	0	0.0	0.0	0.0

ms consultants, inc. 14 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed NO PLAZA
BARRIER DESIGN: Barrier E Final

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier E West	W	20.00	20.00	20.00	746	14926				0
Barrier E Center	W	20.00	20.00	20.00	400	7993				0
Barrier E	W	20.00	20.00	20.00	1105	22107				0
									Total Cost:	0



MP 28-31 NSA E Proposed NO PLAZA		Sheet 1 of 1	14 Jul 2015
		ms consultants, inc.	
Barrier View-Barrier E Final		Project/Contract No. 60-06726-20	
Run name: PR_NSA_E_No_Plaza_West		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:	→	Ground Zone:	polygon
Receiver:	□	Tree Zone:	dashed polygon
Barrier:	⊢→	Contour Zone:	polygon
Building Row:	— —	Parallel Barrier:	═══
Terrain Line:	———	Skew Section:	—→

ms consultants, inc.
KLC 54200

3 July 2015
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed
BARRIER DESIGN: Bar E East - 20ft

ATMOSPHERICS: 68 deg F, 50% RH

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

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
E-36	440	1	64.5	68.1	66	3.6	10	Snd Lvl	63.1	5.0	5	0.0
E-37	441	1	59.5	63.3	66	3.8	10	----	62.6	0.7	5	-4.3
E-36ii	451	1	61.5	65.0	66	3.5	10	----	58.5	6.5	5	1.5
E-36iii	452	1	58.2	62.6	66	4.4	10	----	54.8	7.8	5	2.8
E-36iv	453	1	53.9	58.2	66	4.3	10	----	52.4	5.8	5	0.8
E-36v	454	1	56.1	60.9	66	4.8	10	----	54.3	6.6	5	1.6
E-36vi	455	1	55.4	59.7	66	4.3	10	----	52.9	6.8	5	1.8
E-37ii	456	1	56.4	59.8	66	3.4	10	----	59.0	0.8	5	-4.2
E-37iii	457	1	53.5	56.9	66	3.4	10	----	56.1	0.8	5	-4.2
E-37iv	458	1	51.1	54.6	66	3.5	10	----	54.2	0.4	5	-4.6
E-37v	459	1	51.1	56.3	66	5.2	10	----	56.2	0.1	5	-4.9

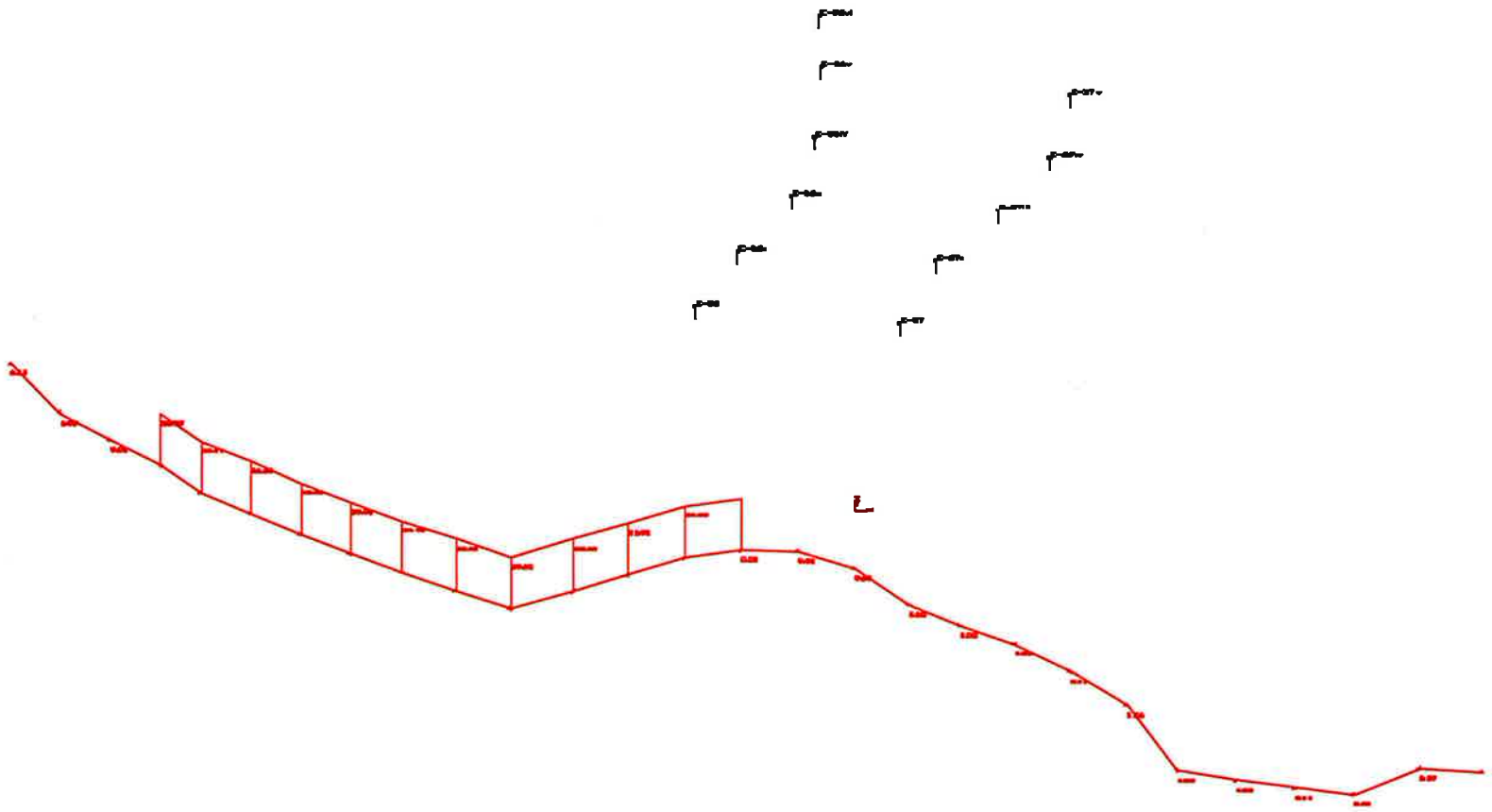
Dwelling Units	# DUs	Noise Reduction Min dB	Avg dB	Max dB
All Selected	11	0.1	3.8	7.8
All Impacted	1	5.0	5.0	5.0
All that meet NR Goal	6	5.0	6.4	7.8

ms consultants, inc. 3 July 2015
KLC 54200 TNM 2.5

RESULTS: BARRIER DESCRIPTIONS
PROJECT/CONTRACT: 60-06726-20
RUN: MP 28-31 NSA E Proposed
BARRIER DESIGN: Bar E East - 20ft

Barriers

Name	Type	Heights along Barrier			Length	If Wall	If Berm			Cost
		Min	Avg	Max		Area	Volume	Top Width	Run:Rise	
		ft	ft	ft	ft	sq ft	cu yd	ft	ft:ft	$
Barrier E East	W	20.00	20.00	20.00	1116	22327				558179
Barrier E East Br	W	0.00	0.00	0.00	0	0				0
Barrier E East3	W	0.00	0.00	0.00	0	0				0
									Total Cost:	558179



MP 28-31 NSA E Proposed		Sheet 1 of 1	3 Jul 2015
		ms consultants, inc.	
Barrier View-Bar E East - 20ft		Project/Contract No. 60-06726-20	
Run name: E_NoP_Ea		TNM Version 2.5, Feb 2004	
Scale: <DNA - due to perspective>		Analysis By: KLC 54200	
Roadway:		Ground Zone:	polygon
Receiver:		Tree Zone:	dashed polygon
Barrier:		Contour Zone:	polygon
Building Row:		Parallel Barrier:	
Terrain Line:		Skew Section:	

Appendix 9

Noise Barrier Summary

Table

PTC Milepost 28-31 Reconstruction Project -- Noise Barrier Summary Table WITH TOLL PLAZA July 2015

NSA/Barrier	Number of Units	Impacted Units	1st Row Units	Barrier Length	Barrier Height	Average IL	Average IL @ Impacted	# Impacted IL > 7dB	# Impacted w/ > 5db IL	% Impacted w/ > 5dB IL	Non-impacted Units > 5db IL	Total Benefited Units	Barrier Sq. Feet	Sq. Feet per Benefited Unit
NSA D	117	24	6	4063 feet	8 feet	1.8	1.2	0	0	0%	4	4	32,503	8,126
Barrier D	117	24	6	4063 feet	10 feet	2.3	1.5	0	1	4%	8	9	40,629	4,514
Entire NSA	117	24	6	4063 feet	12 feet	2.7	1.6	0	1	4%	12	13	48,755	3,750
	117	24	6	4063 feet	14 feet	2.9	1.7	1	3	13%	12	15	56,881	3,792
	117	24	6	4063 feet	16 feet	3.0	1.7	1	3	13%	13	16	65,007	4,063
	117	24	6	4063 feet	18 feet	3.1	1.8	1	3	13%	15	18	73,123	4,062
	117	24	6	4063 feet	20 feet	3.3	1.8	1	3	13%	17	20	81,258	4,063
	117	24	6	4063 feet	LOS 8'-12'	2.3	1.5	0	1	4%	8	9	39,059	4,340
NSA D	76	21	5	2971 feet	8 feet	0.6	0.3	0	0	0%	0	0	23,770	n/a
Barrier D	76	21	5	2971 feet	10 feet	1.0	0.4	0	0	0%	0	0	29,713	n/a
West	76	21	5	2971 feet	12 feet	1.1	0.5	0	0	0%	0	0	35,655	n/a
	76	21	5	2971 feet	14 feet	1.1	0.5	0	0	0%	0	0	41,598	n/a
	76	21	5	2971 feet	16 feet	1.5	0.5	0	0	0%	0	0	47,540	n/a
	76	21	5	2971 feet	18 feet	1.3	0.5	0	0	0%	0	0	53,483	n/a
	76	**21**	**5**	**2971 feet**	**20 feet**	**1.3**	**0.5**	**0**	**0**	**0%**	**0**	**0**	**59,425**	**n/a**
	76	21	5	2971 feet	LOS	n/a								
NSA D	15	3	3	689 Feet	8 feet	2.1	3.7	0	0	0%	1	1	5,510	5,510
Barrier D	15	3	3	689 Feet	10 feet	2.7	4.5	0	1	33%	1	2	6,887	3,444
East	15	3	3	689 Feet	12 feet	3.2	5.0	0	2	67%	1	3	8,265	2,755
	15	3	3	689 Feet	14 feet	3.4	5.2	0	3	100%	1	4	9,246	2,312
	15	3	3	689 Feet	16 feet	3.5	5.4	1	3	100%	1	4	11,020	2,755
	15	3	3	689 Feet	18 feet	3.6	5.5	1	3	100%	1	4	12,397	3,099
	15	3	3	689 Feet	20 feet	3.6	5.6	1	3	100%	1	4	13,775	3,444
	15	**3**	**3**	**689 Feet**	**Optimized 12'-16'**	**3.5**	**5.4**	**1**	**3**	**100%**	**1**	**4**	**10,407**	**2,602**
	15	3	3	689 Feet	LOS 8'-12'	3.1	4.9	0	3	100%	1	4	7,652	1,913
NSA D	45	3	14	2003 feet	8 feet	1.4	0.9	0	0	0%	4	4	16,024	4,006
Barrier D	45	3	14	2003 feet	10 feet	1.7	1.1	0	1	33%	6	7	20,030	2,861
East - Extended	45	3	14	2003 feet	12 feet	1.9	1.3	0	2	67%	7	9	24,036	2,671
	45	3	14	2003 feet	14 feet	2.0	1.3	1	3	100%	6	9	28,041	3,116
	45	3	14	2003 feet	16 feet	2.1	1.4	1	3	100%	8	11	32,047	2,913
	45	3	14	2003 feet	18 feet	2.2	1.4	1	3	100%	9	12	36,053	3,004
	45	3	14	2003 feet	20 feet	2.3	1.4	1	3	100%	9	12	40,059	3,338
	45	3	14	2003 feet	Optimized 12'-14'	2.0	1.3	1	3	100%	6	9	26,663	2,963
	45	3	14	2003 feet	LOS 8'-12'	1.7	1.2	0	2	67%	4	6	19,169	3,195

Highlighted barriers were the most reasonable and are discussed in the narrative.

PTC Milepost 28-31 Reconstruction Project -- Noise Barrier Summary Table WITH TOLL PLAZA July 2015 (cont.)

NSA/Barrier	Number of Units	Impacted Units	1st Row Units	Barrier Length	Barrier Height	Average IL	Average IL @ Impacted	# Impacted IL > 7dB	# Impacted w/ > 5db IL	% Impacted w/ > 5dB IL	Non-impacted Units > 5db IL	Total Benefited Units	Barrier Sq. Feet	Sq. Feet per Benefited Unit
NSA E	60	16	35	2251 feet	8 feet	0.1	0.1	0	0	0%	0	0	18,010	n/a
Barrier E	60	16	35	2251 feet	10 feet	0.2	0.2	0	0	0%	0	0	22,513	n/a
(3 barriers)	60	16	35	2251 feet	12 feet	0.2	0.2	0	0	0%	0	0	27,055	n/a
	60	16	35	2251 feet	14 feet	0.3	0.3	0	0	0%	0	0	31,558	n/a
	60	16	35	2251 feet	16 feet	0.3	0.3	0	0	0%	0	0	36,020	n/a
	60	16	35	2251 feet	18 feet	0.3	0.3	0	0	0%	0	0	40,524	n/a
	60	**16**	**35**	**2251 feet**	**20 feet**	**0.4**	**0.4**	**0**	**0**	**0%**	**0**	**0**	**45,046**	**n/a**
	60	16	35	2251 feet	LOS	n/a								

Highlighted barriers were the most reasonable and are discussed in the narrative.

PTC Milepost 28-31 Reconstruction Project -- Noise Barrier Summary Table NO TOLL PLAZA July 2015

NSA/Barrier	Number of Units	Impacted Units	1st Row Units	Barrier Length	Barrier Height	Average IL	Average IL @ Impacted	# Impacted IL > 7dB	# Impacted w/ > 5db IL	% Impacted w/ > 5dB IL	Non-impacted Units > 5db IL	Total Benefited Units	Barrier Sq. Feet	Sq. Feet per Benefited Unit
NSA D	117	27	6	4063 feet	8 feet	2.0	1.6	0	3	11%	5	8	32,503	4,063
Barrier D	117	27	6	4063 feet	10 feet	2.5	1.9	1	5	19%	10	15	40,629	2,709
Entire NSA	**117**	**27**	**6**	**4063 feet**	**12 feet**	**2.9**	**2.2**	**1**	**6**	**22%**	**16**	**22**	**48,755**	**2,216**
	117	27	6	4063 feet	14 feet	3.2	2.4	5	6	22%	17	23	56,881	2,473
	117	27	6	4063 feet	16 feet	3.3	2.5	5	6	22%	20	26	65,007	2,500
	117	27	6	4063 feet	18 feet	3.5	2.5	5	6	22%	21	27	73,123	2,708
	117	27	6	4063 feet	20 feet	3.6	2.6	5	6	22%	24	30	81,258	2,709
	117	27	6	4063 feet	LOS 8'-12'	2.5	2.0	1	5	19%	12	17	39,059	2,298
NSA D	76	21	5	2971 feet	8 feet	0.6	0.4	0	0	0%	0	0	23,770	n/a
Barrier D	76	21	5	2971 feet	10 feet	1.1	0.5	0	0	0%	0	0	29,713	n/a
West	76	21	5	2971 feet	12 feet	1.2	0.5	0	0	0%	0	0	35,655	n/a
	76	21	5	2971 feet	14 feet	1.3	0.6	0	0	0%	0	0	41,598	n/a
	76	21	5	2971 feet	16 feet	1.4	0.6	0	0	0%	1	1	47,540	47,540
	76	**21**	**5**	**2971 feet**	**18 feet**	**1.4**	**0.6**	**0**	**0**	**0%**	**1**	**1**	**53,483**	**53,483**
	76	21	5	2971 feet	20 feet	1.5	0.6	0	0	0%	2	2	59,425	29,713
	76	21	5	2971 feet	LOS	n/a								
NSA D	15	4	3	689 Feet	8 feet	2.6	4.2	0	1	25%	1	2	5,510	2,755
Barrier D	15	4	3	689 Feet	10 feet	3.0	4.9	1	2	50%	1	3	6,887	2,296
East	15	4	3	689 Feet	12 feet	3.7	5.8	1	3	75%	1	4	8,265	2,066
	15	4	3	689 Feet	14 feet	3.9	6.2	2	4	100%	2	6	9,246	1,541
	15	4	3	689 Feet	16 feet	4.1	6.4	2	4	100%	2	6	11,020	1,837
	15	4	3	689 Feet	18 feet	4.2	6.5	2	4	100%	2	6	12,397	2,066
	15	4	3	689 Feet	20 feet	4.3	6.7	2	4	100%	2	6	13,775	2,296
	15	**4**	**3**	**689 Feet**	**Optimized 12'-16'**	**4.0**	**6.4**	**2**	**4**	**100%**	**2**	**6**	**10,407**	**1,735**
	15	4	3	689 Feet	LOS 8'-12'	3.6	5.8	1	1	25%	1	2	7,652	3,826
NSA D	45	4	14	2003 feet	8 feet	1.5	1.3	0	1	25%	1	2	16,024	8,012
Barrier D	45	4	14	2003 feet	10 feet	1.8	1.6	1	3	75%	1	4	20,030	5,008
East - Extended	45	4	14	2003 feet	12 feet	2.1	1.9	1	4	100%	4	8	24,036	3,005
	45	4	14	2003 feet	14 feet	2.2	2.0	3	4	100%	4	8	28,041	3,505
	45	4	14	2003 feet	16 feet	2.3	2.1	3	4	100%	5	9	32,047	3,561
	45	4	14	2003 feet	18 feet	2.4	2.1	3	4	100%	5	9	36,053	4,006
	45	4	14	2003 feet	20 feet	2.5	2.2	3	4	100%	6	10	40,059	4,006
	45	**4**	**14**	**2003 feet**	**Optimized 12'-14'**	**2.0**	**1.3**	**3**	**4**	**100%**	**4**	**8**	**26,663**	**3,333**
	45	4	14	2003 feet	LOS 8'-12'	1.8	1.8	1	4	100%	3	7	19,169	2,738

Highlighted barriers were the most reasonable and are discussed in the narrative.

PTC Milepost 28-31 Reconstruction Project -- Noise Barrier Summary Table NO TOLL PLAZA July 2015 (cont.)

NSA/Barrier	Number of Units	Impacted Units	1st Row Units	Barrier Length	Barrier Height	Average IL	Average IL @ Impacted	# Impacted IL > 7dB	# Impacted w/ > 5db IL	% Impacted w/ > 5dB IL	Non-impacted Units > 5db IL	Total Benefited Units	Barrier Sq. Feet	Sq. Feet per Benefited Unit
NSA E	60	16	35	2251 feet	8 feet	0.1	0.1	0	0	0%	0	0	18,010	n/a
Barrier E	60	16	35	2251 feet	10 feet	0.2	0.2	0	0	0%	0	0	22,513	n/a
(3 barriers)	60	16	35	2251 feet	12 feet	0.2	0.2	0	0	0%	0	0	27,055	n/a
	60	16	35	2251 feet	14 feet	0.3	0.3	0	0	0%	0	0	31,558	n/a
	60	16	35	2251 feet	16 feet	0.3	0.3	0	0	0%	0	0	36,020	n/a
	60	16	35	2251 feet	18 feet	0.3	0.3	0	0	0%	0	0	40,524	n/a
	60	**16**	**35**	**2251 feet**	**20 feet**	**0.4**	**0.4**	**0**	**0**	**0%**	**0**	**0**	**45,046**	**n/a**
	60	16	35	2251 feet	LOS	n/a								

NSA E	11	1	2	1512 feet	8 feet	0.6	1.2	0	0	0%	0	0	12,093	n/a
Barrier E East	11	1	2	1512 feet	10 feet	1.0	1.5	0	0	0%	0	0	15,117	n/a
	11	1	2	1512 feet	12 feet	1.1	2.0	0	0	0%	0	0	18,140	n/a
	11	1	2	1512 feet	14 feet	1.6	2.4	0	0	0%	0	0	21,164	n/a
	11	1	2	1512 feet	16 feet	2.1	2.6	0	0	0%	0	0	24,187	n/a
	11	1	2	1512 feet	18 feet	3.0	3.3	0	0	0%	4	4	27,210	6,803
	11	**1**	**2**	**1116 feet**	**20 feet**	**3.8**	**5.0**	**0**	**1**	**100%**	**5**	**6**	**22,327**	**3,721**
	11	1	2	1512 feet	LOS	n/a								

Highlighted barriers were the most reasonable and are discussed in the narrative.

Appendix 10

Noise Barrier Worksheets

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	15-Jul-15
Project Name	Turnpike MP 28-31 Reconstruction
County	Allegheny
SR, Section	Turnpike (I-76)
Community Name and/or NSA #	**NSA D**
Noise Wall Identification (i.e., Wall 1)	**D-ALL**
	Without Toll Plaza

General

1. Type of project (new location, reconstruction, etc.):	Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	27 units (14 receivers)
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)	pre-1940 thru 2014	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	n/a	
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* ."	X 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:	**22%**			
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				
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	48,755			
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	22			
c. SF/BR = 2a/2b	**2,216**			
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.				
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? ____ Yes X 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 X 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 X No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes X 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? ____ 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? ____ Yes X No

Is the Noise Wall REASONABLE? ____ Yes X No

Additional Reasons for Decision:

Barrier D-All (barrier along Turnpike for all of NSA D) is not feasible because it cannot reduce noise level 5 dB or more for 50% of the impacted units due to noise from I-79. It is also not reasonable because the amount of barrier per benefited unit exceeds 2000 sq. feet.

Responsible/Qualified Individuals Making the Above Decisions

Pennsylvania Turnpike Commission — Date

Karel L. Cubick, Sr. Planner - ms consultants, inc. — 7/17/2015

Qualified Professional Performing the Analysis (name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	15-Jul-15
Project Name	Turnpike MP 28-31 Reconstruction
County	Allegheny
SR, Section	Turnpike (I-76)
Community Name and/or NSA #	**NSA D**
Noise Wall Identification (i.e., Wall 1)	**D-WEST**
	Without Toll Plaza

General

1. Type of project (new location, reconstruction, etc.):	Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	21 units (9 receivers)
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)	2013-2014			
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	n/a			
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* ."	X	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:	21			
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				
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	53,483			
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	**1**			
c. SF/BR = 2a/2b	53,483			
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.				
a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor?		Yes	X	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 X 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 X 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 X No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes X 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? ____ 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? ____ Yes X No

Is the Noise Wall REASONABLE? ____ Yes X No

Additional Reasons for Decision:

Barrier D-West (barrier for impacted new units at west end of Northgate Drive) is not feasible because it cannot reduce the noise level 5 dB any of the impacted units due to noise from I-79.

Responsible/Qualified Individuals Making the Above Decisions

Pennsylvania Turnpike Commission — Date

Karel L. Cubick, Sr. Planner - ms consultants, inc. — 7/17/2015

Qualified Professional Performing the Analysis (name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	15-Jul-15
Project Name	Turnpike MP 28-31 Reconstruction
County	Allegheny
SR, Section	Turnpike (I-76)
Community Name and/or NSA #	**NSA D**
Noise Wall Identification (i.e., Wall 1)	**D-EAST**
	Without Toll Plaza

General

1. Type of project (new location, reconstruction, etc.):	Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	4 units (single family homes)
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)	pre-1940 thru 1960s	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	n/a	
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* ."	X 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:	4		
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			
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	10,407		
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	**6**		
c. SF/BR = 2a/2b	**1,735**		
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? ____ 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? X Yes ____ No

Additional Reasons for Decision:

Barrier D-East (barrier for impacted units along Mt. Pleasant Road) is warrented, feasible, and reasonable.

Responsible/Qualified Individuals Making the Above Decisions

Pennsylvania Turnpike Commission — Date

Karel L. Cubick, Sr. Planner - ms consultants, inc. — 7/17/2015

Qualified Professional Performing the Analysis (name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	15-Jul-15
Project Name	Turnpike MP 28-31 Reconstruction
County	Allegheny
SR, Section	Turnpike (I-76)
Community Name and/or NSA #	**NSA D**
Noise Wall Identification (i.e., Wall 1)	**D-EAST Extended Without Toll Plaza**

General

1. Type of project (new location, reconstruction, etc.):	Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	4 units (single family homes)
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)	pre-1940 thru 1960s	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	n/a	
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* ."	X 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:	4	
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		
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	26,663	
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	**8**	
c. SF/BR = 2a/2b	**3,333**	
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.

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? ___ Yes X 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? ___ 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:

Barrier D-East Extended (barrier for impacted units along Mt. Pleasant Road and other units along North Gate Drive) is not reasonable because the amount of barrier per benefited unit exceeds 2000 sq. feet.

Responsible/Qualified Individuals Making the Above Decisions

Pennsylvania Turnpike Commission — Date

Karel L. Cubick, Sr. Planner - ms consultants, inc. — 7/17/2015

Qualified Professional Performing the Analysis (name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	15-Jul-15
Project Name	Turnpike MP 28-31 Reconstruction
County	Allegheny
SR, Section	Turnpike (I-76)
Community Name and/or NSA #	**NSA E**
Noise Wall Identification (i.e., Wall 1)	**E**
	Without Toll Plaza

General

1. Type of project (new location, reconstruction, etc.):	Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	16 units (existing & planned homes)
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)	2009 thru 2015 and future	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	n/a	
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* ."	X 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:	16			
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				
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	45,026			
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	**0**			
c. SF/BR = 2a/2b	n/a			
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.				
a. Does the noise wall reduce design year exterior noise levels by at least 7 dB(A) for at least one benefited receptor?		Yes	X	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 X 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 X 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 X No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes X 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? ____ 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? ____ Yes X No

Is the Noise Wall REASONABLE? ____ Yes X No

Additional Reasons for Decision:

Barrier E (barrier for impacted new and planned units overlooking I-79) is not feasible because it can not reduce noise level 5 dB any of the impacted units due to noise from I-79.

Responsible/Qualified Individuals Making the Above Decisions

Pennsylvania Turnpike Commission — Date

Karel L. Cubick, Sr. Planner - ms consultants, inc. — 7/17/2015

Qualified Professional Performing the Analysis (name, title, and company name) — Date

Highway Traffic Noise Abatement
Warranted, Feasible, and Reasonable Worksheet – Noise Wall

Date	15-Jul-15
Project Name	Turnpike MP 28-31 Reconstruction
County	Allegheny
SR, Section	Turnpike (I-76)
Community Name and/or NSA #	**NSA E**
Noise Wall Identification (i.e., Wall 1)	**E-East**
	Without Toll Plaza

General

1. Type of project (new location, reconstruction, etc.):	Reconstruction

2. Total number of impacted receptor units in community

Category A units impacted	
Category B units impacted	1 home site
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)	2009 thru 2015 and future	
b. Date of approval for the Categorical Exclusion (CE), Record of Decision (ROD), or Finding of No Significant Impact (FONSI):	n/a	
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* ."	X 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			
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	22,327		
b. Number of benefited receptor units (any unit receiving 5 dB(A) or more insertion loss)	**6**		
c. SF/BR = 2a/2b	3,721		
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.			
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? ____ Yes X 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 X 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 X No

e. Does the noise wall reduce design year noise levels back to existing levels? ____ Yes X 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? ____ 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:

Barrier E - East (barrier for impacted residences west of Mt. Pleasant Rd.) is not reasonable because the amount of barrier per benefited unit exceeds 2000 sq. feet.

Responsible/Qualified Individuals Making the Above Decisions

Pennsylvania Turnpike Commission — Date

Karel L. Cubick, Sr. Planner - ms consultants, inc. — 7/17/2015

Qualified Professional Performing the Analysis (name, title, and company name) — Date