## Description: CNE A
## Proposed Barriers A1, A2, A3

Common Noise Environment (CNE) A is located along in the northern portion of the study area and is comprised of single-family homes in the Loudoun Valley Estates subdivision along Summerstown Place, Rogersdale Place, and Camerons Point Court. The southernmost homes on Summerstown Place border a proposed storm water basin ("Basin H" in the design plans). South of the storm water basin is a commercial development that contains a daycare. While traffic noise levels would exceed the Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) in the playground area of the day care facility, the day care facility was not included in the noise abatement evaluation for CNE A, but was rather considered as a "stand-alone" noise barrier. The storm water basin would be accessed from the westbound lanes of Route 606 at approximately station 222+00, and so the access point to Basin H is a constraint on the placement of noise barriers in this area.

Traffic noise impact is to occur at 22 single-family homes with the design-year Build case, therefore noise abatement is warranted and Proposed Noise Barriers A1, A2, and A3 were evaluated. Barrier A1 would be located north of Stukely Drive between Route 606 station numbers 250+17 and 258+44. Barrier A1 would benefit impacted receptors located near the property line of affected residences north of Stukely Drive. Barrier A2 would be located between Stukely Drive and Freeport Place between approximate station numbers 239+92 and 249+66. Barrier A3 would be located south of Freeport Place, approximately from station 221+96 to station 239+42.

All three noise barriers are located between the proposed right-of-way and the proposed multi-use trail, and are designed to protect ground-level exterior activity areas in the yards of impacted residential properties in CNE A. Because the proposed multi-use trail is part of the transportation improvement project, it is not considered to be noise-sensitive. Table 1 provides a summary of the barrier design analysis for CNE A. Table 1A provides a summary of the individual noise barrier parameters. As indicated below, Noise Barriers A1, A2, and A3 were found to be feasible and reasonable as a system of barriers.

**Table 1: Proposed Barriers A1, A2, A3 Results Summary**

| | |
|---|---|
| Impacted residential receptors with NAC of 67 dBA Leq | 22 |
| Impacts due to substantial increases in existing noise | 0 |
| Impacted residential receptors receiving 5 dBA IL or more | 22 |
| Not Impacted receptors receiving 5 dBA IL or more | 3 |
| Total benefited noise-sensitive receptors receiving 5 dBA IL or more | 25 |
| Are 50% Impacted receptors receiving 5 dB IL (Yes/No, %) | Yes, 100% |
| Impacted receptors receiving 7 dBA or more IL | 14 |
| Total Barrier Surface Area (Square Feet) | 39,662 |
| Barrier Surface Area (SF) per Benefited Receptor (SF/BR) | 1,586 |
| Is Barrier Reasonable (Surface Area ≤1600 SF/BR)? | **Yes** |
| Total Barrier Length (Feet) | 3,627 |
| Minimum Barrier Height (Feet) | 10 |
| Maximum Barrier Height (Feet) | 14 |
| Average Barrier Height (Feet) | 11.1 |
| Cost per Square Foot (based on < 50,000 SF) | $48 |
| Total Barrier Cost | $1,903,776 |

**Table 1A: Individual Barrier Parameters**

| Barrier | Length (feet) | Height (feet) | Surface Area (square-feet) | Number of Benefited Receptors |
|---|---|---|---|---|
| A1 | 818 | 10 to 14 | 10,357 | 6 |
| A2 | 992 | 10 to 12 | 10,247 | 5 |
| A3 | 1,816 | 10 to 12 | 19,058 | 14 |

## Noise Analysis Approach and Comments:

Harris Miller Miller & Hanson Inc. (HMMH) prepared this report in close coordination with the Virginia Department of Transportation (VDOT). The objectives of this study were to develop more refined and detailed noise modeling for the study area, determine the extent of potential traffic noise impacts, and determine the physical dimensions of noise barriers wherever noise abatement would be warranted as a result of the proposed Project in the design year (2036). This study builds upon the preliminary noise analysis conducted by McCormick Taylor in July 2012.* The methods and procedures used by HMMH are consistent with the latest noise assessment policies issued by FHWA and VDOT (updated on August 6, 2013).

HMMH used the latest version of the FHWA's Traffic Noise Model (TNM Version 2.5) to compute future Build case loudest-hour noise levels and noise barrier performance at all of the noise sensitive receptors in the study area, and to develop the appropriate heights, lengths and locations for all warranted noise barriers. TNM runs were developed using MicroStation design files, which were supplied by VDOT.** The modeling accounted for the variability in the local terrain and included the following parameters that affect the propagation of traffic noise: terrain

lines, shielding from trees, ground zones, building rows and fixed height barriers to represent large commercial buildings. The default ground type used in the modeling was "lawn."

*Table 2: Loudest-hour Noise Levels* provides the details of the predicted at all receptors in CNE A, and includes the address or land-use description, the site number for reference with the attached figures, the number of noise-sensitive dwelling units associated with the receptor, the predicted Loudest-hour $L_{eq}$ without and with the proposed noise barriers, and the barrier insertion loss. Certain cells within Table 2 are shaded red to indicate receptors for which the loudest hour $L_{eq}$ approaches or exceeds the FHWANAC for Activity Category B (residential land use). Other cells within Table 2 are shaded green to indicate benefited receptors (receptors that receive 5 dBA, or more, of insertion loss from the noise barrier).

*Figure 1: Location Map for Common Noise Environment, Receptors, Contours and Barriers* shows the locations of all receptors as well as the noise barriers and Project roadways superimposed on an aerial photograph. The coordinates of the modeled receptor locations contained within the TNM model are shown in *Table 3: Receptor Site Locations*.

HMMH conducted short-term monitoring at six locations in CNE A on August 1 and 3, 2013. During the noise measurement program, HMMH also counted and classified vehicle types for traffic on existing Route 606 (Old Ox Road). Short-term noise measurements were conduct at six locations – identified as Sites M1 through M6 – for periods of up to 30 minutes at each site. Sites M1 through M6 were used to validate the modeling assumptions for receptors in CNE A, while the validation process for CNE B was completed using the short-term monitoring results at Site M7, for which measurements were performed on March 11, 2013, as part of the Dulles Air Cargo, Passenger, and Metro Access Highway Project.*** The validation process compares monitored sound levels at each measurement site to the noise levels calculated with TNM, using the existing site geometry and counted traffic as input to the model. The modeling assumptions are revised, as necessary, until the agreement between monitored and calculated noise levels are within an acceptable range of +/- 3 dBA, in accordance with VDOT policy. *Figure 1: Location Map for Common Noise Environment, Receptors, Contours and Barriers* shows receptor site and monitoring locations for CNE A.

Throughout the Project corridor (CNE A and CNE B), monitored $L_{eq}$s ranged from 48.4 to 69.0 dBA, while the corresponding TNM-calculated noise levels ranged from 50.5 to 71.2 dBA. The average difference between calculated noise levels and monitored noise levels was +2.1 decibels (over all seven sites), which shows excellent agreement between monitored and modeled noise levels, and suggests confidence in the modeling assumptions. The validation comparisons are shown in *Table 5: Noise Modeling Validation Results.* The coordinates of the monitoring sites used for model validation are summarized in *Table 6: Monitoring Site Location Data.* During the monitoring session, traffic counts and vehicle classifications were obtained and are summarized in *Table 7: Validation Traffic Counts Converted to One Hour Volumes.*

Note that the difference between the calculated $L_{eq}$ and the monitored $L_{eq}$ was +3.2 dB at Site M1 and +3.1 dB at Site M5. These differences between calculated and monitored traffic levels are just outside the range that is considered acceptable by VDOT. We examined the validation results at both sites in great detail and believe that we have exhausted whatever modeling options

are available to us within TNM. HMMH believes the following contributing factors may explain the resulting discrepancies between calculated and monitored levels at Sites M1 and M5, as well as some of the resultant over-prediction at the other sites:

- A relatively low sample of trucks in the traffic counts may have introduced a downward bias to the monitored noise levels, especially if the trucks in the sample were quieter than the national average;
- The method of estimating speeds during the traffic counts may have introduced an upward bias to the calculated traffic noise levels;
- Observed weather conditions during the August 2013 measurements suggest increased atmospheric absorption compared to standard atmospheric conditions. When the observed temperature and relative humidity were used within TNM, the difference between calculated and monitored noise levels fell within the range considered acceptable by VDOT, as shown in Table 5.

The modeling also included the geometry for the proposed Project roadways, obtained from the design plans, profiles, and cross-sections for Route 606. Traffic data were supplied by VDOT for the design year (2036) in terms of Average Daily Traffic Volumes, AM and PM Peak Hour volumes, turning movements, and posted speeds for the Existing year, as well as the 2036 Design Year.[†] For the loudest hour analysis, HMMH modeled CNE A in its entirety using both the AM Peak Hour and the PM Peak Hour as input to the model. The traffic for the PM Peak Hour generated higher noise levels at impacted first row receptors, than did the traffic for the AM Peak Hour. Interestingly, the traffic for the AM Peak hour produced higher noise levels at second row receptors, than did the traffic for the PM Peak Hour; however, second row receptors would not be exposed to noise impact during the AM Peak Hour. Based on these results, HMMH determined that the PM Peak Hour represented conditions that could be expected during the worst noise hour of the day in the design-year. Traffic data used as input to the model for the worst noise hour in the design-year are shown in *Table 8: TNM Traffic Volumes Design Year 2036*.

Receptors in CNE A, west of Route 606, were evaluated to determine the extent of future traffic noise impact as a result of the Project. Modeled receptor locations represented exterior activity areas associated with single family homes and were typically positioned in a "worse-case" location within a yard that was exposed to traffic on Route 606. Predicted noise levels in the Design Year would range from 54 to 71 dBA $L_{eq}$ and would approach or exceed the FHWA Noise Abatement Criteria for Activity Category B and C at 22 residences. Based on these findings, noise abatement is warranted for CNE A.

To mitigate the anticipated design-year noise impacts, HMMH evaluated the feasibility and reasonableness of noise barriers for CNE A. The 3-barrier system is comprised of Noise Barrier A1, A2, and A3, which are described in detail below. It should be noted that all of the predicted impacts in CNE A would be benefited by the proposed barriers.

- Barrier A1 would be 818 feet in length, beginning at approximately station 250+17 and ending at station 258+44, and would range in height from 10 to 14 feet, benefiting six receptors. This barrier would be located north of Stukely Drive.

- Barrier A2 would be 992 feet, beginning near Route 606 station 239+92 and ending at station 249+66, and would range in height from 10 to 12 feet, benefiting five receptors. This barrier would be located between Stukely Drive and Freeport Place.
- Barrier A3 would be 1,813 feet in length, beginning at approximately station 221+96 and ending at station 239+42, and would range in height from 10 to 12 feet, benefiting 14 receptors. This barrier would be located south of Freeport Place.

A summary of the noise barrier design is given in *Table 1: Proposed Barriers A1, A2, and A3 Results Summary.* The individual barrier parameters are given in *Table 1A: Individual Barrier Parameters* and the modeled coordinates of the proposed barriers are given in *Table 4: Sound Attenuation Line.* The barriers are shown on the attached plan map graphic, *Figure 1: Location Map for Common Noise Environment, Receptors, Contours and Barriers.* The graphic shows the barrier location with station numbers for reference with the tables. The barrier profile has been smoothed for uniformity.

With Proposed Barriers A1, A2, and A3 constructed, design year noise levels are expected to range from 54 to 73 dBA at residences within CNE A. The proposed noise barriers would benefit 25 residential receptors, each receiving five dBA or more of noise reduction. Fourteen of the impacted and benefited receptor sites would receive at least 7 dBA noise reduction, meeting VDOT's design goal. The feasibility criterion for protecting at least 50% of the impacted noise receptors is satisfied, since all of the impacted receptors will realize a noise reduction of 5 dBA or more. The total surface area for Proposed Barriers A1, A2, and A3 is 39,662 square-feet. The total surface area divided by the number of benefited noise-sensitive receptors is 1,586 square feet per receptor, which just meets VDOT's criterion of 1600. Based on these findings, the proposed barriers meet VDOT's warranted, feasible, and reasonableness criteria. The property owners will be surveyed to determine if the proposed barriers are desirable.

* Reference: "Dulles Loop Project: Route 606 (Old Ox Road) and Loudoun County Parkway – Preliminary Noise Analysis," State Project 0606-053-983, UPC 97529, prepared by McCormick Taylor, July 2012.

** Reference: email message from Lovejoy Muchenje to Chris Bajdek dated 7/16/2013 at 10:09 AM with subject "UPC 97529_TNM runs + other microstation files."

*** Reference: "Noise Analysis Technical Report: Dulles Air Cargo, Passenger, and Metro Access Highway, Loudoun County, Virginia – VDOT Project No. R000-053-032, P-101, UPC 103929," prepared by Harris Miller Miller & Hanson Inc., Report No. 304800.004, April 2013.

† Reference: memorandum from Bahram Jamei to Zamir Mirza dated February 15, 2013, with subject "Traffic Data for Route 606 (Old Ox Road/Loudoun County Parkway) between Evergreen Mills Road (Route 621) and Dulles Greenway (Route 267), Project UPC # 97529, Loudoun County."

## Table 2: Loudest Hour Noise Levels

| Receptor Site Number | Site Address | No. Units | 2036 Loudest-hour Noise Levels | | |
|---|---|---|---|---|---|
| | | | No Barrier $L_{eq}$ (dBA) | With-Proposed Barrier $L_{eq}$ (dBA) | Insertion Loss (dB)* |
| A1-01 | 23272 Rogerdale Pl | 1 | 60 | 59 | 1 |
| A1-02 | 23276 Rogerdale Pl | 1 | 62 | 60 | 1 |
| A1-03 | 23280 Rogerdale Pl | 1 | 63 | 61 | 2 |
| A1-04 | 23284 Rogerdale Pl | 1 | 62 | 60 | 2 |
| A1-05 | 23288 Rogerdale Pl | 1 | 65 | 60 | 5 |
| A1-06 | 23292 Rogerdale Pl | 1 | 64 | 59 | 6 |
| A1-07 | 23296 Rogerdale Pl | 1 | 66 | 60 | 6 |
| A1-08 | 23300 Rogerdale Pl | 1 | 67 | 60 | 7 |
| A1-09 | 23304 Rogerdale Pl | 1 | 67 | 59 | 8 |
| A1-10 | 43478 Stukely Dr | 1 | 68 | 62 | 6 |
| A1-11 | 43474 Stukely Dr | 1 | 62 | 59 | 3 |
| A1-12 | 43618 Parisville Ct | 1 | 54 | 54 | 1 |
| A1-13 | 23293 Rogerdale Pl | 1 | 55 | 55 | 1 |
| A1-14 | 23305 Rogerdale Pl | 1 | 56 | 55 | 1 |
| A1-15 | 23309 Rogerdale Pl | 1 | 57 | 55 | 2 |
| A2-01 | 43479 Stukely Dr | 1 | 66 | 63 | 5 |
| A2-02 | 43620 Camerons Point Ct | 1 | 62 | 59 | 3 |
| A2-03 | 43624 Camerons Point Ct | 1 | 71 | 62 | 9 |
| A2-04 | 43621 Camerons Point Ct | 1 | 68 | 60 | 8 |
| A2-05 | 23340 Rogerdale Pl | 1 | 63 | 58 | 5 |
| A2-06 | 23344 Rogerdale Pl | 1 | 66 | 59 | 7 |
| A2-07 | 43475 Stukely Dr | 1 | 57 | 55 | 2 |
| A2-08 | 23320 Rogerdale Pl | 1 | 57 | 55 | 2 |
| A2-09 | 43616 Camerons Point Ct | 1 | 56 | 54 | 2 |
| A2-10 | 23336 Rogerdale Pl | 1 | 59 | 56 | 3 |
| A2-11 | 43570 Freeport Pl | 1 | 57 | 55 | 1 |
| A3-01 | 23372 Summerstown Pl | 1 | 66 | 61 | 5 |
| A3-02 | 23376 Summerstown Pl | 1 | 66 | 61 | 5 |
| A3-03 | 23380 Summerstown Pl | 1 | 67 | 62 | 5 |
| A3-04 | 23384 Summerstown Pl | 1 | 67 | 62 | 5 |
| A3-05 | 23388 Summerstown Pl | 1 | 67 | 62 | 5 |
| A3-06 | 23392 Summerstown Pl | 1 | 67 | 62 | 6 |
| A3-07 | 23396 Summerstown Pl | 1 | 67 | 61 | 7 |
| A3-08 | 23400 Summerstown Pl | 1 | 68 | 60 | 8 |
| A3-09 | 23404 Summerstown Pl | 1 | 67 | 60 | 8 |

| Receptor Site Number | Site Address | No. Units | 2036 Loudest-hour Noise Levels | | |
|---|---|---|---|---|---|
| | | | No Barrier $L_{eq}$ (dBA) | With-Proposed Barrier $L_{eq}$ (dBA) | Insertion Loss (dB)* |
| A3-10 | 23408 Summerstown Pl | 1 | 66 | 59 | 7 |
| A3-11 | 23412 Summerstown Pl | 1 | 68 | 59 | 8 |
| A3-12 | 23416 Summerstown Pl | 1 | 70 | 60 | 10 |
| A3-13 | 23420 Summerstown Pl | 1 | 71 | 60 | 11 |
| A3-14 | 23424 Summerstown Pl | 1 | 70 | 61 | 10 |
| A3-15 | 43571 Freeport Pl | 1 | 57 | 56 | 1 |
| A3-16 | 23377 Summerstown Pl | 1 | 56 | 55 | 1 |
| A3-17 | 23381 Summerstown Pl | 1 | 56 | 55 | 1 |
| A3-18 | 23385 Summerstown Pl | 1 | 56 | 55 | 1 |
| A3-19 | 23389 Summerstown Pl | 1 | 56 | 55 | 1 |
| A3-20 | 23393 Summerstown Pl | 1 | 56 | 55 | 1 |
| A3-21 | 23397 Summerstown Pl | 1 | 56 | 55 | 1 |
| A3-22 | 23401 Summerstown Pl | 1 | 56 | 54 | 1 |
| A3-23 | 23405 Summerstown Pl | 1 | 56 | 54 | 1 |
| A3-24 | 43506 Ogden Pl | 1 | 55 | 54 | 1 |
| A3-25 | 43507 Ogden Pl | 1 | 56 | 54 | 1 |
| A3-26 | 23421 Summerstown Pl | 1 | 57 | 56 | 1 |
| A3-27 | 23425 Summerstown Pl | 1 | 59 | 58 | 1 |

Notes: * Rounding of decibels may make some subtractions appear incorrect

## Table 3: Receptor Site Locations

| Receptor Site Number | Site Address | Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| A1-01 | 23272 Rogerdale Pl | 11,769,583 | 7,040,066 | 282.6 |
| A1-02 | 23276 Rogerdale Pl | 11,769,585 | 7,039,933 | 282.5 |
| A1-03 | 23280 Rogerdale Pl | 11,769,577 | 7,039,840 | 282.5 |
| A1-04 | 23284 Rogerdale Pl | 11,769,527 | 7,039,758 | 285 |
| A1-05 | 23288 Rogerdale Pl | 11,769,568 | 7,039,668 | 285 |
| A1-06 | 23292 Rogerdale Pl | 11,769,560 | 7,039,561 | 286 |
| A1-07 | 23296 Rogerdale Pl | 11,769,559 | 7,039,464 | 288 |
| A1-08 | 23300 Rogerdale Pl | 11,769,544 | 7,039,357 | 289 |
| A1-09 | 23304 Rogerdale Pl | 11,769,523 | 7,039,241 | 287.8 |
| A1-10 | 43478 Stukely Dr | 11,769,502 | 7,039,132 | 290 |
| A1-11 | 43474 Stukely Dr | 11,769,385 | 7,039,157 | 293 |
| A1-12 | 43618 Parisville Ct | 11,769,291 | 7,039,745 | 286 |
| A1-13 | 23293 Rogerdale Pl | 11,769,282 | 7,039,553 | 288 |
| A1-14 | 23305 Rogerdale Pl | 11,769,265 | 7,039,345 | 291 |
| A1-15 | 23309 Rogerdale Pl | 11,769,184 | 7,039,116 | 294 |
| A2-01 | 43479 Stukely Dr | 11,769,481 | 7,038,887 | 294.5 |
| A2-02 | 43620 Camerons Point Ct | 11,769,396 | 7,038,720 | 297 |
| A2-03 | 43624 Camerons Point Ct | 11,769,507 | 7,038,527 | 293 |
| A2-04 | 43621 Camerons Point Ct | 11,769,435 | 7,038,364 | 294 |
| A2-05 | 23340 Rogerdale Pl | 11,769,308 | 7,038,262 | 296 |
| A2-06 | 23344 Rogerdale Pl | 11,769,316 | 7,038,104 | 297 |
| A2-07 | 43475 Stukely Dr | 11,769,318 | 7,038,852 | 294 |
| A2-08 | 23320 Rogerdale Pl | 11,769,305 | 7,038,754 | 295 |
| A2-09 | 43616 Camerons Point Ct | 11,769,264 | 7,038,681 | 296 |
| A2-10 | 23336 Rogerdale Pl | 11,769,296 | 7,038,405 | 296 |
| A2-11 | 43570 Freeport Pl | 11,769,072 | 7,038,130 | 300 |
| A3-01 | 23372 Summerstown Pl | 11,769,239 | 7,037,881 | 297 |
| A3-02 | 23376 Summerstown Pl | 11,769,217 | 7,037,784 | 296 |
| A3-03 | 23380 Summerstown Pl | 11,769,189 | 7,037,669 | 296 |
| A3-04 | 23384 Summerstown Pl | 11,769,135 | 7,037,538 | 294 |
| A3-05 | 23388 Summerstown Pl | 11,769,096 | 7,037,430 | 293 |
| A3-06 | 23392 Summerstown Pl | 11,769,049 | 7,037,317 | 293 |
| A3-07 | 23396 Summerstown Pl | 11,769,008 | 7,037,195 | 292 |
| A3-08 | 23400 Summerstown Pl | 11,768,976 | 7,037,076 | 293 |
| A3-09 | 23404 Summerstown Pl | 11,768,933 | 7,036,950 | 292 |
| A3-10 | 23408 Summerstown Pl | 11,768,892 | 7,036,840 | 292 |
| A3-11 | 23412 Summerstown Pl | 11,768,873 | 7,036,711 | 292 |
| A3-12 | 23416 Summerstown Pl | 11,768,848 | 7,036,585 | 292 |
| A3-13 | 23420 Summerstown Pl | 11,768,822 | 7,036,463 | 290 |
| A3-14 | 23424 Summerstown Pl | 11,768,776 | 7,036,332 | 288 |
| A3-15 | 43571 Freeport Pl | 11,769,052 | 7,037,968 | 300 |

| Receptor Site Number | Site Address | Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| A3-16 | 23377 Summerstown Pl | 11,769,010 | 7,037,795 | 298 |
| A3-17 | 23381 Summerstown Pl | 11,768,967 | 7,037,681 | 298 |
| A3-18 | 23385 Summerstown Pl | 11,768,920 | 7,037,567 | 296 |
| A3-19 | 23389 Summerstown Pl | 11,768,877 | 7,037,452 | 296 |
| A3-20 | 23393 Summerstown Pl | 11,768,838 | 7,037,322 | 294 |
| A3-21 | 23397 Summerstown Pl | 11,768,794 | 7,037,212 | 293 |
| A3-22 | 23401 Summerstown Pl | 11,768,761 | 7,037,101 | 292 |
| A3-23 | 23405 Summerstown Pl | 11,768,732 | 7,036,982 | 291 |
| A3-24 | 43506 Ogden Pl | 11,768,676 | 7,036,819 | 290 |
| A3-25 | 43507 Ogden Pl | 11,768,647 | 7,036,703 | 290 |
| A3-26 | 23421 Summerstown Pl | 11,768,612 | 7,036,522 | 290 |
| A3-27 | 23425 Summerstown Pl | 11,768,588 | 7,036,412 | 291 |

## Table 4: Sound Attenuation Line

Proposed Barrier A1

| Station No. (Route 606) | Barrier Coordinates (feet) (VDOT Project Coordinates) | | Elevation (feet) | | Estimated Height Above Ground (feet) |
|---|---|---|---|---|---|
| | X | Y | Estimated Ground | Top of Barrier | |
| 258+44 | 11,769,758.00 | 7,039,801.50 | 285.3 | 297.3 | 12 |
| 257+98 | 11,769,738.00 | 7,039,756.50 | 285.5 | 297.5 | 12 |
| 257+51 | 11,769,719.00 | 7,039,711.00 | 285 | 297 | 12 |
| 257+13 | 11,769,704.00 | 7,039,672.50 | 284.8 | 296.8 | 12 |
| 256+61 | 11,769,686.00 | 7,039,620.50 | 284.6 | 296.6 | 12 |
| 256+29 | 11,769,676.00 | 7,039,588.50 | 284.1 | 298.1 | 14 |
| 255+87 | 11,769,661.00 | 7,039,545.00 | 283.9 | 297.9 | 14 |
| 255+32 | 11,769,644.00 | 7,039,489.00 | 284 | 298 | 14 |
| 254+75 | 11,769,627.00 | 7,039,431.50 | 284 | 298 | 14 |
| 254+38 | 11,769,616.00 | 7,039,393.50 | 285.3 | 299.3 | 14 |
| 254+00 | 11,769,609.00 | 7,039,352.00 | 285.7 | 299.7 | 14 |
| 253+58 | 11,769,604.00 | 7,039,308.50 | 285.4 | 299.4 | 14 |
| 253+03 | 11,769,598.00 | 7,039,249.50 | 286 | 300 | 14 |
| 252+34 | 11,769,593.00 | 7,039,180.00 | 286.5 | 298.5 | 12 |
| 251+74 | 11,769,589.00 | 7,039,121.00 | 287.1 | 299.1 | 12 |
| 250+95 | 11,769,583.00 | 7,039,041.50 | 288.5 | 298.5 | 10 |
| 250+63 | 11,769,580.00 | 7,039,010.00 | 289.6 | 299.6 | 10 |
| 250+17 | 11,769,536.00 | 7,038,967.00 | 290.8 | 300.8 | 10 |

Proposed Barrier A2

| Station No. (Route 606) | Barrier Coordinates (feet) (VDOT Project Coordinates) | | Elevation (feet) | | Estimated Height Above Ground (feet) |
|---|---|---|---|---|---|
| | X | Y | Estimated Ground | Top of Barrier | |
| 249+66 | 11,769,524.00 | 7,038,916.50 | 291.1 | 301.1 | 10 |
| 249+39 | 11,769,552.00 | 7,038,888.00 | 291.35 | 301.35 | 10 |
| 249+13 | 11,769,579.00 | 7,038,860.00 | 291.6 | 301.6 | 10 |
| 248+40 | 11,769,573.00 | 7,038,786.50 | 291.4 | 301.4 | 10 |
| 247+24 | 11,769,565.00 | 7,038,671.50 | 292.9 | 302.9 | 10 |
| 246+31 | 11,769,558.00 | 7,038,580.50 | 291 | 301 | 10 |
| 245+63 | 11,769,551.00 | 7,038,516.50 | 290.9 | 300.9 | 10 |
| 245+00 | 11,769,542.00 | 7,038,457.50 | 291 | 301 | 10 |
| 244+36 | 11,769,531.00 | 7,038,398.00 | 291.1 | 301.1 | 10 |
| 243+73 | 11,769,519.00 | 7,038,339.50 | 292 | 302 | 10 |
| 243+09 | 11,769,504.00 | 7,038,281.50 | 293.2 | 303.2 | 10 |
| 242+28 | 11,769,482.00 | 7,038,207.50 | 294.3 | 304.3 | 10 |
| 241+34 | 11,769,452.00 | 7,038,121.50 | 294.9 | 304.9 | 10 |
| 240+42 | 11,769,420.00 | 7,038,037.50 | 294.2 | 306.2 | 12 |
| 240+17 | 11,769,388.00 | 7,038,023.00 | 294.3 | 306.3 | 12 |
| 239+92 | 11,769,355.00 | 7,038,009.00 | 294.4 | 306.4 | 12 |

Proposed Barrier A3

| Station No. (Route 606) | Barrier Coordinates (feet) (VDOT Project Coordinates) | | Elevation (feet) | | Estimated Height Above Ground (feet) |
|---|---|---|---|---|---|
| | X | Y | Estimated Ground | Top of Barrier | |
| 239+42 | 11,769,338.00 | 7,037,962.00 | 294.7 | 304.7 | 10 |
| 239+17 | 11,769,352.00 | 7,037,930.00 | 293.15 | 303.15 | 10 |
| 238+92 | 11,769,366.00 | 7,037,897.50 | 291.6 | 301.6 | 10 |
| 237+81 | 11,769,327.00 | 7,037,793.50 | 290.5 | 300.5 | 10 |
| 236+76 | 11,769,290.00 | 7,037,695.50 | 290.3 | 302.3 | 12 |
| 235+64 | 11,769,250.00 | 7,037,590.50 | 290 | 300 | 10 |
| 234+40 | 11,769,206.00 | 7,037,474.50 | 289.9 | 299.9 | 10 |
| 233+52 | 11,769,174.00 | 7,037,392.50 | 290.1 | 300.1 | 10 |
| 232+73 | 11,769,146.00 | 7,037,319.00 | 289.1 | 299.1 | 10 |
| 232+15 | 11,769,126.00 | 7,037,264.50 | 289.4 | 299.4 | 10 |
| 231+24 | 11,769,093.00 | 7,037,179.50 | 289.9 | 299.9 | 10 |
| 230+14 | 11,769,054.00 | 7,037,075.50 | 290.2 | 302.2 | 12 |
| 229+08 | 11,769,017.00 | 7,036,975.00 | 289.9 | 299.9 | 10 |
| 228+41 | 11,768,995.00 | 7,036,911.50 | 290.3 | 300.3 | 10 |
| 227+76 | 11,768,974.00 | 7,036,848.00 | 291.2 | 301.2 | 10 |
| 227+05 | 11,768,951.00 | 7,036,779.00 | 291.6 | 301.6 | 10 |
| 225+85 | 11,768,916.00 | 7,036,662.50 | 292.5 | 302.5 | 10 |
| 224+78 | 11,768,886.00 | 7,036,557.50 | 291.7 | 301.7 | 10 |
| 224+49 | 11,768,878.00 | 7,036,530.00 | 291.8 | 301.8 | 10 |
| 223+73 | 11,768,859.00 | 7,036,455.00 | 290.1 | 302.1 | 12 |
| 223+02 | 11,768,841.00 | 7,036,384.00 | 286.4 | 298.4 | 12 |
| 222+24 | 11,768,823.00 | 7,036,309.50 | 285.9 | 297.9 | 12 |
| 222+15 | 11,768,822.00 | 7,036,301.00 | 286 | 298 | 12 |
| 222+15 | 11,768,802.00 | 7,036,305.50 | 286 | 296 | 10 |
| 221+96 | 11,768,769.00 | 7,036,290.50 | 285.5 | 295.5 | 10 |

## Table 5: Noise Modeling Validation Results

| CNE | Site No. | Address | Monitored $L_{eq}$ (dBA)* | Default Atmospherics | | Observed Atmospherics** | |
|---|---|---|---|---|---|---|---|
| | | | | TNM Computed $L_{eq}$ (dBA) | Difference (dB) (computed *minus* monitored) | TNM Computed $L_{eq}$ (dBA) | Difference (dB) (computed *minus* monitored) |
| A | M1 | 23420 Summerstown Pl | 58.8 | 62.0 | 3.2 | 61.8 | 3.0 |
| A | M2 | 23376 Summerstown Pl | 57.8 | 57.9 | 0.1 | 57.7 | -0.1 |
| A | M3 | 43624 Camerons Point Ct | 61.6 | 61.9 | 0.3 | 61.8 | 0.2 |
| A | M4 | 23284 Rogerdale Pl | 53.1 | 54.7 | 1.6 | 54.6 | 1.5 |
| A | M5 | 43507 Ogden Pl | 48.5 | 51.6 | 3.1 | 51.4 | 2.9 |
| A | M6 | 43571 Freeport Pl | 48.4 | 50.5 | 2.1 | 50.3 | 1.9 |
| B | M7 | 25289 Evergreen Mills Rd | 69.0 | 71.2 | 2.2 | 71.2 | 2.2 |
| | | | | Average difference: | 2.1 | | 2.0 |
| | | | | Standard deviation of difference: | 1.2 | | 1.1 |

* The monitored (traffic-only) $L_{eq}$ includes an adjustment based on the difference between the "begin" and the "end" field calibration at each site.
** Observed weather conditions during the measurements ranged from 88 to 95°F and from 70 to 75% relative humidity on 8/1/13. On 8/2/13, the temperature ranged from 85 to 86°F and the relative humidity was approximately 60%. On 3/11/13, the temperature was 58°F and the relative humidity was 68%.

## Table 6: Monitoring Site Location Data

| Site Number | Address | Site Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| M1 | 23420 Summerstown Pl | 11768823 | 7036500 | 290 |
| M2 | 23376 Summerstown Pl | 11769208 | 7037806 | 297 |
| M3 | 43624 Camerons Point Ct | 11769494 | 7038481 | 293 |
| M4 | 23284 Rogerdale Pl | 11769552 | 7039900 | 283 |
| M5 | 43507 Ogden Pl | 11768668 | 7036733 | 289 |
| M6 | 43571 Freeport Pl | 11769050 | 7037902 | 299 |
| M7 | 25289 Evergreen Mills Rd | 11761935 | 7027474 | 307 |

Note: Data used in the TNM validation modeling.

## Table 7: Validation Traffic Counts Converted to One Hour Volumes

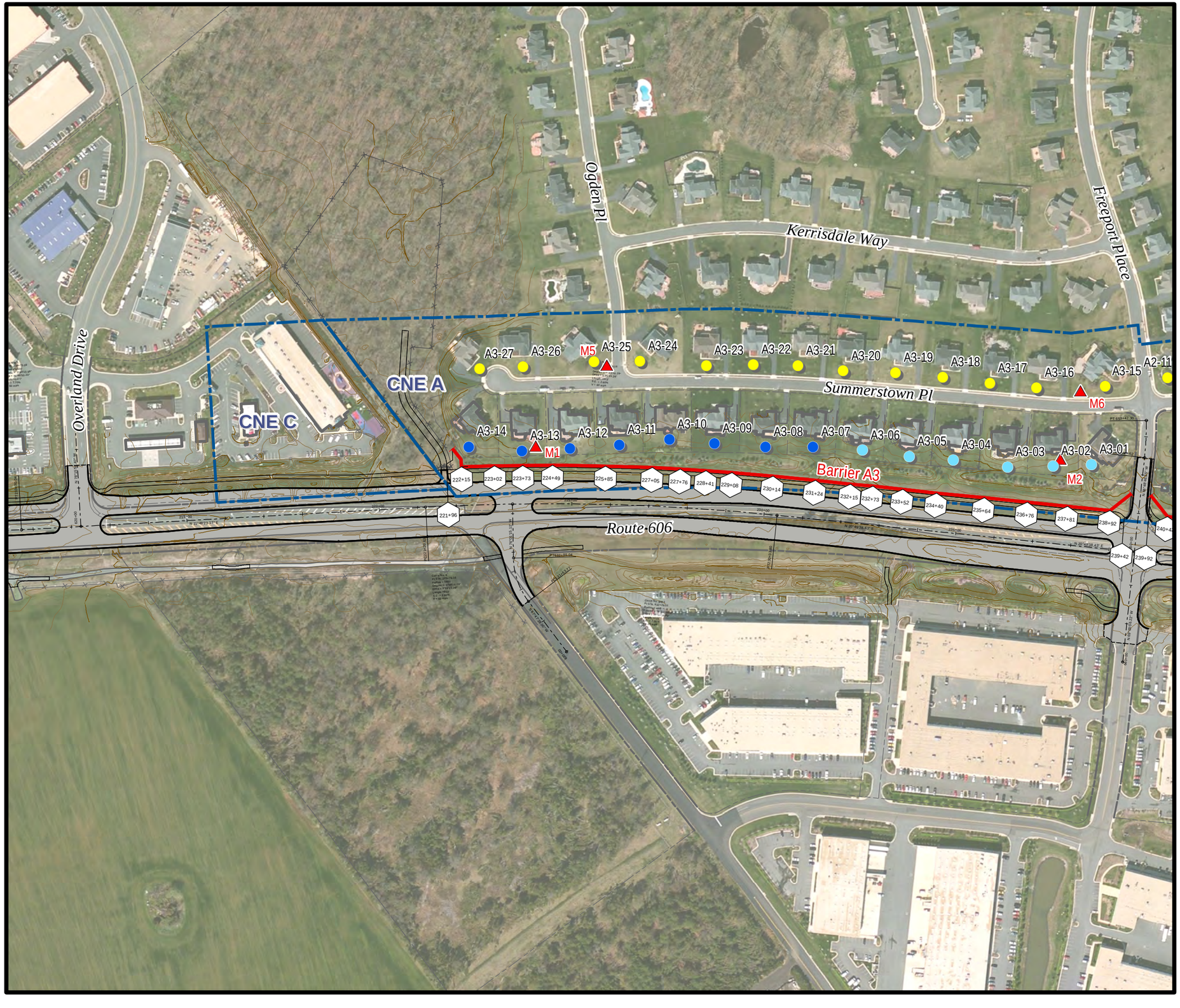
| CNE | Site Number | Roadway | Autos | MT | HT | Estimated Speed (mph) |
|---|---|---|---|---|---|---|
| A | M1 | Route 606 WB | 630 | 18 | 24 | 50 |
| | M1 | Route 606 EB | 570 | 30 | 39 | 50 |
| A | M2 | Route 606 WB | 1,164 | 21 | 27 | 30 |
| | M2 | Route 606 EB | 570 | 15 | 12 | 35 |
| A | M3 | Route 606 WB | 606 | 21 | 12 | 50 |
| | M3 | Route 606 EB | 501 | 33 | 36 | 50 |
| A | M4 | Route 606 WB | 657 | 24 | 36 | 50 |
| | M4 | Route 606 EB | 681 | 21 | 27 | 50 |
| A | M5 | Route 606 WB | 918 | 24 | 39 | 45 |
| | M5 | Route 606 EB | 534 | 24 | 27 | 45 |
| A | M6 | Route 606 WB | 348 | 18 | 21 | 50 |
| | M6 | Route 606 EB | 501 | 18 | 6 | 50 |
| B | M7 | Route 606 WB | 1,390 | 62 | 34 | 55 |
| | M7 | Route 606 EB | 1,060 | 48 | 20 | 55 |

Note: Traffic counts were taken for 30 minutes at each site for 15 minutes in each direction and converted to one-hour volumes.

## Table 8: Modeled Loudest Hour Traffic Volumes for CNE A in Design Year 2036

| Roadway Name | Location | Vehicles per hour (vph) | | | Speed (mph) |
|---|---|---|---|---|---|
| | | Autos | Medium Trucks | Heavy Trucks | |
| Route 606 WB | Ladbrook Dr to Stukely Dr | 1,957 | 108 | 86 | 55 |
| | Stukely Dr to Freeport Pl | 1,915 | 105 | 84 | 55 |
| | Freeport Pl to Beaver Meadow Rd | 1,946 | 107 | 86 | 55 |
| | Beaver Meadow Rd to Overland Dr | 1,977 | 109 | 87 | 55 |
| Route 606 EB | Overland Dr to Beaver Meadow Rd | 818 | 45 | 36 | 55 |
| | Beaver Meadow Rd to Trade Center Pkwy | 795 | 44 | 35 | 55 |
| | Trade Center Pkwy to Weather Service Rd | 886 | 49 | 39 | 55 |
| | Weather Service Rd to Ladbrook Dr | 896 | 49 | 39 | 55 |

Notes:
1.) Traffic data were supplied by VDOT [reference: memorandum from Bahram Jamei to Zamir Mirza dated February 15, 2013, with subject “Traffic Data for Route 606 (Old Ox Road/Loudoun County Parkway) between Evergreen Mills Road (Route 621) and Dulles Greenway (Route 267), Project UPC # 97529, Loudoun County”].
2.) The 2036 PM Peak Hour was determined to be the worst noise hour.
3.) As directed by VDOT, posted speeds were used for the noise analysis [reference: email from L.J. Muchenje to Chris Bajdek dated August 2, 2013, at 10:37 AM with subject “FW: UPC 97529_TNM runs + other microstation files”].




# Figure 1
# Dulles Loop Project
# (Rte 606 and Loudoun County Pkwy)

Loudoun County, Virginia

## Location Map for Common Noise Environment, Receptors, and Barriers A1, A2 and A3

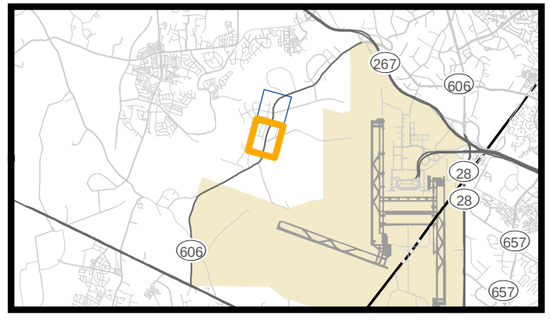
Project No. 0606-053-983; UPC No. 97529
HMMH Report No. 305000.012
September 2013

Receiver Site and Number

- Impacted and 5 or 6 dBA Insertion Loss
- Impacted and 7 dBA or more Insertion Loss
- Impacted and Not Benefited
- Not Impacted and Benefited
- Not Benefited or Impacted
- Potential Acquisitions

- M# Short-Term Measurement Site
- Proposed Barrier
- Common Noise Environment (CNE) Areas
- Proposed Roadway Alignment
- Ground Elevation Contours

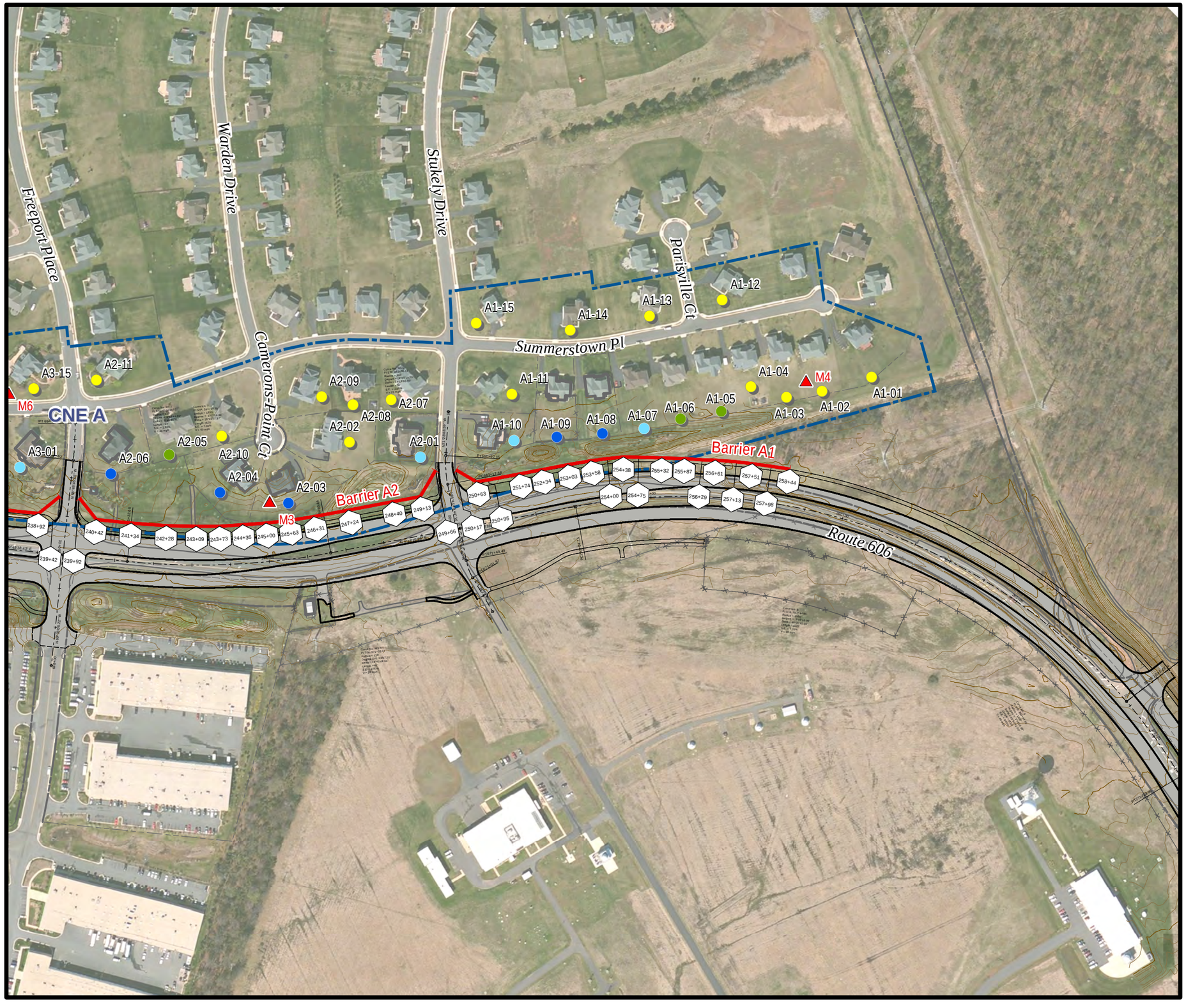
Sheet 1 of 2




0 250 500 Feet

HARRIS MILLER MILLER & HANSON INC.

Path: G:\Projects\305XXX\305000_VDOT\012_DullesLoop_Rt606_Design\GIS\305000_012_DL_Barrier_CNE_A_Sheet_Layout.mxd




Path: G:\Projects\305XXX\305000_VDOT\012_DullesLoop_Rt606_Design\GIS\305000_012_DL_Barrier_CNE_A_Sheet_Layout.mxd

VDOT
Virginia Department of Transportation

# Figure 1
# Dulles Loop Project
# (Rte 606 and Loudoun County Pkwy)

Loudoun County, Virginia

## Location Map for Common Noise Environment, Receptors, and Barriers A1, A2 and A3

Project No. 0606-053-983; UPC No. 97529
HMMH Report No. 305000.012
September 2013

Receiver Site and Number
- Impacted and 5 or 6 dBA Insertion Loss
- Impacted and 7 dBA or more Insertion Loss
- Impacted and Not Benefited
- Not Impacted and Benefited
- Not Benefited or Impacted
- Potential Acquisitions

M# Short-Term Measurement Site

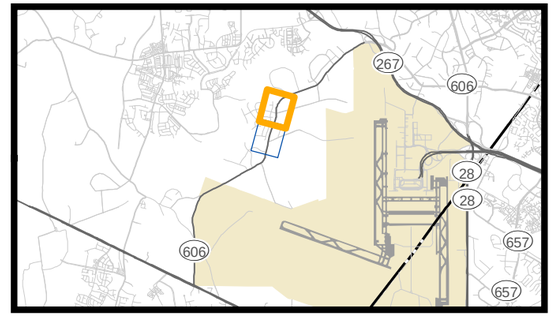
Proposed Barrier

Common Noise Environment (CNE) Areas

Proposed Roadway Alignment

Ground Elevation Contours

Sheet 2 of 2




0 250 500 Feet

HARRIS MILLER MILLER & HANSON INC.

## Description: CNE C, Potential Barrier C1

Common Noise Environment (CNE) C is located west of Route 606 and north of Overland Drive in Sterling, VA. Potential Barrier C1 is being considered just beyond the southern end of CNE A to mitigate potential noise impacts at a playground that is part of the Minnieland Academy at Dulles daycare facility. One non-residential recreational receptor would be exposed to noise levels that approach or exceed the Federal Highway Administration Noise Abatement Criteria (FHWA NAC) for Activity Category C with the design-year (2036) Build alternative. According to the policies of the Virginia Department of Transportation (VDOT), noise abatement is warranted for the impacted noise-sensitive property, in which case the feasibility and reasonableness of a noise barrier must be evaluated. Potential Barrier C1 begins approximately at station 216+50 and ends approximately at station 221+50. It follows the right-of-way adjacent to Route 606 westbound (WB) and is designed to protect ground-level exterior activity areas associated with the playground. As summarized in Table 1, the most cost-effective design option for Potential Barrier C1 would benefit a total of 3 non-residential recreational receptors, with a length of 423 feet and a height of 18 feet. However, with a surface area per benefited receptor value of 2,544 SF/BR, Potential Barrier C1 is not reasonable.

### Table 1: Summary of Results – Potential Barrier C1

| | |
|---|---|
| Impacted non-residential receptors with NAC of 67 dBA Leq | 1 |
| Impacts due to substantial increases in existing noise | 0 |
| Are 50% Impacted receptors receiving 5 dB IL (Yes/No, %) | Yes, 100% |
| Impacted and benefited receptors receiving 5 dBA IL or more | 1 |
| Not Impacted and benefited receptors receiving 5 dBA IL or more | 2 |
| Total benefited noise-sensitive receptors receiving 5 dBA IL or more | 3 |
| Impacted non-residential receptors receiving 7 dBA or more IL | 1 |
| Barrier Surface Area (Square Feet) | 7,632 |
| Barrier Surface Area (SF) per Benefited Receptor | 2,544 |
| Is Barrier Reasonable (Surface Area ≤1600 SF/DU)? | **No** |
| Barrier Length (Feet) | 423 |
| Minimum Barrier Height (Feet) | 18 |
| Maximum Barrier Height (Feet) | 18 |
| Average Barrier Height (Feet) | 18 |
| Cost per Square Foot (based on <50,000 SF for Spot 2) | $48 |
| Total Barrier Cost | $366,336 |

## Noise Analysis Approach and Comments:

Harris Miller Miller & Hanson Inc. (HMMH) prepared this report after conducting a detailed noise barrier design study in close coordination with VDOT. The purposes of this study were to develop more refined and detailed noise modeling for the study area, to determine whether traffic

noise impacts are predicted to occur in the 2036 design year, and to design a noise barrier to mitigate potential impacts, wherever it is warranted. This study updates the preliminary noise study conducted by McCormick Taylor from July 2012.* The methods and procedures used in this study are consistent with the latest noise assessment policies issued by FHWA and VDOT, which were updated on August 6, 2013.

HMMH used the latest version of the FHWA's Traffic Noise Model (TNM Version 2.5) to compute future Build case loudest-hour noise levels and noise barrier performance at all of the noise sensitive receptors in the study area, and to develop the appropriate heights, lengths and locations for all warranted noise barriers. TNM runs were developed using MicroStation design files, which were supplied by VDOT.** The modeling accounted for the variability in the local terrain and included the following parameters that affect the propagation of traffic noise: terrain lines, shielding from trees, ground zones, building rows and fixed height barriers to represent large commercial buildings. The default ground type used in the modeling was "lawn."

*Table 2: Loudest-hour Noise Levels* provides the details of the predicted noise levels at all receptors, and includes the address or land-use description, the site number for reference with the attached figures, the number of noise-sensitive dwelling units associated with the receptor, the predicted Loudest-hour $L_{eq}$ without and with the proposed noise barriers, and the barrier insertion loss. Certain cells within Table 2 are shaded red to indicate receptors for which the loudest hour $L_{eq}$ approaches or exceeds the FHWA NAC for Activity Category C (recreational land use). Other cells within Table 2 are shaded green to indicate benefited receptors (receptors that receive 5 dBA, or more, of insertion loss from the noise barrier). *Figure 1* shows the locations of all receptors as well as the noise barriers and nearby roadways. Receptor site location coordinates as input to the TNM model are shown in *Table 3: Receptor Site Locations*.

HMMH conducted short-term monitoring at six locations on August 1 and 3, 2013. During the noise measurement program, HMMH also counted traffic and classified vehicle types on the existing Route 606 (Old Ox Road). Short-term noise measurements were conduct at six locations – identified as Sites M1 through M6 – for periods of up to 30 minutes at each site. Sites M1 through M6 were used to validate the modeling assumptions for receptors in CNE A and C, while the validation process for CNE B was completed using the short-term monitoring results at Site M7, for which measurements were performed on March 11, 2013, as part of the Dulles Air Cargo, Passenger, and Metro Access Highway Project.***

While noise monitoring was not performed at the daycare facility itself, short-term noise measurements were performed within CNE A, which is adjacent to CNE C, including at one site (M1) located very near the daycare facility. Within CNE A, the monitored $L_{eq}$ ranged from 48.4 to 61.6 dBA, while the corresponding TNM-calculated noise levels ranged from 50.5 to 61.9 dBA. Within CNE B, the monitored $L_{eq}$ was 69.0 dBA, while the corresponding TNM-calculated noise level was 71.2 dBA. The average difference between calculated noise levels and monitored noise levels for the seven monitoring locations was +2.1 decibels, which shows

excellent agreement between monitored and modeled sound levels, and suggests confidence in the modeling assumptions. The validation comparisons are shown in *Table 5: Noise Modeling Validation Results.* TNM monitoring site input data is shown in *Table 6: Monitoring Site Location Data.* During the monitoring session, traffic counts were taken and are shown in *Table 7: Validation Traffic Counts Converted to One Hour Volumes.*

Note that the difference between the calculated $L_{eq}$ and the monitored $L_{eq}$ was +3.2 dB at Site M1 and +3.1 dB at Site M5. These differences between calculated and monitored traffic levels are just outside the range that is considered acceptable by VDOT. We examined the validation results at both sites in great detail and believe that we have exhausted whatever modeling options are available to us within TNM. HMMH believes the following contributing factors may explain the resulting discrepancies between calculated and monitored levels at Sites M1 and M5, as well as some of the resultant over-prediction at the other sites:

- A relatively low sample of trucks in the traffic counts may have introduced a downward bias to the monitored noise levels, especially if the trucks in the sample were quieter than the national average;
- The method of estimating speeds during the traffic counts may have introduced an upward bias to the calculated traffic noise levels;
- Observed weather conditions during the August 2013 measurements suggest increased atmospheric absorption compared to standard atmospheric conditions. When the observed temperature and relative humidity were used within TNM, the difference between calculated and monitored noise levels fell within the range considered acceptable by VDOT, as shown in Table 5.

The noise model for CNE C included roadways for Route 606 mainlines and local cross streets (e.g., Summerstown Pl and Overland Drive). Traffic data were supplied by VDOT for the design year of 2036 for the Route 606 mainline, and was presented as peak AM and peak PM traffic volumes.[†] The design-year traffic data used as input to the TNM are shown in *Table 7: TNM Traffic Volumes Design Year 2036.*

Details of the barrier locations and heights are given in *Table 1: Summary of Results - Potential Barrier C1* and precise coordinates of the proposed noise barrier are given in *Table 4: Sound Attenuation Line.* The barrier is shown on the attached plan map graphic, *Figure 1.* The graphic shows the barrier location with station numbers for reference with the tables. The barrier profile has been smoothed for uniformity.

Non-residential recreational receptors were included in the noise model to evaluate noise impact at the playground area associated with Minnieland Academy at Dulles daycare facility at 23521 Overland Drive. Three receptors were located in the playground of the facility following the procedures and protocol contained in Appendix E of VDOT's "Highway Traffic Noise Impact Analysis Guidance Manual." The playground receptor closest to Route 606 is represented by

Site C-03, and has a projected Build case exterior $L_{eq}$ of 68 dBA. Because noise impact is predicted to occur with the design-year Build alternative, HMMH evaluated the feasibility and reasonableness for a range of noise barrier design options.

The most cost-effective design for Potential Barrier C1 would be 423 feet in length and 18 feet in height for a total surface area of 7,632 square feet. Potential Barrier C1 would benefit the single impacted receptor (100%) and benefit two additional non-impacted receptors. However, with a surface area per benefited receptor value of 2,544 SF/BR, this barrier design is not reasonable.

* Reference: "Dulles Loop Project: Route 606 (Old Ox Road) and Loudoun County Parkway – Preliminary Noise Analysis," State Project 0606-053-983, UPC 97529, prepared by McCormick Taylor, July 2012.

** Reference: email message from Lovejoy Muchenje to Chris Bajdek dated 7/16/2013 at 10:09 AM with subject "UPC 97529_TNM runs + other microstation files."

*** Reference: "Noise Analysis Technical Report: Dulles Air Cargo, Passenger, and Metro Access Highway, Loudoun County, Virginia – VDOT Project No. R000-053-032, P-101, UPC 103929," prepared by Harris Miller Miller & Hanson Inc., Report No. 304800.004, April 2013.

† Reference: memorandum from Bahram Jamei to Zamir Mirza dated February 15, 2013, with subject "Traffic Data for Route 606 (Old Ox Road/Loudoun County Parkway) between Evergreen Mills Road (Route 621) and Dulles Greenway (Route 267), Project UPC # 97529, Loudoun County."

## Table 2: Loudest Hour Noise Levels

| Receptor Site Number | Site Address | No. Units | 2036 Loudest-hour Noise Levels | | |
|---|---|---|---|---|---|
| | | | No-Proposed Barrier $L_{eq}$ (dBA) | With-Proposed Barrier $L_{eq}$ (dBA) | Insertion Loss (dB)* |
| C1-01 | Daycare Playground, 23521 Overland Dr | 1 | 56 | 51 | 5 |
| C1-02 | Daycare Playground, 23521 Overland Dr | 1 | 62 | 55 | 7 |
| C1-03 | Daycare Playground, 23521 Overland Dr | 1 | 68 | 61 | 7 |

* Note: Rounding of decibels may make some subtractions appear incorrect

## Table 3: Receptor Site Locations

| Receptor Site Number | Site Address | Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| C1-01 | 23521 Overland Dr | 11768488 | 7036041 | 289 |
| C1-02 | 23521 Overland Dr | 11768581 | 7036077 | 289 |
| C1-03 | 23521 Overland Dr | 11768680 | 7036114 | 289 |

## Table 4: Sound Attenuation Line

Potential Barrier C1

| Station No. (Route 606) | Barrier Coordinates (feet) (VDOT Project Coordinates) | | Elevation (feet) | | Estimated Height Above Ground (feet) |
|---|---|---|---|---|---|
| | X | Y | Estimated Ground | Top of Barrier | |
| 216+50 | 11,768,711 | 7,035,828 | 285 | 303 | 18 |
| 217+20 | 11,768,719 | 7,035,868 | 285 | 303 | 18 |
| 217+90 | 11,768,727 | 7,035,907 | 285 | 303 | 18 |
| 218+60 | 11,768,736 | 7,035,947 | 285 | 303 | 18 |
| 219+20 | 11,768,744 | 7,035,987 | 285 | 303 | 18 |
| 219+20 | 11,768,752 | 7,036,026 | 286 | 304 | 18 |
| 220+20 | 11,768,762 | 7,036,024 | 284 | 302 | 18 |
| 220+70 | 11,768,784 | 7,036,128 | 285 | 303 | 18 |
| 221+10 | 11,768,795 | 7,036,179 | 285 | 303 | 18 |
| 221+50 | 11,768,806 | 7,036,231 | 285 | 303 | 18 |

## Table 5: Noise Modeling Validation Results

| CNE | Site No. | Address | Monitored $L_{eq}$ (dBA) | Default Atmospherics | | Observed Atmospherics* | |
|---|---|---|---|---|---|---|---|
| | | | | TNM Computed $L_{eq}$ (dBA) | Difference (dB) (computed *minus* monitored) | TNM Computed $L_{eq}$ (dBA) | Difference (dB) (computed *minus* monitored) |
| A | M1 | 23420 Summerstown Pl | 58.8 | 62.0 | 3.2 | 61.8 | 3.0 |
| A | M2 | 23376 Summerstown Pl | 57.8 | 57.9 | 0.1 | 57.7 | -0.1 |
| A | M3 | 43624 Camerons Point Ct | 61.6 | 61.9 | 0.3 | 61.8 | 0.2 |
| A | M4 | 23284 Rogerdale Pl | 53.1 | 54.7 | 1.6 | 54.6 | 1.5 |
| A | M5 | 43507 Ogden Pl | 48.5 | 51.6 | 3.1 | 51.4 | 2.9 |
| A | M6 | 43571 Freeport Pl | 48.4 | 50.5 | 2.1 | 50.3 | 1.9 |
| B | M7 | 25289 Evergreen Mills Rd | 69.0 | 71.2 | 2.2 | 71.2 | 2.2 |
| | | | | Average difference: | 2.1 | | 2.0 |
| | | | | Standard deviation of difference: | 1.2 | | 1.1 |

* Observed weather conditions during the measurements ranged from 88 to 95°F and from 70 to 75% relative humidity on 8/1/13. On 8/2/13, the temperature ranged from 85 to 86°F and the relative humidity was approximately 60%. On 3/11/13, the temperature was 58°F and the relative humidity was 68%.

## Table 6: Monitoring Site Location Data

| Site Number | Address | Site Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| M1 | 23420 Summerstown Pl | 11768823 | 7036500 | 290 |
| M2 | 23376 Summerstown Pl | 11769208 | 7037806 | 297 |
| M3 | 43624 Camerons Point Ct | 11769494 | 7038481 | 293 |
| M4 | 23284 Rogerdale Pl | 11769552 | 7039900 | 283 |
| M5 | 43507 Ogden Pl | 11768668 | 7036733 | 289 |
| M6 | 43571 Freeport Pl | 11769050 | 7037902 | 299 |
| M7 | 25289 Evergreen Mills Rd | 11761935 | 7027474 | 307 |

Note: Data used in the TNM validation modeling.

## Table 7: Validation Traffic Counts Converted to One Hour Volumes

| CNE | Site Number | Roadway | Autos | MT | HT | Speed (mph) |
|---|---|---|---|---|---|---|
| A, C | M1 | Route 606 WB | 630 | 18 | 24 | 50 |
| | M1 | Route 606 EB | 570 | 30 | 39 | 50 |
| A | M2 | Route 606 WB | 1164 | 21 | 27 | 30 |
| | M2 | Route 606 EB | 570 | 15 | 12 | 35 |
| A | M3 | Route 606 WB | 606 | 21 | 12 | 50 |
| | M3 | Route 606 EB | 501 | 33 | 36 | 50 |
| A | M4 | Route 606 WB | 657 | 24 | 36 | 50 |
| | M4 | Route 606 EB | 681 | 21 | 27 | 50 |
| A | M5 | Route 606 WB | 918 | 24 | 39 | 45 |
| | M5 | Route 606 EB | 534 | 24 | 27 | 45 |
| A | M6 | Route 606 WB | 348 | 18 | 21 | 50 |
| | M6 | Route 606 EB | 501 | 18 | 6 | 50 |
| B | M7 | Route 606 WB (LCP) | 1390 | 62 | 34 | 55 |
| | M7 | Route 606 EB (LCP) | 1060 | 48 | 20 | 55 |

Note: Traffic counts were taken for 30 minutes at each site for 15 minutes in each direction and converted to one-hour volumes.

## Table 8: TNM Traffic Volumes Design Year 2036

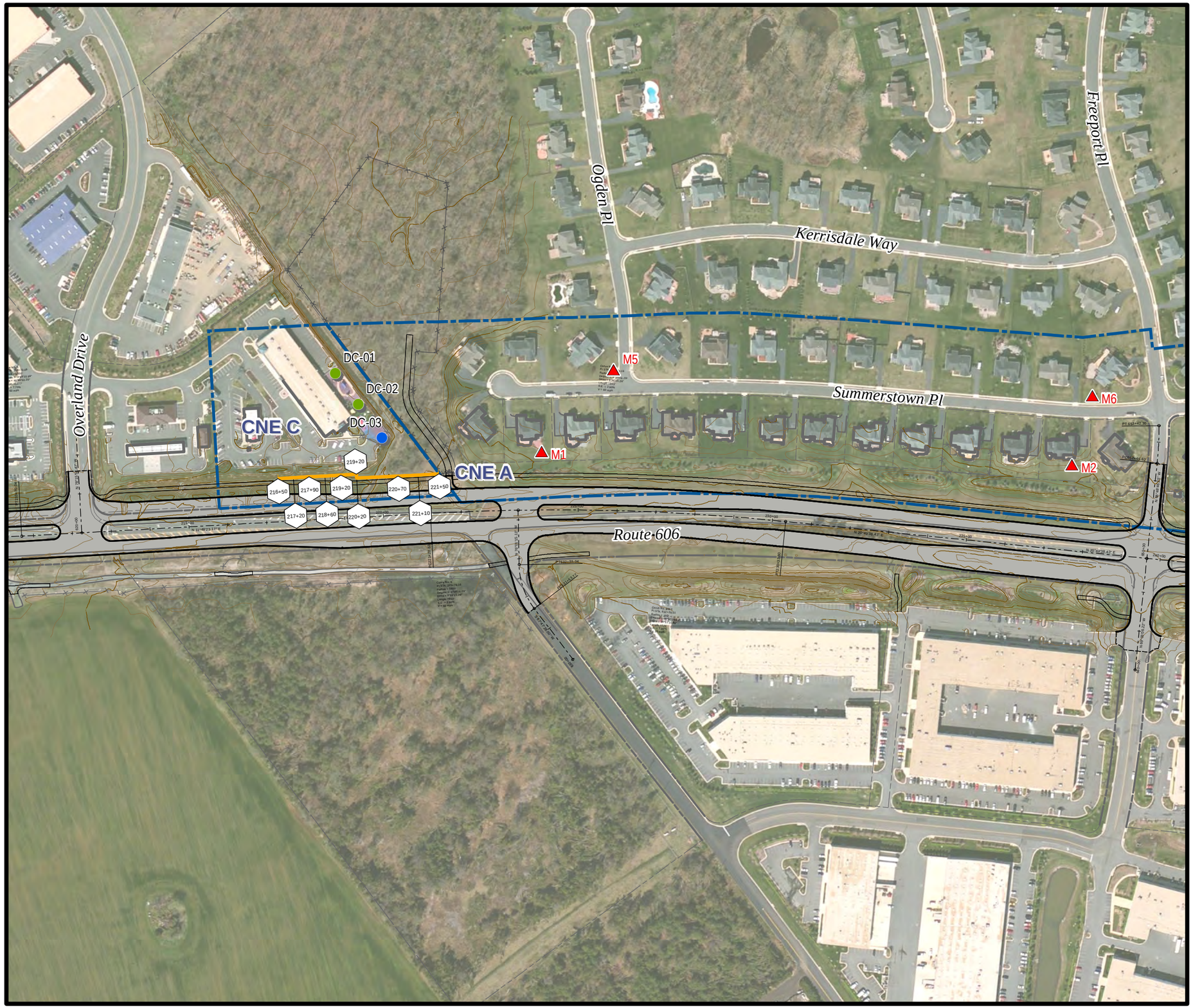
| Roadway Name | Location | Vehicles per hour (vph) | | | Speed (mph) |
|---|---|---|---|---|---|
| | | Autos | Medium Trucks | Heavy Trucks | |
| Route 606 WB | Ladbrook Dr to Stukely Dr | 1957 | 108 | 86 | 55 |
| Route 606 EB | Weather Service Rd to Ladbrook Dr | 896 | 49 | 39 | 55 |
| Route 606 WB | Stukely Dr to Freeport Pl | 1915 | 105 | 84 | 55 |
| Route 606 EB | Trade Center Pkwy to Weather Service Rd | 886 | 49 | 39 | 55 |
| Route 606 WB | Freeport Pl to Beaver Meadow Rd | 1946 | 107 | 86 | 55 |
| Route 606 EB | Beaver Meadow Rd to Trade Center Pkwy | 795 | 44 | 35 | 55 |
| Route 606 WB | Beaver Meadow Rd to Overland Dr | 1977 | 109 | 87 | 55 |
| Route 606 EB | Overland Dr to Beaver Meadow Rd | 818 | 45 | 36 | 55 |
| Route 606 WB (LCP) | To Evergreen Mills Rd | 2076 | 88 | 44 | 55 |
| Route 606 EB (LCP) | From Evergreen Mills Rd | 809 | 34 | 17 | 55 |
| Route 606 WB (LCP) | From Evergreen Mills Rd | 2466 | 105 | 52 | 55 |
| Route 606 EB (LCP) | To Evergreen Mills Rd | 1654 | 70 | 35 | 55 |

Notes:

1.) Traffic data were supplied by VDOT [reference: memorandum from Bahram Jamei to Zamir Mirza dated February 15, 2013, with subject “Traffic Data for Route 606 (Old Ox Road/Loudoun County Parkway) between Evergreen Mills Road (Route 621) and Dulles Greenway (Route 267), Project UPC # 97529, Loudoun County”].

2.) The 2036 PM Peak Hour was determined to be the worst noise hour.

3.) As directed by VDOT, posted speeds were used for the noise analysis [reference: email from L.J. Muchenje to Chris Bajdek dated August 2, 2013, at 10:37 AM with subject “FW: UPC 97529_TNM runs + other microstation files”].




Path: G:\Projects\305XXX\305000_VDOT\012_DullesLoop_Rt606_Design\GIS\305000_012_DL_Barrier_CNE_C_Sheet_Layout.mxd

VDOT
Virginia Department of Transportation

# Figure 1
# Dulles Loop Project
# (Rte 606 and Loudoun County Pkwy)

Loudoun County, Virginia

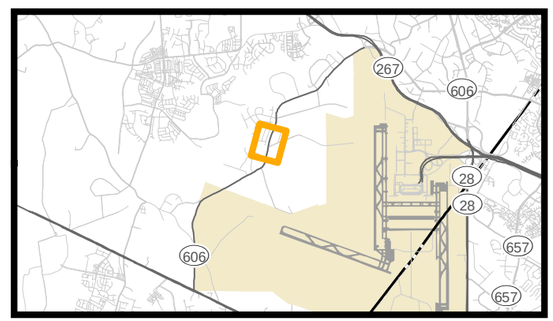
## Location Map for Common Noise Environment, Receptors, and Barrier C1

Project No. 0606-053-983; UPC No. 97529
HMMH Report No. 305000.012
September 2013

Receiver Site and Number
- Impacted and 5 or 6 dBA Insertion Loss
- Impacted and 7 dBA or more Insertion Loss
- Impacted and Not Benefited
- Not Impacted and Benefited
- Not Benefited or Impacted
- Potential Acquisitions

- M# Short-Term Measurement Site
- Proposed Barrier
- Proposed Barrier - Not Reasonable
- Common Noise Environment (CNE) Areas
- Proposed Roadway Alignment
- Ground Elevation Contours

Sheet 1 of 1




0 250 500 Feet

HARRIS MILLER MILLER & HANSON INC.

## Description: CNE B, Potential Barriers B1 and B2

Common Noise Environment (CNE) B is located west of Route 606 (Loudoun County Parkway) and south of Evergreen Mills Road in Sterling, VA. Traffic noise impact is predicted to occur at two single-family homes with the design-year Build case. Therefore, noise abatement is warranted, and Potential Noise Barriers B1 and B2 have been considered. Potential Barrier B1 begins approximately at station 497+51 and ends at station 502+13, and is located on the east side of the proposed multi-use trail. Potential Barrier B2 begins approximately at station 502+00 and ends at station 502+41, and is located on the west side of the proposed multi-use trail. The location of Barrier B2 on the west side of the trail extends the noise barrier system northward and allows for more protection at Site B-2 by blocking a greater view of the Project roadways. Note that it is not feasible to extend Barrier B1 to the north due to potential conflicts with the trail and the Evergreen Mills Road intersection. Barriers B1 and B2 are designed to protect ground-level exterior activity areas associated with impacted residential properties. Because the proposed multi-use trail is part of the transportation improvement project, it is not considered to be noise-sensitive.

Table 1 provides an overall summary of the system of barriers that was considered for CNE B. Table 1A summarizes the individual barrier parameters.

### Table 1: Summary of Results – Potential Barriers B1 and B2

| | |
|---|---|
| Impacted residential receptors with NAC of 67 dBA, Leq | 2 |
| Impacted non-residential residential receptors with NAC of 67 dBA, Leq | 0 |
| Impacts due to substantial increases in existing noise | 0 |
| Impacted residential receptors receiving 5 dBA IL or more | 2 |
| Impacted non-residential receptors receiving 5 dBA IL or more | 0 |
| Not Impacted receptors receiving 5 dBA IL or more | 0 |
| Total benefited noise-sensitive receptors receiving 5 dBA IL or more | 2 |
| Are 50% Impacted receptors receiving 5 dB IL (Yes/No, %) | Yes, 100% |
| Impacted receptors receiving 7 dBA or more IL | 2 |
| Total Barrier Surface Area (Square Feet) | 5,680 |
| Barrier Surface Area (SF) per Benefited Receptor (SF/BR) | 2,840 |
| Is Barrier Reasonable (Surface Area ≤1600 SF/BR)? | **No** |
| Total Barrier Length (Feet) | 507 |
| Minimum Barrier Height (Feet) | 10 |
| Maximum Barrier Height (Feet) | 12 |
| Average Barrier Height (Feet) | 11.3 |
| Cost per Square Foot (based on 30,000 SF) | $48 |
| Total Barrier Cost | $272,640 |

**Table 1A: Individual Barrier Parameters**

| Barrier | Length (feet) | Height (feet) | Surface Area (square-feet) | Number of Benefited Receptors |
|---|---|---|---|---|
| B1 | 461 | 10to 12 | 5224 | 1 |
| B2 | 46 | 10 | 456 | 1 |

## Noise Analysis Approach and Comments:

Harris Miller Miller & Hanson Inc. (HMMH) prepared this report after conducting a detailed noise barrier design study in close coordination with VDOT. The purposes of this study were to develop more refined and detailed noise modeling for the study area, to determine whether traffic noise impacts are predicted to occur in the 2036 design year, and to design a noise barrier to mitigate potential impacts, wherever it is warranted. This study updates the preliminary noise study conducted by McCormick Taylor from July, 2012. * The methods and procedures used in this study are consistent with the latest noise assessment policies issued by FHWA and VDOT, which were updated on August 6, 2013.

HMMH used the latest version of the FHWA's Traffic Noise Model (TNM Version 2.5) to compute future Build case loudest-hour noise levels and noise barrier performance at all of the noise sensitive receptors in the study area, and to develop the appropriate heights, lengths and locations for all warranted noise barriers. TNM runs were developed using MicroStation design files, which were supplied by VDOT.** The modeling accounted for the variability in the local terrain and included the following parameters that affect the propagation of traffic noise: terrain lines, shielding from trees, ground zones, building rows and fixed height barriers to represent large commercial buildings. The default ground type used in the modeling was "lawn."

*Table 2: Loudest-hour Noise Levels* provides the details of the predicted noise levels at all receptors, and includes the address or land-use description, the site number for reference with the attached figures, the number of noise-sensitive dwelling units associated with the receptor, the predicted Loudest-hour $L_{eq}$ without and with the proposed noise barrier, and the barrier insertion loss. Certain cells within Table 2 are shaded red to indicate receptors for which the loudest hour $L_{eq}$ approaches or exceeds the FHWA Noise Abatement Criteria (NAC) for Activity Category B (residential land use). Other cells within Table 2 are shaded green to indicate benefited receptors (receptors that receive 5 dBA, or more, of insertion loss from the noise barrier). *Figure 1: Location Map for Common Noise Environment, Receptors, Contours and Barriers* shows the locations of all receptors as well as the noise barriers and nearby roadways. The coordinates of the modeled receptor locations contained within the TNM model are shown in *Table 3: Receptor Site Locations*.

HMMH conducted short-term monitoring at six locations on August 1 and 3, 2013. During the noise measurement program, HMMH also counted traffic and classified vehicle types on the existing Route 606 (Old Ox Road). Short-term noise measurements were conduct at six locations – identified as Sites M1 through M6 – for periods of up to 30 minutes at each site. Sites M1 through M6 were used to validate the modeling assumptions for receptors in CNE A, while the validation process for CNE B was completed using the short-term monitoring results at Site M7, for which measurements were performed on March 11, 2013, as part of the Dulles Air Cargo, Passenger, and Metro Access Highway Project.[***]

The validation process compares monitored sound levels at each measurement site to the noise levels calculated with TNM, using the existing site geometry and counted traffic as input to the model. The modeling assumptions are revised, as necessary, until the agreement between monitored and calculated noise levels are within an acceptable range of +/- 3 dBA, in accordance with VDOT policy. *Figure 1: Location Map for Common Noise Environment, Receptors, Contours and Barriers* shows receptor site and monitoring locations for CNE A.

Within CNE A, the monitored $L_{eq}$ ranged from 48.4 to 61.6 dBA, while the corresponding TNM-calculated noise levels ranged from 50.5 to 62.0 dBA. Within CNE B, the monitored $L_{eq}$ was 69.0 dBA, while the corresponding TNM-calculated noise level was 71.2 dBA. The Project-wide average difference between calculated noise levels and monitored noise levels was +2.1 decibels (over all seven sites), which shows excellent agreement between monitored and modeled sound levels, and suggests confidence in the modeling assumptions. The validation comparisons are shown in *Table 5: Noise Modeling Validation Results.* TNM monitoring site input data is shown in *Table 6: Monitoring Site Location Data.* During the monitoring session, traffic counts were taken and are shown in *Table 7: Validation Traffic Counts Converted to One Hour Volumes*.

Note that the difference between the calculated $L_{eq}$ and the monitored $L_{eq}$ was +3.2 dB at Site M1 and +3.1 dB at Site M5. These differences between calculated and monitored traffic levels are just outside the range that is considered acceptable by VDOT. We examined the validation results at both sites in great detail and believe that we have exhausted whatever modeling options are available to us within TNM. HMMH believes the following contributing factors may explain the resulting discrepancies between calculated and monitored levels at Sites M1 and M5, as well as some of the resultant over-prediction at the other sites:

- A relatively low sample of trucks in the traffic counts may have introduced a downward bias to the monitored noise levels, especially if the trucks in the sample were quieter than the national average;
- The method of estimating speeds during the traffic counts may have introduced an upward bias to the calculated traffic noise levels;
- Observed weather conditions during the August 2013 measurements suggest increased atmospheric absorption compared to standard atmospheric conditions. When the observed temperature and relative humidity were used within TNM, the difference

between calculated and monitored noise levels fell within the range considered acceptable by VDOT, as shown in Table 5.

The noise model for CNE B included roadways for Route 606 mainlines and local cross streets (e.g., Evergreen Mills Road). Traffic data were supplied by VDOT for the design year of 2036 for the Route 606 mainline, and was presented as peak AM and peak PM traffic volumes.† The design-year traffic data used as input to the TNM are shown in *Table 7: TNM Traffic Volumes Design Year 2036*.

Details of the barrier location and height are given in *Table 1: Summary of Results - Potential Barriers B1 and B2* and precise coordinates of the proposed barriers are given in *Table 4: Sound Attenuation Line.* The potential barriers are shown on the attached plan map graphic, *Figure 1: Location Map for Common Noise Environment, Receptors, Contours and Barriers.* The graphic shows the barrier location with station numbers for reference with the tables. The barrier profile has been smoothed for uniformity.

Eight receptors within CNE B to the west of Route 606 and south of Evergreen Mills Road were evaluated to determine noise impact. All eight receptors were located at single-family homes. The two receptors closest to Route 606 are represented by site B-1 and site B-2, and have projected Build case exterior $L_{eq}$s of 72 and 66 dBA, respectively, which exceed the FHWA NAC for Activity Category B. Because noise impact is predicted to occur with the design-year Build alternative, noise abatement is warranted, and so HMMM evaluated the feasibility and reasonableness for a range of noise barrier design options. With the optimized design for Potential Barriers B1 and B2, receptor site B1 would receive 7 dBA of noise reduction, while receptor site B2 would receive 5 dBA of noise reduction.

The most cost-effective design for Potential Barriers B1 and B2 would be 507 feet in length and would have a height range of 10 to 12 feet, and a total surface area of 5,680 square feet. Potential Barriers B1 and B2 would benefit the both impacted residential receptors (100%). However, with a surface area per benefited receptor value of 2,840 SF/BR, this barrier design option is not reasonable.

* Reference: "Dulles Loop Project: Route 606 (Old Ox Road) and Loudoun County Parkway – Preliminary Noise Analysis," State Project 0606-053-983, UPC 97529, prepared by McCormick Taylor, July 2012.

** Reference: email message from Lovejoy Muchenje to Chris Bajdek dated 7/16/2013 at 10:09 AM with subject "UPC 97529_TNM runs + other microstation files."

*** Reference: "Noise Analysis Technical Report: Dulles Air Cargo, Passenger, and Metro Access Highway, Loudoun County, Virginia – VDOT Project No. R000-053-032, P-101, UPC 103929," prepared by Harris Miller Miller & Hanson Inc., Report No. 304800.004, April 2013.

† Reference: memorandum from Bahram Jamei to Zamir Mirza dated February 15, 2013, with subject "Traffic Data for Route 606 (Old Ox Road/Loudoun County Parkway) between Evergreen Mills Road (Route 621) and Dulles Greenway (Route 267), Project UPC # 97529, Loudoun County."

## Table 2: Loudest Hour Noise Levels

| Receptor Site Number | Site Address | No. Units | 2036 Loudest-hour Noise Levels | | |
|---|---|---|---|---|---|
| | | | No-Proposed Barrier $L_{eq}$ (dBA) | With-Proposed Barrier $L_{eq}$ (dBA) | Insertion Loss (dB)* |
| B-1 | 25289 Evergreen Mills Rd | 1 | **72** | 65 | **7** |
| B-2 | 25269 Evergreen Mills Rd | 1 | **66** | 61 | **5** |
| B-3 | 25247 Evergreen Mills Rd | 1 | 64 | 63 | 2 |
| B-4 | 24227 Evergreen Mills Rd | 1 | 62 | 62 | 0 |
| B-5 | 25213 Evergreen Mills Rd | 1 | 63 | 63 | 0 |
| B-6 | 25195 Evergreen Mills Rd | 1 | 64 | 64 | 0 |
| B-7 | 25137 Evergreen Mills Rd | 1 | 51 | 50 | 0 |
| B-8 | 25119 Evergreen Mills Rd | 1 | 52 | 52 | 0 |

* Note: Rounding of decibels may make some subtractions appear incorrect

## Table 3: Receptor Site Locations

| Receptor Site Number | Site Address | Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| B-1 | 25289 Evergreen Mills Rd | 11761935 | 7027474 | 307 |
| B-2 | 25269 Evergreen Mills Rd | 11761802 | 7027720 | 309 |
| B-3 | 25247 Evergreen Mills Rd | 11761728 | 7027855 | 309 |
| B-4 | 24227 Evergreen Mills Rd | 11761507 | 7028034 | 307 |
| B-5 | 25213 Evergreen Mills Rd | 11761441 | 7028142 | 305 |
| B-6 | 25195 Evergreen Mills Rd | 11761342 | 7028250 | 303 |
| B-7 | 25137 Evergreen Mills Rd | 11760826 | 7028725 | 299 |
| B-8 | 25119 Evergreen Mills Rd | 11760905 | 7028663 | 300 |

## Table 4: Sound Attenuation Line

Potential Barrier B1

| Station No. (Route 606) | Barrier Coordinates (feet) (VDOT Project Coordinates) | | Elevation (feet) | | Estimated Height Above Ground (feet) |
|---|---|---|---|---|---|
| | X | Y | Estimated Ground | Top of Barrier | |
| 497+51 | 11,762,012.0 | 7,027,387.0 | 310.3 | 320.3 | 10 |
| 498+03 | 11,762,007.0 | 7,027,438.0 | 310.1 | 320.1 | 10 |
| 498+54 | 11,762,002.0 | 7,027,489.0 | 310.0 | 321.0 | 11 |
| 499+05 | 11,761,997.0 | 7,027,539.5 | 309.8 | 321.8 | 12 |
| 499+56 | 11,761,992.0 | 7,027,590.5 | 309.6 | 321.6 | 12 |
| 500+00 | 11,761,988.0 | 7,027,635.0 | 309.5 | 321.5 | 12 |
| 500+43 | 11,761,978.0 | 7,027,677.0 | 309.5 | 321.5 | 12 |
| 500+85 | 11,761,969.0 | 7,027,718.5 | 309.4 | 321.4 | 12 |
| 501+24 | 11,761,966.0 | 7,027,757.0 | 309.6 | 321.6 | 12 |
| 501+64 | 11,761,962.0 | 7,027,796.0 | 309.8 | 320.8 | 11 |
| 501+99 | 11,761,957.0 | 7,027,831.0 | 310.0 | 320.0 | 10 |
| 502+13 | 11,761,955.0 | 7,027,845.0 | 310.0 | 320.0 | 10 |

Potential Barrier B2

| Station No. (Route 606) | Barrier Coordinates (feet) (VDOT Project Coordinates) | | Elevation (feet) | | Estimated Height Above Ground (feet) |
|---|---|---|---|---|---|
| | X | Y | Estimated Ground | Top of Barrier | |
| 502+00 | 11,761,936.00 | 7,027,830.00 | 309.6 | 319.6 | 10 |
| 502+41 | 11,761,910.00 | 7,027,867.50 | 310.1 | 320.1 | 10 |

## Table 5: Noise Modeling Validation Results

| CNE | Site No. | Address | Monitored $L_{eq}$ (dBA) | Default Atmospherics | | Observed Weather* | |
|---|---|---|---|---|---|---|---|
| | | | | TNM Computed $L_{eq}$ (dBA) | Difference (dB) (computed *minus* monitored) | TNM Computed $L_{eq}$ (dBA) | Difference (dB) (computed *minus* monitored) |
| A | M1 | 23420 Summerstown Pl | 58.8 | 62.0 | 3.2 | 61.8 | 3.0 |
| A | M2 | 23376 Summerstown Pl | 57.8 | 57.9 | 0.1 | 57.7 | -0.1 |
| A | M3 | 43624 Camerons Point Ct | 61.6 | 61.9 | 0.3 | 61.8 | 0.2 |
| A | M4 | 23284 Rogerdale Pl | 53.1 | 54.7 | 1.6 | 54.6 | 1.5 |
| A | M5 | 43507 Ogden Pl | 48.5 | 51.6 | 3.1 | 51.4 | 2.9 |
| A | M6 | 43571 Freeport Pl | 48.4 | 50.5 | 2.1 | 50.3 | 1.9 |
| B | M7 | 25289 Evergreen Mills Rd | 69.0 | 71.2 | 2.2 | 71.2 | 2.2 |
| | | | | Average difference: | 2.1 | | 2.0 |
| | | | | Standard deviation of difference: | 1.2 | | 1.1 |

* Observed weather conditions during the measurements ranged from 88 to 95°F and from 70 to 75% relative humidity on 8/1/13. On 8/2/13, the temperature ranged from 85 to 86°F and the relative humidity was approximately 60%. On 3/11/13, the temperature was 58°F and the relative humidity was 68%.

## Table 6: Monitoring Site Location Data

| Site Number | Address | Site Coordinates (feet) | | |
|---|---|---|---|---|
| | | X | Y | Z |
| M1 | 23420 Summerstown Pl | 11768823 | 7036500 | 290 |
| M2 | 23376 Summerstown Pl | 11769208 | 7037806 | 297 |
| M3 | 43624 Camerons Point Ct | 11769494 | 7038481 | 293 |
| M4 | 23284 Rogerdale Pl | 11769552 | 7039900 | 283 |
| M5 | 43507 Ogden Pl | 11768668 | 7036733 | 289 |
| M6 | 43571 Freeport Pl | 11769050 | 7037902 | 299 |
| M7 | 25289 Evergreen Mills Rd | 11761935 | 7027474 | 307 |

Note: Data used in the TNM validation modeling.

## Table 7: Validation Traffic Counts Converted to One Hour Volumes

| CNE | Site Number | Roadway | Autos | MT | HT | Speed (mph) |
|---|---|---|---|---|---|---|
| A | M1 | Route 606 WB | 630 | 18 | 24 | 50 |
| | M1 | Route 606 EB | 570 | 30 | 39 | 50 |
| A | M2 | Route 606 WB | 1164 | 21 | 27 | 30 |
| | M2 | Route 606 EB | 570 | 15 | 12 | 35 |
| A | M3 | Route 606 WB | 606 | 21 | 12 | 50 |
| | M3 | Route 606 EB | 501 | 33 | 36 | 50 |
| A | M4 | Route 606 WB | 657 | 24 | 36 | 50 |
| | M4 | Route 606 EB | 681 | 21 | 27 | 50 |
| A | M5 | Route 606 WB | 918 | 24 | 39 | 45 |
| | M5 | Route 606 EB | 534 | 24 | 27 | 45 |
| A | M6 | Route 606 WB | 348 | 18 | 21 | 50 |
| | M6 | Route 606 EB | 501 | 18 | 6 | 50 |
| B | M7 | Route 606 WB (LCP) | 1390 | 62 | 34 | 55 |
| | M7 | Route 606 EB (LCP) | 1060 | 48 | 20 | 55 |

Note: Traffic counts were taken for 30 minutes at each site for 15 minutes in each direction and converted to one-hour volumes.

## Table 8: TNM Traffic Volumes Design Year 2036

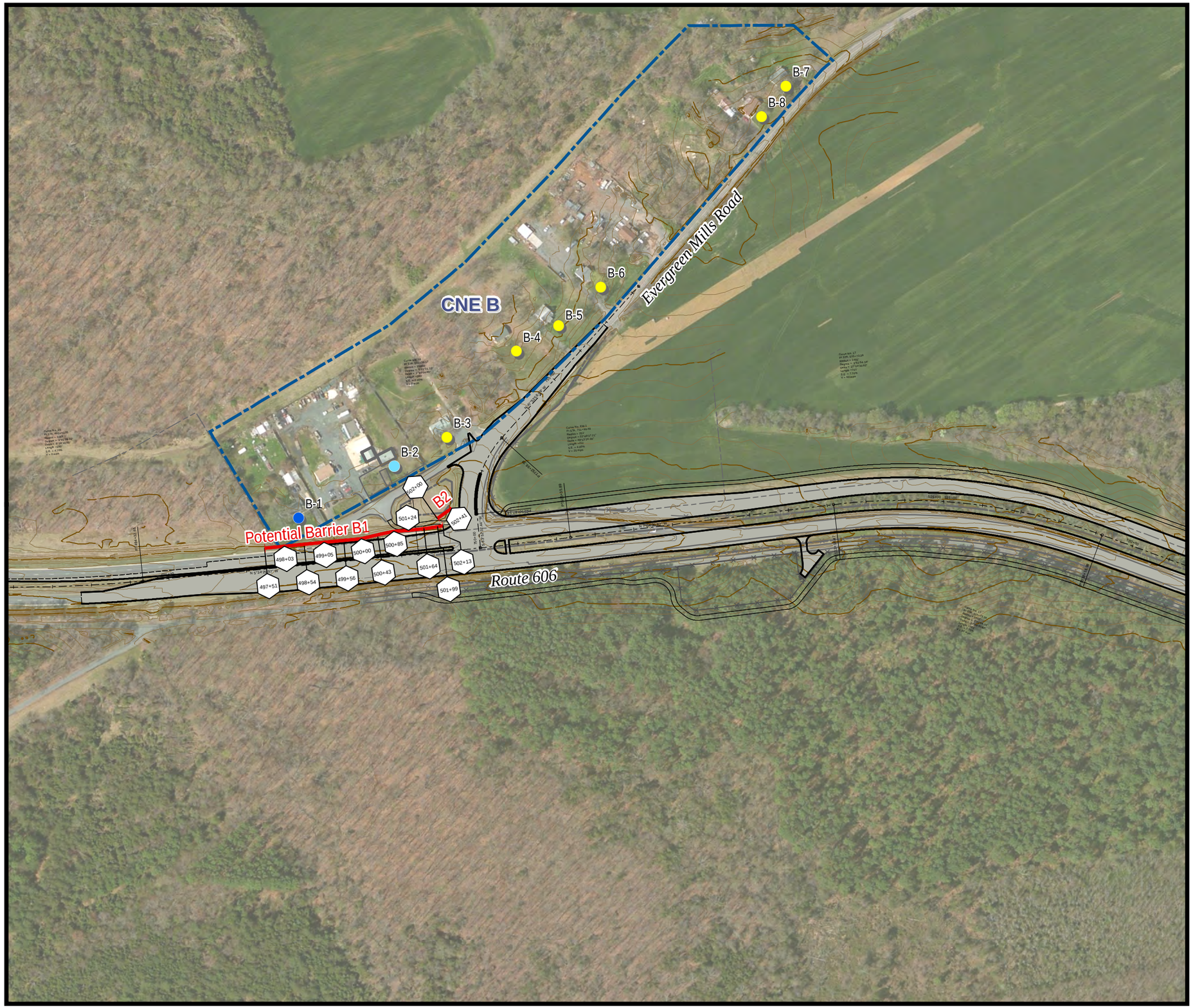
| Roadway Name | Location | Vehicles per hour (vph) | | | Speed (mph) |
|---|---|---|---|---|---|
| | | Autos | Medium Trucks | Heavy Trucks | |
| Route 606 WB | Ladbrook Dr to Stukely Dr | 1957 | 108 | 86 | 55 |
| Route 606 EB | Weather Service Rd to Ladbrook Dr | 896 | 49 | 39 | 55 |
| Route 606 WB | Stukely Dr to Freeport Pl | 1915 | 105 | 84 | 55 |
| Route 606 EB | Trade Center Pkwy to Weather Service Rd | 886 | 49 | 39 | 55 |
| Route 606 WB | Freeport Pl to Beaver Meadow Rd | 1946 | 107 | 86 | 55 |
| Route 606 EB | Beaver Meadow Rd to Trade Center Pkwy | 795 | 44 | 35 | 55 |
| Route 606 WB | Beaver Meadow Rd to Overland Dr | 1977 | 109 | 87 | 55 |
| Route 606 EB | Overland Dr to Beaver Meadow Rd | 818 | 45 | 36 | 55 |
| Route 606 WB (LCP) | To Evergreen Mills Rd | 2076 | 88 | 44 | 55 |
| Route 606 EB (LCP) | From Evergreen Mills Rd | 809 | 34 | 17 | 55 |
| Route 606 WB (LCP) | From Evergreen Mills Rd | 2466 | 105 | 52 | 55 |
| Route 606 EB (LCP) | To Evergreen Mills Rd | 1654 | 70 | 35 | 55 |
| Evergreen Mills NB | From Route 606 | 1006 | 43 | 21 | 35 |
| Evergreen Mills SB | To Route 606 | 551 | 23 | 12 | 35 |
| Evergreen Mills SB | Turning lane to Route 606 EB | 71 | 3 | 2 | 20 |
| Evergreen Mills SB | Turning lane to Route 606 WB | 479 | 20 | 10 | 20 |

Notes:

1.) Traffic data were supplied by VDOT [reference: memorandum from Bahram Jamei to Zamir Mirza dated February 15, 2013, with subject “Traffic Data for Route 606 (Old Ox Road/Loudoun County Parkway) between Evergreen Mills Road (Route 621) and Dulles Greenway (Route 267), Project UPC # 97529, Loudoun County”].

2.) The 2036 PM Peak Hour was determined to be the worst noise hour.

3.) As directed by VDOT, posted speeds were used for the noise analysis [reference: email from L.J. Muchenje to Chris Bajdek dated August 2, 2013, at 10:37 AM with subject “FW: UPC 97529_TNM runs + other microstation files”].




Path: G:\Projects\305XXX\305000_VDOT\012_DullesLoop_Rt606_Design\GIS\305000_012_DL_Barrier_CNE_B_Sheet_Layout.mxd

VDOT
Virginia Department of Transportation

# Figure 1
# Dulles Loop Project
# (Rte 606 and Loudoun County Pkwy)

Loudoun County, Virginia

## Location Map for Common Noise Environment, Receptors, and Barriers B1 and B2

Project No. 0606-053-983; UPC No. 97529
HMMH Report No. 305000.012
September 2013

Receiver Site and Number
- Impacted and 5 or 6 dBA Insertion Loss
- Impacted and 7 dBA or more Insertion Loss
- Impacted and Not Benefited
- Not Impacted and Benefited
- Not Benefited or Impacted
- Potential Acquisitions

M# Short-Term Measurement Site

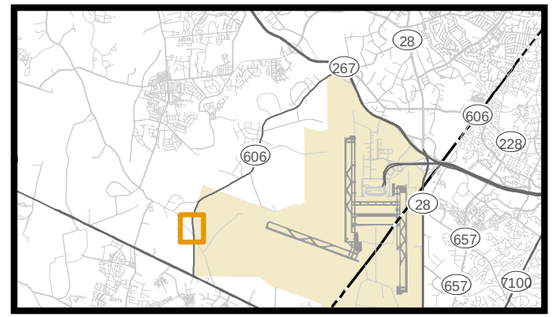
Proposed Barrier

Common Noise Environment (CNE) Areas

Proposed Roadway Alignment

Ground Elevation Contours

Sheet 1 of 1




0 250 500 Feet

HARRIS MILLER MILLER & HANSON INC.