Virginia Department of Transportation

Coalfields Expressway Section II

Final Noise Analysis

Submitted to:

Virginia Department of Transportation
Environmental Division
1401 East Broad Street
Richmond, VA 23219

Submitted by:

McCormick Taylor
Engineers & Planners Since 1946

April, 2012
Virginia Department of Transportation
Coalfields Expressway
Section II

State Project: 0121-013-772, PE-101
UPC 85126

From: Pound Bypass at Route 83 (Approximate Station 195+00)
To: Route 460 Connector (Approximate Station 1565+00)
Wise, Dickenson, and Buchanan Counties

NOISE ANALYSIS

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Prepared by:

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April 2012
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I. Executive Summary

The Virginia Department of Transportation (VDOT), in cooperation with the Federal Highway Administration (FHWA), is preparing a Reevaluation to evaluate changes to Section II of the proposed Coalfields Expressway. The Final Environmental Impact Statement (FEIS) for the Coalfields Expressway (U.S. Route 121), a proposed four-lane, limited access (partial control of access), primary highway to be constructed through Wise, Dickenson, and Buchanan Counties, was completed in 2001 and a reevaluation was prepared in 2009. Since that time, under provisions of the Virginia Public-Private Transportation Act (PPTA), the PPTA private partners have proposed revisions to the selected alignment that was presented in the 2001 FEIS and Record of Decision (ROD) and 2009 Reevaluation. Section II begins at the Pound Bypass at Route 83 (approximate Station 195+00) and extends approximately 26.6 miles northeast and terminates at the proposed Route 460 Connector at Station 1565+00. The noise analysis in this document will focus solely on the Common Noise Environments, referred to as CNEs. Noise sensitive receptors within 500 feet of the construction limits were considered for this evaluation.

This report documents the Existing and Design Year (2035) noise levels associated with Section II of the Coalfields Expressway, hereafter referred to as CFXII. A project field view was performed to examine the project area, as well as document major sources of acoustic shielding (e.g., terrain lines, building rows, etc.), adjacent to the project corridor. Noise monitoring was performed at 28 locations. Due to the rural nature of the project corridor, there were varying ambient noise levels based on location and proximity to natural noise sources (e.g., birds, insects, farm animals). Sound levels in the project area are dominated by background, non-roadway sources; therefore, existing noise levels were derived from noise monitoring. Furthermore, due to the rural characteristics of the sensitive receptors, influence from existing roadways contributed minimally to the overall existing noise levels.

Noise modeling was completed only for Design Year Build (2035) conditions. Existing worst-case noise levels were derived from short-term noise monitoring and did not approach or exceed the FHWA/VDOT Noise Abatement Criteria (NAC) at any of the receptors in the project area. Design Year No-Build (2035) noise levels are expected to remain the same as existing noise levels due to the lack of dominant roadway sources. As identified in Table 2, Column 6, Design Year Build (2035) noise levels are projected to create a substantial impact at one receptor site, R14. Due to the mountainous terrain along the project, noise abatement is not feasible at this site.

The findings in this document are based on conceptual information. A Final Design Noise Analysis will be performed for this project based on detailed engineering information. Thus, any conclusions derived in the report should be considered preliminary in nature and subject to change.
II. Introduction

Impacts associated with noise are often a prime concern when evaluating roadway improvement projects. Roadway construction at a new location or improvements to the existing transportation network may cause impacts to the noise-sensitive environment located adjacent to the project corridor. For this reason, FHWA and VDOT have established a noise analysis methodology and associated noise level criteria to assess the potential noise impacts associated with the construction and use of transportation related projects.

This report details the steps involved in the noise analysis for Section II of the Coalfields Expressway (CFX), including noise monitoring, noise modeling methodologies, results, and impact evaluation. The project area can be seen in Figure 1 - Regional Location Map. Due to the size and scope of the project, Figures 2A and 2B - Project Map Overview were developed to depict the overall project and identify areas of sensitive receptors. The appendices attached at the end of this report include all relevant information that was incorporated into the noise modeling process.

III. Noise Analysis Methodology, Terminology and Criteria


To determine the degree of highway noise impact, Noise Abatement Criteria (NAC) has been established for a number of different land use categories. Table 1 documents the NAC for the associated activity land use category shown in the adjacent column. All of the noise sensitive land uses within this project corridor are considered Category B. Category B receptors are comprised of and limited to residential areas. Coordination with Wise, Dickenson, and Buchanan counties occurred to ensure that there are no undeveloped permitted land uses present within the project corridor, including Categories E and G. Category E receptors include hotels, motels, offices, and undeveloped lands that are permitted for those uses. Category G represents undeveloped lands with no permits. The NAC are given in terms of an hourly, A-weighted, equivalent sound level. The A-weighted sound level frequency is used for human use areas because it is comprised of the sound level frequencies that are most easily distinguished by the human ear, out of the entire sound level spectrum. Highway traffic noise is categorized as a linear noise source, where varying noise levels occur at a fixed point during a single vehicle pass by. It is acceptable to characterize these fluctuating noise levels with a single number known as the equivalent noise level ($L_{eq}$). The $L_{eq}$ is the value of a steady sound level that would represent the same sound energy as the actual time-varying sound evaluated over the same time period. For highway noise assessments, $L_{eq}$ is typically evaluated over a one-hour period.

Noise abatement determination is based on VDOT’s three-phase approach. The first phase (Phase 1) distinguishes if a sensitive receptor, within a project corridor, warrants highway traffic
Coalfields Expressway, Section II
Noise Analysis
Wise, Dickenson, and Buchanan Counties, VA
Coalfields Expressway, Section II
Noise Analysis
Wise, Dickenson, and Buchanan Counties, VA
Coalfields Expressway, Section II
Noise Analysis
Wise, Dickenson, and Buchanan Counties, VA
### TABLE 1
Coalfields Expressway, Section II
FHWA/VDOT Noise Abatement Criteria
Hourly-A-Weighted Sound Level in Decibels (dB(A))

<table>
<thead>
<tr>
<th>Activity Category</th>
<th>Activity L&lt;sub&gt;eq&lt;/sub&gt; (h)&lt;sup&gt;*&lt;/sup&gt;</th>
<th>Criteria L&lt;sub&gt;10&lt;/sub&gt; (h)&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Evaluation Location</th>
<th>Description of Activity Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>57</td>
<td>60</td>
<td>Exterior</td>
<td>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.</td>
</tr>
<tr>
<td>B&lt;sup&gt;3&lt;/sup&gt;</td>
<td>67</td>
<td>70</td>
<td>Exterior</td>
<td>Residential.</td>
</tr>
<tr>
<td>C&lt;sup&gt;3&lt;/sup&gt;</td>
<td>67</td>
<td>70</td>
<td>Exterior</td>
<td>Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.</td>
</tr>
<tr>
<td>D</td>
<td>52</td>
<td>55</td>
<td>Interior</td>
<td>Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools, and television studios.</td>
</tr>
<tr>
<td>E&lt;sup&gt;3&lt;/sup&gt;</td>
<td>72</td>
<td>75</td>
<td>Exterior</td>
<td>Hotels, motels, offices, restaurants/bars, and other developed lands, properties of activities not included in A-D or F.</td>
</tr>
<tr>
<td>F</td>
<td>--</td>
<td>--</td>
<td>Exterior</td>
<td>Agriculture, airports, bus yards, emergency services, industrial logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing</td>
</tr>
<tr>
<td>G</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Undeveloped lands that are not permitted.</td>
</tr>
</tbody>
</table>

---

1. Either Leq (h) or L10 (h) (but not both) may be used on a project.
2. The Leq (h) and L10 (h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measure.
3. Includes undeveloped lands permitted for this Activity Criteria.
4. VDOT utilizes the Leq(h) designation.

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*Coalfields Expressway, Section II*

*Noise Analysis*

*Wise, Dickenson, and Buchanan Counties, VA*
noise abatement. The following describes the **Phase 1** warranted criterion, as discussed in VDOT policy. Receptors that satisfy either condition warrants consideration of highway traffic noise abatement.

- Predicted highway traffic noise levels (for the design year) approach or exceed the highway traffic noise abatement criteria in Table 1. “Approach” has been defined by VDOT as 1 dB(A) below the noise abatement criteria.

- A substantial noise increase has been defined by VDOT as a 10 dB(A) increase above existing noise levels for all noise-sensitive exterior activity categories. A 10 dB(A) increase in noise reflects the generally accepted range of a perceived doubling of the loudness.

Phase 2 and Phase 3 of the three-phased approach will be discussed in the noise abatement evaluation, located in Section VI of this report.

The identification of noise-sensitive land uses guided the selection of noise monitoring locations along the project corridor. In order to determine the existing noise conditions within the project area, noise monitoring was conducted at 28 representative noise sensitive receptor sites. In addition, one modeling-only site was added to accommodate shifts in the alignments. Figures 3, Sheets 1 through 7 identify the project area and the locations of the 28 noise monitoring sites. Due to the rural nature of the project corridor and the lack of sensitive receptors, only those areas where both noise monitoring and modeling were completed are shown on Figure 3, Sheets 1 through 7. Therefore, some portions of the alignment are not highlighted on the sheets because there are no noise sensitive receptors along those portions.

Monitoring was performed at each of the selected noise sensitive receptors using Metrosonics dB-3080 dosimeters (noise meters). The noise meters were placed at each receptor site in a manner that would yield a typical absolute ambient environment noise reading, and allowed for minimal influence from atypical, background noise sources. Readings were taken on the A-weighted scale and reported in decibels (dB(A)). Prior to noise monitoring, noise meters were calibrated using a Metrosonics cl-304 acoustical calibrator. The noise monitoring equipment meets all requirements of the American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983 (R1991), Type 2, and meets all requirements as defined by FHWA. Noise monitoring was conducted in accordance with the methodologies contained in FHWA-PD-96-046, *Measurement of Highway-Related Noise*, (FHWA, May 1996).

Because of the rural nature of the project corridor, existing ambient background noise levels are predominantly from natural noise sources (e.g., birds, insects, farm animals). Local roadway noise was of minimal, if any, significance at all of the monitored sites. The results of the monitoring process indicate that noise levels are relatively consistent throughout the day. Ambient conditions dominate throughout CFXII and range from the low 40s dB(A) to the upper 50s dB(A).
Coalfields Expressway, Section II
Noise Analysis
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Coalfields Expressway, Section II
Noise Analysis
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Coalfields Expressway
Section II
Noise Receivers
Location Map

Figure 3  Sheet 3
- Monitoring / Modeling Receiver
- Proposed New Alignment
- Right of Way
- CNE Boundary

0 750 1,500 3,000 Feet
Noise monitoring was conducted on September 9th and 10th, 2008, and on March 4th and 5th, 2009. Monitoring during the peak travel period aids analysts in establishing existing worst-case noise levels at the noise-sensitive locations within the corridor. However, there was no peak noise period, due to the rural nature of the project corridor; therefore, monitoring was conducted throughout the day at each location. Noise level data were recorded at 10-second intervals for 10 to 15-minute durations for each test. Data included time, average noise level ($L_{av}$), maximum noise level ($L_{max}$), and instantaneous peak noise level ($L_{pk}$) for each 10-second interval. Additional data collected at each monitoring location included atmospheric conditions, wind conditions, background noise sources, and unusual noise events. Due to the project’s rural nature and rugged terrain, background noise influence was dominant throughout the day. Because all noise receivers are distant from existing major roadway noise sources, noise model validation was not applicable. At those locations, existing monitored noise levels represent ambient (background) noise levels associated with non-roadway-related noise sources.

Short-term noise monitoring is not a process to determine design year noise impacts or barrier locations. Short-term noise monitoring provides a level of consistency between what is present in real-world situations and how that is represented in the computer noise model. Short-term monitoring does not need to occur within every CNE to validate the computer noise model.

IV. Validation and Existing Conditions

Computer modeling is the accepted technique for predicting Existing and Design Year (2035) noise levels associated with traffic-induced noise. Currently, the FHWA Traffic Noise Model (TNM) 2.5 computer-modeling program is the approved highway noise prediction model. The TNM has been established as a reliable tool for representing noise generated by highway traffic. The information applied to the modeling effort includes the following: highway design files (existing and proposed conceptual design), traffic data, roadway cross-sections, and surveying of terrain. Base mapping, aerial photography, and field views were used to identify noise-sensitive land uses within the corridor and any terrain features that may shield roadway noise. All of the noise sensitive land uses in the project area are residential and thus will be categorized as Category B.

The modeling process begins with model validation, as per VDOT requirements. This is accomplished by comparing the monitored noise levels with noise levels generated by the computer model, using the traffic volumes, speeds and composition that were witnessed during the monitoring effort. This comparison ensures that reported changes in noise levels between Existing and Design Year (2035) conditions are due to changes in traffic conditions and not to discrepancies between monitoring and modeling techniques. A difference of three decibels (3 dB(A)) or less between the monitored and modeled level is considered acceptable, since this is the limit of change detectable by the typical human ear. However, significant traffic noise was not a factor at any of the monitored sites. Therefore, due to the lack of any considerable traffic influence at all of the monitored sites, noise model validation was not applicable.
### Table 2

**Coalfields Expressway Section II**  
**Sound Level Summary in dBA**

<table>
<thead>
<tr>
<th>Receptor Site</th>
<th>Number of residences</th>
<th>Monitored/Existing Noise Level(^{(1)})</th>
<th>Criteria</th>
<th>CFX Noise Level (2035)</th>
<th>Design Year Build (2035)(^{(2)})</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNE 1</td>
<td>R1</td>
<td>1</td>
<td>49</td>
<td>59</td>
<td>47</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>R2</td>
<td>1</td>
<td>52</td>
<td>62</td>
<td>43</td>
<td>53</td>
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<tr>
<td>CNE 2</td>
<td>R3</td>
<td>1</td>
<td>48</td>
<td>58</td>
<td>53</td>
<td>54</td>
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<tr>
<td></td>
<td>R4</td>
<td>3</td>
<td>48</td>
<td>58</td>
<td>56</td>
<td>56</td>
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<tr>
<td>CNE 3</td>
<td>R5</td>
<td>1</td>
<td>44</td>
<td>54</td>
<td>48</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>R6</td>
<td>1</td>
<td>59</td>
<td>69</td>
<td>46</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>R7</td>
<td>1</td>
<td>52</td>
<td>62</td>
<td>43</td>
<td>53</td>
</tr>
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<td>CNE 4</td>
<td>R8</td>
<td>1</td>
<td>56</td>
<td>66</td>
<td>49</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>R9</td>
<td>1</td>
<td>53</td>
<td>63</td>
<td>47</td>
<td>54</td>
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<td></td>
<td>R10</td>
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<td>46</td>
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<td>R11</td>
<td>1</td>
<td>48</td>
<td>58</td>
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<td>54</td>
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<tr>
<td></td>
<td>R12</td>
<td>1</td>
<td>52</td>
<td>62</td>
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<td>R13</td>
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<td>R15</td>
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<td></td>
<td>R16</td>
<td>1</td>
<td>52</td>
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<td>58</td>
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<td>CNE 5</td>
<td>R17</td>
<td>2</td>
<td>48</td>
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<td>44</td>
<td>54</td>
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<td>52</td>
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</tr>
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<td></td>
<td>R21</td>
<td>2</td>
<td>44</td>
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<td>53</td>
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<tr>
<td>CNE 7</td>
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<td>49</td>
<td>59</td>
<td>48</td>
<td>52</td>
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<td></td>
<td>R23</td>
<td>2</td>
<td>42</td>
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<td></td>
<td>R27</td>
<td>2</td>
<td>50</td>
<td>60</td>
<td>57</td>
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<td></td>
<td>R28</td>
<td>1</td>
<td>55</td>
<td>65</td>
<td>58</td>
<td>60</td>
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<td>CNE 9</td>
<td>R25</td>
<td>2</td>
<td>45</td>
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<td></td>
<td>R26</td>
<td>4</td>
<td>54</td>
<td>64</td>
<td>60</td>
<td>61</td>
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<td>CNE 10</td>
<td>R29</td>
<td>1</td>
<td>52</td>
<td>62</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

\(^{(1)}\) Due to the rural nature of the project and lack of significant traffic noise, the Existing noise level is assumed to be the same as the monitored noise level.

\(^{(2)}\) Design Year Build noise levels are the logarithmic summation of the Existing and CFX noise levels. Highlighted cells indicate impact.
Monitored noise levels are summarized in Column 3 of Table 2. Based on these existing noise levels, the noise impact criterion was determined at each receptor site, based on either the “absolute” criteria shown in Table 1 or VDOT’s “substantial increase” above existing conditions criterion. Due to the rural nature of the project corridor and low ambient noise levels, both the “absolute” and “substantial increase” criterion will apply for this report.

During the field view and subsequent monitoring, it was determined that any roadways in close proximity to the receptor sites do not carry considerable traffic volumes and therefore, were not a major determinant of existing background noise levels. For the purposes of this noise analysis, it was determined through field verification that background noise is the dominant noise source in the project area.

A summary of existing, worst-case noise levels for this project is contained in Column 3 of Table 2. Due to the rural nature of this project and the lack of any significant traffic noise, existing noise levels are assumed to be the same as the monitored noise levels.

The following is a discussion of the monitored and existing noise environment for each CNE evaluated for the Coalfields Expressway, Section II project. For reporting purposes, Section II was divided into areas of Common Noise Environments (CNE). CNEs are groupings of receptor sites that, by location, form distinct communities within the project area. These areas are used to evaluate traffic noise impacts and potential noise mitigation options to residential developments or communities as a whole, as well as for consideration of feasibility and reasonableness of possible noise abatement measures for specific communities. Where residential communities or groupings of noise-sensitive land uses exist, noise monitoring sites were grouped into CNEs. Ambient (background) noise conditions dominate throughout the project corridor, therefore the following CNE descriptions are more a function of geographic proximity as opposed to common noise environment. The existing conditions described below are from either 2008 or 2009, depending on when those sites were monitored.

CNE 1

Common Noise Environment 1 (CNE 1) is located in Wise County and extends from just east of the proposed Route 83 Connector and continues northeast along Mill Creek and Mountain Cove Roads. CNE 1 contains two noise monitoring sites (R1 and R2), which represent two residences. The locations of these receptor sites can be seen in Figure 3, Sheet 1. Both monitored receptor sites represent ambient (background) noise environments. Existing monitored noise levels within CNE 1 were found to range from 49 to 52 dB(A), as shown in Column 3 of Table 2.

CNE 2

Common Noise Environment 2 (CNE 2) is located in both Wise and Dickenson Counties and extends from approximately 3,000 feet west of the intersection of Mountain Cove Road and River Hill Road to approximately 1,500 feet east of the proposed realigned Camp Creek Road (see Figure 3, Sheet 2). CNE 2 contains one noise monitoring site (R3), and one modeling–only site (R4) which represent four residences. This CNE was adjacent to the alignment shift,
resulting in the addition of a new site, R4. Since no new monitoring was completed, R4 was assigned the same background monitored noise level as R3. The locations of these receptor sites can be seen in Figure 3, Sheet 2. Both monitored and modeled receptor sites represent ambient (background) noise environments. Existing noise levels within CNE 2 were found to be 48 dB(A), as shown in Column 3 of Table 2.

CNE 3

Common Noise Environment 3 (CNE 3) is located in Dickenson County and extends from approximately 200 feet west of the proposed Lower Georges Fork Hollow Road overpass to approximately 3,000 feet east of Brush Creek Road (see Figure 3, Sheet 3). CNE 3 contains three noise monitoring sites (R5 through R7), which represent three residences. The locations of these receptor sites can be seen in Figure 3, Sheet 3. Sites R5 and R7 represent ambient (background) noise environments. Site R6 was minimally influenced by traffic on Brush Creek Road. Although not studied in detailed (since detailed engineering was not available for Brush Creek Road), the future alignment of Brush Creek Road will have minimal affect on the local noise environment. Existing monitored noise levels within CNE 3 were found to range from 44 to 59 dB(A), as shown in Column 3 of Table 2.

CNE 4

Common Noise Environment 4 (CNE 4) is located in Dickenson County and extends from approximately 800 feet west of Route 689 (Jerrys Bridge) and follows the CFX alignment until approximately 500 feet east of Route 607 (Dwale Lane) as shown on Figure 3, Sheet 4. CNE 4 contains nine noise monitoring sites (R8 through R16), which represent nine residences. The locations of these receptor sites can be seen in Figure 3, Sheet 4. All nine monitored receptor sites represent ambient (background) noise environments. Existing monitored noise levels within CNE 4 were found to range from 46 to 56 dB(A), as shown in Column 3 of Table 2.

CNE 5

Common Noise Environment 5 (CNE 5) is located in Dickenson County and extends from just north of the proposed CFX alignment along Newberry Ridge Road and Wilderness Lane (see Figure 3, Sheet 5). CNE 5 contains two noise monitoring sites (R17 and R18), which represent three residences. The locations of these receptor sites can be seen in Figure 3, Sheet 5. Each monitored receptor site represents ambient (background) noise environments. Existing monitored noise levels within CNE 5 were found to range from 44 to 48 dB(A), as shown in Column 3 of Table 2.

CNE 6

Common Noise Environment 6 (CNE 6) is located in Dickenson County and extends from just south of the proposed CFX alignment along Newberry Ridge Road, Dead End Road, and Big Ridge Road (see Figure 3, Sheet 5). CNE 6 contains three noise monitoring sites (R19, R20 and R22), which represent eight residences. The locations of these receptor sites can be seen in
Figure 3, Sheet 5. All three monitored receptor sites represent ambient (background) noise environments. Existing monitored noise levels within CNE 6 were found to range from 44 to 49 dB(A), as shown in Column 3 of Table 2.

CNE 7

Common Noise Environment 7 (CNE 7) is located in Dickenson County and extends along the north side of the proposed CFX alignment along Big Ridge Road (see Figure 3, Sheet 5). CNE 7 contains two noise monitoring sites (R21 and R23), which represent four residences. The locations of these receptor sites can be seen in Figure 3, Sheet 5. Both monitored receptor sites represent ambient (background) noise environments. Existing monitored noise levels within CNE 7 were found to range from 42 to 49 dB(A), as shown in Column 3 of Table 2.

CNE 8

Common Noise Environment 8 (CNE 8) is located in Dickenson County and extends along the north side of the proposed CFX alignment along Ira Owens Lane, Big Ridge Road and Juniper Lane (see Figure 3, Sheet 6). CNE 8 contains three noise monitoring sites (R24, R27, and R28), which represent five residences. The locations of these receptor sites can be seen in Figure 3, Sheet 6. All three monitored receptor sites represent ambient (background) noise environments. Existing monitored noise levels within CNE 8 were found to range from 46 to 55 dB(A), as shown in Column 3 of Table 2.

CNE 9

Common Noise Environment 9 (CNE 9) is located in Dickenson County and extends along the south side of the proposed CFX alignment along Big Ridge Road (see Figure 3, Sheet 6). CNE 9 contains two noise monitoring sites (R25 and R26), which represent six residences. The locations of these receptor sites can be seen in Figure 3, Sheet 6. Both monitored receptor sites represent ambient (background) noise environments. Existing monitored noise levels within CNE 9 were found to range from 45 to 54 dB(A), as shown in Column 3 of Table 2.

CNE 10

Common Noise Environment 10 (CNE 10) is located in Dickenson County and extends along the north side of the proposed CFX alignment along Breaks Park Road (see Figure 3, Sheet 7). CNE 10 contains one noise monitoring site (R29), which represents one residence. The location of the receptor site can be seen in Figure 3, Sheet 7. The monitored receptor site represents ambient (background) noise environments. The Existing monitored noise level within CNE 10 was determined to be 52 dB(A), as shown in Column 3 of Table 2.

V. Evaluation of Design Year Noise Levels & Noise Impact Assessment

Following the determination that ambient noise is dominant throughout the project corridor, the noise assessment continued with the projection of Design Year (2035) noise levels. This task
was accomplished by accounting for the proposed improvements and applying Design Year (2035) traffic volumes and composition to the computer model. As there are no other considerable noise sources within Section II, the computer model represents roadway noise only from the proposed CFX. Design Year (2035) Build noise levels were predicted with the proposed improvements in place and in use.

The next step in the noise analysis is to determine if future noise levels at the sensitive receptors will approach or exceed the FHWA/VDOT NAC. If the criteria are approached or exceeded at any receptor, noise mitigation would be considered and evaluated in an attempt to reduce future noise to acceptable levels. The noise levels associated with the Design Year (2035) modeling analysis (CFX Contribution) are summarized in Column 5 of Table 2.

Design Year (2035) traffic volumes, vehicle composition, and speeds were assigned to all proposed roadways. All traffic data used in the Design Year (2035) noise analyses were derived from traffic engineering studies performed during the preliminary engineering phase of the project (Reference Appendix D).

Federal regulations (23 CFR Part 772) state that if a noise level at any given receptor approaches or exceeds the appropriate abatement criterion, or if predicted traffic noise levels substantially exceed the existing noise levels (by 10 dBA), abatement considerations are warranted. Table 1 summarizes the federal and state criteria for a variety of activity categories. All sites modeled in this noise analysis represent Category B land uses.

Design Year Build (2035) noise levels (Column 6 of Table 2) were determined by logarithmically combining the existing ambient (background) noise levels (Column 3 of Table 2) with the CFX (2035) noise levels (Column 5 of Table 2). This step was essential since several receptor sites experience higher noise levels under ambient conditions as opposed to noise levels generated by the CFX alignment. Design Year Build (2035) noise levels represent the combination of both ambient (background) and project noise levels which are summarized in Column 6 of Table 2. Therefore, the Design Year Build (2035) noise levels will be used to determine if noise levels approach or exceed the NAC.

As shown in Table 2, Design Year Build (2035) noise levels are predicted to substantially increase at one receptor site, R14, representing one residence. The lack of noise impacts is due in part to the rural nature of the project corridor, as well as the lack of noise-sensitive receptors adjacent to the proposed alignment. Additionally, the significant cut/fill slopes present throughout the corridor provide abundant shielding for the nearby noise sensitive environment. The 66 dBA contour was not developed and displayed on project mapping since it falls within the proposed cut/fill slopes; and therefore, within the proposed right-of-way.

VI. Noise Abatement Evaluation

Design Year Build (2035) noise levels are projected to create a substantial increase at one CNE (CNE 4) within the project corridor. Therefore, as per FHWA/VDOT procedures, noise
abatement considerations are warranted, as discussed in Phase 1, for the impacted properties within CNE 4.

Phase 2 and Phase 3 of VDOT’s three-phased approach to considering noise abatement and determining the feasibility and reasonableness of noise barriers is discussed below in detail.

**Phase 2: Feasibility Criteria for Noise Barriers**

- at least a 5 dB(A) highway traffic noise reduction at impacted receptors. Per 23 CFR 772, FHWA requires the highway agency to determine the number of impacted receptors required to achieve at least 5 dB(A) of reduction. VDOT requires that fifty percent (50%) or more of the impacted receptors experience 5 dB(A) or more of insertion loss to be feasible; and;

- the determination that it is possible to design and construct the noise abatement measure. The factors related to the design and construction include: safety, barrier height, topography, drainage, utilities, and maintenance of the abatement measure, maintenance access to adjacent properties, and general access to adjacent properties (i.e. arterial widening projects).

FHWA and VDOT guidelines recommend a variety of abatement measures which should be considered in response to transportation-related noise impacts. While noise barriers and/or earth berms are generally the most effective form of noise abatement, additional abatement measures exist which have the potential to provide considerable noise reductions, under certain circumstances. Additionally, the Code of Virginia (§33.1-223.2:21) states: “Whenever the Commonwealth Transportation Board or the Department plan for or undertake any highway construction or improvement project and such project includes or may include the requirement for the mitigation of traffic noise impacts, first consideration should be given to the use of noise reducing design and low noise pavement materials and techniques in lieu of construction of noise walls or sound barriers. Vegetative screening, such as the planting of appropriate conifers, in such a design would be utilized to act as a visual screen if visual screening is required.”

Consideration will be given to these measures during the final design stage, where feasible:

- Construction of noise barriers, including acquisition of property rights, either within or outside the highway right-of-way. Landscaping is not a viable noise abatement measure.

- Traffic management measures including, but not limited to, traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and exclusive lane designations.

- Alteration of horizontal and vertical alignments.
• Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development which would be adversely impacted by traffic noise. This measure may be included in Type I projects only.

• Noise insulation of Activity Category D land use facilities listed in Table 1. Post-installation maintenance and operational costs for noise insulation are not eligible for Federal-aid funding.

Since there is a noise impact, HB 2577 requires coordination with the Project Manager and Environmental Contact to inquire about the possibility of noise reducing design, the usage of low noise pavement, and visual screening. Noise reducing design is not a feasible option for this project, as any minor shifts (horizontal or vertical) could result in major increases in excavation quantities and lead to needing additional right of way. At this time, VDOT is not authorized by FHWA to use ‘quiet pavement’ as a form of noise mitigation. Should visual screening be required, landscaping would be the preferred method; as long as care is taken to assure that the landscaping does not encroach on the clear zone or decrease driver sight distance. In addition, the landscaping must not require additional right of way.

Due to the project need and the nature of the proposed improvements, traffic control measures were not considered an appropriate solution. Property acquisition to provide noise abatement was not necessary or supported by the analysis. Therefore, noise barriers and/or earth berms were considered the only form of abatement having the potential to reduce Design Year Build (2035) noise levels.

Noise walls and earth berms are often implemented into the highway design in response to identified noise impacts. The effectiveness of a free-standing (post and panel) noise barrier and an earth berm of equivalent height are relatively consistent; however, an earth berm is often perceived as a more aesthetically pleasing option. Therefore, where possible, earth berms are typically the preferred form of noise abatement. The use of earth berms is not always an option, however, due to the excessive space they require adjacent to the roadway corridor. At a standard slope of 2:1, every one foot of berm height would require approximately four feet of horizontal width. This requirement becomes more complex on roadway improvement projects, where residential properties often abut the proposed roadway corridor. In these situations, implementation of earth berms can require considerable property acquisition to accommodate noise abatement. Due to limited right-of-way throughout the proposed roadway corridor and the potential impact (and acquisition) to adjacent residential properties and local roadways that would be required to provide berms, earth berms were not considered a viable abatement option for this project. Therefore, noise barriers were evaluated in an attempt to reduce Design Year Build (2035) noise levels below criteria.

**Phase 3: Reasonableness Criteria for Noise Barriers**

A determination of noise barrier reasonableness will include the consideration of the parameters listed below. The parameters used during the NEPA process are also used during the Final Design Phase when making a determination of noise barrier reasonableness. When performing a
Reasonableness analysis for the NEPA document, some parameters (e.g., desires of the impacted community) will not yet be quantifiable. All of the reasonableness factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable.

- **Viewpoints of the benefited receptors.**
  VDOT shall solicit the viewpoints of all benefited receptors through certified mailings and obtain enough responses to document a decision as to whether or not there is a desire for the proposed noise abatement measure. Fifty percent (50%) or more of the respondents shall be required to favor the noise abatement measure in determining reasonableness.

- **Cost-effectiveness**
  VDOT’s noise barrier cost effectiveness value is based upon a Maximum Square Footage of Abatement per Benefited Receptor (MaxSF/BR) value of 1,600 sq. ft. This MaxSF/BR criterion shall be applied as part of the noise barrier reasonableness determination. It replaces the previously used “Cost per Benefited Receptor” criteria.

- **Noise Reduction Design Goals**
  The design goal is a reasonableness factor indicating a specific reduction in noise levels that VDOT uses to identify that a noise abatement measure effectively reduces noise. The design goal establishes a criterion, selected by VDOT, that noise abatement must achieve. The design goal is not the same as acoustic feasibility, which is the minimum level of effectiveness of a noise abatement measure. Acoustic feasibility indicates that the noise abatement measure can, at a minimum, achieve a discernible reduction in noise levels.

  The effectiveness of a noise barrier is measured by examining the barrier’s capability to reduce Design Year Build noise levels. Noise reduction is measured by comparing Design Year Build pre- and post-barrier noise levels. This difference between unabated and abated noise levels is known as “insertion loss” (IL). It is important to optimize the noise barrier design to achieve the most effective noise barrier in terms of both noise reduction (insertion losses) and cost. Although at least a 5 dB(A) reduction is required to meet the feasibility criteria, the following tiered noise barrier abatement goals should be used to govern barrier design and optimization.

  - Reduction of future highway traffic noise by 7dB(A) at one (1) or more of the impacted receptor sites (required criterion).
  - Reduction of future highway traffic noise levels to the low-60-decibel range when practical (desirable).
  - Reduction of future highway traffic noise levels to existing noise levels when practical (desirable).

  The following discussion presents potential abatement alternatives for CNE 4 within the CFX II project corridor. Where a noise barrier was evaluated, the effectiveness was measured in terms of achievable IL (reference Table 3).
The following is a preliminary discussion of the evaluated noise barrier system for CNE 4. Noise abatement was evaluated where noise impacts are predicted to occur. The noise evaluation is preliminary and a more detailed review will be completed during the final design stage. As such, noise barriers that are found to be feasible and reasonable during the preliminary noise analysis may not be found to be feasible and reasonable during the final design noise analysis. Conversely, noise barriers that were not considered feasible and reasonable may meet the established criteria and be recommended for construction. Appendix G provides completed warranted, feasible, and reasonable worksheets.

CNE 4

Design Year Build (2035) noise levels are predicted to create a substantial increase at one impacted property within CNE 4 located along Route 607 (Dwale Lane). A continuous post and panel noise barrier was evaluated along the CFX II eastbound lanes, just east of Route 607 (Dwale Lane). The preliminary barrier has a length of 446 feet. However, even at a height of 30 feet, it was not possible to obtain the required 5 dB(A) insertion losses at the receptor. Therefore, noise abatement within this CNE is not considered feasible at this time. However, this area of the project will be re-evaluated during the final design phase of the project.

VII. Construction Noise

VDOT is also concerned with noise generated during the construction phase of the proposed project. The degree of noise impact will vary, as it is directly related to the types and number of equipment used and the proximity to the noise-sensitive land uses within the project area.

Based on a review of the project area, no considerable, long-term construction-related noise impacts are anticipated. Any noise impacts that do occur, as a result of roadway construction measures, are anticipated to be temporary in nature and will cease upon completion of the project construction phase.

The following will be utilized to help minimize potential construction-related noise impacts. A detailed discussion of VDOT’s construction noise policy can be viewed in Section 107.16(b) 3 Noise, VDOT’s Road and Bridge Specifications (VDOT, 2007).

- The Contractor’s operations shall be performed so that exterior noise levels measured during a noise-sensitive activity shall not exceed 80 decibels. Such noise level measurements shall be taken at a point on the perimeter of the construction limit that is closest to the adjoining property on which a noise-sensitive activity is occurring. A noise-sensitive activity is any activity for which lowered noise levels are essential if the activity is to serve its intended purpose and not present an unreasonable public nuisance. Such activities include, but are not limited to, those associated with residences, hospitals, nursing homes, churches, schools, libraries, parks, and recreational areas.

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• VDOT may monitor construction-related noise. If construction noise levels exceed 80 decibels during noise sensitive activities, the Contractor shall take corrective action before proceeding with operations. The Contractor shall be responsible for costs associated with the abatement of construction noise and the delay of operations attributable to noncompliance with these requirements.

• VDOT may prohibit or restrict to certain portions of the project any work that produces objectionable noise between 10 P.M. and 6 A.M. If other hours are established by local ordinance, the local ordinance shall govern.

• Equipment shall in no way be altered so as to result in noise levels that are greater than those produced by the original equipment.

• When feasible, the Contractor shall establish haul routes that direct his vehicles away from developed areas and ensure that noise from hauling operations is kept to a minimum.

• These requirements shall not be applicable if the noise produced by sources other than the Contractor’s operation at the point of reception is greater than the noise from the Contractor’s operation at the same point.

VIII. Public Involvement/Local Officials Coordination

FHWA and VDOT policies require that VDOT provides certain information to local officials within whose jurisdiction the highway project is located, to minimize future traffic noise impacts of Type I projects on currently undeveloped lands. (Type I projects involve highway improvements with noise analysis.) This information must include information on noise-compatible land-use planning, noise impact zones in undeveloped land in the highway project corridor and federal participation in Type II projects (noise abatement only). This section of the report provides that information, as well as information about VDOT’s noise abatement program. VDOT’s current noise policy outlines VDOT’s approach to communication with local officials and provides information and resources on highway noise and noise-compatible land-use planning. VDOT’s intention is to assist local officials in planning the uses of undeveloped land adjacent to highways to minimize the potential impacts of highway traffic noise.

*Entering the Quiet Zone*, is a brochure that provides general information and examples to elected officials, planners, developers, and the general public about the problem of traffic noise and effective responses to it. A link to this brochure on FHWA’s website is provided: [http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/land_use/qz00.cfm](http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/land_use/qz00.cfm).

A wide variety of administrative strategies may be used to minimize or eliminate potential highway noise impacts, thereby preventing the need or desire for costly noise abatement structures such as noise barriers in future years. There are five broad categories of such strategies:
• Zoning,
• Other legal restrictions (subdivision control, building codes, health codes),
• Municipal ownership or control of the land,
• Financial incentives for compatible development, and
• Educational and advisory services.

_The Audible Landscape: A Manual for Highway and Land Use_ is a very well-written and comprehensive guide addressing these noise-compatible land use planning strategies, with significant detailed information. This document is available through FHWA’s Website, at [http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/audible_landscape/al00.cfm](http://www.fhwa.dot.gov/environment/noise/noise_compatible_planning/federal_approach/audible_landscape/al00.cfm)

**IX. Conclusion**

In summary, the results of the preliminary noise analysis for Section II of the Coalfields Expressway project indicate that Design Year Build (2035) noise levels are anticipated to create a substantial increase impact at one location, representing one residence. However, due to the mountainous terrain of the project corridor, noise abatement is not considered to be feasible at this time. However, noise abatement considerations for each CNE within the Coalfields Expressway Section II project area should be reassessed during the Final Design phase of the project.