TABLE OF CONTENTS

EXHIBITS

TABLES

1. SUMMARY

The purpose of this study is to determine the effect of the proposed Coalfields Expressway on sound levels in the immediate project area. The Coalfields Expressway project proposes a four-lane facility on a new alignment in southwestern Virginia, from Pound northeast to the West Virginia state line. Exhibit 1 shows the study area. Preliminary engineering studies have determined five alternatives. This Type I study investigated possible noise impacts from these five build alternatives.

Approximately 1700 properties were initially identified as being noise sensitive. Further study narrowed this number to 458, and these remaining receptors where incorporated into detailed noise modeling. The proposed Coalfields Expressway will result in impacts to one residential property. Every effort is being made to minimize the effects of the roadway project on the adjacent noise sensitive properties. One of the most effective noise abatement measures is the construction of sound barrier walls. Walls must satisfy certain criteria before they can be approved for construction, including a cost-per-residence maximum dollar value. The rural nature of this area of Virginia makes these criteria difficult to meet. The following study identifies the locations of impacted noise sensitive properties and discusses their respective potential for mitigation.

exhibit 1

2. BUILD ALTERNATIVES

Over the course of the project, nine project alternatives were established for consideration. The No-Build Alternative and five Build Alternatives have been retained for further study.

This section describes the five proposed build alternatives, shown on Exhibit 2. As the study progresses and more information is obtained, portions of different alternatives may be combined to form the final alternative.

Alternative A – Begins at Pound in Wise County with its connection to Route 23 near Horse Gap. It travels east along the northern town limits of Pound to Route 83. It then follows the Route 83 alignment to the vicinity of Route 621 in Dickenson County. Alternative A parallels Route 621 for approximately one mile and heads east north of Clintwood. Traveling along Big Ridge in a northeasterly direction, it passes north of Haysi and crosses the Russell Fork just south of its connection with the Pound River. From there, it travels east to Bull Gap in Buchanan County. From Bull Gap, Alternative A travels in a southeasterly direction and passes close to the Grundy Airport and crosses Route 460 south of Grundy. It continues to the east along the ridge top, paralleling Route 83 approximately one mile to the south, until it ties to Route 83 at the West Virginia State line near Paynesville.

Alternative B – Begins at Pound in Wise County with its connection to Route 23 near Horse gap. It travels east, paralleling Route 83 an average of one-half mile to the north, to Route 621 in Dickenson County. From there, it continues eastward to the north of Clintwood. Traveling along Big Ridge in a northeasterly direction, it passes just to the north of Haysi and crosses the Russell Fork approximately one-half mile north of the Haysi town limits. From here, it travels along Barts Lick Creek, to a point just south of Bull Gap and parallels the Route 609 alignment in Buchanan County. From near the Route 609/Route 460 intersection, Alternative B parallels Route 460 until they cross in the vicinity of Route 460/Route 656 intersection. It then continues eastward, parallel to Looney Creek. For the remainder, it travels along the ridge top, paralleling Route 83 an average of one and one-half miles to the north, until it ties to Route 83 at the West Virginia State line near Paynesville.

Exhibit 2, Build Alternatives A-E

Alternative C – Begins at Pound in Wise County with its connection to Route 23 near Horse Gap. It travels east along the northern town limits of Pound to Route 83. It follows the Route 83 alignment to the vicinity of Route 621 in Dickenson County. From there, the alignment parallels Route 72 to the south for a short distance, then turns east, traveling on the ridge top along the southern town limits of Clintwood. Alternative C turns and travels in a northeasterly direction close to the Dickenson County Technology Park, until it follows the same alignment as Alternatives A and B. From this point, it travels across Cranes Nest Creek and along Big Ridge in a northeasterly direction and passes north of Haysi, along the town limits. Continuing east, it travels near Poplar Gap, parallels Routes 614 and 615 in Buchanan County and crosses Route 460 in Grundy in the vicinity of Route 615. Alternative C travels east through Grundy along the ridge top and parallels Route 83 approximately one mile to the south until it ties to Route 83 at the West Virginia State line near Paynesville.

Alternative D – Begins just south of the Pound town limits in Wise County, with its connection to Route 23. It travels in a northeasterly direction along the town limits until it meets Route 83 and continues to the east along the Route 83 alignment to the vicinity of Route 621 in Dickenson County. From there, the alignment parallels Route 72 to the south for a short distance, then turns east, traveling on the ridge top along the southern town limits of Clintwood. At the southeastern corner of Clintwood, Alternative D realigns with Route 83 and either follows the alignment or parallels the alignment south of the McClure River to the southern town limits of Haysi. From there, it crosses Route 80/83, traveling east along the ridge top, to a point near Poplar Gap in Buchanan County. From Poplar Gap, it travels in a southeasterly direction and passes close to the Grundy Airport. It continues east along the ridge top, paralleling Route 83 approximately one mile to the south until it ties to Route 83 at the West Virginia State line near Paynesville.

Alternative E – Begins just south of the Pound town limits in Wise County, with its connection to Route 23. It travels in a northeasterly direction along the town limits, crosses Route 83, and parallels Route 83 one-half mile to the north until it realigns with Route 83 in Dickenson County west of Clintwood. It continues along Route 83 and then turns and parallels Route 72 to the south for a short distance, then turns east, traveling along the southern limits of Clintwood. At the southeastern corner of Clintwood, Alternative E parallels Route 83 south of the McClure River to the southern town limits of Haysi. From there, it crosses Routes 80/83, traveling east to a point near Poplar Gap in Buchanan County. At this point, the alignment turns in a northeasterly direction until it turns east paralleling Route 460. Alternative E crosses Route 460 near its intersection with Route 656. It continues to the east, paralleling Looney Creek and then

Route 83 approximately one and one-half miles to the north along the ridge top until it ties to Route 83 at the West Virginia State line near Paynesville.

3. GUIDELINES

The noise impacts for the five build alternatives have been assessed in accordance with Federal Highway Administration (FHWA) guidelines published in Part 772 of the Federal Aid Policy Guide (FAPG). In order to determine the degree of impact of highway traffic noise on human activity, the Noise Abatement Criteria (NAC) established by FAPG Part 772 are used. The NAC, listed in Table 1 for various activities, represent the upper limit of acceptable traffic noise conditions as well as a measure of that which may be desirable with that which may be achievable. The NAC apply to areas having regular human use and where lowered noise levels are desired. They do not apply to the entire tract of land on which the activity is based, but only to that portion where the activity takes place.

The NAC are given in terms of the hourly, A-weighted, equivalent sound level in decibels or dB(A). The A-weighted sound level is a single number measure of sound intensity with weighted frequency characteristics that correspond to human subjective response to noise. However, since most environmental noise fluctuates from moment to moment, it is common practice to condense all of this information into a single number called the equivalent sound level (Leq). The Leq is the value of a steady sound level that would represent the same sound energy as the actual time-varying sound levels evaluated over the same time period. For highway traffic noise assessment, Leq is typically evaluated over a one hour period, and is denoted as Leq(h).

The noise impact assessment is made using the guidelines listed in Table 1. If, for a given activity, the design year noise levels “approach or exceed the NAC”, then the activity is impacted and a series of abatement measures must be considered. The Commonwealth of Virginia has defined approach as one decibel less than the NAC. A second criterion for assessing impact is provided in the Federal guidelines. For some locations a project may impose a large increase in noise levels over existing levels, even though the levels may not reach the NAC. Virginia’s policy defines an increase of 10 dB(A) or more as a “substantial increase” that justifies consideration of noise abatement measures. The final decision to recommend abatement measures along a project corridor will take into account the feasibility of the design and the construction cost per protected receptor weighed against the environmental benefit.

Table 1
FHWA Noise Abatement Criteria

Activity Category	Leq(h) dB(A)	Description of Activity
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreational areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed land, properties or activities not included in Categories A or B above.
D	----	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

4. METHODS

Initially, approximately 1700 noise sensitive properties were identified within a corridor 2000 feet wide along all five build alternatives. Preliminary noise modeling of the worst case situation showed no impacts would occur outside a corridor 750 feet wide, which reduced the number of properties to 458. These 458 properties are scattered along the five build alternatives, with denser areas located along Route 83. Impact assessments were performed on the 458 potentially impacted properties, of which, 454 are residences, one is a school and three are churches. Exhibit 3 shows approximate locations of the noise modeling sites. Noise levels in these areas have been determined for the existing conditions, the design year (2020) no-build conditions, and the design year (2020) build conditions.

The study area is rural. The few towns along the five build alternatives are small and most other development has occurred along isolated valley bottoms. Route 83 serves as the area's only major east-west roadway. The other roadways can best be described as local access, and traffic on these roads is sporadic and unpredictable. Therefore, existing and no-build traffic was only available for Route 83. To determine existing and no-build levels for properties located away from Route 83, monitoring was conducted at 27 locations along the five proposed alternatives (see Exhibit 3). Monitored sites in rural areas, where traffic was not the major source of sound energy, were averaged to develop a background level applicable to properties located in other remote areas. This average background noise level was determined to be 51dB(A). Properties located along more traveled roadways, excluding Route 83, were assigned levels based on nearby monitored sites. Since no major industrial, commercial, or residential development is expected away from Route 83 due to the topography and lack of access, the monitored values for existing conditions can be used to approximate design year no-build levels.

At sites along Route 83 where traffic is a major contributor to the ambient noise level, *FHWA Traffic Noise Model (TNM)* was used to determine the traffic generated noise. TNM is an FHWA-approved highway noise prediction computer model released in 1998 to replace Stamina/Optima. The model accounts for such factors as terrain, atmospheric absorption, ground absorption, intervening barriers, roadway geometry, receptor distance, vehicle volumes and speeds, and volumes of medium trucks (vehicles with 2 axles/6 tires) and heavy trucks (3 axles or more). Noise levels have been predicted for that hour of the day when the vehicle volume, operating speed and number of heavy trucks combine to produce the worst traffic noise conditions. Results from the model were combined with the 51 dB(A) base background noise level to establish the actual ambient noise levels at these sites. This same scenario was also used to predict the design year noise levels for both the build and no-build conditions where traffic is anticipated to be the major noise generator.

Exhibit 3, Receptor Locations

The assessment of noise impacts requires three comparisons:

1) The noise levels under existing conditions must be compared to those under build conditions. This comparison shows the change in noise level that will occur between the present time and the design year if the project is built.

2) The noise levels under design year no-build conditions must be compared to those under build conditions. This comparison shows how much of the change in levels will be attributed to the proposed project.

3) The noise levels under build conditions must be compared to the applicable NAC. This comparison determines the compatibility of noise levels under build conditions and present land use.

Table 2 summarizes the noise prediction results. Included for each site are the applicable NAC and the highest hourly equivalent sound levels for the existing, no-build, and build conditions.

5. IMPACT ASSESSMENT

The results of the noise study, as presented in Table 2, indicate that the proposed improvements will have a varying effect on noise levels for noise sensitive properties. Generally, noise levels can be expected to remain near existing year levels for the design year (2020) no-build condition due to the lack of any projected increase in traffic or development. The design year no-build noise levels are not expected to increase by more than 3 dB(A) at any of the study site locations. For reference purposes, an increase of 3 decibels is considered barely perceptible, and an increase of 10 decibels is considered to double the loudness.

Comparing Design Year Build with the Existing Condition
Comparing the design year build alternative noise levels with existing indicates a wide range in noise level differences. The largest increase for the build alternatives will occur with Alternative C, an 11 dB(A) variance. The largest increase for all the other alternatives will be 9 dB(A). The average increase for most sites for Alternatives A and D will be 3 dB(A), and 4 dB(A) for Alternatives B, C and E. Alternative C is the only alternative that will have a property experiencing a substantial increase in noise level, and that will occur at one site only (see Table 3).

Comparing Design Year Build with No-Build
Since design year no-build noise levels are very similar to existing levels (maximum of 3 dB(A) difference), a comparison between the design year build alternatives and the no-build is similar to that of the design year build alternatives and the existing condition. The greatest difference between the build and no-build alternatives will occur between Alternative C and the No-Build Alternative. Noise levels under Alternative C will be 11 dB(A) higher than under the No-Build Alternative at one location. For all the other alternatives, the maximum difference in noise levels between the build and no-build conditions will be 9 dB(A. The average increase for most sites will be 3 dB(A) for Alternatives A and D, and 4 dB(A) for Alternatives B, C and E

Comparing Design Year Build with NAC
A comparison of the design year build noise levels with the applicable NAC reveals that no properties will experience noise levels from any of the Coalfields Expressway alternatives that will approach or exceed the NAC.

Table 3 summarizes the five build alternatives and includes the number of properties modeled, the highest level expected, the numbers of properties approaching or exceeding the NAC and the anticipated number of properties with a substantial increase in noise levels. Table 3 indicates that for all alternatives there will be no properties that will experience noise levels approaching or exceeding the NAC. However, there will be one property that will have a substantial increase in noise, and that will occur with Alternative C.

Table 3
Impact Summary

	Build Alternatives				
	A	**B**	**C**	**D**	**E**
Properties Modeled	219	133	269	192	135
Highest Level	64	60	65	64	64
Properties Approaching/exceeding NAC	0	0	0	0	0
Properties with Substantial Increases	0	0	1	0	0

The single impacted property noted in the table above is a residence and is described as follows:

Receptor 617
This residential property is located along Alternative C east of Clintwood in a remote area. The existing level for this property is 51 dB(A), and the proposed build level is expected to be 62 dB(A), an increase of 11 dB(A). The general location of the property is identified in Exhibit 3, with a blow-up of the area appearing in Exhibit 4.

Impact Assessment Summary
It would be reasonable to assume that a project of this size which skirts several communities would generate enough noise to impact several properties adjacent to the proposed roadway. Modeling, however, has indicated that at only one location (near Alternative C) would a noise criteria not be met. Examination of the noise analyses reveals that there are two major reasons why more properties are not impacted. The first reason is, due to the rugged terrain of the area, cut and fill sections will require considerable right of way. This required right of way would result in the acquisition of most of those properties that are close enough to a build alternative to be in violation of VDOT noise level criteria. The second reason involves the low projected traffic volumes on the Coalfields Expressway.

Exhibit 4, Impacted Property

6. NOISE ABATEMENT MEASURES

A discussion of sound barriers and other traffic noise mitigation features as they apply to the project is presented below.

The Federal Aid Policy Guide (FAPG), Part 772 identifies certain noise abatement measures that may be incorporated in the project design to reduce traffic noise impacts. These abatement measures include: traffic management, alteration of vertical and/or horizontal alignments, and the construction of sound barriers.

Traffic Management

Traffic management measures that are considered effective to reduce traffic noise include speed reduction and the restriction of heavy truck traffic. Speed reduction along this project is not considered applicable. The purpose of this project is to provide a limited access, high-speed facility. Restricting heavy truck traffic would also not be effective. Heavy trucks will produce lower noise levels on the Coalfields Expressway than existing roadways because of more controlled grades and less stop-condition intersections.

Vertical Alignment Alteration

Altering the vertical alignment is only effective for traffic noise reduction when there is truck traffic present and the roadway gradient can be sufficiently altered (2% or more change). The rugged terrain of this area does not allow any further flattening of the alignments without further environmental impact and increased cost.

Horizontal Alignment Alteration

Altering the horizontal alignment can be an effective measure for reducing traffic noise but is difficult to accomplish. The five alternatives being studied all avoid the larger developed towns, but do pass properties located in remote areas. Although this facility is being planned along a new alignment, the terrain and vertical grades have a large influence in the chosen alignments. Further modification of the alternatives would create alignments too sinuous or grades above the required design criteria.

Sound Barriers

The construction of a sound barrier has been considered for the impacted receptor. Sound barriers are only effective when there are no openings for pedestrian or vehicular access. In order for a barrier to be effective it must be continuous along the roadway adjacent to the impacted site or sites. Upon completion of the location study phase and after more detailed plans become available, a more detailed noise study will be undertaken which will include a more detailed noise abatement design.

6.1 Barrier Discussion

This section discusses the reasonableness of a sound barrier that does not have access requirement restrictions. The reasonableness of a sound barrier is based on the Department's $30,000 per protected residential property criteria. This criteria assumes that the sound barrier cost will be $174 per square meter ($16 per square foot) and only includes barrier materials and installation costs. To remain in compliance with the State Noise Abatement Policy an effective barrier must: 1.) eliminate or reduce the noise impact and 2.) provide a minimum of 5 dB(A) reduction in build traffic levels. Another criterion is the third party funding provision. When a noise barrier is determined to exceed the $30,000 per protected residential property cost criteria, the opportunity exists for the affected community to contribute the difference between the estimated cost and the $30,000 per impacted residential property cost criteria. After a fiscal commitment is made by the effected properties, the Department will undertake the final design of an effective traffic sound barrier. Sound barriers to protect public-use, non-profit facilities do not fall into the $30,000 per protected property cost criteria and are considered by the Department on a case by case basis. To remain in compliance with Federal regulations, the Department must consider properties which are not impacted but which would "benefit" from the construction of a sound barrier. This project has no properties that would benefit from this provision.

In barrier design, one of the most critical requirements is for the noise wall to be continuous. Any gap in the barrier will render it ineffective. Site conditions at the impacted property (Site 617) are favorable to the construction of a noise barrier because access will not be required from the Coalfields Expressway.

Barrier 1

A sound barrier to protect Site 617 (Alternative C) has been considered (see Exhibit 5). A ten-foot barrier 180 feet long in this situation is able to provide for a 5 dB(A) reduction in noise level at one property. The estimated cost of this barrier is $42,240. It is not considered to be cost effective, and will receive further consideration only if third party funding is committed.

Exhibit 5, Barrier 1

7. CONSTRUCTION NOISE

Land uses that would be sensitive to traffic noise would also be sensitive to construction noise. A method of controlling construction noise is to establish the maximum level of noise that construction operations can generate. In view of this, the Department has developed, and the FHWA has approved, a specification that establishes construction noise limits. This specification can be found in VDOT's Metric Road and Bridge Specifications, January 1997, Section 107.14 (b.3), Page 82, "Pollution, Noise". The contractor will be required to conform to this specification to reduce the impact of construction noise on the surrounding community.