APPENDIX D

NOISE QUALITY ANALYSIS, PROCEDURES AND RESULTS

Overview

Ambient noise measurements were taken at 24 sites along the proposed project alignment alternatives. These sites were located to represent noise sensitive receptors that would likely be affected by the proposed project. Existing measured noise levels are presented in Table D-1 and the locations of the measurements are shown in Figure D-1.

Table D-1
Existing (Ambient) Noise Levels
Samples taken April 26 –28, 2006

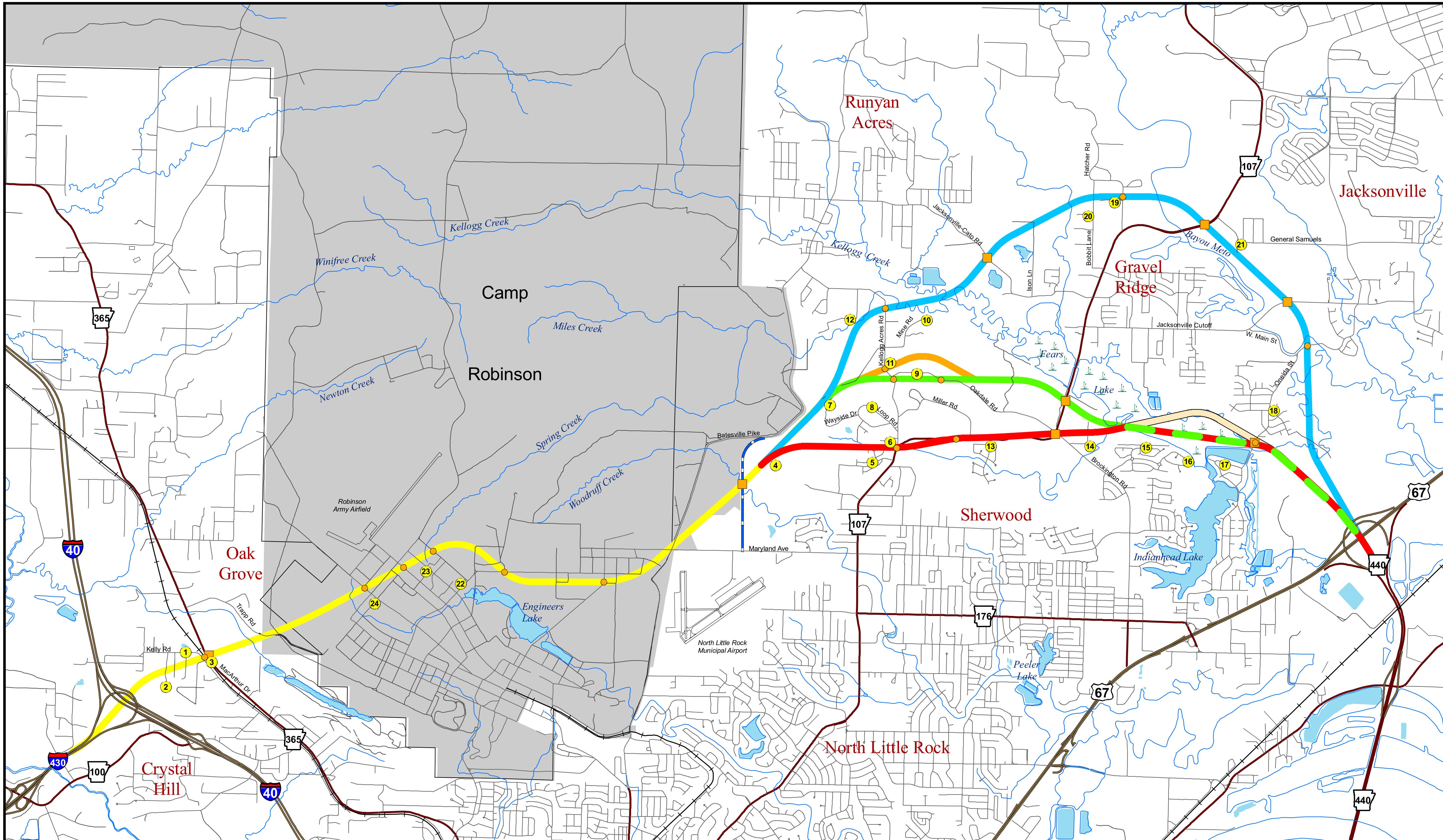
Noise Sampling Sites	Land Use	L_{eq}(h) (dBA)	General Location
1	Residential	55	Kelly Road and Bruce Lane
2	Residential	49	Circle R Road
3	Residential & Commercial	70	Highway 365
4	Recreational	43	Sherwood Athletic Fields
5	Residential	45	Stoneridge Drive (Windridge subdivision)
6	Residential	47	Amber Oaks Drive (Amber Oaks subdivision)
7	Residential	49	Wayside Road
8	Residential	54	Loop Road
9	Residential	56	Oakdale Road
10	Residential	47	Mine Road (Silver Springs subdivision)
11	Residential	61	Kellogg Acres Road
12	Residential	46	Simler Road
13	Residential	58	West Lake Circle (Miller's Crossing subdivision)
14	Residential	48	Private road east of Brockington Road
15	Residential	48	Ascot Road (Gap Creek subdivision)
16	Residential	51	Gap Creek subdivision
17	Residential	57	Indianhead Lake subdivision
18	Residential	59	Oneida Street (Northlake subdivision)
19	Residential	55	Kellogg Valley Road
20	Residential	48	Mudge Road
21	Residential	50	General Samuels Road
22	Residential	48	16th Street in Camp Robinson
23	Residential	50	Camp Robinson, east of airport
24	Residential	48	22nd Street in Camp Robinson

Noise measurement samples were ten minutes in length and were taken at peak and off-peak hours using a Larson-Davis 812 sound level meter. A log was kept noting time of day, calibration results and any unusual sound sources experienced during each measurement. The meter was calibrated as part of the noise measurement process.

The previous DEIS/FEIS and this SDEIS utilized the same values of the FHWA Noise Abatement Criteria (NAC) and the respective interpretations of the NAC by the AHTD in the analysis of the acoustic impacts of the proposed facility (See Table D-2). This analysis was conducted according to the guidelines as presented in the Federal Code of Regulations, Title 23, Part 772, which provides procedures to assess the acoustic impact of the proposed action and the need for abatement measures when the noise levels approach or exceed the FHWA NAC for various land uses. The noise level descriptor is the equivalent sound level, L_{eq}(h), defined as the steady state sound level which contains the same sound energy as the actual time-varying sound in a stated time period (usually one hour).

The receptors located within the study corridor of the proposed facility were evaluated for current noise levels in excess of the FHWA NAC for noise sensitive receptors included within Activity Group B. These sensitive receptors include residences, churches, schools, libraries, hospitals, nursing homes, apartment buildings, condominiums, and others. An hourly L_{eq} NAC noise level of 67 dBA was used for the analysis. Areas farther away from existing Interstate 40, Highway 365, Highway 107 and Highway 67 have lower ambient noise levels. Based upon ambient noise readings within the study area, background noise levels range from 43 to 70 dBA L_{eq}(h). Sites located closer to local roads would likely have ambient noise levels between five and ten decibels higher than the surrounding background noise levels.

Noise abatement measures for traffic noise impacts are considered when the predicted noise levels "approach" or exceed those values shown for the appropriate activity category of the FHWA NAC (Table D-2), or when the predicted traffic noise levels "substantially" (10 dBA or more) exceed the existing noise levels.



Job R60101	
AHTD - Environmental GIS - Farrell	
11/1/2006	

Miles: 0 0.25 0.5 1 1.5 2

Kilometers: 0 0.375 0.75 1.5 2.25 3

Legend*

- Common Alignment
- Alignment Alternative A
- Alignment Alternative B
- Alignment Alternative C
- Segment a
- Segment b
- Interchange
- Grade Separation
- Interchange or Grade Separation (...to be determined)
- Relocated Batesville Pike
- Noise Sampling Site

Colored Lines Represent a 300 ft. Wide Corridor

Figure D-1
Ambient Noise Sampling Sites
North Belt Freeway

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Table D-2
FHWA Noise Abatement Criteria (NAC)
Hourly A-Weighted Sound Level-Decibels (dBA)

Activity Category	L_{eq}(h) (1 Hr)	Description of Activity / Land Uses for Receptors
A	57 dBA (Exterior)	Land 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 lands are to continue to serve their intended purpose.
B	67 dBA (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, golf courses, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 dBA (Exterior)	Developed lands, properties or activities not included in Categories A or B above.
D	—	Undeveloped lands.
E	52 dBA (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Source: Code of Federal Regulations, Title 23 Part 772, Revised August 1982.

AHTD Noise Abatement Criteria (NAC)

The AHTD has defined “approach” as being one dBA less than the noise levels shown in Table D- 2, and defines an increase of 10 dBA or more over the existing noise levels as being “substantial.” The AHTD's definition of feasible noise mitigation is the ability to achieve a 10 dBA reduction in the peak hour L_{eq}(h) noise level for at least one residence. Reasonableness is a more subjective criterion than feasibility. Therefore, the AHTD has established seven factors that are reviewed prior to the determination of reasonableness. A weighted system is used to rate each factor as a “High Yes,” “Low Yes,” “Low No,” or a “High No.” The factors are summarized as follows:

- <u>Mitigation Cost per Residence</u> – Cost per residence should be no more than $20,000 with a minimum decrease of five dBA. Rating Scale: Less than $15,000/residence – “High Yes” to greater than $25,000/residence – “High No.”

- Opinion of Residents – Rating Scale: Greater than 80% of residents want noise abatement – "High Yes" to Less than 40% - "High No."

- Date of Residence – Rating Scale: Greater than 80% of housing development predated initial highway construction – "High Yes" to less than 30% - "High No."

- Age of Structures – Rating Scale: Greater than 80% of impacted developments have existed for at least 10 years – "High Yes" to less than 30% - "High No."

- Activity Category – Rating Scale:

  – Activity Category "A" L_{eq}(h) noise level greater than 62 dBA – "High Yes" to less than 52 dBA "High No."
  – Activity Category "B" L_{eq}(h) noise level greater than 72 dBA – "High Yes" to less than 62 dBA "High No."
  – Activity Category "C" L_{eq}(h) noise level greater than 78 dBA – "High Yes" to less than 68 dBA "High No."

- Magnitude of Noise Increase over Existing – Rating Scale: Future "build" noise levels greater than existing noise levels by 15 dbA L_{eq}(h) – "High Yes" to less than 5 dBA L_{eq}(h) – "High No."

- Magnitude of Noise Increase over "No-Action" – Future "build" noise levels greater than "no-action" noise levels by 10 dBA L_{eq}(h) – "High Yes" to less than 4 dBA L_{eq}(h) – "High No."

Analysis Methods

The FHWA highway traffic noise prediction computer program STAMINA 2.0 was utilized for the previous DEIS/FEIS to predict future noise levels within the study area. The following parameters were used in the model to calculate an hourly L_{eq}(h) at a specified receiver location:

- Distance between roadway and receiver
- Hourly traffic volumes for the following vehicles:
  – Light-duty (two axles, four tires)

  - Medium-duty (two axles, six tires)
  - Heavy-duty (three or more axles)
- Vehicle speed
- Noise source height of the following vehicles:
  - Light-duty - 0 feet (0 meter)
  - Medium-duty - 2.3 feet (0.7 meter)
  - Heavy-duty - 8.0 feet (2.4 meters)

However, for the SDEIS, FHWA's Traffic Noise Model version 2.5 (TNM) was utilized as the highway traffic noise prediction computer program to project future design-hour traffic noise levels for the year 2030. This transition was implemented due to the recent release of TNM as the new and updated highway traffic noise prediction model approved by the FHWA. Since it was necessary to update the traffic analyses for the SDEIS, the noise analysis for this project was updated by using TNM, the current state-of-the-art technology. TNM is considered a more advanced and precise program as a result of its capability for an increased number of input types and is currently required by the FHWA for all noise analyses. The same parameters were used in TNM to calculate an hourly Leq (h) at a specific distance as with the STAMINA model, except that an additional parameter, Ground Types, was added. TNM has wide range of Ground Type selections for use in analysis ranging from hard surfaces (example-pavement) to soft surfaces (example-field grass).

The number of impacted noise receptors for the SDEIS was estimated by utilizing the 66 dBA Leq(h) contour (the "approach" level for the FHWA's NAC Activity Category B) and also the 10 dBA or greater ("substantial" increase from existing) contour. Aerial photography was used to count the receptors within the contours. Visual field surveys were used to establish the use of various structures affected. Also, structures that may benefit from shielding by other structures, earth berms, or earth cuts were still counted as noise receptors.

Analysis Overview

The Common Alignment and Alignment Alternatives A, Ab, B, Ba, Bb, Bab and C were evaluated for current (ambient) conditions and modeled for an estimated increase in noise levels. For each, the study corridor was divided into segments based upon changes in the projected design-hour traffic volumes. Design-hour traffic for the year 2030 was the basis for the analysis. In addition, the noise impacts of the proposed Oneida Street Interchange were evaluated based on the projected changes in traffic volumes associated with both the presence and the absence of the proposed interchange. With the proposed Oneida Street Interchange, Alignment Alternatives A, Ab, B, Ba, Bb and Bab consisted of three noise segments. Without the proposed Oneida Street Interchange, these alignment alternatives consisted of only two noise segments. Alignment Alternative C was independent of the proposed Oneida Street Interchange and consisted of four noise segments. The Common Alignment consisted of two noise segments. For all alignment alternatives, each noise segment was numbered beginning from the west as shown in Table D-3.

For each noise segment, the widths of the 66 dBA Leq(h) contour and also the 10 dBA or greater contour were estimated based on the design-hour traffic volume, design speed and the features of the roadway. The model analysis utilized the roadway cross-section identified in the Purpose and Need section. FHWA's TNM was used to determine the predicted noise contour widths. Artificial receivers, extending to 454 feet (138.4 meters) from the roadway centerline at 15-foot (4.6-meter), 25 foot (7.6-meter) and 50-foot (15.2-meter) intervals, were simulated. The distance to the 66 dBA Leq(h) noise level was then interpolated from the receivers to develop the width of the 66 dBA Leq(h) contour. This same procedure was used to determine the distance to the 10 dBA or greater ("substantial" increase) noise level, and thus, the width of this contour. This procedure provides a conservative estimate of the future design-hour noise levels, but does not account for natural barriers such as cuts or fills.

Analysis Results

The following tables document the number of noise receptors identified along each noise segment for both the Common Alignment and Alignment Alternatives A, Ab, B, Ba, Bb, Bab and C. Also documented in the following tables are the number of noise receptors identified along each noise segment.

Table D-3
Noise Segments

Alignment Alternative(s)	Noise Segment #	Beginning Terminus	Ending Terminus
Common	1	I-430/I-40 Interchange	Interchange at Highway 365
Common	2	Interchange at Highway 365	Interchange at relocated Batesville Pike
A & Ab *with OSI**	1	Interchange at the relocated Batesville Pike	Interchange at Highway 107 and Brockington Road
A & Ab *with OSI*	2	Interchange at Highway 107 and Brockington Road	OSI
A & Ab *with OSI*	3	OSI	Highway 67/Highway 440 Interchange
A & Ab *without OSI*	1	Interchange at relocated Batesville Pike	Interchange at Highway 107 and Brockington Road
A & Ab *without OSI*	2	Interchange at Highway 107 and Brockington Road	Highway 67/440 Interchange
B, Ba, Bb & Bab *with OSI*	1	Interchange at relocated Batesville Pike	Interchange at Highway 107
B, Ba, Bb & Bab *with OSI*	2	Interchange at Highway 107	OSI
B, Ba, Bb & Bab *with OSI*	3	OSI	Highway 67/440 Interchange
B, Ba, Bb & Bab *without OSI*	1	Interchange at relocated Batesville Pike	Interchange at Highway 107
B, Ba, Bb & Bab *without OSI*	2	Interchange at Highway 107	Highway 67/Highway 440 Interchange
C	1	Interchange at relocated Batesville Pike	Interchange at Jacksonville-Cato Road
C	2	Interchange at Jacksonville-Cato Road	Interchange at Highway 107
C	3	Interchange at Highway 107	Interchange at Jacksonville Cutoff Road
C	4	Interchange at Jacksonville Cutoff Road	Highway 67/440 Interchange

* OSI- Oneida Street Interchange

These receptors are grouped by those that are predicted to experience noise levels above 66 dBA Leq(h) (NAC "approach" level), shown in Table D-4 and Table D-6, and those that are predicted to experience a 10 dBA or greater increase from their existing ambient noise level, shown in Table D-5 and Table D-7.

Table D-4
Estimated Noise Receptors that Approach the Noise Abatement Criteria (66 dBA)for the Common Alignment◊
(Based on the Design Year of 2030)

Alignment Alternative	Segment 1◊		Segment 2◊		Totals	
	With OSI*	Without OSI*	With OSI*	Without OSI*	With OSI*	Without OSI*
A	6	6	0	0	6	6
Ab	6	6	0	0	6	6
B	5	5	0	0	5	5
Ba	5	5	0	0	5	5
Bb	5	5	0	0	5	5
Bab	5	5	0	0	5	5
C♦	6		0		6	

◊See Table D-3.
*Refers to the presence or absence of the proposed Oneida Street Interchange (OSI).
♦Alignment Alternative C is independent of the proposed Oneida Street Interchange.

Table D-5
Estimated Noise Receptors with a 10 dBA or Greater Increase Above the Estimated Existing Levels for the Common Alignment◊
(Based on the Design Year of 2030)

Alignment Alternative	Segment 1◊		Segment 2◊		Totals	
	With OSI*	Without OSI*	With OSI*	Without OSI*	With OSI*	Without OSI*
A	5	5	0	0	5	5
Ab	5	5	0	0	5	5
B	5	5	0	0	5	5
Ba	5	5	0	0	5	5
Bb	5	5	0	0	5	5
Bab	5	5	0	0	5	5
C♦	5		0		5	

Table D-6
Estimated Noise Receptors that Approach the Noise Abatement Criteria (66 dBA) for each Alignment Alternative◊
(Based on the Design Year of 2030)

Alignment Alternative	Segment 1◊		Segment 2◊		Segment 3◊		Segment 4◊	Totals	
	With OSI*	Without OSI*	With OSI*	Without OSI*	With OSI*	Without OSI ♣	C only	With OSI*	Without OSI*
A	6	6	0	0	0			6	6
Ab	6	6	0	2	0			6	8
B	2	2	0	0	0			2	2
Ba	2	2	0	0	0			2	2
Bb	2	2	0	3	0			2	5
Bab	2	2	0	3	0			2	5
C♦	0		6		0		0	6	

◊See Table D-3.
*Refers to the presence or absence of the proposed Oneida Street Interchange (OSI).
♣With the absence of the proposed Oneida Street Interchange, Segment 3 does not exist.
♦Alignment Alternative C does not include the proposed Oneida Street Interchange.

Table D-7
Estimated Noise Receptors
With a 10 dBA or Greater Increase Above the Estimated Existing Levels
For each Alignment Alternative◊
(Based on the Design Year of 2030)

Alignment Alternative	Segment 1◊		Segment 2◊		Segment 3◊		Segment 4◊	Totals	
	With OSI*	Without OSI*	With OSI*	Without OSI*	With OSI*	Without OSI ♣	C only	With OSI*	Without OSI*
A	50	48	1	7	0			51	55
Ab	50	48	1	7	0			51	55
B	13	13	0	6	0			13	19
Ba	7	7	0	6	0			7	13
Bb	13	13	0	7	0			13	20
Bab	7	7	0	7	0			7	14
C♦	7		29		1		0	37	

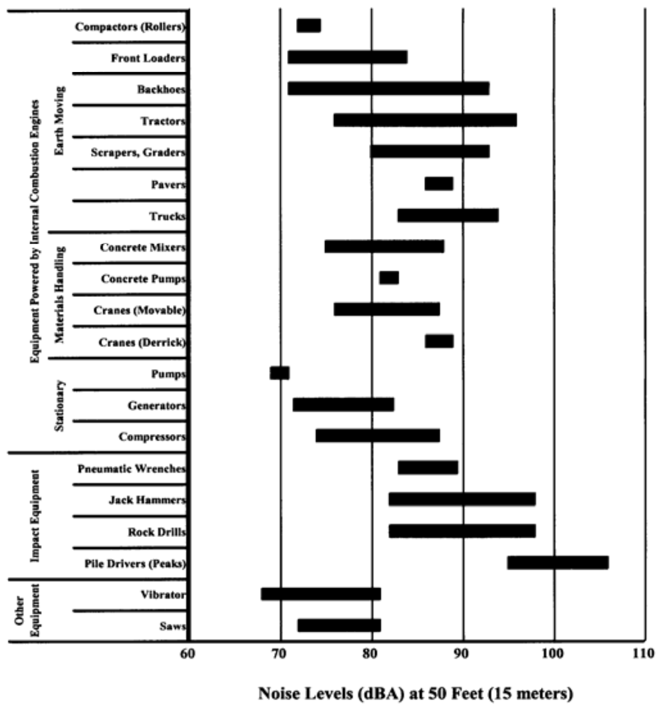
Construction Noise

The major construction elements of this proposed project are expected to consist of land clearing, earth moving, hauling, grading, paving, and bridge construction. General construction noise impacts, particularly from clearing, earth moving and paving operations, can be expected for passing traffic and for those individuals living or working near the project. Table D-8 lists some typical peak operating noise levels at a distance of 50 feet (15 meters), grouping construction equipment according to mobility and operating characteristics. In general, for a project of this magnitude, any given area requires two years to complete. However, during certain phases of construction (for example land clearing) and during certain seasons of the year, there will be areas along the project where no construction activity is taking place. Also, considering the relatively short-term nature of construction noise, impacts are not expected to be substantial. Yet, for brief periods of time, some construction noise impacts could be substantial (an increase in existing noise levels by 10 dBA or greater). However, these episodes usually occur during daytime work hours. As a result, these impacts will be minimized to adjacent residents. Additionally, nearby structures usually contribute to transmission loss and a resulting moderation of intrusive construction noise.

Table D-8

Construction Equipment Sound Levels

SOURCE: U.S. Report to the President and Congress on Noise, February, 1972



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