



# Noise Analysis Technical Memorandum

## Brent Spence Bridge Corridor Project

Kentucky – Northern Section

KYTC Item No. 6-17.00; ODOT PIN 116649

November 28, 2022



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# CHAPTER 1 – INTRODUCTION

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## 1.1 PURPOSE OF THE TECHNICAL MEMORANDUM

This *Noise Analysis Technical Memorandum (Tech Memo)* supplements the *Traffic Noise Impact Analysis: Kentucky – Northern Section* completed for the Preferred Alternative (Concept I-W) of the Brent Spence Bridge (BSB) Corridor project (KYTC Item No. 6-17.00; ODOT PIN 116649). The evaluations in that document were conducted in accordance with Federal Highway Administration's (FHWA) 23 CFR Part 772 – *Procedures for Abatement of Highway Traffic Noise and Construction Noise* and Kentucky Transportation Cabinet's (KYTC) *Noise Analysis and Abatement Policy* effective August 1, 2022 (KYTC 2022). The purpose of this *Tech Memo* is to further evaluate potential structural noise barrier walls that did not meet KYTC's feasibility or reasonableness criteria.

## 1.2 SUMMARY OF THE TRAFFIC NOISE IMPACT ANALYSIS

### 1.2.1 NORTHERN SECTION STUDY AREA

The completed *Traffic Noise Impact Analysis: Kentucky – Northern Section* analyzed the project's Preferred Alternative (Concept I-W) beginning at approximate mile point 189.5 and ending at the Kentucky/Ohio state line, which corresponds to the Brent Spence Bridge over the Ohio River. The noise analysis for the *Southern Section* is being completed concurrently by others.

### 1.2.2 SUMMARY OF IMPACTED RECEPTORS

Six Noise Sensitive Areas (NSAs) were identified in the *Traffic Noise Impact Analysis: Kentucky – Northern Section*. NSAs were labeled going north to south on the east side of I-71/I-75 and then the west side. The boundaries are shown on Figure 1.3–1. Within the six NSAs, a review of electronic mapping and field reconnaissance revealed 1,567 noise receptors were identified within the 800 feet of the proposed edge of pavement. In the proposed condition, the noise levels ranged from a high of 78.6 dB(A) to a low of 45.1 dB(A). There was a total of 1,033 impacted receptors (573 modeled receivers) recorded during analysis. The majority (1,030 receptors) are impacts due to exceeding the NAC, while one receptor had substantial increase impacts, and two receptors were impacts due to exceeding both criteria. The general location of the receivers is shown in Figure 1.3–1.

### 1.2.3 SUMMARY OF BARRIER ANALYSES

Abatement was considered at area with impacted receptors. A detailed analysis was not required at NSA D since there was only one impacted receptor, and a barrier could not meet KYTC's feasibility criteria of benefiting three or more impacted receptors. A detailed analysis was performed for the other five NSA's. In addition, NSA's B, C, E and F were sub-divided into smaller areas for analysis. In addition to these independent barrier analyses, three barrier systems, covering multiple NSAs, were also evaluated. The evaluations found that structural noise barriers were considered likely for Area C2 of NSA C and for Areas F1 and F2 of NSA F. Barriers were not reasonable and feasible for barriers for NSA A, NSA B (which includes Area B1, B2, and B3), Area C1 of NSA C, NSA E.

For the barrier systems, a structural noise barrier was found to be reasonable and feasible for barrier system C, which all of NSA C, and for barrier system E/F, which includes all of the NSA's E and F. The barrier system B, which covered all three areas of NSA B, was feasible but not reasonable as it did not meet the design goal or KYTC's cost-effectiveness criteria. The general location of barrier walls evaluated is shown in Figure 1.3–2.

## 1.3 ADDITIONAL NOISE ANALYSIS

This *Tech Memo* will evaluate the following locations:

- **Barrier System B (including areas B1, B2, and B3)** – As the study area approaches the Ohio River, the proposed I-71/I-75 roadway is bridged over the local roads. This resulted in multiple locations where structural noise barriers were modeled as 12-foot-high barriers mounted on the

proposed bridge barrier wall. Twelve-foot height barriers were used due to the design constraints, such as weight and wind load, that would apply with higher heights. This height limitation reduced the potential noise reduction and contributed to barrier walls that were unable to meet KYTC's design goal and cost effectiveness criteria. These barrier segments were reevaluated with additional two-foot increments up to 18 feet in height to maximize the amount of benefited receptors, despite the inability to achieve KYTC's design goal criterion.

- **NSA D** – There was only one impacted receptor in NSA D, so a detailed analysis was not performed in the original analysis. For this *Tech Memo*, a barrier wall would be analyzed to determine the benefit provided to the receptors located within the NSA.
- **Barrier System E/F** – as with Barrier System B, barrier segments located on a bridge were reevaluated at 18 feet in height to maximize the amount of benefited receptors.



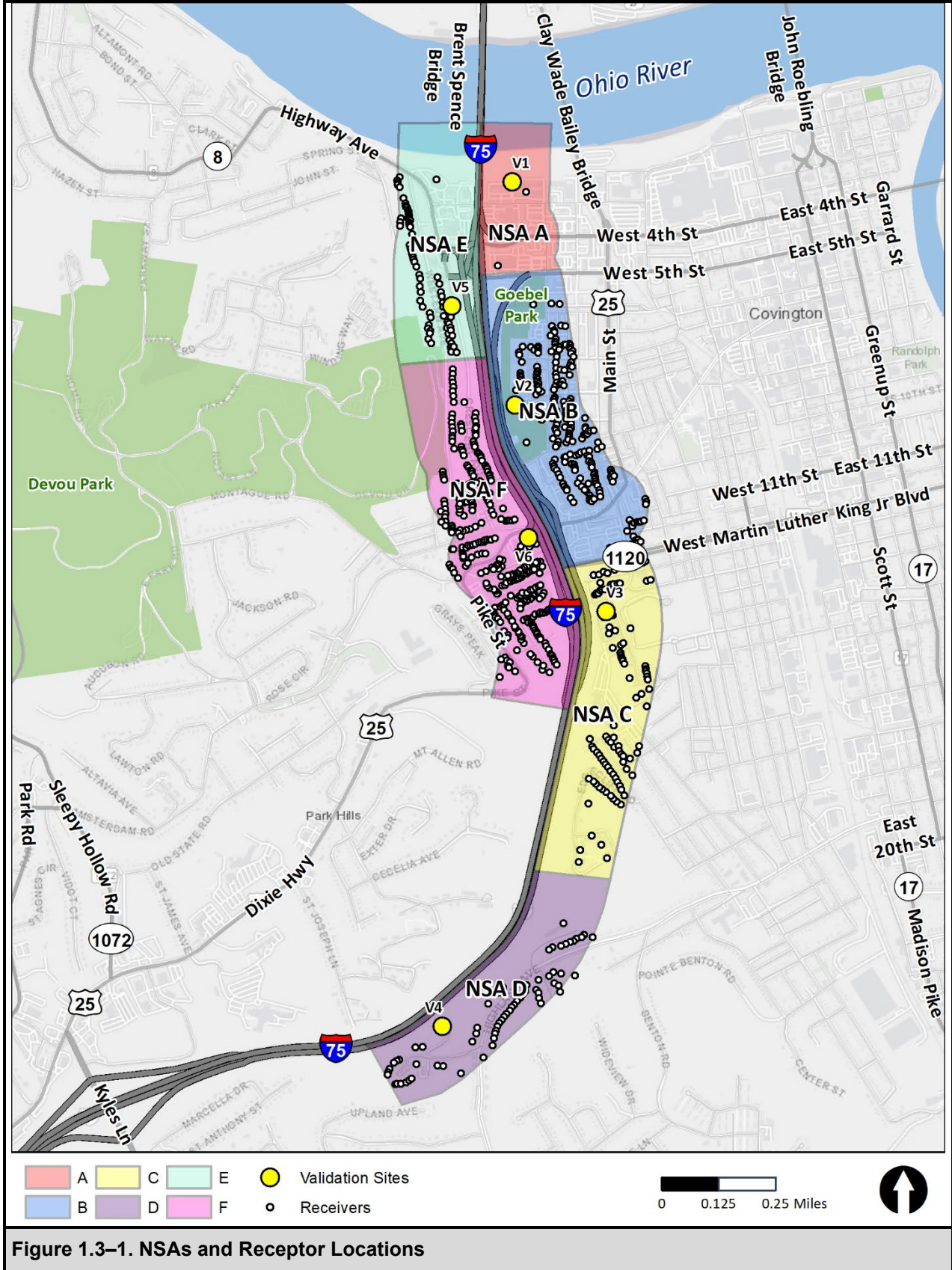
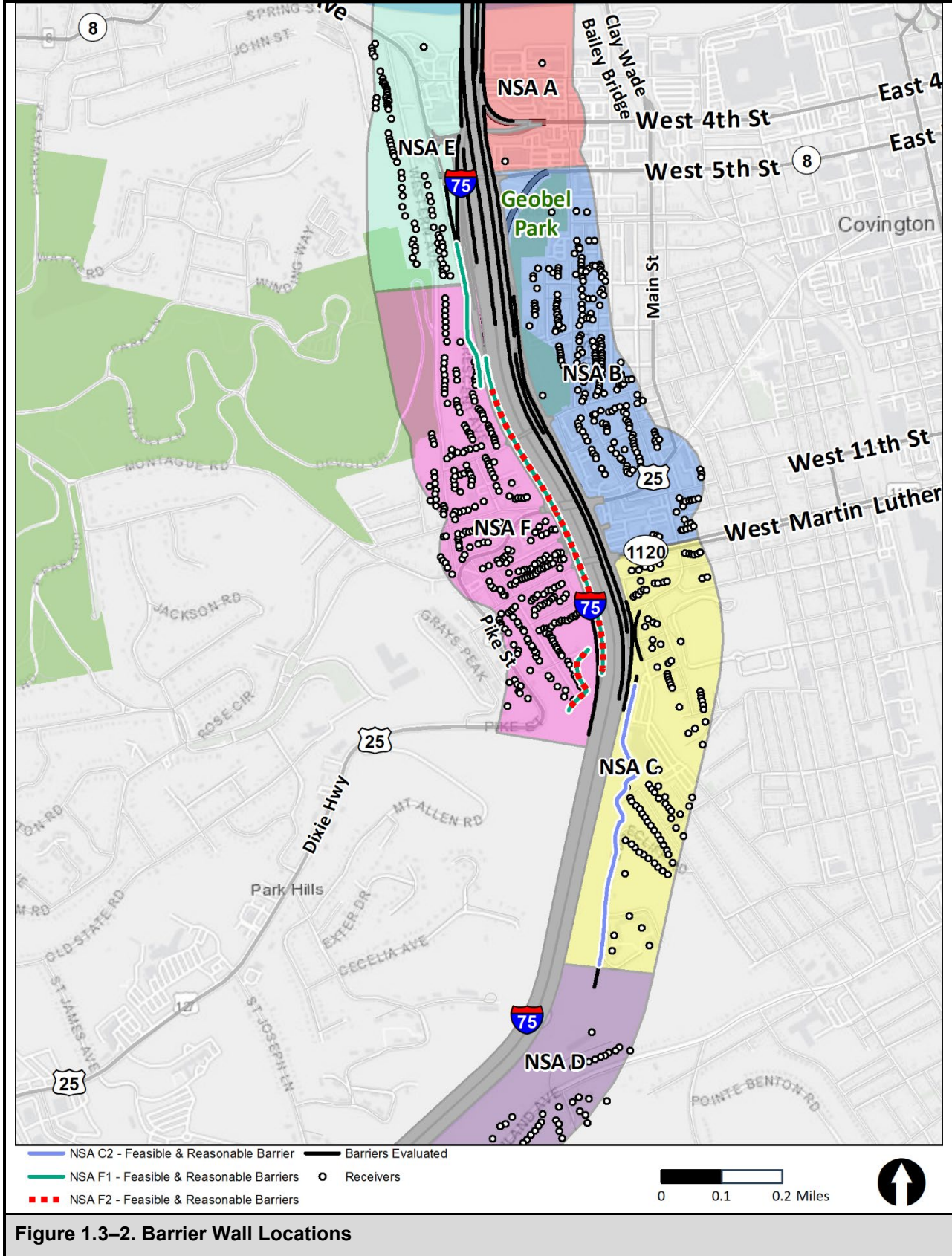


Figure 1.3–1. NSAs and Receptor Locations





# CHAPTER 2 – BARRIER RESULTS

## 2.1.1 BARRIER SYSTEM B – NOISE ABATEMENT EVALUATION

### Barrier System B – Analysis Area

This barrier system covers the area on the east side of I-71/I-75 from West 5<sup>th</sup> Street to MLK Jr. Boulevard and combines the structural noise barriers proposed for the three areas within NSA B (B1, B2, and B3). The original Barrier System B analysis found that a structural noise barrier was feasible, benefiting 153 receptors. It could not provide 7 dB(A) reduction at any receptor, though, so it could not meet the design goal. The barrier system also failed to meet the cost-effectiveness criteria with a \$49,377 cost per benefited receptor.

Since Barrier System B has multiple locations where 12-foot noise barriers were modeled mounted on the proposed bridge barrier wall, the barrier system was reevaluated with additional two-foot increments up to 18 feet in height. In addition to the raised height on bridges, the length and height of the wall was optimized to maximize the number of benefited receptors and the cost-per-benefited receptor. Modeled receivers, the modeled structural noise barrier location, and the receiver’s attenuation level thresholds are presented in Figure 1.3–1 through Figure 1.3–3. Tables with updated sound level results, including existing, predicted, and predicted with barrier, are presented in Appendix A. These tables also identify the number of receptors represented by the receiver, front row receiver/receptors, and an impact summary.

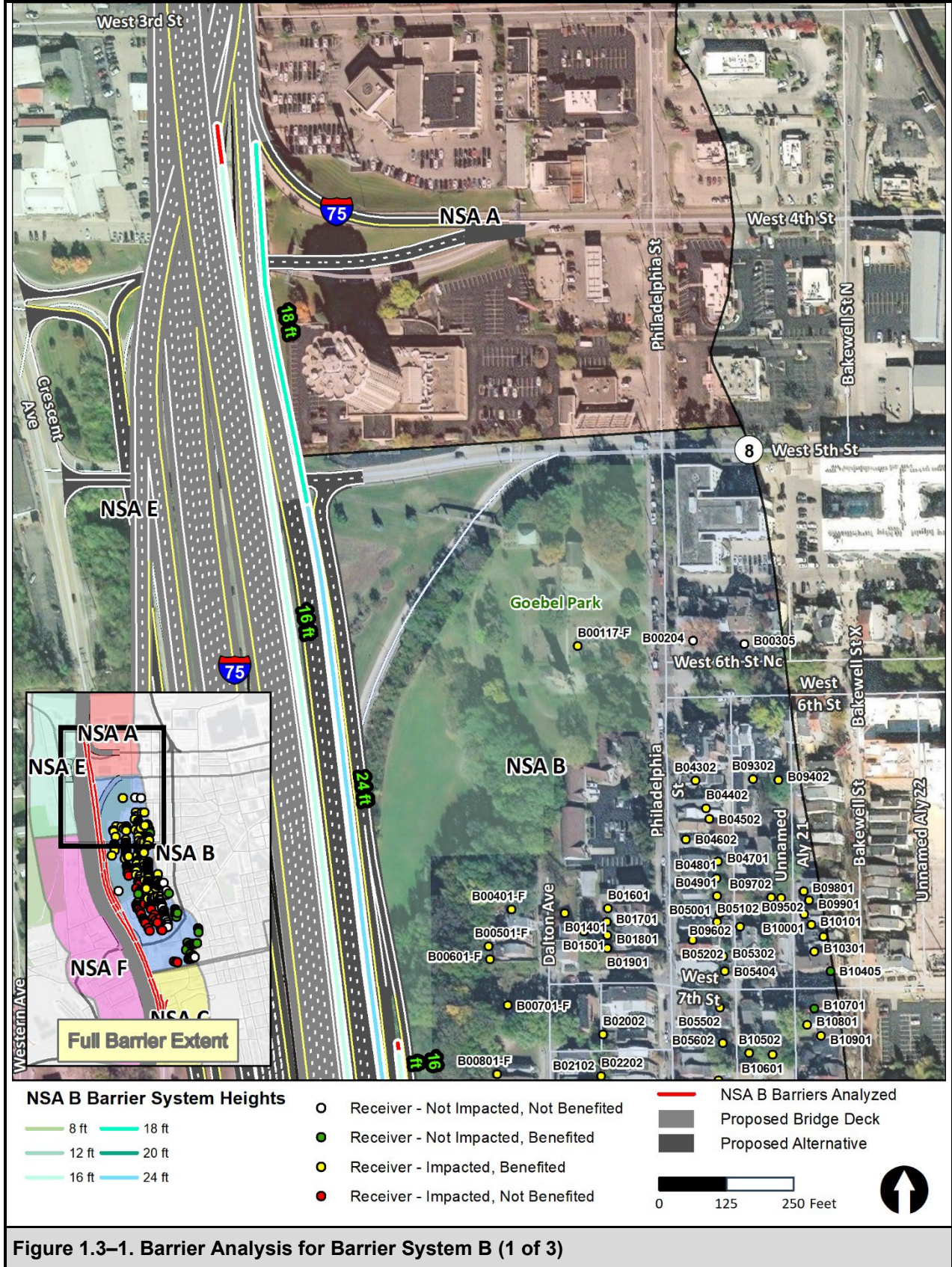
### Barrier System B – Barrier Summary

The reevaluated barrier system totaled 10,154 feet in length and averaging a height of 16.58 feet. This was 2,449 feet shorter in length and approximately 2.15 feet shorter height than the original evaluated barrier system. The reevaluated barrier system was predicted to benefit 293 receptors by providing at least 5 dB(A) of noise reduction (140 more benefited receptors than the original evaluated barriers). As expected, the barrier system did not provide 7 dB(A) of attenuation for any of the front-row receptors.

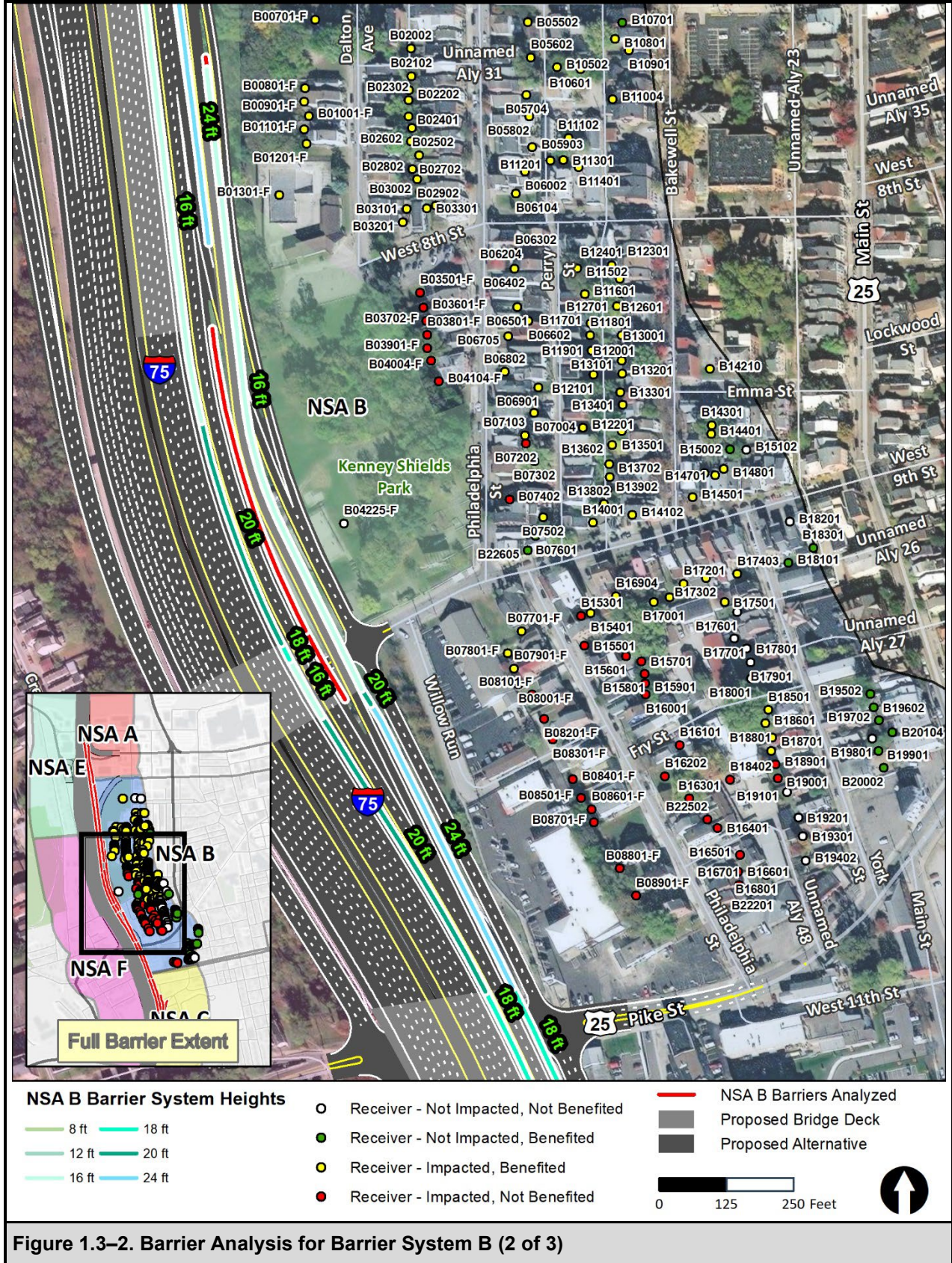
The cost of the modeled barriers was \$6,245,070, for a cost-effectiveness ratio of \$21,314 per benefited receptor, which is \$1,309,612 less and decreases the cost-effectiveness ratio by \$30,431 than the original evaluated barriers. This cost does not, however, include any additional structural cost associated with the additional height of the noise barrier on bridges. See Table 1.3–1 for a summary and comparison of the barrier wall evaluations.

**Table 1.3–1. Reevaluated Barrier System B Results**

BARRIER DESCRIPTION	NUMBER OF BENEFITED RECEPTORS; COST PER BENEFITED RECEPTOR	BARRIER LENGTH (FT)	AVERAGE BARRIER HEIGHT (FT)	BARRIER AREA (SQ FT)	TOTAL BARRIER COST @ \$32/SQ FT
Reevaluated Barrier	293 Benefited \$21,314	10,154	16.58	195,158	\$6,245,070
Original Barrier	153 Benefited \$51,745	12,603	18.73	236,083	\$7,554,682
Difference	+140 Benefited -\$30,431	2,449 ft. shorter	average of 2.15 ft. shorter	40,925 less sq. ft.	\$1,309,612 less (optimized)









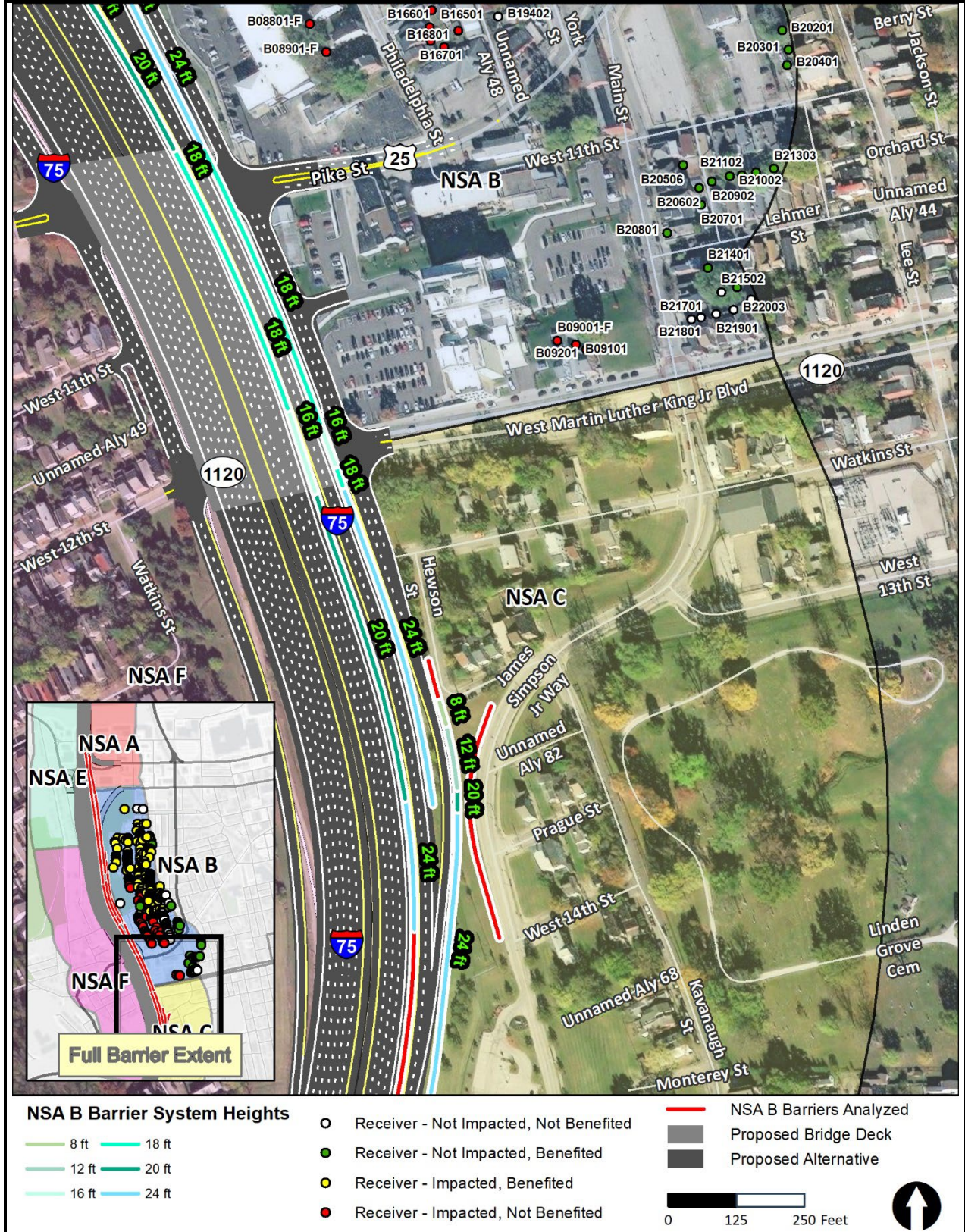


Figure 1.3–3. Barrier Analysis for Barrier System B (3 of 3)



## 2.1.2 NSA D (HIGHLAND AVENUE) – NOISE ABATEMENT EVALUATION

### NSA D (Highland Avenue) – Analysis Area

NSA D is on the east side of the I-71/I-75 corridor, covering the area adjacent to Highland Avenue, between Edgecliff Road and Emery Place. This is a dense residential area with several multi-family apartment buildings within the NSA. Other land uses include a retirement community (Ivy Knoll Senior Living Community). The I-71/I-75 roadway is between 70 to 110-ft higher in elevation than 166 of the 167 receptors through this area. Receptor D04801-FV is the only receptor roughly at-grade with the roadway and is the sole impacted receptor for NSA D. A detailed barrier evaluation was not completed at this location since it was not possible to meet KYTC’s feasibility criteria of achieving a 5 dB(A) reduction at three or more impacted receptors. However, for the purpose of this *Tech Memo*, a barrier evaluation was conducted.

Structural noise barriers were evaluated at the edge of the proposed I-71/I-75 roadway as well as the proposed right-of-way. Modeled receivers, the modeled structural noise barrier locations, and the receiver’s attenuation level thresholds are presented in Figure 1.3–4 through Figure 1.3–5. Tables of sound level results, including existing, predicted, and predicted with barrier, are presented in Appendix A. These tables also identify the number of receptors represented by the receiver, front row receiver/receptors, and an impact summary.

### NSA D (Highland Avenue) – Barrier Summary

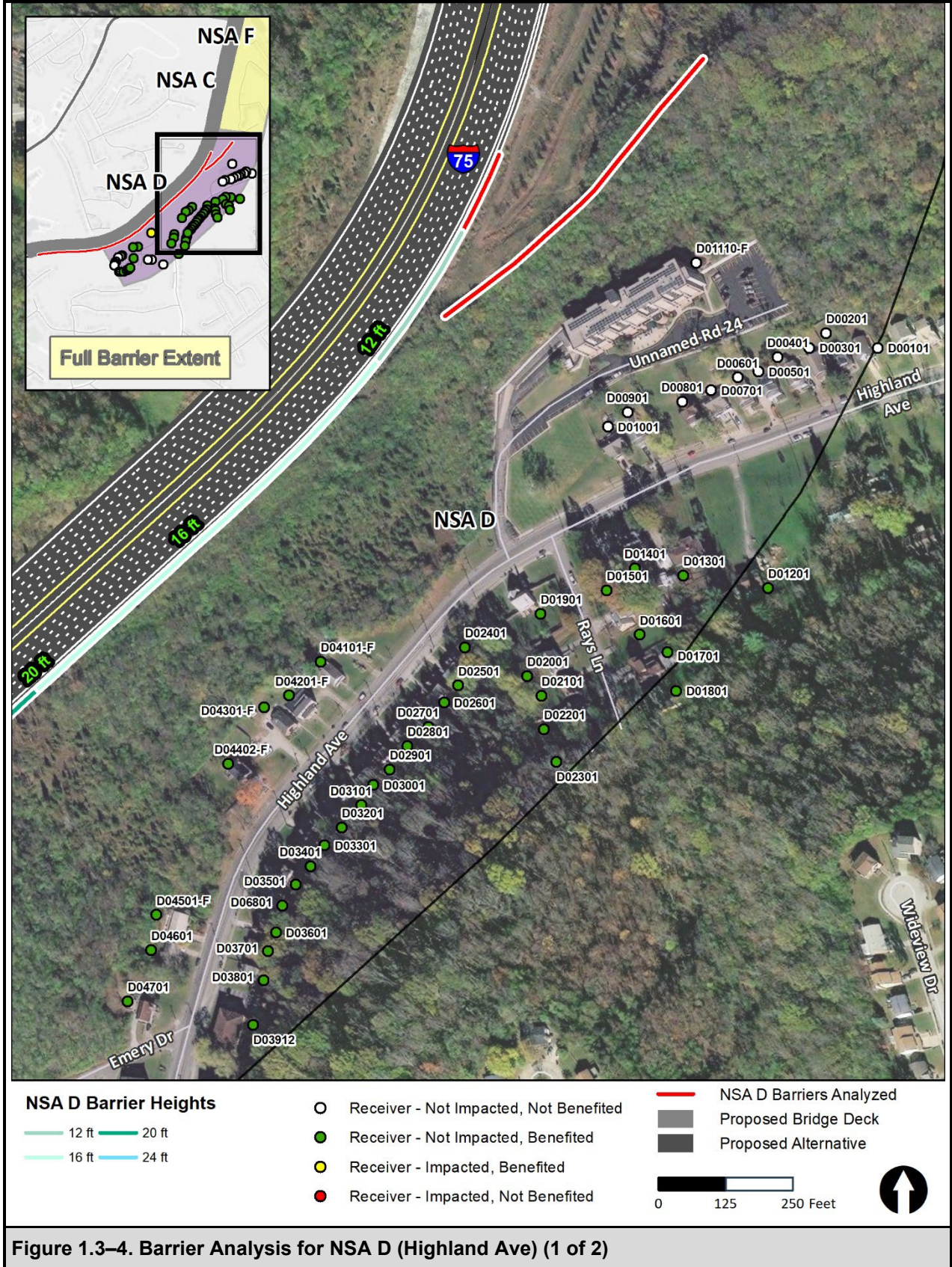
*Note: The NSA D barrier is evaluated as a complete barrier system in the **Kentucky—Southern Section Technical Memorandum**, to assess the overall results for the Fort Wright residences along Marcella Drive and St. Anthony Circle. The description below is only for the portion in the Northern Section.*

One barrier segment, totaling 3,280 feet in length and averaging a height of 17.12 feet, was predicted to benefit, with at least 5 dB(A) noise reduction, to 103 receptors. In addition, the barrier would provide over 7 dB(A) reduction to 40 receptors. Receptor D04801-FV, which is the only impacted receptor in NSA D, would receive a 9.4 dB(A) reduction with the proposed wall, bringing its predicted noise level down to 62.2 dB(A). The cost of the modeled barrier was \$1,797,250 and it has a cost–effectiveness ratio of \$17,449 per benefited receptor. This value is well below KYTC’s cost–effectiveness criterion of \$40,000 per benefited receptor. See Table 1.3–2 for a summary of the barrier wall evaluated as part of the Northern Section.

**Table 1.3–2. NSA D (Highland Ave) – Barrier Description**

BARRIER DESCRIPTION	NO. OF IMPACTED RECEPTORS / TOTAL RECEPTORS	NO. BENEFITED AND COST PER BENEFITED	BARRIER LENGTH (FT)	AVERAGE BARRIER HEIGHT (FT)	BARRIER AREA (SQ FT)	BARRIER COST @ \$32/SQ FT
1 barrier segment; located along I-71/I-75.	1 / 167	103 Benefited; \$17,449 / Benefited	3,280	17.12	56,164	\$1,797,250







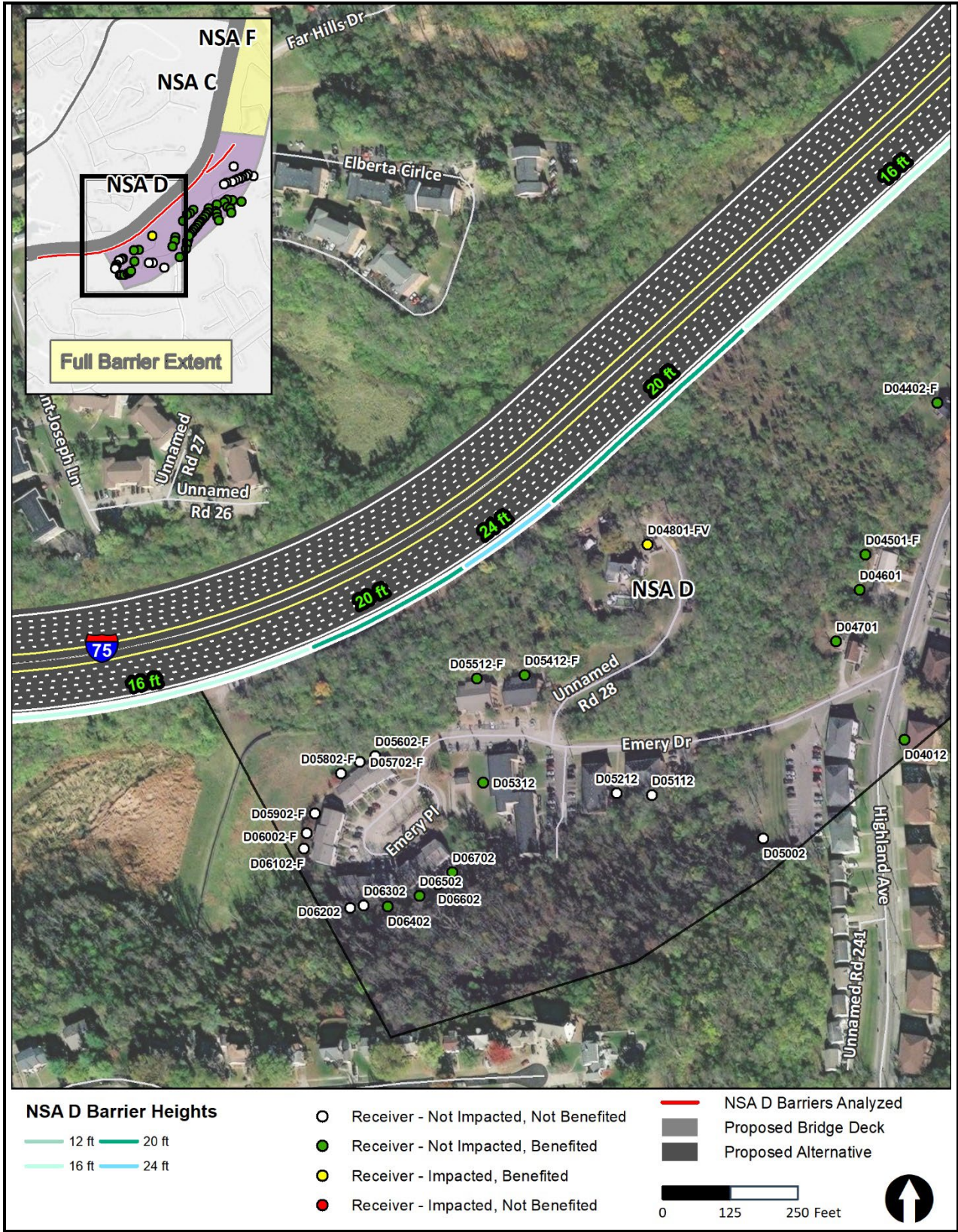


Figure 1.3–5. Barrier Analysis for NSA D (Highland Ave) (2 of 2)

### 2.1.3 BARRIER SYSTEM E/F – NOISE ABATEMENT EVALUATION

#### Barrier System E/F – Analysis Area

This barrier system combines the structural noise barriers proposed for NSA’s E and F. These NSA’s cover the entire western side of the I-71/I-75 study area. Despite being both feasible and reasonable in accordance with KYTC’s noise policy, there are locations where structural noise barriers were originally modeled as 12-foot-high barriers mounted on the proposed bridge barrier walls. These barrier segments were reevaluated with additional two-foot increments up to 16 feet in height to add more benefited receptors, specifically, receptors near US 25. Modeled receivers, the modeled structural noise barrier location, and the receiver’s attenuation level thresholds are presented in Figure 1.3–6 through Figure 1.3–8. Tables with sound level results, including existing, predicted, and predicted with barrier, are presented in Appendix A. These tables also identify the number of receptors represented by the receiver, front row receiver/receptors, and an impact summary.

#### Barrier System E/F – Barrier Summary

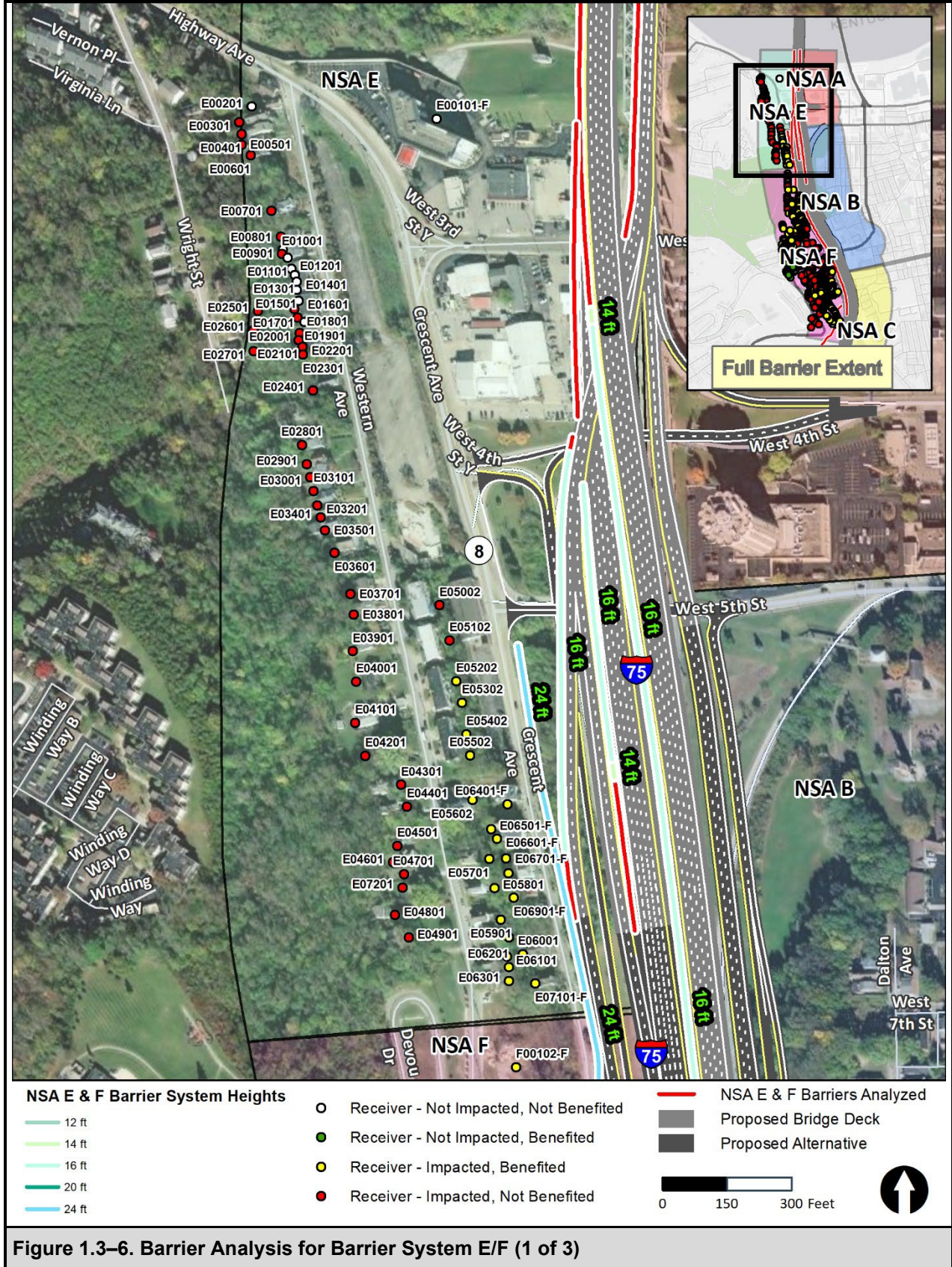
The reevaluated barrier system was 9,624 feet in length, the same as the original analysis, but the average height increased to 18.17 feet (1.69 feet taller) due to the increased height of the noise barrier walls on bridges. The reevaluated barrier system was predicted to benefit 252 receptors, which is 44 more benefited receptors than the original evaluated barriers. Included in these benefited receptors are 65 receptors with over 7 dB(A) of attenuation, 17 receptors with over 10 dB(A) of attenuation, and 5 receptors with over 15dB(A) of attenuation. Most of these additional benefited receptors were north of US 25, in the areas surrounding Baker Street and along Crescent Avenue. The receptors south of US 25, around West 11<sup>th</sup> Street, saw very little additional attenuation from the increased height. This is likely due to how close they are to the interstate roadway and the vibration noise coming from below the bridges.

The cost of the barrier system was \$5,701,353; however, ten of the benefited receptors had predicted noise levels at or above 76.0 dBA, so an additional reduction of \$2,500 for the ten receptors was applied. This amounts to an adjusted total cost of \$5,676,353, and a cost–effectiveness ratio of \$22,252 per benefited receptor. This is \$577,933 more expensive than the original wall, but it decreases the cost per benefited receptor by \$2,260 from the original evaluated barriers. This cost does not, however, include any additional structural cost associated with the additional height of the noise barrier on bridges. See Table 1.3–3 for a summary of the barrier wall evaluation.

**Table 1.3–3. Reevaluated Barrier System E/F Results**

BARRIER EVALUATED	NUMBER OF IMPACTED RECEPTORS / TOTAL RECEPTORS	NUMBER OF BENEFITED RECEPTORS; COST PER BENEFITED RECEPTOR	BARRIER LENGTH (FT)	AVERAGE BARRIER HEIGHT (FT)	BARRIER AREA (SQ FT)	BARRIER COST @ \$32/SQ FT & ADJUSTED
Reevaluated Barrier	440 / 517	252 Benefited \$22,252	9,624	18.17	178,167	\$5,676,353
Original Barrier	440 / 517	208 Benefited \$24,512	9,624	16.48	158,594	\$5,098,420
Difference	-	+44 Benefited -\$2,260	Same length	average of 1.69 ft taller	19,573 more sq. ft.	\$577,933 more expensive







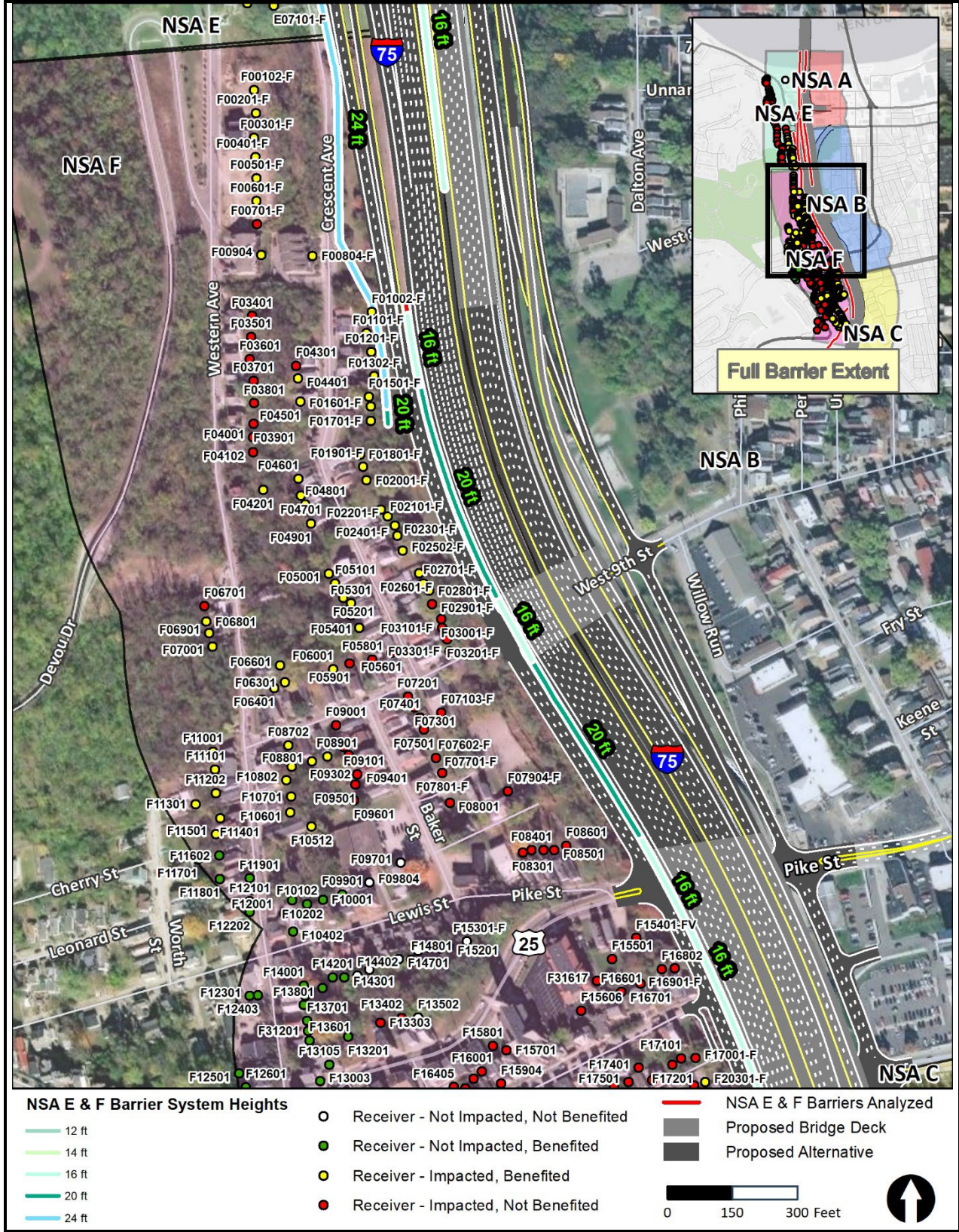
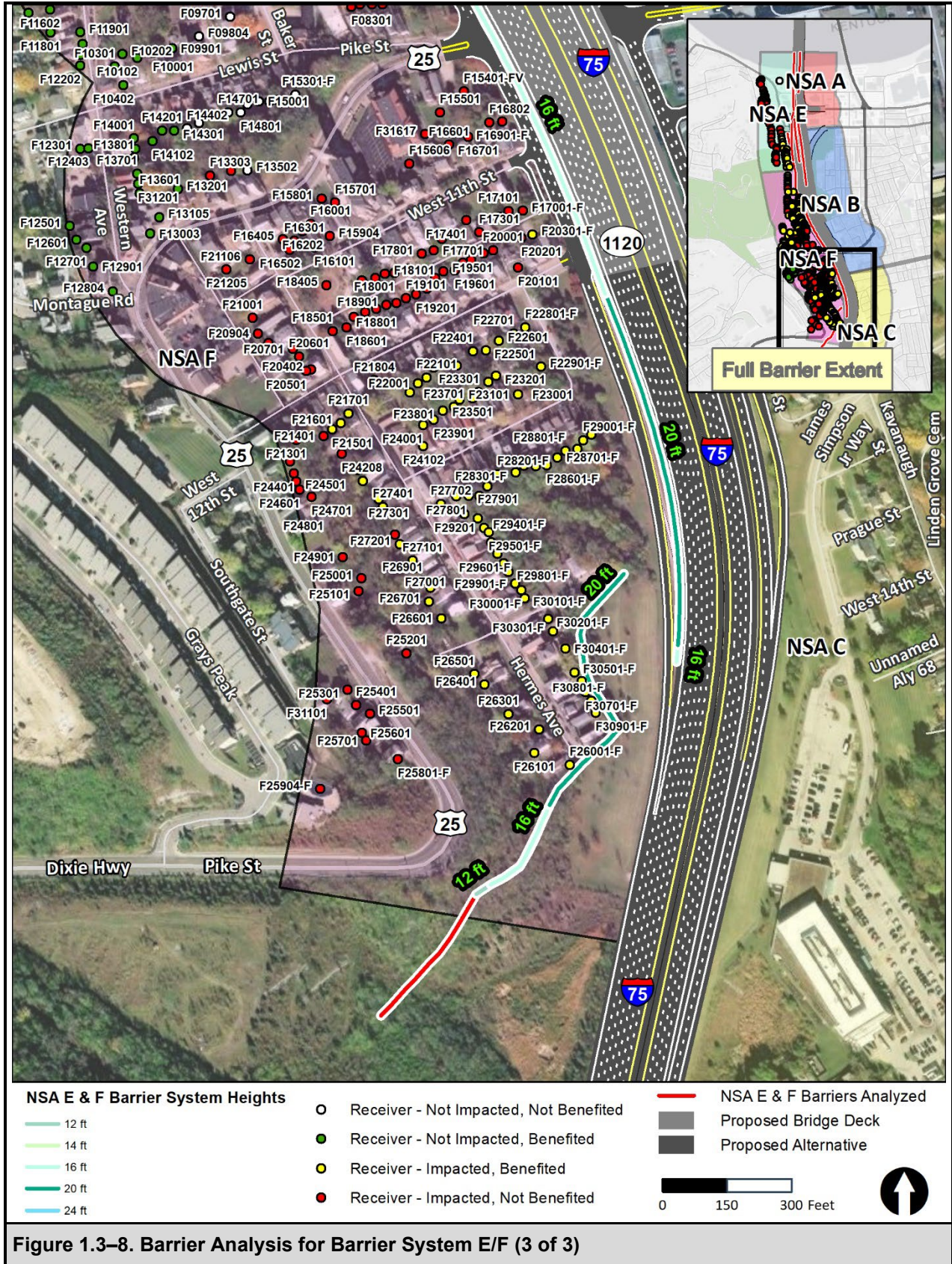


Figure 1.3–7. Barrier Analysis for Barrier System E/F (2 of 3)







# CHAPTER 3 – SUMMARY

## 3.1 DIRECT IMPACTS

### 3.1.1 SUMMARY OF BARRIER ANALYSES

The NSA B barrier system was reevaluated with up to 18-foot-high barriers mounted on the proposed bridge barrier walls and optimized to provide the maximum benefit. The reevaluated wall increased the total number of benefited receptors from 153 to 293 benefited receptors; decreased the length of the system by 2,449 feet; decreased the cost of the system by \$1,309,612; and decreased the cost-effectiveness ratio by \$30,341 for a total of \$21,314 per benefited receptor. This cost does not, however, include any additional structural cost associated with the additional height of the noise barrier on bridges.

A structural noise barrier was evaluated for NSA D, however, the final results are included as a complete system with the **Kentucky—South Section Technical Memorandum**. Please refer to that document for the overall results of the barrier system for the Fort Wright residences along Marcella Drive and St. Anthony Circle.

Since the NSA E/F barrier system already met KYTC’s feasibility and reasonability criteria, it was reevaluated with up to 18-foot-high barriers mounted on the proposed bridge barrier walls to potentially benefit the receptors in the Lewisburg Historic District located just south of US 25. However, even with 18-foot-high barriers in these areas, receptors were unable to attain 5 dB(A) of noise reduction. This is likely due to how close they are to the interstate roadway and the vibration noise coming from below the bridges. The wall was then optimized and resulted in 16-foot-high noise barriers on the bridges. While the wall did not result in benefited receptors in the Lewisburg Historic District south of US 25, the increased heights did increase the total number of benefited receptors from 208 to 252. It also increased the number of first-row benefited receptors with at least 7 dB(A) noise reduction from 50 to 57, increased the total number of first-row benefited receptors from 73 to 74; increased the cost of the barrier system by \$577,933; and decreased the cost-effectiveness ratio by \$2,260 for a total of \$22,252 per benefited receptor. Table 3.1–1 summarizes the results of the barriers reevaluation.

**Table 3.1–1. Summary of the Reevaluated Barrier Analyses**

BARRIER EVALUATION	CHANGES TO THE BARRIER EVALUATED	PROPOSED COST OF REEVALUATED BARRIER
System B*	Reevaluated and optimized barrier system using 18-foot barriers on bridges and maximizing the number of benefited receptors and the cost-per-benefited receptor.	\$6,245,070
NSA D	Evaluated a new barrier for the NSA	\$1,797,250
System E/F*	Reevaluated and optimized barrier system using up to 18-foot barriers on bridges.	\$5,676,353
<b>REEVALUATION TOTAL</b>		<b>\$13,718,673</b>

\* Not including additional structural cost associated with the additional height of the noise barrier on bridges.

## APPENDIX A – TABLES

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**Table 1: Barrier Results for Barrier System B**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
B00117-F	B1	17	69.4	64.0	5.4	Yes	No
B00204	B1	4	67.1	62.5	4.6	No	No
B00305	B1	5	66.3	61.7	4.6	No	No
B00401-F	B1	1	70.4	64.6	5.8	Yes	No
B00501-F	B1	1	71.1	65.5	5.6	Yes	No
B00601-F	B1	1	71.2	65.6	5.6	Yes	No
B00701-F	B1	1	71.1	65.2	5.9	Yes	No
B00801-F	B1	1	69.6	62.8	6.8	Yes	No
B00901-F	B1	1	69.2	62.6	6.6	Yes	No
B01001-F	B1	1	68.9	62.5	6.4	Yes	No
B01101-F	B1	1	68.8	62.5	6.3	Yes	No
B01201-F	B1	1	68.8	62.8	6.0	Yes	No
B01301-F	B1	1	69.3	63.7	5.6	Yes	No
B01401	B1	1	69.8	64.2	5.6	Yes	No
B01501	B1	1	69.8	64.0	5.8	Yes	No
B01601	B1	1	68.9	63.5	5.4	Yes	No
B01701	B1	1	69.0	63.4	5.6	Yes	No
B01801	B1	1	69.2	63.4	5.8	Yes	No
B01901	B1	1	69.3	63.4	5.9	Yes	No
B02001	B1	1	69.0	63.1	5.9	Yes	No
B02102	B1	2	69.0	63.1	5.9	Yes	No
B02202	B1	2	69.0	63.1	5.9	Yes	No
B02302	B1	2	69.0	63.1	5.9	Yes	No
B02401	B1	1	68.9	63.1	5.8	Yes	No
B02502	B1	2	68.8	63.0	5.8	Yes	No
B02602	B1	2	68.6	62.9	5.7	Yes	No
B02702	B1	2	68.5	62.9	5.6	Yes	No
B02802	B1	2	68.4	62.9	5.5	Yes	No
B02902	B1	2	68.4	63.0	5.4	Yes	No
B03002	B1	2	68.3	63.0	5.3	Yes	No
B03101	B1	1	68.1	62.9	5.2	Yes	No
B03201	B1	1	68.1	63.0	5.1	Yes	No
B03301	B1	1	68.0	62.7	5.3	Yes	No
B03401	B1	1	68.1	62.7	5.4	Yes	No
B03501-F	B1	1	67.6	62.9	4.7	No	No
B03601-F	B1	1	67.4	62.8	4.6	No	No
B03702-F	B1	2	67.6	63.1	4.5	No	No
B03802-F	B1	2	67.5	63.0	4.5	No	No
B03902-F	B1	2	66.9	62.6	4.3	No	No
B04004-F	B1	4	66.7	62.5	4.2	No	No
B04104-F	B1	4	66.7	62.4	4.3	No	No
B04225-F	B1	25	62.7	59.3	3.4	No	No
B04302	B1	2	67.3	62.3	5.0	Yes	No
B04402	B1	2	67.3	62.1	5.2	Yes	No
B04502	B1	2	67.3	62.0	5.3	Yes	No
B04602	B1	2	67.6	62.2	5.4	Yes	No
B04701	B1	1	67.4	62.0	5.4	Yes	No

**Table 1: Barrier Results for Barrier System B**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
B04801	B1	1	67.5	61.9	5.6	Yes	No
B04901	B1	1	67.5	62.0	5.5	Yes	No
B05001	B1	1	67.5	62.1	5.4	Yes	No
B05102	B1	2	67.6	62.0	5.6	Yes	No
B05202	B1	2	68.1	62.4	5.7	Yes	No
B05302	B1	2	67.7	62.1	5.6	Yes	No
B05404	B1	4	67.5	61.9	5.6	Yes	No
B05502	B1	2	67.6	62.1	5.5	Yes	No
B05602	B1	2	67.6	62.1	5.5	Yes	No
B05704	B1	4	67.4	61.9	5.5	Yes	No
B05802	B1	2	67.3	61.8	5.5	Yes	No
B05903	B1	3	67.3	61.7	5.6	Yes	No
B06002	B1	2	67.3	61.7	5.6	Yes	No
B06104	B1	4	67.3	61.8	5.5	Yes	No
B06204	B1	4	67.3	62.0	5.3	Yes	No
B06302	B1	2	67.4	61.9	5.5	Yes	No
B06402	B1	2	67.4	62.0	5.4	Yes	No
B06501	B1	1	67.4	62.2	5.2	Yes	No
B06602	B1	2	67.3	62.1	5.2	Yes	No
B06705	B1	5	67.6	62.5	5.1	Yes	No
B06802	B1	2	67.7	62.7	5.0	Yes	No
B06901	B1	1	67.4	62.4	5.0	Yes	No
B07004	B1	4	67.5	62.5	5.0	Yes	No
B07103	B1	3	67.6	62.6	5.0	Yes	No
B07202	B1	2	67.6	62.7	4.9	No	No
B07302	B1	2	67.6	62.8	4.8	No	No
B07402	B1	2	68.1	63.2	4.9	No	No
B07502	B1	2	68.1	63.0	5.1	Yes	No
B07601	B1	1	68.2	63.1	5.1	Yes	No
B07701-F	B2	1	69.2	63.9	5.3	Yes	No
B07801-F	B2	1	68.7	63.7	5.0	Yes	No
B07901-F	B2	1	68.6	63.5	5.1	Yes	No
B08001-F	B2	1	68.3	63.4	4.9	No	No
B08101-F	B2	1	67.1	62.7	4.4	No	No
B08201-F	B2	1	67.0	62.7	4.3	No	No
B08301-F	B2	1	66.9	62.7	4.2	No	No
B08401-F	B2	1	67.1	63.3	3.8	No	No
B08501-F	B2	1	67.3	63.7	3.6	No	No
B08601-F	B2	1	68.1	64.2	3.9	No	No
B08701-F	B2	1	68.4	64.5	3.9	No	No
B08801-F	B2	1	68.8	65.2	3.6	No	No
B08901-F	B2	1	68.6	65.2	3.4	No	No
B09001-F	B3	1	66.9	62.0	4.9	No	No
B09101	B3	1	66.6	61.9	4.7	No	No
B09201	B3	1	66.5	62.0	4.5	No	No
B09302	B1	2	67.0	61.9	5.1	Yes	No
B09402	B1	2	66.6	61.4	5.2	Yes	No
B09502	B1	2	67.1	61.7	5.4	Yes	No
B09602	B1	2	67.3	61.7	5.6	Yes	No
B09702	B1	2	66.8	61.5	5.3	Yes	No



**Table 1: Barrier Results for Barrier System B**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
B09801	B1	1	66.2	61.0	5.2	Yes	No
B09901	B1	1	66.2	61.0	5.2	Yes	No
B10001	B1	1	66.3	61.0	5.3	Yes	No
B10101	B1	1	66.2	60.9	5.3	Yes	No
B10201	B1	1	66.0	60.8	5.2	Yes	No
B10301	B1	1	66.3	61.0	5.3	Yes	No
B10405	B1	5	66.0	60.8	5.2	Yes	No
B10502	B1	2	67.6	62.4	5.2	Yes	No
B10601	B1	1	67.2	62.1	5.1	Yes	No
B10701	B1	1	66.3	61.2	5.1	Yes	No
B10801	B1	1	66.5	61.2	5.3	Yes	No
B10901	B1	1	66.3	61.0	5.3	Yes	No
B11004	B1	1	66.5	61.2	5.3	Yes	No
B11102	B1	2	67.1	61.7	5.4	Yes	No
B11201	B1	1	67.0	61.5	5.5	Yes	No
B11301	B1	1	66.8	61.3	5.5	Yes	No
B11401	B1	1	66.6	61.2	5.4	Yes	No
B11502	B1	2	66.6	61.3	5.3	Yes	No
B11601	B1	1	66.5	61.3	5.2	Yes	No
B11701	B1	1	66.5	61.4	5.1	Yes	No
B11801	B1	1	66.6	61.4	5.2	Yes	No
B11901	B1	1	66.7	61.5	5.2	Yes	No
B12001	B1	1	66.7	61.6	5.1	Yes	No
B12101	B1	1	66.8	61.6	5.2	Yes	No
B12201	B1	1	67.1	62.0	5.1	Yes	No
B12301	B1	1	66.3	61.1	5.2	Yes	No
B12401	B1	1	66.3	61.1	5.2	Yes	No
B12501	B1	1	66.2	61.1	5.1	Yes	No
B12601	B1	1	66.2	61.1	5.1	Yes	No
B12701	B1	1	66.2	61.1	5.1	Yes	No
B12801	B1	1	66.2	61.0	5.2	Yes	No
B12901	B1	1	66.3	61.1	5.2	Yes	No
B13001	B1	1	66.3	61.2	5.1	Yes	No
B13101	B1	1	66.4	61.3	5.1	Yes	No
B13201	B1	1	66.6	61.5	5.1	Yes	No
B13301	B1	1	67.5	61.9	5.6	Yes	No
B13401	B1	1	67.5	62.0	5.5	Yes	No
B13501	B1	1	67.5	61.9	5.6	Yes	No
B13604	B1	4	67.6	62.1	5.5	Yes	No
B13702	B1	2	67.8	62.3	5.5	Yes	No
B13802	B1	2	68.0	62.3	5.7	Yes	No
B13902	B1	2	67.2	62.0	5.2	Yes	No
B14001	B1	1	67.6	62.4	5.2	Yes	No
B14102	B1	2	67.8	62.2	5.6	Yes	No
B14210	B1	10	66.0	60.8	5.2	Yes	No
B14301	B1	1	66.2	60.9	5.3	Yes	No
B14401	B1	1	66.2	60.9	5.3	Yes	No
B14501	B1	1	66.8	61.5	5.3	Yes	No
B14601	B1	1	66.5	61.2	5.3	Yes	No
B14701	B1	1	66.3	61.1	5.2	Yes	No
B14801	B1	1	66.2	61.0	5.2	Yes	No
B15002	B1	2	65.9	60.8	5.1	Yes	No
B15102	B1	2	65.5	60.7	4.8	No	No
B15202	B1	2	65.2	60.5	4.7	No	No

**Table 1: Barrier Results for Barrier System B**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
B15301	B2	1	67.8	62.9	4.9	No	No
B15401	B2	1	67.8	62.8	5.0	Yes	No
B15501	B2	1	67.6	62.8	4.8	No	No
B15601	B2	1	67.0	62.2	4.8	No	No
B15701	B2	1	66.7	62.0	4.7	No	No
B15801	B2	1	66.7	62.1	4.6	No	No
B15901	B2	1	66.8	62.1	4.7	No	No
B16001	B2	1	66.8	62.3	4.5	No	No
B16101	B2	1	66.6	62.3	4.3	No	No
B16202	B2	2	66.9	62.9	4.0	No	No
B16301	B2	1	66.7	62.6	4.1	No	No
B16401	B2	1	66.6	62.5	4.1	No	No
B16501	B2	1	66.4	62.1	4.3	No	No
B16601	B2	1	66.4	62.1	4.3	No	No
B16701	B2	1	66.2	62.0	4.2	No	No
B16801	B2	1	66.2	61.8	4.4	No	No
B16904	B2	4	67.6	62.5	5.1	Yes	No
B17001	B2	1	67.5	62.2	5.3	Yes	No
B17101	B2	1	67.4	62.1	5.3	Yes	No
B17201	B2	1	67.2	61.9	5.3	Yes	No
B17302	B2	2	66.8	61.5	5.3	Yes	No
B17403	B2	3	66.2	61.0	5.2	Yes	No
B17501	B2	1	66.4	61.2	5.2	Yes	No
B17601	B2	1	65.8	61.0	4.8	No	No
B17701	B2	1	65.7	60.9	4.8	No	No
B17801	B2	1	65.4	60.7	4.7	No	No
B17901	B2	1	65.3	60.7	4.6	No	No
B18001	B2	1	65.5	60.9	4.6	No	No
B18101	B2	1	65.3	60.3	5.0	Yes	No
B18201	B2	1	65.1	60.3	4.8	No	No
B18301	B2	1	64.9	59.9	5.0	Yes	No
B18402	B2	2	66.4	62.0	4.4	No	No
B18501	B2	1	66.2	61.2	5.0	Yes	No
B18601	B2	1	66.4	61.4	5.0	Yes	No
B18701	B2	1	66.3	61.3	5.0	Yes	No
B18801	B2	1	66.4	61.4	5.0	Yes	No
B18901	B2	1	66.3	61.4	4.9	No	No
B19001	B2	1	66.3	61.4	4.9	No	No
B19101	B2	1	65.9	61.2	4.7	No	No
B19201	B2	1	65.7	61.0	4.7	No	No
B19301	B2	1	65.7	61.0	4.7	No	No
B19402	B2	2	65.8	61.3	4.5	No	No
B19502	B2	2	64.5	59.5	5.0	Yes	No
B19602	B2	2	64.5	59.5	5.0	Yes	No
B19702	B2	2	64.5	59.4	5.1	Yes	No
B19801	B2	1	64.7	59.8	4.9	No	No
B19901	B2	1	64.6	59.5	5.1	Yes	No
B20002	B2	2	64.6	59.5	5.1	Yes	No
B20104	B2	4	64.4	59.4	5.0	Yes	No
B20201	B3	1	61.4	55.6	5.8	Yes	No
B20301	B3	1	61.0	55.3	5.7	Yes	No
B20401	B3	1	60.8	55.2	5.6	Yes	No
B20506	B3	6	62.0	56.5	5.5	Yes	No



**Table 1: Barrier Results for Barrier System B**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
B20602	B3	2	62.1	56.5	5.6	Yes	No
B20701	B3	1	62.3	56.6	5.7	Yes	No
B20801	B3	1	63.2	57.5	5.7	Yes	No
B20902	B3	2	62.0	56.3	5.7	Yes	No
B21002	B3	2	61.8	56.2	5.6	Yes	No
B21102	B3	2	61.7	56.1	5.6	Yes	No
B21202	B3	2	61.5	55.8	5.7	Yes	No
B21303	B3	3	61.3	55.6	5.7	Yes	No
B21401	B3	1	63.2	57.8	5.4	Yes	No
B21502	B3	2	63.5	58.7	4.8	No	No
B21602	B3	2	63.2	58.2	5.0	Yes	No
B21701	B3	1	64.5	60.1	4.4	No	No
B21801	B3	1	64.7	60.0	4.7	No	No
B21901	B3	1	64.5	59.9	4.6	No	No
B22003	B3	3	64.3	59.5	4.8	No	No
B22104	B3	4	63.9	58.9	5.0	Yes	No
B22201	B2	1	66.4	62.1	4.3	No	No
B22302	B1	2	66.7	61.4	5.3	Yes	No
B22402	B1	2	67.3	62.2	5.1	Yes	No
B22502	B2	2	66.8	62.7	4.1	No	No
B22605	B1	5	68.5	63.3	5.2	Yes	No

**Table 2: Barrier Results for NSA D (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
D00101	D	1	54.1	50.4	3.7	No	No
D00201	D	1	55.7	52.1	3.6	No	No
D00301	D	1	55.6	52.0	3.6	No	No
D00401	D	1	56.0	52.4	3.6	No	No
D00501	D	1	56.1	52.5	3.6	No	No
D00601	D	1	56.6	52.9	3.7	No	No
D00701	D	1	56.9	53.2	3.7	No	No
D00801	D	1	57.3	53.5	3.8	No	No
D00901	D	1	57.8	53.9	3.9	No	No
D01001	D	1	58.1	54.2	3.9	No	No
D01110-F	D	10	58.9	55.9	3.0	No	No
D01201	D	1	58.4	53.4	5.0	Yes	No
D01301	D	1	58.6	53.5	5.1	Yes	No
D01401	D	1	58.7	53.6	5.1	Yes	No
D01501	D	1	59.2	53.7	5.5	Yes	No
D01601	D	1	59.5	53.9	5.6	Yes	No
D01701	D	1	59.7	54.0	5.7	Yes	No
D01801	D	1	59.9	54.1	5.8	Yes	No
D01901	D	1	60.1	54.1	6.0	Yes	No
D02001	D	1	60.8	54.5	6.3	Yes	No
D02101	D	1	60.8	54.2	6.6	Yes	No
D02201	D	1	61.3	54.3	7.0	Yes	Yes
D02301	D	1	61.6	54.6	7.0	Yes	Yes
D02401	D	1	60.9	54.5	6.4	Yes	No
D02501	D	1	61.1	53.8	7.3	Yes	Yes
D02601	D	1	61.2	53.7	7.5	Yes	Yes
D02701	D	1	61.2	53.6	7.6	Yes	Yes
D02801	D	1	61.3	53.7	7.6	Yes	Yes
D02901	D	1	61.2	53.6	7.6	Yes	Yes
D03001	D	1	61.2	53.5	7.7	Yes	Yes
D03101	D	1	61.2	53.5	7.7	Yes	Yes
D03201	D	1	61.1	53.3	7.8	Yes	Yes
D03301	D	1	61.0	53.1	7.9	Yes	Yes
D03401	D	1	60.7	52.9	7.8	Yes	Yes
D03501	D	1	60.0	52.7	7.3	Yes	Yes
D03601	D	1	59.4	52.4	7.0	Yes	Yes
D03701	D	1	59.2	52.3	6.9	Yes	No
D03801	D	1	60.0	52.7	7.3	Yes	Yes
D03912	D	12	59.7	52.6	7.1	Yes	Yes
D04012	D	12	58.6	52.6	6.0	Yes	No
D04101-F	D	1	61.1	55.5	5.6	Yes	No
D04201-F	D	1	61.3	55.6	5.7	Yes	No
D04301-F	D	1	61.3	55.6	5.7	Yes	No
D04402-F	D	2	60.9	55.2	5.7	Yes	No
D04501-F	D	1	60.4	54.1	6.3	Yes	No
D04601	D	1	59.8	53.5	6.3	Yes	No
D04701	D	1	60.0	53.8	6.2	Yes	No
D04801-FV	D	1	71.6	62.2	9.4	Yes	Yes
D05002	D	2	57.9	53.0	4.9	No	No
D05112	D	12	57.8	53.1	4.7	No	No
D05212	D	12	58.5	53.6	4.9	No	No
D05312	D	12	59.1	54.0	5.1	Yes	No
D05412-F	D	12	55.6	49.2	6.4	Yes	No



**Table 2: Barrier Results for NSA D (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
D05512-F	D	12	53.0	46.0	7.0	Yes	Yes
D05602-F	D	2	51.3	48.8	2.5	No	No
D05702-F	D	2	52.7	49.8	2.9	No	No
D05802-F	D	2	52.0	49.4	2.6	No	No
D05902-F	D	2	54.0	50.6	3.4	No	No
D06002-F	D	2	55.1	51.1	4.0	No	No
D06102-F	D	2	55.2	51.3	3.9	No	No
D06202	D	2	58.0	53.7	4.3	No	No
D06302	D	2	58.0	53.2	4.8	No	No
D06402	D	2	60.3	54.4	5.9	Yes	No
D06502	D	2	59.7	54.0	5.7	Yes	No
D06602	D	2	58.6	54.1	4.5	No	No
D06702	D	2	59.1	54.0	5.1	Yes	No
D06801	D	1	59.1	52.2	6.9	Yes	No

**Table 3: Barrier Results for Barrier System E/F (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
F00102-F	F1	2	73.6	67.6	6.0	Yes	No
F00201-F	F1	1	73.4	67.1	6.3	Yes	No
F00301-F	F1	1	73.3	68.2	5.1	Yes	No
F00401-F	F1	1	73.2	67.6	5.6	Yes	No
F00501-F	F1	1	73.2	67.9	5.3	Yes	No
F00601-F	F1	1	72.6	66.9	5.7	Yes	No
F00701-F	F1	1	72.9	68.1	4.8	No	No
F00804-F	F1	4	74.5	65.9	8.6	Yes	Yes
F00904	F1	4	72.8	67.5	5.3	Yes	No
F01002-F	F1	2	78.6	60.2	18.4	Yes	Yes
F01101-F	F1	1	77.8	63.1	14.7	Yes	Yes
F01201-F	F1	1	77.4	63.3	14.1	Yes	Yes
F01302-F	F1	2	77.9	62.7	15.2	Yes	Yes
F01501-F	F1	1	76.9	64.2	12.7	Yes	Yes
F01601-F	F1	1	76.9	64.7	12.2	Yes	Yes
F01701-F	F1	1	76.6	65.4	11.2	Yes	Yes
F01801-F	F1	1	75.2	64.9	10.3	Yes	Yes
F01901-F	F1	1	75.2	65.5	9.7	Yes	Yes
F02001-F	F1	1	75.0	65.3	9.7	Yes	Yes
F02101-F	F1	1	72.8	65.3	7.5	Yes	Yes
F02201-F	F1	1	72.9	65.7	7.2	Yes	Yes
F02301-F	F1	1	73.6	66.3	7.3	Yes	Yes
F02401-F	F1	1	73.5	66.4	7.1	Yes	Yes
F02502-F	F1	2	73.7	66.7	7.0	Yes	Yes
F02601-F	F1	1	73.0	66.9	6.1	Yes	No
F02701-F	F1	1	72.5	66.7	5.8	Yes	No
F02801-F	F1	1	71.9	66.8	5.1	Yes	No
F02901-F	F1	1	71.1	66.8	4.3	No	No
F03001-F	F1	1	70.7	67.4	3.3	No	No
F03101-F	F1	1	69.8	66.8	3.0	No	No
F03201-F	F1	1	69.7	67.3	2.4	No	No
F03301-F	F1	1	70.2	68.1	2.1	No	No
F03401	F1	1	72.4	68.8	3.6	No	No
F03501	F1	1	72.3	68.9	3.4	No	No
F03601	F1	1	72.1	68.7	3.4	No	No
F03701	F1	1	72.0	68.5	3.5	No	No
F03801	F1	1	71.8	68.1	3.7	No	No
F03901	F1	1	71.6	67.7	3.9	No	No
F04001	F1	1	71.5	67.5	4.0	No	No
F04102	F1	2	71.4	67.0	4.4	No	No
F04201	F1	1	71.2	65.8	5.4	Yes	No
F04301	F1	1	73.4	69.1	4.3	No	No
F04401	F1	1	73.2	67.9	5.3	Yes	No
F04501	F1	1	73.1	67.4	5.7	Yes	No
F04601	F1	1	72.4	65.9	6.5	Yes	No
F04701	F1	1	72.1	64.5	7.6	Yes	Yes
F04801	F1	1	72.2	64.1	8.1	Yes	Yes
F04901	F1	1	72.1	63.9	8.2	Yes	Yes
F05001	F1	1	70.6	63.4	7.2	Yes	Yes
F05101	F1	1	70.6	63.7	6.9	Yes	No
F05201	F1	1	70.5	63.9	6.6	Yes	No
F05301	F1	1	69.4	63.4	6.0	Yes	No
F05401	F1	1	68.9	63.3	5.6	Yes	No



**Table 3: Barrier Results for Barrier System E/F (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
F05501	F1	1	68.9	63.6	5.3	Yes	No
F05601	F1	1	68.7	64.6	4.1	No	No
F05801	F1	1	68.1	63.8	4.3	No	No
F05901	F1	1	67.5	63.1	4.4	No	No
F06001	F1	1	67.7	62.7	5.0	Yes	No
F06102	F1	2	68.4	62.9	5.5	Yes	No
F06301	F1	1	68.9	62.5	6.4	Yes	No
F06401	F1	1	68.9	62.4	6.5	Yes	No
F06501	F1	1	68.5	62.2	6.3	Yes	No
F06601	F1	1	69.5	62.8	6.7	Yes	No
F06701	F1	1	68.9	64.0	4.9	No	No
F06801	F1	1	68.9	63.9	5.0	Yes	No
F06901	F1	1	68.8	63.7	5.1	Yes	No
F07001	F1	1	68.7	63.5	5.2	Yes	No
F07103-F	F1	3	68.4	64.7	3.7	No	No
F07201	F1	1	68.4	64.5	3.9	No	No
F07301	F1	1	67.6	63.7	3.9	No	No
F07401	F1	1	67.3	63.3	4.0	No	No
F07501	F1	1	67.2	63.3	3.9	No	No
F07602-F	F1	2	67.6	63.6	4.0	No	No
F07701-F	F1	1	67.4	63.4	4.0	No	No
F07801-F	F1	1	67.4	63.4	4.0	No	No
F07904-F	F1	4	66.2	62.4	3.8	No	No
F08001	F1	1	66.2	61.8	4.4	No	No
F08301	F1	1	67.2	62.9	4.3	No	No
F08401	F1	1	67.5	63.7	3.8	No	No
F08501	F1	1	67.5	63.8	3.7	No	No
F08601	F1	1	67.6	64.0	3.6	No	No
F08702	F1	2	67.9	62.1	5.8	Yes	No
F08801	F1	1	67.5	62.1	5.4	Yes	No
F08901	F1	1	67.3	62.3	5.0	Yes	No
F09001	F1	1	67.5	62.6	4.9	No	No
F09101	F1	1	67.1	62.4	4.7	No	No
F09201	F1	1	66.9	62.3	4.6	No	No
F09302	F1	2	66.9	62.4	4.5	No	No
F09401	F1	1	66.6	62.1	4.5	No	No
F09501	F1	1	66.5	61.9	4.6	No	No
F09601	F1	1	66.3	61.6	4.7	No	No
F09701	F1	1	65.8	61.2	4.6	No	No
F09804	F1	4	65.3	60.4	4.9	No	No
F09901	F1	1	64.8	59.8	5.0	Yes	No
F10001	F1	1	64.6	59.4	5.2	Yes	No
F10102	F1	2	64.7	59.4	5.3	Yes	No
F10202	F1	2	64.7	59.5	5.2	Yes	No
F10301	F1	1	64.4	59.0	5.4	Yes	No
F10402	F1	2	64.0	58.7	5.3	Yes	No
F10512	F1	12	66.0	60.8	5.2	Yes	No
F10601	F1	1	66.6	61.1	5.5	Yes	No
F10701	F1	1	66.8	61.2	5.6	Yes	No
F10802	F1	2	67.1	61.4	5.7	Yes	No
F10901	F1	1	67.5	61.8	5.7	Yes	No
F11001	F1	1	67.5	61.7	5.8	Yes	No
F11101	F1	1	67.5	61.8	5.7	Yes	No

**Table 3: Barrier Results for Barrier System E/F (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
F11202	F1	2	67.0	61.0	6.0	Yes	No
F11301	F1	1	66.9	61.3	5.6	Yes	No
F11401	F1	1	66.7	60.6	6.1	Yes	No
F11501	F1	1	66.0	60.0	6.0	Yes	No
F11602	F1	2	65.7	59.8	5.9	Yes	No
F11701	F1	1	65.8	59.9	5.9	Yes	No
F11801	F1	1	65.1	59.3	5.8	Yes	No
F11901	F1	1	65.0	59.6	5.4	Yes	No
F12001	F1	1	64.8	59.3	5.5	Yes	No
F12101	F1	1	64.4	59.0	5.4	Yes	No
F12202	F1	2	64.1	58.7	5.4	Yes	No
F12301	F1	1	63.3	57.6	5.7	Yes	No
F12403	F1	3	63.4	57.7	5.7	Yes	No
F12501	F1	1	63.3	58.1	5.2	Yes	No
F12601	F1	1	63.6	58.4	5.2	Yes	No
F12701	F1	1	63.8	58.6	5.2	Yes	No
F12804	F1	4	64.6	59.6	5.0	Yes	No
F12901	F1	1	64.1	59.0	5.1	Yes	No
F13003	F1	3	65.7	60.7	5.0	Yes	No
F13105	F1	5	65.7	60.7	5.0	Yes	No
F13201	F1	1	65.7	60.6	5.1	Yes	No
F13303	F1	3	66.4	61.9	4.5	No	No
F13402	F1	2	66.2	62.1	4.1	No	No
F13502	F1	2	65.8	62.0	3.8	No	No
F13601	F1	1	63.7	58.4	5.3	Yes	No
F13701	F1	1	63.6	58.1	5.5	Yes	No
F13801	F1	1	63.4	58.0	5.4	Yes	No
F13901	F1	1	63.4	58.1	5.3	Yes	No
F14001	F1	1	63.4	58.0	5.4	Yes	No
F14102	F1	2	63.5	58.4	5.1	Yes	No
F14201	F1	1	63.5	58.4	5.1	Yes	No
F14301	F1	1	63.5	58.5	5.0	Yes	No
F14402	F1	2	63.7	58.8	4.9	No	No
F14501	F1	1	63.9	59.0	4.9	No	No
F14601	F1	1	63.9	59.2	4.7	No	No
F14701	F1	1	64.1	59.4	4.7	No	No
F14801	F1	1	64.1	59.5	4.6	No	No
F14901	F1	1	64.3	59.7	4.6	No	No
F15001	F1	1	64.5	59.9	4.6	No	No
F15101	F1	1	64.5	60.0	4.5	No	No
F15201	F1	1	64.5	60.2	4.3	No	No
F15301-F	F1	1	64.8	60.8	4.0	No	No
F15401-FV	F2	1	73.7	71.7	2.0	No	No
F15501	F2	1	72.8	69.6	3.2	No	No
F15606	F2	6	71.4	67.8	3.6	No	No
F15701	F2	1	69.9	66.1	3.8	No	No
F15801	F2	1	70.2	67.0	3.2	No	No
F15904	F2	4	68.9	64.6	4.3	No	No
F16001	F2	1	69.2	65.4	3.8	No	No
F16101	F2	1	68.5	64.2	4.3	No	No
F16202	F2	2	68.9	65.0	3.9	No	No
F16301	F2	1	68.4	64.3	4.1	No	No
F16405	F2	5	68.1	64.2	3.9	No	No



**Table 3: Barrier Results for Barrier System E/F (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
F16502	F2	2	68.0	63.9	4.1	No	No
F16601	F2	1	73.0	69.5	3.5	No	No
F16701	F2	1	73.8	70.8	3.0	No	No
F16802	F2	2	74.4	72.5	1.9	No	No
F16901-F	F2	1	73.4	72.5	0.9	No	No
F17001-F	F2	1	72.8	70.8	2.0	No	No
F17101	F2	1	73.0	70.6	2.4	No	No
F17201	F2	1	73.2	70.7	2.5	No	No
F17301	F2	1	72.5	69.5	3.0	No	No
F17401	F2	1	72.5	69.2	3.3	No	No
F17501	F2	1	72.1	68.5	3.6	No	No
F17601	F2	1	71.5	67.8	3.7	No	No
F17701	F2	1	71.1	67.3	3.8	No	No
F17801	F2	1	70.8	67.0	3.8	No	No
F17901	F2	1	70.2	66.2	4.0	No	No
F18001	F2	1	69.7	65.7	4.0	No	No
F18101	F2	1	69.7	65.5	4.2	No	No
F18201	F2	1	69.4	65.1	4.3	No	No
F18301	F2	1	69.0	64.7	4.3	No	No
F18405	F2	5	68.1	63.7	4.4	No	No
F18501	F2	1	68.0	63.3	4.7	No	No
F18601	F2	1	68.4	63.8	4.6	No	No
F18701	F2	1	68.9	64.3	4.6	No	No
F18801	F2	1	69.2	64.7	4.5	No	No
F18901	F2	1	69.5	65.0	4.5	No	No
F19001	F2	1	69.7	65.4	4.3	No	No
F19101	F2	1	69.9	65.7	4.2	No	No
F19201	F2	1	70.2	66.1	4.1	No	No
F19301	F2	1	70.5	66.5	4.0	No	No
F19401	F2	1	70.7	66.9	3.8	No	No
F19501	F2	1	70.9	67.3	3.6	No	No
F19601	F2	1	71.2	67.8	3.4	No	No
F19701	F2	1	71.4	68.2	3.2	No	No
F19801	F2	1	71.6	68.5	3.1	No	No
F19901	F2	1	72.1	69.1	3.0	No	No
F20001	F2	1	72.2	69.5	2.7	No	No
F20101	F2	1	72.1	68.9	3.2	No	No
F20201	F2	1	72.0	69.4	2.6	No	No
F20301-F	F2	1	72.3	70.1	2.2	No	No
F20402	F2	2	67.4	62.7	4.7	No	No
F20501	F2	1	67.3	62.5	4.8	No	No
F20601	F2	1	67.1	62.3	4.8	No	No
F20701	F2	1	66.9	62.1	4.8	No	No
F20802	F2	2	66.5	61.8	4.7	No	No
F20904	F2	4	66.3	61.6	4.7	No	No
F21001	F2	1	66.5	62.1	4.4	No	No
F21106	F2	6	67.1	62.9	4.2	No	No
F21205	F2	5	66.7	62.5	4.2	No	No
F21301	F2	1	67.2	62.7	4.5	No	No
F21401	F2	1	67.6	62.7	4.9	No	No
F21501	F2	1	67.8	62.8	5.0	Yes	No
F21601	F2	1	67.9	62.8	5.1	Yes	No
F21701	F2	1	68.1	63.0	5.1	Yes	No

**Table 3: Barrier Results for Barrier System E/F (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
F21804	F2	4	69.2	64.8	4.4	No	No
F21902	F2	2	69.7	64.6	5.1	Yes	No
F22001	F2	1	69.9	64.8	5.1	Yes	No
F22101	F2	1	70.2	65.1	5.1	Yes	No
F22201	F2	1	70.4	65.4	5.0	Yes	No
F22302	F2	2	71.0	65.6	5.4	Yes	No
F22401	F2	1	71.7	66.4	5.3	Yes	No
F22501	F2	1	72.1	66.6	5.5	Yes	No
F22601	F2	1	72.7	67.2	5.5	Yes	No
F22701	F2	1	73.0	67.7	5.3	Yes	No
F22801-F	F2	1	73.3	67.8	5.5	Yes	No
F22901-F	F2	1	74.4	67.3	7.1	Yes	Yes
F23001	F2	1	74.0	66.8	7.2	Yes	Yes
F23101	F2	1	73.5	66.4	7.1	Yes	Yes
F23201	F2	1	72.8	66.2	6.6	Yes	No
F23301	F2	1	72.5	66.0	6.5	Yes	No
F23401	F2	1	72.1	65.8	6.3	Yes	No
F23501	F2	1	71.9	65.6	6.3	Yes	No
F23601	F2	1	71.5	65.4	6.1	Yes	No
F23701	F2	1	71.2	65.2	6.0	Yes	No
F23801	F2	1	70.9	65.1	5.8	Yes	No
F23901	F2	1	70.6	64.9	5.7	Yes	No
F24001	F2	1	70.2	64.5	5.7	Yes	No
F24102	F2	2	70.0	64.2	5.8	Yes	No
F24208	F2	8	68.0	63.1	4.9	No	No
F24301	F2	1	67.1	62.7	4.4	No	No
F24401	F2	1	67.1	62.7	4.4	No	No
F24501	F2	1	67.1	62.8	4.3	No	No
F24601	F2	1	67.2	62.9	4.3	No	No
F24701	F2	1	67.4	63.2	4.2	No	No
F24801	F2	1	67.6	63.3	4.3	No	No
F24901	F2	1	67.8	63.7	4.1	No	No
F25001	F2	1	68.0	64.0	4.0	No	No
F25101	F2	1	67.9	63.8	4.1	No	No
F25201	F2	1	68.8	65.7	3.1	No	No
F25301	F2	1	67.5	65.2	2.3	No	No
F25401	F2	1	67.7	65.6	2.1	No	No
F25501	F2	1	67.7	65.6	2.1	No	No
F25601	F2	1	67.8	65.9	1.9	No	No
F25701	F2	1	68.0	66.1	1.9	No	No
F25801-F	F2	1	68.5	66.5	2.0	No	No
F25904-F	F2	4	67.8	67.0	0.8	No	No
F26001-F	F2	1	73.9	61.7	12.2	Yes	Yes
F26101	F2	1	72.2	0.0	72.2	Yes	Yes
F26201	F2	1	72.2	63.2	9.0	Yes	Yes
F26301	F2	1	71.4	65.0	6.4	Yes	No
F26401	F2	1	70.4	64.1	6.3	Yes	No
F26501	F2	1	70.2	64.2	6.0	Yes	No
F26601	F2	1	69.6	64.1	5.5	Yes	No
F26701	F2	1	69.3	64.0	5.3	Yes	No
F26801	F2	1	69.3	63.6	5.7	Yes	No
F26901	F2	1	69.1	63.3	5.8	Yes	No
F27001	F2	1	69.0	63.5	5.5	Yes	No



**Table 3: Barrier Results for Barrier System E/F (cont.)**

RECEIVER	NSA	NUMBER OF RECEPTORS	TECHNICAL MEMO RESULTS				
			2050 PREDICTED NOISE LEVEL dB(A)	2050 PREDICTED NOISE LEVEL W/ BARRIER dB(A)	NOISE REDUCTION W/ BARRIER dB(A)	BENEFITED WITH 5dB(A) or MORE REDUCTION?	BENEFITED WITH 7dB(A) or MORE REDUCTION?
F27101	F2	1	69.0	63.5	5.5	Yes	No
F27201	F2	1	68.8	63.4	5.4	Yes	No
F27301	F2	1	68.7	63.4	5.3	Yes	No
F27401	F2	1	68.8	63.6	5.2	Yes	No
F27503	F2	3	68.3	63.0	5.3	Yes	No
F27602	F2	2	68.3	63.1	5.2	Yes	No
F27702	F2	2	70.1	63.9	6.2	Yes	No
F27801	F2	1	70.6	64.3	6.3	Yes	No
F27901	F2	1	71.0	64.6	6.4	Yes	No
F28001-F	F2	1	71.4	64.8	6.6	Yes	No
F28101-F	F2	1	71.8	65.1	6.7	Yes	No
F28201-F	F2	1	72.2	65.3	6.9	Yes	No
F28301-F	F2	1	72.8	65.4	7.4	Yes	Yes
F28401-F	F2	1	73.1	65.7	7.4	Yes	Yes
F28501-F	F2	1	73.5	65.8	7.7	Yes	Yes
F28601-F	F2	1	73.9	66.1	7.8	Yes	Yes
F28701-F	F2	1	74.4	66.0	8.4	Yes	Yes
F28801-F	F2	1	74.8	66.3	8.5	Yes	Yes
F28901-F	F2	1	75.3	66.7	8.6	Yes	Yes
F29001-F	F2	1	75.8	66.8	9.0	Yes	Yes
F29101-F	F2	1	76.3	67.3	9.0	Yes	Yes
F29201	F2	1	70.7	64.2	6.5	Yes	No
F29301-F	F2	1	71.0	64.2	6.8	Yes	No
F29401-F	F2	1	71.0	64.0	7.0	Yes	Yes
F29501-F	F2	1	71.1	63.8	7.3	Yes	Yes
F29501-F	F2	1	71.1	63.9	7.2	Yes	Yes
F29601-F	F2	1	71.0	63.6	7.4	Yes	Yes
F29701-F	F2	1	70.8	63.3	7.5	Yes	Yes
F29801-F	F2	1	70.8	63.3	7.5	Yes	Yes
F29901-F	F2	1	71.0	63.4	7.6	Yes	Yes
F30001-F	F2	1	71.9	64.1	7.8	Yes	Yes
F30101-F	F2	1	72.0	64.1	7.9	Yes	Yes
F30201-F	F2	1	72.9	64.2	8.7	Yes	Yes
F30301-F	F2	1	73.1	64.3	8.8	Yes	Yes
F30401-F	F2	1	73.7	63.9	9.8	Yes	Yes
F30501-F	F2	1	73.9	62.5	11.4	Yes	Yes
F30601-F	F2	1	74.0	60.8	13.2	Yes	Yes
F30701-F	F2	1	74.2	60.5	13.7	Yes	Yes
F30801-F	F2	1	74.5	60.0	14.5	Yes	Yes
F30901-F	F2	1	74.8	60.5	14.3	Yes	Yes
F31001-F	F2	1	75.9	59.8	16.1	Yes	Yes
F31101	F2	1	67.2	65.2	2.0	No	No
F31201	F1	1	63.6	58.1	5.5	Yes	No
F31301	F2	1	68.6	64.0	4.6	No	No
F31401	F2	1	68.9	63.8	5.1	Yes	No
F31501	F1	1	67.3	63.2	4.1	No	No
F316017	F2	17	72.1	68.7	3.4	No	No