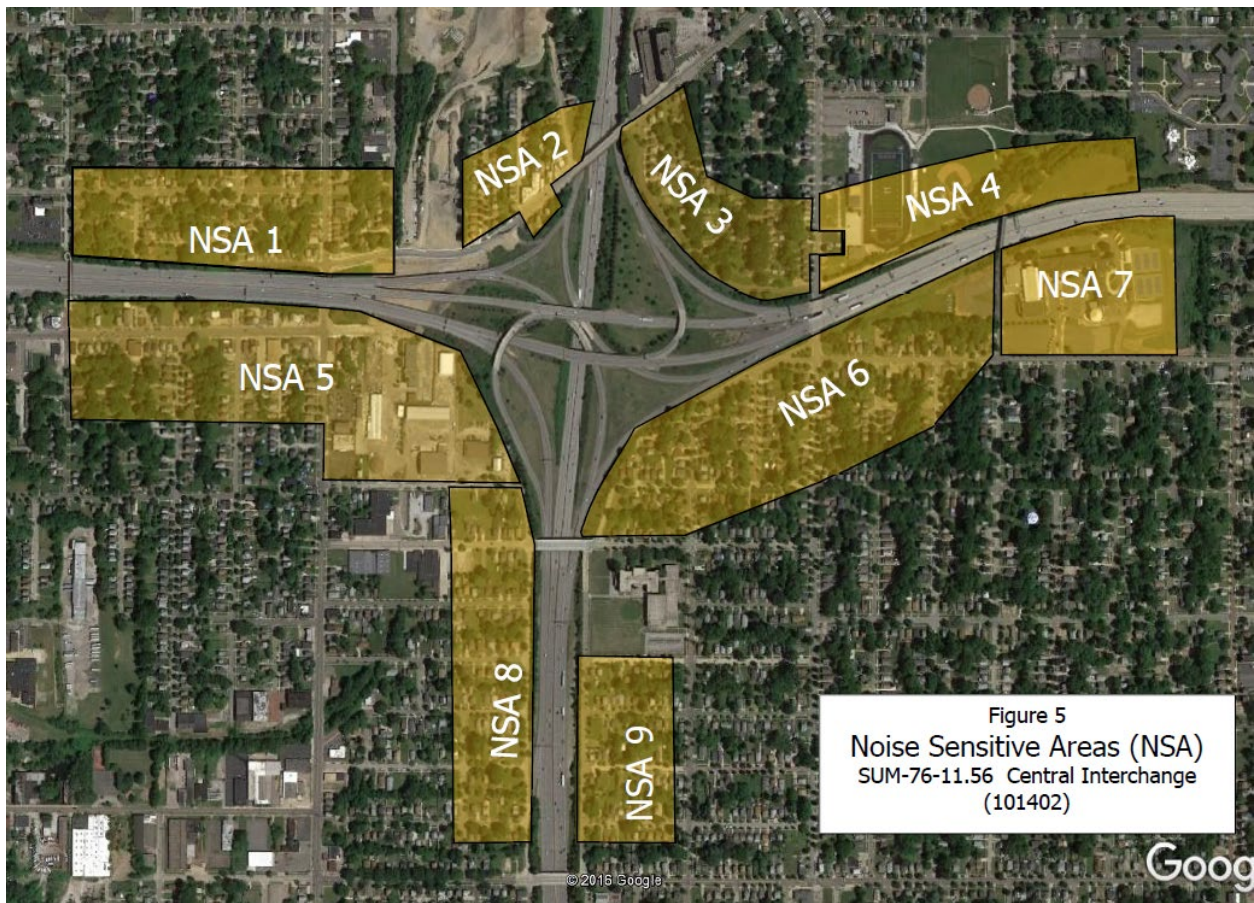


Revisions to Central Interchange Noise Analysis

This document contains revisions to the Noise Analysis Report, dated August 7, 2017, performed under SUM-I 76/I 77/SR 8 Akron Central Interchange, PID 101402. The revisions are limited to noise walls in NSAs 3, 4, 5, 6.



**Recommended Noise Barrier Walls
Revised for NSAs 3, 4 and 6**

Barrier	Barrier Length (feet)	Barrier Height (feet)	Square Footage of Barrier	Maximum Insertion Loss ^a (dB)	Benefitted Properties ^b	Barrier Cost ^c	Cost per benefitted receptor	Effectiveness		Barrier Location ^f	Barrier Recommended ^g
								Feasible ^d	Reasonable ^e		
NSA 3 Scenario 2	1,785	16	28,560	7.3	29	\$714,081	\$24,623	Yes	Yes	EOS/ROW	Yes
NSA 4 Scenario 1	526	14	7,364	6.7	16 (Equivalent)	\$181,387	\$11,336	Yes	Yes	EOS/ROW	Yes
NSA 6 Scenario 2	1,970	17	32,555	10.6	43	\$734,811	\$17,088	Yes	Yes	EOS/ROW	Yes

^a Insertion Loss (IL) is the maximum noise reduction provided by the noise barrier.

^b A receptor is considered benefitted by the noise barrier if the IL is 5dB or greater.

^c Cost is based on \$25 per square foot of noise barrier constructed on ground and \$100 per square foot constructed on structure..

^d A noise barrier is considered feasible if it can provide a substantial noise reduction of at least 7dB at one receptor location.

^e A noise barrier is considered cost reasonable if the cost per benefitted receptor is less than \$35,000.

^f The location of the noise barrier wall: ROW=noise barrier is located along the right of way line; EOS=noise barrier is located along the edge of shoulder.

^g Noise barrier recommendation is based on the number of benefitted receptors and the relative cost per benefitted receptor.

NSA 3 Scenario 2
 Noise Barrier Not on Bridge over Inman St.
 1,785 L x 16' high x \$25=\$714,081
 29 Benefited Receptors
 Cost per Benefited Receptor = \$24,623
 Feasible and Reasonable
 Recommended Scenario



- Receptor Impacted and Benefited
- Receptor not Impacted and Benefited
- Receptor Impacted and Not Benefited
- Receptor Not Impacted and Not Benefited
- Proposed Noise Barrier

NSA 3 Scenario 2

Noise Barrier Not on Bridge over Inman Street

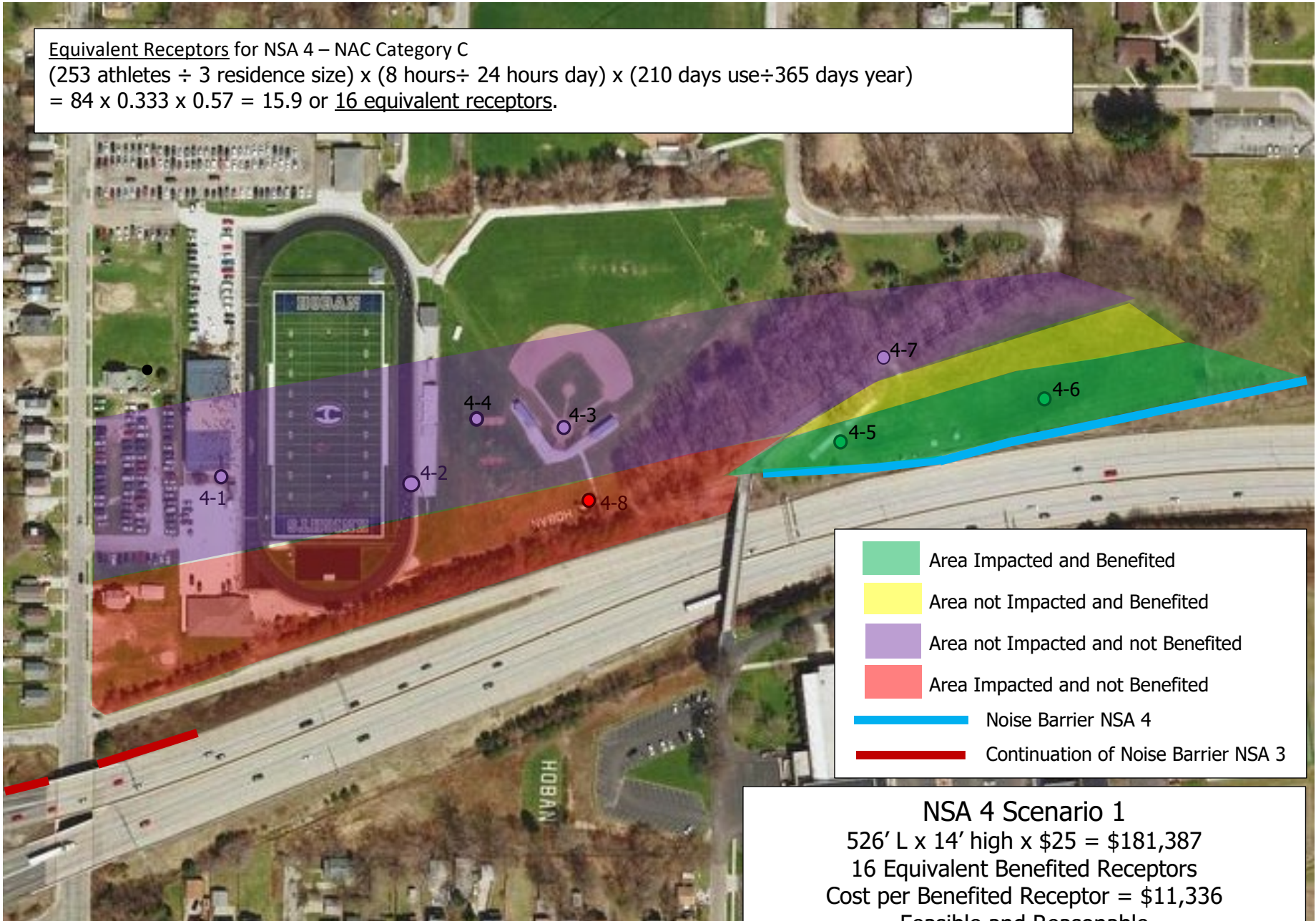
Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction	Impacted	Benefited
NSA 3-1	1	65.3	66.9	65.0	2.1	Yes	No
NSA 3-2	1	65.3	66.9	63.6	3.5	Yes	No
NSA 3-3	1	65.3	66.9	62.6	4.5	Yes	Yes (1)
NSA 3-4	1	65.8	67.5	62.0	5.6	Yes	Yes (1)
NSA 3-5	1	66.8	68.5	62.3	6.2	Yes	Yes (1)
NSA 3-6	1	67.4	69.0	62.1	6.8	Yes	Yes (1)
NSA 3-7	1	67.5	68.8	61.8	6.8	Yes	Yes (1)
NSA3-8	1	65.6	65.9	60.6	5.3	Yes	Yes (1)
NSA 3-9	1	65.8	65.3	60.0	5.3	No	Yes (1)
NSA 3-10	1	65.3	65.6	60.6	5.0	Yes	Yes (1)
NSA 3-11	1	62.3	64.0	60.4	3.7	No	No
NSA 3-12	1	61.8	63.7	60.7	3.2	No	No
NSA 3-13	1	62.0	64.0	61.1	3.0	No	No
NSA 3-14	1	61.9	63.8	61.4	2.6	No	No
NSA 3-15	2	61.4	63.1	61.0	2.4	No	No
NSA 3-16	1	61.3	63.0	61.2	2.1	No	No
NSA 3-17	1	61.6	63.2	61.7	1.8	No	No
NSA 3-18	1	61.6	62.8	61.7	1.5	No	No
NSA 3-19	1	62.4	63.6	61.8	1.8	No	No
NSA 3-20	1	62.8	63.8	62.6	1.2	No	No
NSA 3-21	1	63.3	64.4	62.8	1.6	No	No
NSA 3-22	1	65.6	64.4	59.1	5.3	No	Yes (1)
NSA 3-23	1	65.0	65.8	60.6	5.3	Yes	Yes (1)
NSA 3-24	1	64.8	65.8	61.1	4.7	Yes	Yes (1)
NSA 3-25	1	63.7	64.4	59.9	4.5	No	Yes (1)
NSA 3-26	1	63.5	64.6	61.8	2.9	No	No
NSA 3-27	1	66.9	66.3	60.1	6.2	Yes	Yes (1)
NSA 3-28	1	72.9	68.3	61.0	7.3	Yes	Yes (1)
NSA 3-29	1	65.9	66.9	61.1	5.8	Yes	Yes (1)

NSA 3 Scenario 2
Noise Barrier Not on Bridge over Inman Street

Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction	Impacted	Benefited
NSA 3-30	1	65.0	66.4	61.2	5.2	Yes	Yes (1)
NSA 3-31	1	65.0	66.0	61.4	4.7	Yes	Yes (1)
NSA 3-32	1	64.5	65.6	61.1	4.5	Yes	Yes (1)
NSA3-33	1	69.0	69.0	62.5	6.5	Yes	Yes (1)
NSA 3-34	1	67.8	68.1	62.7	5.4	Yes	Yes (1)
NSA 3-35	1	64.8	67.3	62.0	5.3	Yes	Yes (1)
NSA 3-36	1	64.3	67.1	61.9	5.2	Yes	Yes (1)
NSA 3-37	1	64.0	66.7	62.0	4.7	Yes	Yes (1)
NSA 3-38	1	63.4	66.2	61.7	4.5	Yes	Yes (1)
NSA 3-39	1	69.2	69.3	65.1	4.2	Yes	No
NSA 3-40	1	67.6	68.4	64.0	4.5	Yes	Yes (1)
NSA 3-41	1	66.6	67.5	62.9	4.6	Yes	Yes (1)
NSA 3-42	1	65.7	66.7	62.1	4.6	Yes	Yes (1)
NSA 3-43	1	65.4	66.2	61.4	4.8	Yes	Yes (1)
NSA 3-44	1	67.3	67.5	64.0	3.6	Yes	No
NSA3-45	1	64.0	65.1	61.3	3.8	No	No
NSA3-46	1	63.1	64.2	60.8	3.4	No	No
NSA3-47	1	65.4	65.9	61.5	4.5	Yes	Yes (1)
NSA3-48	1	64.9	65.4	61.2	4.3	No	No
NSA3-49	1	64.1	64.7	60.8	3.9	No	No
NSA3-50	1	65.0	65.3	61.3	4.0	No	No
NSA3-51	1	63.8	64.2	60.5	3.7	No	No
	52					30	29

Equivalent Receptors for NSA 4 – NAC Category C

$(253 \text{ athletes} \div 3 \text{ residence size}) \times (8 \text{ hours} \div 24 \text{ hours day}) \times (210 \text{ days use} \div 365 \text{ days year})$
 $= 84 \times 0.333 \times 0.57 = 15.9$ or 16 equivalent receptors.

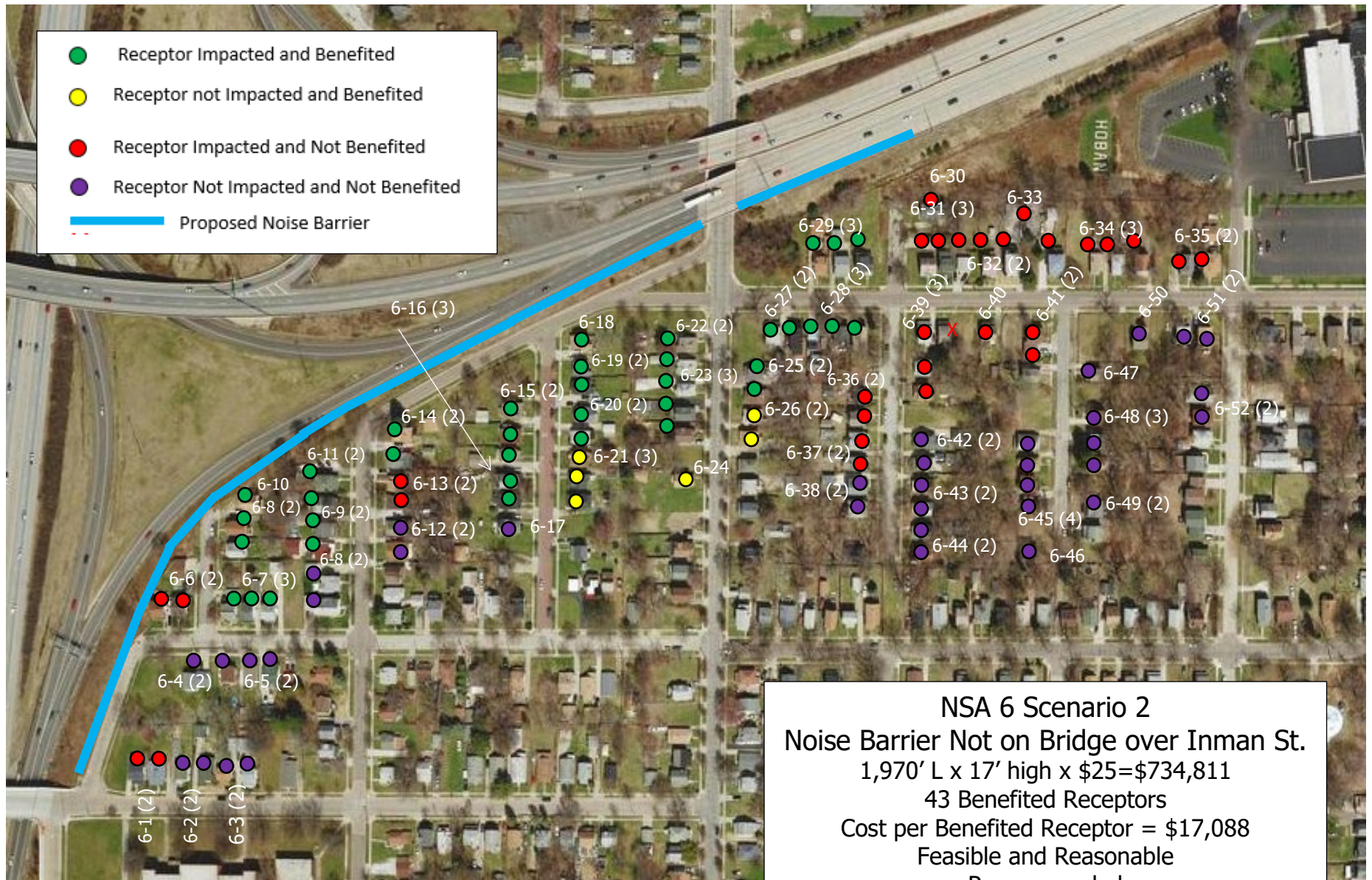


NSA 4 Scenario 1
526' L x 14' high x \$25 = \$181,387
16 Equivalent Benefited Receptors
Cost per Benefited Receptor = \$11,336
Feasible and Reasonable
Recommended Scenario

NSA 4 Scenario 1

Noise barrier along WB I-76 ROW

Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction	Impacted	Benefited
NSA4-1	---	64.0	63.7	61.3	2.4	No	No
NSA4-2	---	65.1	64.5	63.6	0.9	No	No
NSA4-3	---	64.3	62.9	62.5	0.4	No	No
NSA4-4	---	64.0	63.4	62.6	0.7	No	No
NSA4-5	---	68.0	68.8	63.9	4.9	Yes	Yes
NSA4-6	---	69.1	69.8	63.1	6.7	Yes	Yes
NSA4-7	---	63.7	64.4	61.2	3.2	No	No
NSA4-8	---	68.6	65.6	65.4	0.2	Yes	No
						Equivalent Receptors	16



- Receptor Impacted and Benefited
- Receptor not Impacted and Benefited
- Receptor Impacted and Not Benefited
- Receptor Not Impacted and Not Benefited
- Proposed Noise Barrier

NSA 6 Scenario 2
Noise Barrier Not on Bridge over Inman St.
 1,970' L x 17' high x \$25=\$734,811
 43 Benefited Receptors
 Cost per Benefited Receptor = \$17,088
Feasible and Reasonable
Recommended

NSA 6 Scenario 2							
Noise Barrier Not on Bridge over Inman Street							
Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction with noise barrier	Impacted	Benefited
NSA 6-1	2	65.8	68.2	64.1	4.0	Yes	No
NSA 6-2	2	62.9	64.7	61.4	3.2	No	No
NSA 6-3	2	61.6	63.1	60.3	2.7	No	No
NSA 6-4	2	63.5	65.3	61.1	4.1	No	No
NSA 6-5	2	62.0	63.5	60.5	2.9	No	No
NSA 6-6	2	71.4	73.0	68.6	4.4	Yes	No
NSA 6-7	3	64.0	65.6	61.0	4.5	Yes	Yes (3)
NSA 6-8	2	67.8	69.7	62.7	7.0	Yes	Yes (2)
NSA 6-9	2	63.5	65.1	59.5	5.6	No	Yes (2)
NSA 6-10	1	69.2	71.4	60.8	10.6	Yes	Yes (1)
NSA 6-11	2	66.4	67.9	60.7	7.2	Yes	Yes (2)
NSA 6-12	2	61.1	62.8	59.7	3.1	No	No
NSA 6-13	2	64.3	66.0	62.6	3.4	Yes	No
NSA 6-14	2	67.0	68.4	61.8	6.5	Yes	Yes (2)
NSA 6-15	2	65.8	67.4	60.4	7.0	Yes	Yes (2)
NSA 6-16	3	63.5	65.4	60.3	5.1	No	Yes (3)
NSA 6-17	1	61.7	63.6	60.4	3.2	No	No
NSA 6-18	1	68.0	70.4	61.4	9.0	Yes	Yes (1)
NSA 6-19	2	65.7	67.6	59.9	7.7	Yes	Yes (2)
NSA 6-20	2	63.8	65.6	59.3	6.3	Yes	Yes (2)
NSA 6-21	3	62.2	63.9	59.2	4.6	No	Yes (3)
NSA 6-22	2	65.9	67.6	61.5	6.0	Yes	Yes (2)
NSA 6-23	3	64.9	66.3	60.2	6.1	Yes	Yes (3)
NSA 6-24	1	63.3	64.1	59.1	4.9	No	Yes (1)
NSA 6-25	2	64.8	65.9	60.8	5.0	Yes	Yes (2)
NSA 6-26	2	63.8	64.5	60.0	4.5	No	Yes (2)
NSA 6-27	2	67.2	68.3	63.5	4.8	Yes	Yes (2)
NSA 6-28	3	67.1	68.3	63.5	4.7	Yes	Yes (3)
NSA 6-29	3	69.4	70.2	64.7	5.6	Yes	Yes (3)

NSA 6 Scenario 2							
Noise Barrier Not on Bridge over Inman Street							
Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction with noise barrier	Impacted	Benefited
NSA 6-30	1	68.9	70.2	67.5	2.8	Yes	No
NSA 6-31	3	67.7	68.9	66.4	2.5	Yes	No
NSA 6-32	2	67.5	68.3	66.7	1.7	Yes	No
NSA 6-33	1	67.8	69.2	68.2	1.0	Yes	No
NSA 6-34	3	64.5	66.3	65.4	0.9	Yes	No
NSA 6-35	2	64.8	65.7	65.0	0.6	Yes	No
NSA 6-36	2	65.2	65.9	61.9	3.9	Yes	No
NSA 6-37	2	66.4	67.7	64.9	2.8	Yes	No
NSA 6-38	2	63.2	63.7	60.1	3.6	No	No
NSA 6-39	3	66.0	66.8	63.2	3.5	Yes	No
NSA 6-40	1	65.5	66.3	64.0	2.3	Yes	No
NSA 6-41	2	65.3	66.5	64.2	2.2	Yes	No
NSA 6-42	2	63.2	63.5	60.6	2.9	No	No
NSA 6-43	2	62.2	62.2	59.6	2.6	No	No
NSA 6-44	2	61.0	61.4	59.0	2.5	No	No
NSA 6-45	4	63.3	64.6	62.1	2.4	No	No
NSA 6-46	1	61.9	63.1	60.6	2.5	No	No
NSA 6-47	1	63.9	65.2	63.4	1.8	No	No
NSA 6-48	3	62.3	63.5	61.5	1.9	No	No
NSA 6-49	2	60.9	62.0	60.1	1.9	No	No
NSA 6-50	1	63.6	64.5	63.0	1.5	No	No
NSA 6-51	2	63.5	64.6	63.4	1.1	No	No
NSA 6-52	2	63.7	64.3	63.0	1.3	No	No
NSA6-53	2	62.3	63.8	62.4	1.3	No	No
	108					60	43

Akron Central Interchange
PID 101402
Proposed Revisions to Recommended Noise Wall NSA 5

Prepared by: Thomas Bolte, PE Craig Cox
 Project Manager Lawhon & Associates, Inc.
 Burgess & Niple, Inc.

A noise analysis report was prepared for the Akron Central Interchange project by Lawhon & Associates, Inc. and is dated August 7, 2017. In the report, Noise Wall NSA 5 Scenario 1 is listed as feasible and reasonable, and therefore recommended. NSA 5 Scenario 1 extends along the south shoulder of I-76 EB across the Brown St. bridge, ending about 500 feet east of the Brown St. bridge. A plan view of NSA 5 Scenario 1 taken from the noise analysis report is shown as Exhibit A.

Project SUM-76/77-11.27 & 12.12 (hereafter referred as PID 86979) was recently completed in this area. As part of that project, the three existing bridges over Spicer St. and Johnston St. just east of Brown St. were removed and replaced with embankment (see Exhibits B and C).

In order to reduce the footprint of the embankment, to not encroach on the new South St. cul-de-sac built as part of the PID 86979 project, a geogrid reinforced embankment was built on the south side of I-76 EB with a 1:1 side slope (see Exhibits D and E).

Constructing a conventional noise wall with conventional drilled shaft foundations is not feasible in the area where the geogrid reinforcing exists because the drilling associated with installing the drilled shafts would destroy the geogrid material and damage the integrity of the slope.

Lawhon & Associates, Inc. has prepared a supplemental noise analysis in this area assuming NSA 5 ends at the west side of the Brown St. bridge. The results of that analysis are presented in Exhibit F. Four receptors, consisting of five dwelling units, would no longer be benefited without the section of barrier east of Brown Street. The receptors that are no longer benefited are: 5-24, 5-35 (2 dwelling units), 5-37, and 5-39. The shortened noise barrier wall would still be a feasible and reasonable noise abatement measure for NSA-5.

Exhibit A



- Receptor Impacted and Benefited
- Receptor not Impacted and Benefited
- Receptor Impacted and Not Benefited
- Receptor Not Impacted and Not Benefited
- Proposed Noise Barrier

NSA 5 Scenario 1
Noise Barrier on Bridge over Brown Street
 1,656' L x 14' high x \$25=\$747,460*
 69 Benefited Receptors
 Cost per Benefited Receptor = \$10,832
 Feasible and Reasonable
Recommended Scenario

*includes \$100 ft² for barrier on bridge (160')

Exhibit B

Aerial Taken Prior to PID 86979 Project

Bridges removed as part of PID 86979 project



- Receptor Impacted and Benefited
- Receptor not Impacted and Benefited
- Receptor Impacted and Not Benefited
- Receptor Not Impacted and Not Benefited
- Proposed Noise Barrier

NSA 5 Scenario 1
Noise Barrier on Bridge over Brown Street
 1,656' L x 14' high x \$25=\$747,460*
 69 Benefited Receptors
 Cost per Benefited Receptor = \$10,832
 Feasible and Reasonable
Recommended Scenario

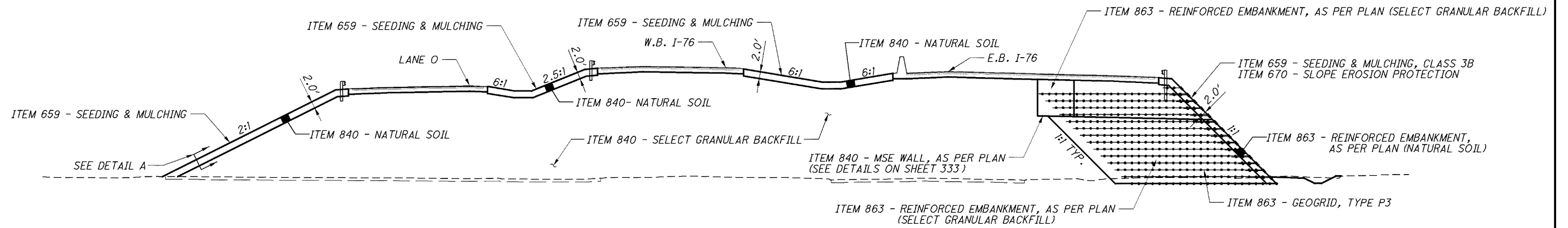
*includes \$100 ft² for barrier on bridge (160')

Exhibit C
2018 Aerial Image after completion of
PID 86979 project

Approx. area of
geogrid reinforced
slope

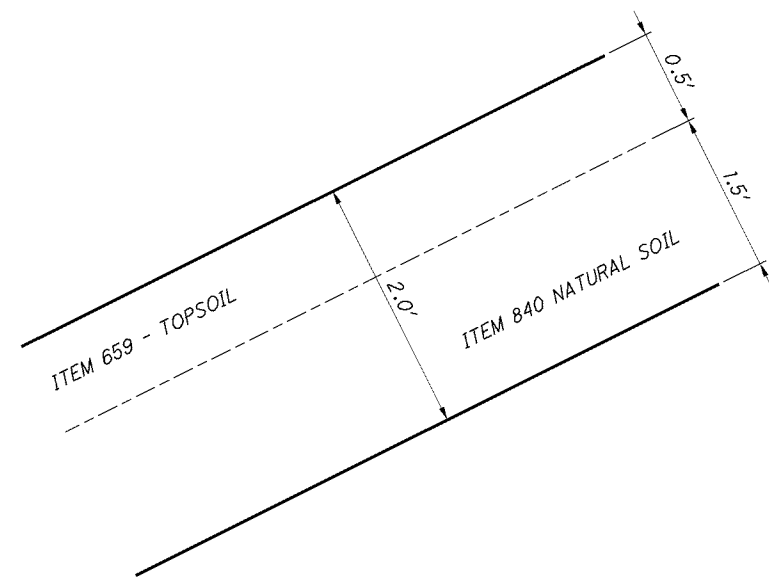


Exhibit D



PHASED EMBANKMENT CONSTRUCTION MATERIAL COMPOSITION

N.T.S.



DETAIL A

STA. 5+00.00 TO STA. 9+00.00 (W.B. I-76)
 APPLIES ONLY TO THE EMBANKMENT ON LEFT SIDE OF LANE 0 (PER TYPICAL SECTION ON THIS SHEET)
 WHICH DRAINS TO THE DITCH ON RIGHT SIDE OF JOHNSTON ST.
 STA. 3+75.00 TO STA. 9+00.00

CONSTRUCTION PHASING - TYPICAL SECTION

SUM-76 / 77-11.27 / 12.12

334
652

Exhibit E



Exhibit F



- Receptor Impacted and Benefited
- Receptor not Impacted and Benefited
- Receptor Impacted and Not Benefited
- Receptor Not Impacted and Not Benefited
- Proposed Noise Barrier

NSA 5
Noise Barrier to Brown St.
 1,257' L x 14' high x \$25=\$440,088
 45 Benefited Receptors
 Cost per Benefited Receptor = \$9,780
 Feasible and Reasonable

NSA 5
Noise Barrier to Brown Street

Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction	Impacted	Benefited
NSA5-1	1	73.4	73.6	64.7	8.9	Yes	Yes (1)
NSA5-2	1	74.0	74.0	63.3	10.7	Yes	Yes (1)
NSA5-3	1	74.0	74.3	63.3	11.0	Yes	Yes (1)
NSA5-4	2	71.8	72.8	63.0	9.8	Yes	Yes (2)
NSA5-5	2	73.9	75.0	63.9	11.1	Yes	Yes (2)
NSA5-6	2	73.5	73.4	63.8	9.6	Yes	Yes (2)
NSA5-7	2	72.6	72.2	64.6	7.6	Yes	Yes (2)
NSA5-8	1	71.4	71.8	65.8	6.0	Yes	Yes (1)
NSA5-9	1	67.3	67.5	63.7	3.8	Yes	No
NSA5-10	3	67.9	68.2	63.1	5.1	Yes	Yes (3)
NSA5-11	3	68.1	68.2	60.9	7.3	Yes	Yes (3)
NSA5-12	4	67.2	67.6	60.7	6.9	Yes	Yes (4)
NSA5-13	2	67.2	67.5	60.8	6.7	Yes	Yes (2)
NSA5-14	2	69.1	69.8	66.9	2.9	Yes	No
NSA5-15	2	69.0	69.7	66.4	3.3	Yes	No
NSA5-16	2	63.7	63.8	60.1	3.7	No	No
NSA5-17	2	64.6	64.8	60.1	4.7	No	Yes (2)
NSA5-18	3	65.3	65.4	59.8	5.6	No	Yes (3)
NSA5-19	2	66.4	66.6	59.4	7.2	Yes	Yes (2)
NSA5-20	2	65.7	65.3	59.0	6.3	No	Yes (2)
NSA5-21	2	65.1	65.1	58.8	6.3	No	Yes (2)
NSA5-22	3	65.0	65.6	59.4	6.2	Yes	Yes (3)
NSA5-23	1	66.1	66.0	60.4	5.6	Yes	Yes (1)
NSA5-24	1	68.3	68.2	64.5	3.7	Yes	No
NSA5-25	1	67.4	67.3	63.0	4.3	Yes	No
NSA5-26	2	65.9	66.4	62.0	4.4	Yes	No
NSA5-27	1	68.4	68.7	64.8	3.9	Yes	No
NSA5-28	2	66.9	67.4	63.5	3.9	Yes	No
NSA5-29	1	62.7	62.9	59.3	3.6	No	No

NSA 5
Noise Barrier to Brown Street

Receptor	Dwelling units	Existing Year Noise Level	Design Year Noise Level	Noise Level with Noise Barrier	Noise Reduction	Impacted	Benefited
NSA5-30	2	62.9	63.0	59.0	4.0	No	No
NSA5-31	1	64.6	64.9	60.4	4.5	No	Yes (1)
NSA5-32	2	64.2	64.5	59.7	4.8	No	Yes (2)
NSA5-33	3	63.3	63.6	59.5	4.1	No	No
NSA5-34	3	63.7	63.8	58.5	5.3	No	Yes (3)
NSA5-35	2	64.1	64.1	59.8	4.3	No	No
NSA5-36	2	63.7	63.9	59.6	4.3	No	No
NSA5-37	1	64.6	64.7	60.8	3.9	No	No
NSA5-38	2	63.7	63.7	59.3	4.4	No	No
NSA5-39	1	64.6	64.6	61.4	3.2	No	No
NSA5-40	2	63.7	63.0	58.9	4.1	No	No
NSA5-42	1	64.9	64.9	60.8	4.1	No	No
NSA5-43	2	65.3	65.7	61.9	3.0	Yes	No
NSA5-44	1	64.1	64.3	60.8	3.5	No	No
NSA5-45	1	66.8	67.1	63.6	3.5	Yes	No
	80					40	45