



**STATE OF MINNESOTA
ENVIRONMENTAL ANALYSIS
AND COMPLIANCE SECTION
ENVIRONMENTAL MODELING AND
TESTING UNIT**

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Subject: Effects of noise wall located on East side of TH 100 on noise levels of residences on the Westside of TH 100 in the vicinity of Vernon Avenue.

Summary:

Due to the concerns of residents on the west side of TH 100 in the vicinity of Vernon Ave. about possible increases of their noise levels due to the construction of a noise wall on the east side of TH 100, the Metro Division requested a test to determine if increases in noise level occur, and if so, the magnitude of the increases. Before the wall and after the wall testing was done over the two-year period 2000 to 2001 at three residences and Brookside school in the vicinity of Vernon Ave. There is not evidence that the wall increased noise levels at Brookside school or the residences at 4180 and 4250 Vernon Ave. There is evidence that the wall increased the noise level at the residence at 4362 Vernon Ave. by a measurable average amount of ½ dBA. While this increase is measurable it's not detectable as judged by human hearing capabilities. The human ear doesn't detect changes in noise level of less than 3 dBA. Why the one residence has a measurable increase can't be determined without further consideration of the geometrics of the roadway in relation to the location of the residences and possibly further noise level measurements.

Test Methodology at TH100 in the vicinity of Vernon Avenue in St. Louis Park:

The four sites in this study are all on the West side of TH 100. Between the years 2000 and 2001 a noise wall was built on the East side of TH 100. Noise measurements were taken in 2000 without the wall on the East side and again in 2001 with the wall in place on the East side. Both sets of measurements were done under similar traffic conditions. The question asked is "is there a difference

between the two sets of measurements at each site that is due to the introduction of a noise wall on the East side of TH 100?"

To answer this question measurements were made before and after the introduction of the noise wall. During each level measurement, traffic was counted and classified. The noise prediction model Stamina 2.0 was run, without the noise wall being taken into account, for each measurement made. The modeled levels track changes in noise level due to changes in traffic volumes and mix. A comparison was done on the sets of differences between each measurement and its corresponding modeled level. Using the differences in this manner reduces, if not eliminate, variations due to changes in traffic and make the test more sensitive to any changes due to the introduction of the noise wall. Any measurable, unexpected change between the sets of difference data can be attributed to the placement of the noise wall on the east side of the highway. Student's t-test was used at a confidence level of 95% to test for statistically significant differences at the four sites where testing was done.

Using 95% confidence values for t (which equates to a 0.05 probability value for t) we see there is good evidence that no measurable, detectable increase due to the noise wall exists at the sites with addresses 4100 (Brookside school), 4180, and 4250 Vernon Ave. There is good evidence that at the site with address 4362 Vernon Ave. there is a measurable increase due to the noise wall. The increase averages 1/2 dBA, which isn't a detectable change as judged by human hearing. The ability of the human ear to detect noise level change is limited to noise level changes of 3 dBA or more. (See, U.S. Department of Transportation, Federal Highway Administration, *Fundamentals and Abatement of Highway Traffic Noise* (Textbook and Training Course); Document 2, Sec. 3.5.1 (Sept. 1980).)

**Data Analysis
And
Statistical Testing**

T TEST FOR EQUALITY OF CORRECTIONS NECESSARY TO MAKE MODELED LEVELS EQUAL TO CORRESPOND

MEASURED LEVELS									
SITE	4100	4180	4250	4362					
T TEST	0.2405	0.4087	0.5000	0.0474					
TH 100 Vernon Avenue		St. Louis Park							
		Measurements	Stamina	Ave			Measureme	Stamina	Ave
Meas #	Date	L10	L10	Correction	Meas #	Date	L10	L10	Correction
1(4100)	8/3/2000	76.5	75.9	0.6	1(4100)	9/12/2001	76.5	75.8	0.7
2(4100)	8/3/2000	76.0	75.4	0.6	2(4100)	9/12/2001	76.0	75.6	0.4
3(4100)	8/3/2000	76.0	75.3	0.7	3(4100)	9/12/2001	76.5	75.5	1.0
4(4100)	8/3/2000	76.5	75.6	0.9	4(4100)	9/12/2001	77.0	75.7	1.3
					5(4100)	9/12/2001	77.0	76.0	1.0
					6(4100)	9/12/2001	76.0	75.5	0.5
	Ave	76.3	75.6	0.7		Ave	76.5	75.7	0.8
1(4180)	8/3/2000	75.5	74.8	0.7	1(4180)	9/12/2001	75.5	74.7	0.8
2(4180)	8/3/2000	75.0	74.3	0.7	2(4180)	9/12/2001	75.0	74.5	0.5
3(4180)	8/3/2000	74.5	74.2	0.3	3(4180)	9/12/2001	75.0	74.4	0.6
4(4180)	8/3/2000	75.0	74.5	0.5	4(4180)	9/12/2001	75.0	74.6	0.4
					5(4180)	9/12/2001	75.5	74.8	0.7
					6(4180)	9/12/2001	74.5	74.4	0.1
	Ave	75.0	74.5	0.5		Ave	75.1	74.6	0.5
1(4250)	8/3/2000	77.0	76.0	1.0	1(4250)	9/12/2001	77.0	75.8	1.2
2(4250)	8/3/2000	76.0	75.5	0.5	2(4250)	9/12/2001	76.0	75.6	0.4
3(4250)	8/3/2000	76.5	75.3	1.2	3(4250)	9/12/2001	76.5	75.5	1.0
4(4250)	8/3/2000	76.5	75.6	0.9	4(4250)	9/12/2001	77.0	75.7	1.3
					5(4250)	9/12/2001	77.0	76.0	1.0
					6(4250)	9/12/2001	76.0	75.5	0.5
	Ave	76.5	75.6	0.9		Ave	76.6	75.7	0.9
1(4362)	8/3/2000	76.5	77.7	-1.2	1(4362)	9/12/2001	77.0	77.6	-0.6
2(4362)	8/3/2000	75.5	77.1	-1.6	2(4362)	9/12/2001	76.0	77.4	-1.4
3(4362)	8/3/2000	75.5	77.0	-1.5	3(4362)	9/12/2001	77.0	77.3	-0.3
4(4362)	8/3/2000	76.0	77.4	-1.4	4(4362)	9/12/2001	76.5	77.4	-0.9
					5(4362)	9/12/2001	77.0	77.7	-0.7
					6(4362)	9/12/2001	75.5	77.3	-1.8
	Ave	75.9	77.3	-1.4		Ave	76.5	77.5	-1.0
	Ave	Ave		Ave					
	Measurement	Measurement		Stamina					
	L10	L10		L10					
Site	2000	2001		2000					
4100	76.3	76.5		75.6					
4180	75.0	75.1		74.5					
4250	76.5	76.6		75.6					
4362	75.9	76.5		77.3					
TRAFFIC									
SB 2000	1	2	3	4					
Autos	3356	2812	2268	2640					

Med Trk	92	112	116	108					
Hvy Trk	32	12	36	44					
Bus	16	12	0	12					
Mcycle	8	8	4	28					
<u>SB 2001</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>			
Autos	3120	2736	2652	2826	2496	2568			
Med Trk	60	108	102	54	84	78			
Hvy Trk	42	42	48	54	102	54			
Bus	12	6	6	6	12	12			
MCycle	12	6	12	18	12	12			
<u>NB 2000</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>					
Autos	3120	3004	2812	2748					
Med Trk	80	92	100	92					
Hvy Trk	24	36	48	20					
Bus	24	40	12	8					
Mcycle	56	40	8	12					
<u>NB 2001</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>			
Autos	3366	3132	2622	2646	2526	2454			
Med Trk	126	72	72	66	42	126			
Hvy Trk	18	24	24	60	48	36			
Bus	6	24	6	12	0	0			
MCycle	6	6	12	0	6	0			