CHAPTER 4

RESULTS AND DISCUSSION

4.0 RESULTS

A summary of the results for the day and night time noise levels are presented in **Tables 4.1, 4.2 and 4.3**. The detailed noise logging data for all the sampling sites is presented in **Appendix A**.

The noise analysis is based on the Leq levels which is the average noise, and is commonly used in noise monitoring activities. The data collected over three samplings are analyzed and discussed in the following sections.

Audiometer hearing test carried out on the sample urban and suburban residents is attached in **Appendix B and C**. Discussion on the results is presented in the proceeding sections.

TABLE 4.1 Noise Levels Monitoring
(1 st. Sampling)

Station Location	RESULTS																					
Station	N1 KESAS HIGHWAY Before Barrier			After Barrier			N2 KG. LEMBAH JAYA UTARA						N3 KG.SRI TANJUNG						N4 JALAN PUCHONG						N5 JALAN ENGGANG					
Station No:	N1-1			N1-2			N1-3			N1-4			N2-1			N2-2			N3-1			N3-2			N4-1			N4-2			N5-1			N5-2		
Environment:	Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time		
Time:	9:42:05			22:49:10			8:59:20			22:00:13			12:30:38			22:41:12			14:17:10			22:25:09			15:36:20			21:47:09			17:01:28			22:58:32		
Date:	24/08/98			7/09/98			24/08/98			7/09/98			24/08/98			14/09/98			24/08/98			28/09/98			24/08/98			21/09/98			24/08/98			21/09/98		
	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M
Number of Vehicles	1131	62	46	769	51	44	1947	68	166	403	25	39	85	–	74	34	–	21	130	2	53	73	–	24	879	9	202	312	–	112	1980	39	980	396	–	102
Lmin (dBA) *	64.8			46.0			57.0			44.4			43.3			41.3			43.7			42.4			44.0			45.1			52.4			45.3		
Lmax (dBA)*	90.7			82.8			75.2			70.1			89.2			80.4			81.7			85.8			88.0			78.1			94.6			79.3		
Leq (dBA) *	75.8			67.3			64.1			55.8			61.6			56.8			58.7			55.3			68.7			56.1			73.9			58.1		
L_{10} (dBA) *	78.4			71.1			66.4			58.2			63.2			48.3			61.0			63.5			71.4			58.3			76.6			59.7		
L_{50} (dBA) *	74.3			64.2			63.4			55.0			48.9			48.1			48.1			60.1			64.9			52.7			70.5			56.7		
L_{90} (dBA) *	69.8			55.7			60.7			51.2			45.0			40.7			45.1			57.1			55.2			49.3			64.8			52.2		

Notes:

* = In-situ measurement
C = Car/Van/Small Bus/ 3 ton Lorry
L = Lorry
M = Motorcycles

TABLE 4.2 Noise Levels Monitoring
(2 nd. Sampling-Replicate)

Station Location	RESULTS																																	
Station	N1 KESAS HIGHWAY Before Barrier / After Barrier												N2 KG. LEMBAH JAYA UTARA						N3 KG.SRI TANJUNG						N4 JALAN PUCHONG.						N5 JALAN ENGGANG					
Station No:	N1-1			N1-2			N1-3			N1-4			N2-1			N2-2			N3-1			N3-2			N4-1			N4-2			N5-1			N5-2		
Environment:	Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time		
Time:	9:45:53			21:19:06			9:09:02			22:20:58			11:57:16			22:45:57			13:12:57			22:28:03			15:32:30			23:01:13			16:46:56			1:08:22		
Date:	27/08/98			10/09/98			27/08/98			10/09/98			27/08/98			17/09/98			27/08/98			3/09/98			27/08/98			3/09/98			27/08/98			4/09/98		
	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M
Number of Vehicles	1458	66	112	625	59	68	1304	51	103	284	45	22	102	4	109	29	—	61	156	—	43	86	—	31	1207	3	253	294	—	78	1919	3	143	87	—	21
Lmin (dBA) *	64.8			41.6			55.6			43.7			46.3			41.5			42.9			45.4			48.8			42.4			51.9			41.6		
Lmax (dBA)*	91.4			79.4			77.8			72.6			99.9			85.9			92.4			88.8			98.2			91.9			100.5			93.9		
Leq (dBA) *	78.6			64.5			66.0			55.4			68.7			61.5			65.0			68.3			74.8			63.4			78.3			65.6		
L_{10} (dBA) *	81.5			69.3			68.4			57.8			67.0			58.1			66.6			71.5			77.7			63.2			81.0			68.0		
L_{50} (dBA) *	77.3			57.7			64.9			54.5			53.9			53.4			52.4			66.1			71.8			50.2			75.3			53.8		
L_{90} (dBA) *	73.3			48.4			62.0			51.3			49.5			41.5			47.3			62.1			62.5			46.2			69.9			45.3		

Notes:

* = In-situ measurement
C = Car/Van/Small Bus/ 3 ton Lorry
L = Lorry
M = Motorcycles

TABLE 4.3 Noise Levels Monitoring
(3 rd. Sampling-Replicate)

Station Location	RESULTS																					
Station	N1 KESAS HIGHWAY Before Barrier				After Barrier				N2 KG. LEMBAH JAYA UTARA				N3 KG.SRI TANJUNG				N4 JALAN PUCHONG .				N5 JALAN ENGGANG			
Station No:	N1-1			N1-2			N1-3			N1-4			N2-1			N2-2			N3-1			N3-2		
Environment:	Day time			Night time			Day time			Night time			Day time			Night time			Day time			Night time		
Time:	9:46:43			22:40:06			9:05:16			22:21:09			12:01:44			21:28:55			13:15:49			22:51:37		
Date:	29/08/98			12/09/98			29/08/98			13/09/98			29/08/98			30/08/98			29/08/98			30/08/98		
	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M	C	L	M
Number of Vehicles	923	128	84	402	48	35	809	148	69	162	24	14	328	1	244	39	—	51	204	—	54	109	—	32
Lmin (dBA) *	62.7			42.3			54.5			42.1			43.1			45.4			38.6			43.2		
Lmax (dBA)*	91.6			84.2			82.9			66.7			94.3			89.0			88.5			85.1		
Leq (dBA) *	78.0			67.0			65.1			55.3			67.8			62.0			62.7			61.1		
L_{10} (dBA) *	80.8			70.9			67.0			58.0			70.6			61.7			65.2			63.2		
L_{50} (dBA) *	76.5			62.7			64.0			54.2			58.9			51.1			49.8			48.4		
L_{90} (dBA) *	71.9			52.6			61.1			54.9			51.5			49.1			44.0			45.3		

Station Location	RESULTS											
Station	N4 JALAN PUCHONG .				N5 JALAN ENGGANG							
Station No:	N4-1			N4-2			N5-1			N5-2		
Environment:	Day time			Night time			Day time			Night time		
Time:	14:18:41			0:12:50			15:30:48			1:24:46		
Date:	12/09/98			5/09/98			13/09/98			5/09/98		
	C	L	M	C	L	M	C	L	M	C	L	M
Number of Vehicles	968	2	157	287	—	97	636	2	319	317	—	109
Lmin (dBA) *	43.3			41.6			44.3			46.5		
Lmax (dBA)*	96.0			99.1			90.6			104.7		
Leq (dBA) *	67.5			69.6			70.2			73.3		
L_{10} (dBA) *	67.9			70.8			73.0			74.5		
L_{50} (dBA) *	61.9			58.3			67.2			63.1		
L_{90} (dBA) *	52.4			44.9			59.0			58.5		

Notes:

* = In-situ measurement
C = Car/Van/Small Bus/ 3 ton Lorry
L = Lorry
M = Motorcycles

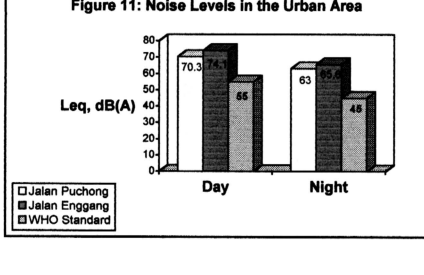
4.1 ANALYSIS OF DATA

Traffic Noise in the Urban Area

Based on the noise survey, it is found that Leq (average noise level) for day time hours was between 68.7dB(A) and 78.3dB(A). The results averaged over three samples showed a level of 70.3dB(A) for Jalan Puchong and 74.1dB(A) for Jalan Enggang. These levels were above the WHO standard of 55dB(A) for day time noise by about 15 to 19 dB.

The night time Leq noise levels were found to be between 56.1dB(A) and 73.3 dB(A). The average over three samples showed a level of 63.0dB(A) for Jalan Puchong and 65.6dB(A) for Jalan Enggang, which is also higher than the WHO Standard of 45dB(A) for night time noise. The night time noise levels were higher then the WHO standard by about 18 to 20 dB.

Figure 11: Noise Levels in the Urban Area

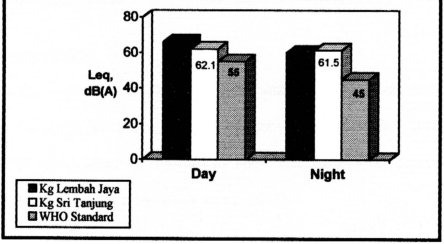


Traffic Noise in the Suburban Area

Leq noise levels during the day time in the two suburban areas was found to be between 58.7 to 68.7 dB(A) with an average of 66.0dB(A) for Kampung Lembah Jaya and 62.1dB(A) for Kampung Sri Tanjung. The suburban areas also did not meet the WHO Standard of 55 dB(A) during the day. The noise levels were found to be about 7 to 11 dB higher than the standard set by WHO.

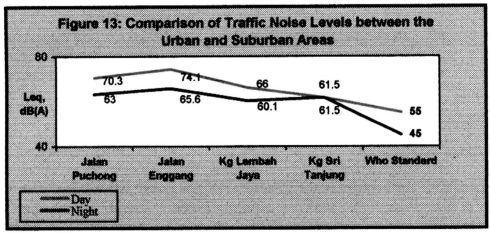
Night time noise for the suburban areas was found to be between 55.3 and 68.3 dB(A) with an average of 60.1dB(A) for Kampung Lembah Jaya and 61.5dB(A) for Kampung Sri Tanjung. These levels also did not meet the WHO Standard of 45dB(A) for night time noise and were higher by about 15 to 16.5dB.

Figure 12: Noise Levels in the Suburban Area



Traffic Noise in Urban Areas Vs Suburban Areas

The comparison between urban traffic noise and suburban traffic noise showed the day time noise levels for the suburban areas to be approximately 8 - 12dB lower than the urban areas. The night time noise level of the suburban areas was approximately 3 – 4 B lower than the urban areas. However, both the areas did not meet the WHO Standard for residential noise.



Traffic Volume

Traffic volume in the urban areas was found to be high which contributed to the higher noise level. A total of 1090-1463 vehicles/hour and 2999-3065 vehicle/hour was recorded for both the urban area i.e Jalan Puchong and Jalan Enggang respectively during the day.

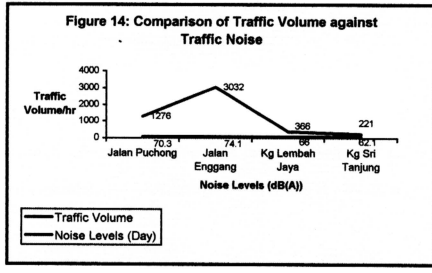
Night time volume in the urban areas was much lower with a total of between 372 - 424 vehicles/hour along Jalan Puchong and a total of 108 – 578 vehicle/hour along Jalan Enggang. There was a reduction of approximately 18 to 30% in traffic volume in the night.

Traffic volume was much lower in the suburban area with a volume of 159 to 573 vehicles/hour for Kampung Lembah Jaya and 185 to 258 vehicles/hour for Kampung Sri Tanjung during the day.

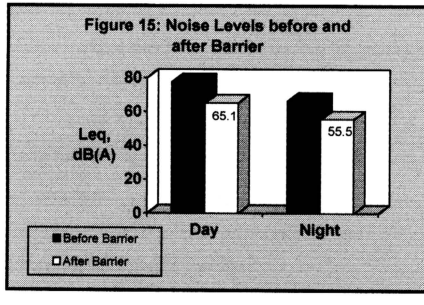
The night time traffic volume in the suburban area was also lower than in the urban area with a total of 55 to 90 vehicles/hour in Kampung Lembah Jaya and 97 to 141 vehicles/hour in Kampung Sri Tanjung.

Comparing against the average traffic in the urban and suburban areas it was found that the suburban traffic volume was approximately 86% lower than the traffic volume in the urban areas during the day and 25% during the night. The lower traffic volume in the suburban areas could be due the lower economic level of the suburban population. Thus, lower economic level would mean less ability to own vehicles.

It can be said that there is a direct relationship between the traffic volume and noise levels. The higher the traffic volume the higher the noise levels.



Noise Barrier



Levels of noise was found to be approximately 10 dB lower after the barrier compared to before the barrier. Day time noise levels after the barrier was 64.1,66.0 and 65.1 dB(A) over three samplings. The night time noise levels after the barrier was 55.8, 55.4 and 55.3 dB(A).

These levels were also above the WHO Standard of 55 dB(A) and 45 dB(A) for day and-night time noise.

The barrier showed an attenuation of approximately 10 dB(A) which was relatively effective. However, sine the base levels from the source was high, the attenuated levels were still above the WHO Standard.

Audiometric Test

Pure Tone Audiometry, conducted by an ENT (Ear, Nose & Throat) Specialits on a sample of 10 people from the urban as well as the suburban areas was carried out to determine whether the traffic noise had caused any noise induced hearing loss. For this purpose, the chosen people had to meet with the following criteria:

(a) Living in the area for at least 15 to 20 years

(b) Not working in a noisy environment (i.e in a factory or with noisy machinery)

(c) Housewives and people who are staying home most of the time

(d) Ages between 35 to 55 years old

(e) Not on any long term medication

(f) Do not have illnesses such as hypertension and diabetes

Results of the audiometer test is as follows:

10 number of people	**Suburban**	**Urban**
Noise Induced Hearing Loss (NIHL)	None	2

Tests carried out on a sample of 10 people from the suburban area showed non of the residents have noise induced hearing loss. The testing on the urban residents showed two (2) out of ten (10) to have very mild noise induced hearing loss.

In the DOSH (Department of Occupational Safety and Health) definition of the maximum noise level a person can be exposed to is 90dB(A) for 8 hours/day and 5 days/week. This is for workers in noisy environment. The same definition is used here in assessing hearing loss due to traffic noise.

4.2 DISCUSSION

From the results of the study, it is seen that both the urban and suburban areas did not meet the day and night time noise standards set by WHO for residents. Thus it is important that measures be taken to reduce the traffic noise which is a nuisance and which may pose problems to residents exposed to high noise levels for a long period of time.

The day and night time noise level in the suburban areas are high and in one instance (Table 4.2) the night time level in Kampung Sri Tanjung was higher than even the urban areas. This could be due to motorcycles speeding in the suburban roads with the silencers removed. It is very common amongst the young motorcyclist to do this especially in the suburban areas where there is lack of control on such matters.

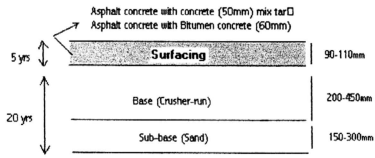
The initiative for reducing vehicles noise can come either from legislations and regulations, from research and development of the vehicle itself and from attention to the tire/road interface.

Most countries including Malaysia have regulations on vehicle noise. Strict enforcement of the vehicle noise emissions must be carried out because the law is not effective if there is no enforcement. Vehicles must be maintained to meet the noise emission standards. Vehicles especially heavy vehicles, after certain number of years should be phased out and be replaced with newer, technologically advanced vehicles which produce less noise and are more road worthy. This could be made as a requirement by the government so as to reduce the older more noisy vehicles on the roads.

Heavy vehicles are noisy because they need large and powerful engines. Development of quieter engines and silencers using better absorption materials is needed. Research and development of such components are necessary and should be carried out by the vehicle manufacturing industries, institutions of higher learning and other related agencies.

The rolling noise caused by the tire/road interaction is the main cause of surface noise. The road surface roughness causes friction with the tires thus producing high noise levels. However, road roughness is needed to provide better skid resistance. Currently asphalt concrete mixed with tar and asphalt concrete with bitumen concrete are used as road surface materials. The road surfacings have a 5 year lifespan.

Following is a sketch of the current road requirement by the Road Works Department of Malaysia (JKR Standard).



Other road surface materials which produce less noise are being used in some countries. Test showed that porous asphalt can attenuate noise by at least 3 to 10 dB(A). It would be beneficial to use road surface materials which produce less noise and research into this should be carried out by the road and transport agencies to reduce traffic noise on our roadways.

Factors affecting noise include traffic flow, mean speed, road gradient and distance between road and the receiver.