A Comparative study of daily variations in noise levels at major crossings on the national highway of Jammu City, J&K

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Abstract: In the present study an attempt has been made to analyze the daily variations in noise levels at five major crossings on the national highway of Jammu city. Three crossings lie within the Jammu city while the other two crossings lie in the periphery of the city. Traffic noise was measured on a weighted scale at all of these locations for periods extending over 15 hrs. and parameters Minimum, Maximum and Leq were obtained. The values of Leq were statistically analyzed using One Way Anova (SPSS-17.0) and differences in Leq values at all the crossings at all time intervals were found to be statistically significant at 0.05 (5%) level of significance. The Jewel crossing in the heart of city on national highway exhibited statistically significant higher values as compared with that of two crossings in the periphery of the city.

Key words: Traffic noise, Major crossings, National Highway, Leq (Equivalent noise level).

Introduction

Road traffic is a major source of noise in urban areas with far-reaching and wide range effect to human beings. It produces disturbance and inversely impacts more than other forms of noise. Urban traffic noise impact assessment has thus become an active environmental acoustics domain. It is a global problem and is common to both developed as well as developing countries. This is curse of population explosion, modern living, urbanization and industrialization. All motor vehicles produce noise from their gear boxes and exhaust systems. In addition, heavy vehicles produce rattles, squeaks and vibrations in accordance with their age and loading capacity. According to the World Health Organization, noise pollution is nowadays the third most hazardous environmental type of pollution, preceded only by air (gas emission) and water pollution (Khilman, 2004). Davis and Masten (2004) stated perception of noise as a subjective experience, short decay time, and difficulty to associate cause with effect were three valid reasons as to why widespread recognition of noise pollution problem has not materialized in a similar fashion as have air and water pollution problems when it comes to health impacts. In the present study, investigation has been carried out to assess daily variations in noise levels during daytime (7.00 a.m-9.00 p.m.) at major crossings of Jammu City.

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Material and Methods

Study Area: The study area has been divided into five sites: Site-I (Ambphalla crossing), Site-II (Rehari crossing), Site-III (Jewel crossing), Site-IV (Vikram crossing), Site-V (Satwari crossing). All these sites lie on the Jammu-Srinagar National Highway I-A.

Site-I (Ambphalla crossing): This crossing forms the exit point of Jammu city. Various vehicles going to different hilly areas of Jammu as well as different parts of the Jammu city pass through this crossing. Thus, there is a huge rush of heavy and light vehicles on this crossing. Site-II (Rehari crossing): This crossing on National Highway (I-A) lies next to

Ambphalla crossing towards Bus stand. Various public and private vehicles going to Rajpura, Parade, Bantalab, Janipur etc. pass through this crossing. Site-III (Jewel crossing): It is one of the busiest crossings of Jammu city. The traffic routes to TalabTillo, Gumat, Bus Stand, Satwari pass through this crossing. Site-IV (Vikram Crossing):- This crossing connects old Jammu city with New Jammu city and lies on NH-IA. Muthi-Bagh-e-Bahu temple, Janipur-Satwari, Ambphalla-Channi, Parade-Railway station, Ambphalla-Airport, Parade-Gandhi Nagar traffic routes pass through this crossing. Site-V (Satwari Crossing):- This crossing is gateway to Jammu city. Public and private vehicles plying to to Airport and, to Pathankot via Samba-Kathua route follow this traffic crossing.

The measurement of sound pressure level was carried out at an interval of one hour from 7.00 A.M.-9.00 P.M. hours, with the help of Sound level meter model-8928 at "A" weightage. During each sampling of noise, 20 readings of SPL were recorded at an interval of 30 seconds in a period of 10 minutes. The minimum and maximum SPL were recorded. From the 20 readings of SPL obtained for each time-interval L_{eq} wascalculated.

The $L_{eq}$was calculated by using the formula:-

$$L_{eq} = 10 \log \left(\sum_{i=1}^{n} fi \, (10^{Li/10})\right) \text{ dB (A)}$$

Where,fi=fraction of time for which the constant sound level persists, i=time intervals,n=number of observations, Li=sound intensity at a time interval.

The analysis of the compiled data of seven days at Ambphalla crossing (Site-I) revealed maximum sound pressure level of 104.7 dB (A) at 6.00 p.m. on Monday. The value of L_{eq} was observed to range from 67.4 dB (A) - 85.8 dB (A) on different days with a maximum average value of 80.4 dB (A) at 11.00 a.m. The compiled data analysis of the various noise indices at Rehari crossing (Site-II) revealed maximum sound pressure level of 104.6 dB (A) at 6.00 p.m. The value of L_{eq} was observed to range from 63.5 dB (A)-83.0 dB (A) on different days with a maximum average value of 79.7 dB (A) at 6.00 p.m. The analysis of the compiled data of seven days at Jewel crossing (Site-III) revealed maximum sound pressure level of 106.2 dB (A) at 2.00, 3.00 and 7.00 p.m. The value of L_{eq} was observed to range from 71.0 dB (A)-90.2 dB (A) on different days with a maximum average value of 87.5 dB (A) at 2.00 p.m. The Vikram crossing (Site-IV) on analysis of the compiled data of seven days revealed maximum sound pressure level of 106.9 dB (A) at 1.00 p.m. The value of L_{eq} was observed to range from 64.7 dB (A)-85.3 dB (A) on different days with a maximum average value of 82.8 dB (A) at 11.00 a.m. The analysis of the compiled data of seven days at Satwari crossing (Site-V) revealed maximum sound pressure level of 106.7 dB (A) at 11.00 a.m. The value of L_{eq} was observed to range from 67.7 dB (A)-84.8 dB (A) on different days with a maximum average value of 82.4 dB (A) at 3.00 p.m. From the above analysis it can be concluded that all the crossings exhibited same trend of rise in noise level from 7.00 a.m. to afternoon. Thereafter, value decreased only for 1-2 dB (A) but exhibited random trends. These increasing values correspond with increase in commercial activity, traffic flow rate, opening of shops, institutes and thereafter values remain elevated till 9.00 p.m. due to continuity of these activities. But all the sites on all the days during all the day hours (7.00-9.00 p.m.) exhibited value above the prescribed limits of 65.0 dB (A) and 55.0 dB (A) for commercial and residential areas respectively as set by Central Pollution Control Board.Dhillon *et al.* (1994) in Ludhiana, Ravichandran*et al.* (1998) in Hosur (Tamilnadu), Das *et al.* (1999) in Jaipur, Pandya and Srivastava (1999) in Jabalpur, Chakraborty *et al.*(2002) in Calcutta, Mishra (2004) in Rewa town (M.P),Rao *et al.*(2007) in Vishakhapatnam city,Rampal and Pathania (2008) andRampal and Pathania (2009) in Bishnah Town of Jammu, also observed the values of noise levels above the

noise level values of commercial and residential areas as prescribed by Central Pollution Control Board. The values of L_{eq}were statistically analyzed using One Way Anova (SPSS-17.0) and differences in L_{eq} values at all the crossings at all time intervals were found to be statistically significant at 0.05 (5%) level of significance. The Jewel crossing in the heart of city on national highway exhibited statistically significant higher values as compared with that of two crossings in the periphery of the city.

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Table I. Showing daily variations in noise levels at Ambphalla crossing (Site-I) of Jammu city during different days of the week.

		Noise levels (dB A) at														
	Noise parameters	**7.00 A.M**	**8.00 A.M**	**9.00 A.M**	**10.00 A.M**	**11.00 A.M**	**12.00 P.M**	**1.00 P.M**	**2.00 P.M**	**3.00 P.M**	**4.00 P.M**	**5.00 P.M**	**6.00 P.M**	**7.00 P.M**	**8.00 P.M**	**9.00 P.M**
Sunday	**Min.**	39.9	45.1	54.4	51.7	50.3	50.8	49.2	52.6	48.2	53.6	52.5	54.0	53.3	47.4	44.2
	Max.	79.2	86.4	93.6	99.6	100.5	96.6	98.5	101.4	94.3	98.4	100.4	97.8	101.4	94.3	90.7
	L_{eq}	68.6*	70.3*	74.8*	77.9*	74.4*	74.6*	74.9*	77.0*	75.9*	74.4*	69.4*	77.8*	80.6*	76.1*	76.4*
Monday	**Min.**	48.4	52.0	57.5	67.7	67.7	62.0	59.1	54.6	59.4	60.6	62.2	66.5	54.2	58.1	53.3
	Max.	89.1	90.6	99.1	101.5	101.5	98.3	102.3	96.2	103.6	94.4	100.6	104.7	95.7	98.4	99.2
	L_{eq}	71.4*	73.0*	77.4*	82.4*	85.8*	77.9*	78.2*	78.4*	80.6*	77.6*	78.6*	78.4*	80.6*	78.3*	76.9*
Tuesday	**Min.**	46.1	48.3	52.7	66.1	67.8	63.5	59.8	64.7	65.1	59.2	60.5	66.5	61.4	61.3	58.6
	Max.	90.4	97.6	99.2	102.9	98.4	96.6	101.2	98.2	103.4	98.6	96.1	99.3	99.6	99.2	97.8
	L_{eq}	72.2*	77.2*	76.0*	80.2*	81.5*	77.6*	77.6*	78.3*	81.2*	77.4*	80.1*	78.4*	80.4*	79.4*	75.3*
Wednesday	**Min.**	45.2	47.6	54.2	64.5	63.9	62.5	59.3	64.1	65.4	63.8	66.1	62.9	59.4	62.0	58.2
	Max.	87.1	94.5	98.6	103.3	100.7	95.4	102.6	99.7	97.5	101.4	103.2	102.1	99.2	98.4	98.7
	L_{eq}	71.6*	76.3*	79.2*	82.0*	81.5*	80.0*	80.4*	80.6*	80.4*	81.6*	81.4*	81.0*	79.7*	79.8*	76.8*
Thursday	**Min.**	47.2	46.1	58.8	63.4	64.5	58.2	57.1	62.4	62.0	64.5	59.6	67.2	68.0	57.1	52.4
	Max.	84.5	90.4	95.2	100.2	101.2	97.6	94.3	102.5	96.6	100.7	98.4	104.1	98.7	103.4	90.9
	L_{eq}	67.4*	71.6*	77.2*	80.0*	80.0*	75.8*	76.2*	79.6*	80.3*	77.9*	79.8*	84.3*	78.9*	80.4*	77.1*
Friday	**Min.**	50.5	48.6	53.4	65.8	66.0	65.7	59.6	62.5	59.4	60.8	61.9	58.9	64.3	61.4	59.3
	Max.	90.3	94.2	99.3	102.4	98.8	99.1	100.1	99.3	101.2	98.4	102.3	98.5	101.2	98.2	96.8
	L_{eq}	74.0*	71.6*	73.0*	80.8*	79.4*	78.0*	79.3*	78.5*	80.6*	77.0*	78.8*	79.4*	81.9*	79.8*	77.6*
Saturday	**Min.**	50.2	46.3	61.1	62.2	66.3	63.1	61.4	67.5	63.5	60.6	65.7	63.8	58.9	56.7	51.4
	Max.	81.4	90.7	97.8	100.1	99.1	97.6	100.7	104.2	100.8	96.8	102.2	98.3	96.4	98.6	94.8
	L_{eq}	69.1*	72.1*	76.4*	79.0*	80.4*	76.7*	78.4*	78.4*	79.9*	77.8*	77.0*	80.6*	76.3*	78.8*	74.4*

*= Significant at 0.05 (5%) level of significance.

Table II. Showing daily variations in noise levels at Rehari crossing (Site-II) of Jammu city during different days of the week.

		Noise levels (dB A) at														
	Noise parameters	**7.00 A.M**	**8.00 A.M**	**9.00 A.M**	**10.00 A.M**	**11.00 A.M**	**12.00 P.M**	**1.00 P.M**	**2.00 P.M**	**3.00 P.M**	**4.00 P.M**	**5.00 P.M**	**6.00 P.M**	**7.00 P.M**	**8.00 P.M**	**9.00 P.M**
Sunday	**Min.**	40.5	53.6	56.0	51.5	53.0	51.3	53.2	54.0	56.3	53.2	55.2	52.1	57.1	51.5	50.3
	Max.	89.2	98.2	95.7	94.7	100.1	98.7	99.7	95.8	100.3	95.6	98.3	101.6	99.8	97.2	95.7
	L_{eq}	67.0*	72.4*	75.8*	75.1*	76.2*	77.0*	76.0*	75.3*	75.0*	75.6*	76.4*	75.9*	76.8*	74.9*	76.0*
Monday	**Min.**	39.9	54.2	51.7	62.4	58.8	63.1	67	56.4	62.4	62.9	61.1	67.3	69.8	65.1	52.9
	Max.	87.4	92.5	90.4	102.4	99.6	98.9	102	103.3	98.8	97.4	98.6	104.6	99.8	102.6	93.3
	L_{eq}	66.6*	74.3*	77.4*	79.7*	79.8*	77.8*	79.9*	79.4*	80.3*	80.2*	78.4*	80.6*	79.0*	79.5*	76.8*
Tuesday	**Min.**	39.9	42.1	44.7	49.5	54.9	59.4	58.6	59.6	56.4	52.7	56.4	55.4	51.7	45.2	45.7
	Max.	85.7	96.8	100.9	97.3	99.6	104.3	101.1	96.3	98.9	97.7	101.2	98.9	100.2	94.8	99.9
	L_{eq}	67.2*	75.7*	77.1*	79.8*	79.6*	79.7*	83.0*	77.6*	80.1*	77.4*	81.0*	80.5*	79.4*	79.4*	78.7*
Wednesday	**Min.**	39.9	44.6	52.1	50.8	54.6	52.7	51.4	49.3	57.5	52.0	48.4	53.6	54.2	56.5	51.2
	Max.	89.7	97.8	101.4	99.2	100.1	98.6	96.2	101.8	97.4	92.7	93.7	104.2	93.9	102.9	100.4
	L_{eq}	71.6*	75.4*	80.5*	80.1*	79.3*	77.4*	78.3*	79.3*	79.4*	77.2*	79.6*	79.3*	77.2*	79.2*	74.3*
Thursday	**Min.**	42.0	44.2	49.3	50.4	65.8	57.3	60.4	66.7	67.2	62.8	63.9	65.8	58.2	66.3	59.8
	Max.	82.3	91.6	88.7	96.4	103.4	98.1	100.3	102.6	101.4	98.3	102.8	99.2	98.6	100.5	101.7
	L_{eq}	63.5*	74.2*	80.2*	79.5*	80.5*	78.5*	79.6*	78.5*	80.7*	78.8*	81.1*	80.5*	80.0*	82.7*	80.0*
Friday	**Min.**	42.7	41.6	54.8	63.4	64.9	66.8	67.5	66.1	67.7	65.2	61.4	62.9	59.7	58.8	56.4
	Max.	90.8	99.4	100.7	104.2	101.4	103.9	98.4	99.8	102.6	101.7	98.8	100.4	99.1	100.1	101.2
	L_{eq}	66.2*	73.5*	80.1*	77.3*	80.7*	77.4*	78.6*	78.5*	79.3*	80.4*	78.3*	80.7*	79.5*	78.0*	78.1*
Saturday	**Min.**	42.4	52.7	54.9	65.7	66.2	62.7	63.2	66.1	68.4	64.8	65.9	66.2	59.8	62.8	65.3
	Max.	87.6	91.4	97.2	100.2	99.1	98.3	98.7	102.9	101.7	100.4	98.8	103.1	100.7	99.8	101.2
	L_{eq}	66.2*	73.7*	81.1*	79.5*	79.9*	77.8*	80.5*	79.0*	80.6*	77.2*	79.8*	80.5*	80.5*	77.9*	79.7*

*= Significant at 0.05 (5%) level of significance.

Table III. Showing daily variations in noise levels at Jewel crossing (Site-III) of Jammu city during different days of the week.

		Noise levels (dB A) at														
	Noise parameters	**7.00 A.M**	**8.00 A.M**	**9.00 A.M**	**10.00 A.M**	**11.00 A.M**	**12.00 P.M**	**1.00 P.M**	**2.00 P.M**	**3.00 P.M**	**4.00 P.M**	**5.00 P.M**	**6.00 P.M**	**7.00 P.M**	**8.00 P.M**	**9.00 P.M**
Sunday	**Min.**	43.2	49.5	52.1	53.2	54.7	52.1	53.7	54.6	55.2	53.1	54.6	53.9	53.1	55.1	53.9
	Max.	89.4	95.1	100.4	102.7	102.6	101.4	102.8	103.5	100.4	102.3	103.5	104.2	104.3	101.7	103.1
	L_{eq}	72.8*	77.9*	79.4*	82.3*	78.8*	79.5*	79.9*	82.5*	80.5*	80.4*	80.6*	82.4*	81.4*	81.6*	82.1*
Monday	**Min.**	45.6	46.2	54.6	64.2	65.4	62.5	65.9	67.4	67.1	64.5	66.2	68.3	68.3	62.3	63.9
	Max.	87.3	95.4	102.5	105.1	104.6	105.6	104.2	105.2	106.2	104.3	103.7	105.2	102.5	105.1	104.2
	L_{eq}	72.7*	80.9*	85.8*	88.0*	90.2*	88.6*	90.2*	89.2*	88.8*	87.6*	87.7*	87.9*	87.9*	88.6*	89.3*
Tuesday	**Min.**	44.7	51.6	63.4	67.3	66.4	63.7	60.6	65.9	67.8	65.6	64.7	66.4	64.8	66.4	64.9
	Max.	89.5	95.4	104.8	105.9	103.5	102.3	104.8	106.2	105.4	103.1	104.5	103.7	106.2	104.1	105.4
	L_{eq}	77.6*	79.0*	87.6*	87.1*	88.1*	85.8*	88.5*	89.6*	89.6*	88.8*	85.5*	89.4*	88.7*	88.2*	89.8*
Wednesday	**Min.**	46.2	52.8	57.9	65.4	68.4	65.7	64.3	66.9	65.3	63.7	65.2	62.4	61.2	63.8	64.6
	Max.	87.4	97.4	104.8	103.5	105.2	103.4	104.7	103.2	105.1	104	102.5	104.7	103.8	104.2	105.4
	L_{eq}	71.0*	80.4*	88.4*	90.2*	89.1*	83.0*	86.6*	88.5*	87.7*	86.3*	87.1*	86.8*	86.6*	87.6*	85.3*
Thursday	**Min.**	45.1	48.4	68.2	65.9	67.9	64.1	63.7	65.6	67.1	63.8	64.2	62.9	64.9	65.9	64.6
	Max.	86.9	99.7	104.1	103.7	105.4	103.4	104.1	104.8	105.3	102.5	104.6	103.4	104.8	105.2	103.5
	L_{eq}	71.8*	77.8*	88.3*	87.8*	89.4*	87.2*	85.0*	88.0*	86.4*	86.5*	86.0*	86.6*	86.2*	84.2*	87.6*
Friday	**Min.**	46.1	50.3	63.4	66.1	62.8	61.3	62.4	64.9	67.1	63.2	65.1	62.0	67.4	63.2	66.3
	Max.	88.4	92.5	104.3	105.2	102.6	103.4	101.4	105.3	104.3	102.5	105.4	102.4	105.7	103.3	104.3
	L_{eq}	74.7*	77.2*	87.8*	87.6*	87.4*	86.2*	84.8*	88.1*	87.5*	85.4*	87.8*	87.2*	87.0*	87.2*	87.4*
Saturday	**Min.**	43.6	49.1	61.1	64.8	60.7	58.4	61.5	64.7	68.2	64.7	65.9	63.7	62.9	64.8	63.7
	Max.	89.1	95.7	103.6	105.7	103.2	102.5	103.4	104.2	105.3	102.1	104.4	103.5	103.8	102.7	105.3
	L_{eq}	72.9*	79.4*	87.0*	87.7*	87.4*	86.3*	87.0*	86.6*	87.8*	85.4*	88.0*	88.0*	87.8*	86.5*	86.4*

*= Significant at 0.05 (5%) level of significance.

Table IV. Showing daily variations in noise levels at Vikram crossing (Site-IV) of Jammu city during different days of the week.

		Noise levels (dB A) at														
	Noise parameters	**7.00 A.M**	**8.00 A.M**	**9.00 A.M**	**10.00 A.M**	**11.00 A.M**	**12.00 P.M**	**1.00 P.M**	**2.00 P.M**	**3.00 P.M**	**4.00 P.M**	**5.00 P.M**	**6.00 P.M**	**7.00 P.M**	**8.00 P.M**	**9.00 P.M**
Sunday	**Min.**	43.8	49.3	53.9	59.8	58.4	61.7	57.1	55.8	59.6	60.2	54.8	58.1	59.9	61.7	56.8
	Max.	82.5	92.4	88.6	96.3	97.5	95.8	100.3	98.2	101.2	99.7	96.3	100.4	101.6	98.3	102.6
	L_{eq}	68.1*	74.7*	76.3*	78.5*	78.7*	76.5*	76.9*	78.6*	79.2*	75.9*	77.3*	79.5*	78.4*	79.5*	78.7*
Monday	**Min.**	44.5	54.3	59.2	57.4	67.1	66.2	65.3	67.2	68.4	64.3	62.8	66.2	61.9	65.2	67.9
	Max.	87.1	95.8	97.4	103.9	105.4	102.1	100.7	101.3	103.2	101.1	102.7	105.6	103.5	100.7	101.8
	L_{eq}	69.5*	78.0*	80.1*	84.6*	85.3*	83.0*	80.2*	83.3*	84.2*	81.1*	81.2*	84.4*	82.3*	79.3*	84.1*
Tuesday	**Min.**	48.3	56.8	65.2	67.4	68.1	61.5	58.4	59.7	62.2	59.4	67.6	61.8	60.1	67.5	58.7
	Max.	85.1	99.4	100.8	102.1	104.7	101.8	97.5	100.4	100.3	99.8	101.9	102.7	99.4	103.2	100.5
	L_{eq}	69.6*	77.9*	80.7*	81.4*	84.4*	80.8*	84.0*	81.6*	82.3*	80.2*	83.0*	82.4*	82.1*	80.2*	82.3*
Wednesday	**Min.**	42.6	44.8	57.3	68.4	66.8	64.2	61.7	58.3	63.2	61.5	63.0	67.4	60.9	58.2	56.4
	Max.	83.9	91.5	98.2	105.1	102.3	104.1	98.6	97.4	99.8	102.4	100.7	103.2	103.5	100.1	102.7
	L_{eq}	64.7*	75.5*	80.5*	82.2*	82.6*	82.4*	80.0*	79.9*	83.7*	80.5*	82.1*	81.1*	83.5*	82.4*	80.0*
Thursday	**Min.**	46.4	45.1	54.9	61.8	65.4	62.7	57.4	60.2	64.2	59.3	63.8	62.9	66.1	60.2	63.9
	Max.	84.3	90.5	98.6	97.4	101.6	98.2	106.9	101.9	103.4	100.9	72.2	105.1	103.3	100.4	104.1
	L_{eq}	68.4*	79.8*	82.6*	80.9*	83.0*	80.4*	80.7	79.9*	83.7*	81.1*	81.4*	82.4*	81.2*	82.2*	81.9*
Friday	**Min.**	42.6	49.4	55.9	65.1	66.1	63.9	61.2	58.5	59.4	56.4	61.6	64.3	63.9	60.2	65.8
	Max.	91.4	94.2	98.1	102.3	104.7	102.7	100.5	101.8	101.7	103.1	98.5	102.5	103.7	100.9	104.2
	L_{eq}	73.1*	75.3*	80.7*	81.5*	83.5*	81.6*	80.5*	81.1*	82.1*	81.5*	80.7*	79.6*	80.9*	81.8*	82.8*
Saturday	**Min.**	50.2	48.7	57.6	59.2	62.5	64.9	67.2	64.2	59.4	62.3	60.3	66.8	61.5	58.7	56.2
	Max.	86.3	93.5	100.3	102.4	103.2	102.1	100.3	104.7	104.8	98.9	100.1	102.9	101.9	104.3	102.1
	L_{eq}	69.1*	76.8*	80.3*	78.9*	81.9*	80.1*	83.5*	80.3*	81.1*	79.7*	82.3*	81.9*	80.1*	78.9*	79.5*

*= Significant at 0.05 (5%) level of significance.

Table V. Showing daily variations in noise levels at Satwari crossing (Site- V) of Jammu city during different days of the week.

		Noise levels (dB A) at														
	Noise parameters	**7.00 A.M**	**8.00 A.M**	**9.00 A.M**	**10.00 A.M**	**11.00 A.M**	**12.00 P.M**	**1.00 P.M**	**2.00 P.M**	**3.00 P.M**	**4.00 P.M**	**5.00 P.M**	**6.00 P.M**	**7.00 P.M**	**8.00 P.M**	**9.00 P.M**
Sunday	**Min.**	45.2	52.6	54.1	53.2	56.2	54.8	52.8	54.2	57.8	53.9	55.7	54.2	56.3	58.4	53.9
	Max.	81.3	86.4	89.7	93.7	95.4	97.2	95.1	98.6	100.6	97.4	96.5	101.9	99.7	100.2	98.5
	L_{eq}	67.8*	70.8*	78.2*	78.8*	79.9*	77.6*	78.8*	79.0*	79.2*	78.5*	79.2*	79.8*	80.2*	77.0*	79.0*
Monday	**Min.**	46.8	48.2	53.7	60.1	58.2	52.7	53.1	56.8	57.4	54.2	57.2	56.4	58.6	55.9	53.8
	Max.	87.1	90.4	98.1	102.4	100.7	98.2	100.4	101.4	102.1	99.6	100.4	101.9	99.4	98.1	102.2
	L_{eq}	68.7*	75.5*	82.0*	81.1*	81.4*	79.2*	82.6*	81.8*	83.2*	83.4*	82.0*	81.9*	83.4*	80.7*	82.0*
Tuesday	**Min.**	43.6	46.2	54.6	62.3	57.1	53.7	55.9	56.4	62.4	56.5	58.0	57.4	53.8	55.2	52.9
	Max.	79.5	87.4	98.5	103.1	99.8	97.6	100.2	100.8	104.7	98.3	100.5	102.6	97.4	103.1	100.7
	L_{eq}	67.7*	76.4*	82.8*	84.2*	81.6*	80.2*	83.1*	81.3*	82.7*	81.2*	82.4*	82.4*	81.7*	82.5*	80.5*
Wednesday	**Min.**	42.4	48.7	54.6	61.4	56.1	52.8	54.1	57.6	62.7	53.2	58.4	60.1	53.3	52.4	63.8
	Max.	81.6	91.2	97.8	101.4	100.8	96.3	98.2	100.9	101.5	98.1	100.6	99.4	96.2	101.5	98.2
	L_{eq}	68.0*	78.4*	82.9*	84.8*	81.5*	80.1*	82.4*	80.8*	82.6*	78.5*	83.2*	81.2*	81.8*	80.3*	81.4*
Thursday	**Min.**	44.6	43.2	50.9	55.2	63.1	52.7	56.2	54.1	56.7	52.9	53.4	56.2	53.9	58.4	52.6
	Max.	89.2	92.6	96.4	100.9	96.9	102.1	98.4	97.3	101.4	98.2	96.5	100.1	102.4	99.1	97.4
	L_{eq}	73.4*	75.6*	82.2*	81.7*	82.2*	81.0*	78.8*	81.8*	82.4*	80.8*	79.4*	82.6*	83.1*	80.8*	79.4*
Friday	**Min.**	46.2	45.1	59.6	57.2	59.1	62.6	56.7	54.8	58.9	55.9	53.8	61.2	56.4	57.2	53.6
	Max.	88.4	94.3	99.5	102.4	106.7	100.9	98.4	101.2	102.8	96.4	100.7	103.4	103.1	100.5	101.4
	L_{eq}	71.4*	77.8*	80.8*	82.0*	81.8*	81.0*	80.2*	81.6*	83.0*	81.0*	81.4*	81.6*	82.8*	81.7*	78.2*
Saturday	**Min.**	43.1	47.4	51.7	58.4	59.2	54.7	63.2	56.1	58.2	54.6	52.1	57.0	54.1	55.9	52.6
	Max.	84.9	85.1	95.2	99.3	102.2	99.2	100.6	95.6	99.5	101.5	98.7	102.4	100.4	98.1	101.2
	L_{eq}	71.7*	76.2*	80.8*	83.0*	80.8*	81.6*	80.0*	82.2*	83.6*	80.0*	80.4*	81.4*	81.4*	79.1*	79.6*

*= Significant at 0.05 (5%) level of significance.

Table VI. Showing daily variations in noise levels at different crossings of Jammu city.

		Noise levels (dB A) at														
	Noise parameters	**7.00 A.M**	**8.00 A.M**	**9.00 A.M**	**10.00 A.M**	**11.00 A.M**	**12.00 P.M**	**1.00 P.M**	**2.00 P.M**	**3.00 P.M**	**4.00 P.M**	**5.00 P.M**	**6.00 P.M**	**7.00 P.M**	**8.00 P.M**	**9.00 P.M**
Ambphalla	**Avg. Min.**	46.8	47.7	56	63.1	63.8	60.8	57.9	61.2	60.4	60.4	61.2	62.8	59.9	57.7	53.9
	Avg. Max.	86	92.1	97.5	101.4	100	97.3	100	100.2	99.6	98.4	100.5	100.7	98.9	98.6	95.6
	Avg. L_{eq}	70.6	73.2	76.3	80.3	80.4	77.2	77.9	78.7	79.8	77.7	77.9	80	79.8	78.9	76.4
Rehari	**Avg. Min.**	41	47.6	51.9	56.2	59.7	59	60.2	59.7	62.3	59.1	58.9	60.5	58.6	58	54.5
	Avg. Max.	87.5	95.4	96.4	99.2	100.5	100.1	99.5	100.4	100.2	97.7	98.9	101.7	98.9	99.7	99.1
	Avg. L_{eq}	66.9	74.2	78.9	78.7	79.4	77.9	79.4	78.2	79.3	78.1	79.2	79.7	78.9	78.8	77.7
Jewel	**Avg. Min.**	44.9	49.7	60.1	63.8	63.8	61.1	61.7	64.3	65.4	62.7	63.7	62.8	63.2	63.1	63.1
	Avg. Max.	88.3	95.9	103.5	104.5	103.9	103.1	103.6	104.6	104.6	103	104.1	103.9	104.4	103.8	104.5
	Avg. L_{eq}	73.4	78.9	86.3	87.2	87.2	85.2	86	87.5	86.9	85.8	86.1	86.9	86.5	86.3	86.8
Vikram	**Avg. Min.**	45.5	49.8	57.7	62.7	64.9	63.6	61.2	60.6	62.3	60.5	62	63.9	62	61.7	60.8
	Avg. Max.	85.8	93.9	97.4	101.4	102.8	101	100.7	100.8	102.1	100.8	96.1	103.2	102.4	101.1	102.6
	Avg. L_{eq}	68.9	76.9	80.2	81.1	82.8	80.7	80.8	80.7	82.3	80	81.1	81.6	81.2	80.6	81.3
Satwari	**Avg. Min.**	44.6	47.3	54.2	58.3	58.4	54.9	56	55.7	59.2	54.5	55.5	57.5	55.2	56.2	54.7
	Avg. Max.	84.6	89.6	96.5	100.5	100.4	98.8	98.8	99.4	101.8	98.5	99.1	101.7	99.8	100.1	99.9
	Avg. L_{eq}	69.8	75.8	81.4	82.2	81.3	80.1	80.8	81.2	82.4	80.5	81.1	81.6	82.1	80.3	80