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Noise Level Signatures Over Bida Town, Niger State, Nigeria

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Abstract

The trends towards urbanization in Nigeria mean that it becomes of academic interest to quantify and describe the levels and prevalence of urban noise pollution. In this study, noise level signatures over portions of Bida town were measured and the results have been duly presented. The core objective of this study is to quantify the levels of noise at strategic locations in Bida town in relation to the internationally-recognised tolerable level of 70dB so that a pattern of noise pollution in these areas could be established. A couple cadastral sheets from the map of Bida town were considered for this survey, and measurements were taken from over one hundred stations of interest on the ground. Thirty-four GPS points were surveyed for noise level values for each of the cadastral maps whence it was noticed that nearly all of these points suffer from high ambient amount of noise pollution at peak activity periods. In each case, the loudest contributor to environmental noise pollution was the electric milling machine. The noise level corresponding to the electric milling machine was found to be 97.06 dBA in Sheets 14 and 22; in Sheet 16 the noise level was peaked at 102.2 dBA. All of the principal sources of noise in the three sheets considered for investigation can be appropriately termed "noisy". It is recommended that, in the nearest future, a more detailed survey over longer exposure periods spread across several days should be conducted for Bida in order to define a broader noise signature picture for the town.

Keywords: Environmental pollution, noise, survey, health, hazard

INTRODUCTION

Interest is now being increasingly centred on noise pollution as an integral part of the concept of "environmental pollution" (Jonah *et al.,* 2009; Franssen *et al*., 2004; Abumere *et al.,* 1999; Ising *et al.*, 1999). The trends towards urbanization in Nigeria mean that it becomes of academic interest to quantify and describe the levels and prevalence of urban noise pollution. In this study, noise level signatures over portions of Bida town were measured and the results have been duly presented.

Problem Statement

At present, there exists no database on the noise pollution patterns of Bida town, so it is hoped that this study would serve as a pointer or "roadmap" in this regard.

Aim of Study

The core objective of this study is to quantify the levels of noise at strategic locations in Bida town in relation to the internationally-recognised tolerable level of 70dB so that a pattern of noise pollution in these areas could be established.

Scope of Study

Three cadastral sheets of Bida town were considered for this survey, and measurements were taken from over one hundred stations of interest on the ground. Before noise level measurements were made, site selection and co-ordinate identification were run in tandem for one hundred and fifty locations scattered on the ground in the parts of Bida towns identified on the cadastral sheets; the street locations of the stations of interest were recorded, as well as their corresponding Global Positioning System (GPS) values. These GPS values were recorded by the aid of a hand-held GPS unit. Subsequently, several values of noise levels were recorded at peak times at the appropriate stations that are affected by high noise levels.

Literature Review

Jonah et al (2009) pointed out that only a limited amount of studies have been carried out in Nigeria with respect to noise level measurements within Nigerian cities. Abumere et al (1999) carried out a study to investigate noise pollution within Port-Harcourt City. Their study concluded that noise exposure limits in Port-Harcourt City exceeds the value recommended by the International Environmental Protection Agency (IEPA), i.e. 70dB; consequently, they suggested some strategies for limiting noise levels in Port-Harcourt city. Menkiti (1976) highlighted the fact that the incidence of impaired hearing in Nigeria could be blamed on exposure to noise (Abumere *et al.,* 1999). Onuu and Menkiti (1993) have analyzed the spectra of road traffic noise for parts of southeastern Nigeria and they concluded that this type of noise dominates the low frequency range, 500-800Hz (Abumere *et al.,* 1999). The Microsoft Encarta (2008) stated that most hearing loss occurs in workplaces, where workers may be unable to avoid unhealthy noise,

and where exposure may continue for years. Factory workers, construction workers, farmers, military personnel, police officers, firefighters, and musicians all have reason to be concerned about their occupational exposure to noise. Even at levels below those that cause hearing loss, noise pollution produces problems. Noise makes conversation difficult, interferes with some kinds of work, and disturbs sleep. As a source of stress, it can promote high blood pressure and other cardiovascular problems, as well as nervous disorders. Noise also puts stress on domestic animals and wildlife. In remote areas, helicopters and military aircraft often frighten animals. Aircraft noise in Alaska, for example, has been shown to reduce the survival rate of caribou calves. There is concern that increasing noise levels in the oceans may confuse the natural sonar that whales use to navigate, communicate, and locate food.

Ouise (2002) has addressed the negative effects resulting from the exposure to road traffic noise on people's well-being. Following observations, the writer said annoyance was one of the first and most direct reaction on environmental noise, and that the continuous exposure of people to road traffic noise lead to suffering from various kinds of discomfort; this he said reduced the number of their well-being elements. He also said his conclusion was still determined by non-acoustical factors like sensitivity, socio-economic situation and age. He reported that certain quantitative relationship between the objective quantities characterising road traffic noise was established. Finally, he pointed out that the importance of these findings could be in more efficient ways of planning road traffic activity, in order to secure and provide some succour. Shih (1971) saw noise as sound with little or no periodicity, with its essential characteristic of undesirability. He then defined noise as any annoying or unwanted sound. He also pointed out that the rapid increase of noise level in the environment was a national public health hazard, and that noise affects man's state of mental, physical and social well-being, saying it was a type of air pollution. The author saw his work as an attempt to arrive at the understanding of the general situation on the problem of noise, being then, a rather new subject among other branches of science. His survey consisted of four major parts: the present status of noise pollution, its sources, its effects, and the control.

FIELD EQUIPMENT

The standard Xtech A-weighted noise level meter was used to measure noise levels for the purpose of this research.

RESULTS AND DATA ANALYSIS

Sheet 14: The noise level dataset for the stations of Sheet 14 that were recognised to suffer from significant noise pollution are presented in Table 1.

Table 1: Values of noise levels from various sources

	Description of Sources of Noise				GPS Values		Noise Level
	Source of Noise	Model/Serial No.	Rating	Age	UTM Values	Local Coordinates	(1st)
1	Lister generator	251110NM	75kVA	1yr	X: 0827656 Y: 1006328	E: 11.9804396° N: 009.0924367°	90.0
2	Vulcanising machine	07116743BN	3hp	1yr	X: 0827677 Y: 1006351	E: 11.9806322° N: 009.0926429°	93.2
3	Elemax generator	SH2900DX	3kVA	6 mo	X: 0827726 Y: 1006415	E: 11.9810823° N: 009.0932174°	87.3
4	Birla Yamaha generator	LG 1000	0.8kVA	8 mo	X: 0827810 Y: 1006354	E: 11.9818411° N: 009.0926601°	91.2
5	Milkano generator	MK658800I	27.5kVA	1mo	X: 0827814 Y: 1006218	E: 11.9818673° N: 009.0914312°	93.8
6	Birla Yamaha generator	LG 1000	0.8kVA	3 mo	X: 0827824 Y: 1006309	E: 11.981965° N: 009.0922525°	91.2
7	Vulcanising machine	07116743BN	3hp	1yr	X:0827867 Y:1006267	E:11.9823526° N: 009.0918699°	93.2
8	Lister generator	251110NM	10.5kVA 20W	2 yr	X:0827935 Y:1006217	E: 11.9829668° N: 009.0914132°	90.0
9	Grinding machine	G200		6 mo	X: 0827018 Y: 1006193	E: 11.9746315° N: 009.0912645°	95.5

10	Yamaha generator	DY9500LXHB	2kVA	1yr	X: 0828128 Y: 1006066	E: 11.9847094° N:009.0900348°	95.5
11	Vulcanising machine	07116743BN	3hp	2 yr	X:0828146 Y:1006156	E: 11.9848798° N: 009.0908465°	93.2
12	Elemax generator	SH2900DX	3kVA	9 mo	X: 0828181 Y:1006070	E: 11.9851914° N: 009.090067°	87.3
13	Grinding machine	G200		3 yr	X: 0828105 Y:1006063	E: 11.9845002° N: 009.0900094°	95.5
14	Tiger head generator	TG 2700	0.8kVA	6 mo	X: 0828357 Y: 1006097	E:11.9867928° N: 009.0902978°	88.3
15	Imec diesel engine	EC380CX	2.6kVA	1yr	X: 0828364 Y:1006088	E:11.9868558° N: 009.090216°	86.3
16	Elemax generator	SH2900DX	3kVA	9 mo	X: 0828433 Y: 1006037	E: 11.987479° N: 009.0897501°	87.3
17	Vulcanising machine	07116743BN	3hp	3 mo	X: 0828437 Y: 1006014	E: 11.9875136° N: 009.089542°	93.2
18	Vulcanising machine	07116743BN	3hp	1yr	X: 0828522 Y: 1005981	E: 11.9882836° N: 009.0872306°	93.2
19	Yamaha generator	DY9500LXHB	3kVA	9 mo	X: 0828486 Y: 1005914	E: 11.9879514° N: 009.088635°	95.5
20	Elemax generator	SH2900DX	3kVA	6 mo	X: 0828489 Y: 1005898	E:11.9879775° N; 009.0884903°	87.3
21	Sunico generator	HD578093K	8kVA	18mo	X: 0828525 Y: 1005880	E:11.9883033° N: 009.088325°	97.3
22	Tiger head generator	TG 2700	0.8kVA	6 mo	X: 0828636 Y:1006848	E: 11.9893846° N: 009.0970611°	88.3

23	Birla Yamaha	LG 1000	0.8kVA	3 mo	X: 0828560 Y: 1006850	E: 11.9886941° N: 009.0970849°	91.2
24	Himo gasoline generator	0987658ET	10.5kVA	I yr	X: 0828617 Y: 1006851	E: 11.9892122° N: 009.0970896°	95.5
25	Milkano generator	MK658800I	10.5kVA	2 yr	X: 0828683 Y: 1006907	E: 11.9898162° N: 009.0975906°	93.8
26	Corn milling machine	G200			X: 0828739 Y: 1006853	E: 11.990321° N: 009.0970986°	95.5
27	Vulcanising machine	07116743BN	3hp	2 yr	X: 0828772 Y: 1006848	E: 11.9906206° N: 009.097051°	93.2
28	Welding machine		87kVA	2 yr	X: 0828806 Y: 1006875	E: 11.9909302° N: 009.0971297°	94.3
29	Tiger head generator	TG 2700	0.8kVA	9 mo	X: 0828917 Y: 1006821	E: 11.9919363° N: 009.0967962°	88.3
30	Yamaha generator	DY9500LXHB	3kVA	6 mo	X: 0828928 Y: 1006817	E: 11.9920359° N: 009.0967593°	95.5
31	Tiger head generator	TG 2700	0.8kVA	6 mo	X: 0828941 Y:1006849	E: 11.9921565° N: 009.0970474°	88.3
32	Birla Yamaha	LG 1000	0.8kVA	3 mo	X: 0828972 Y: 1006801	E: 11.9924346° N: 009.0966115°	91.2
33	Vulcanising machine	07116743BN	3hp	2 yr	X: 0828995 Y: 1006813	E: 11.9926445° N: 009.0967182°	93.2
34	Vulcanising machine	07116743BN	3hp	1 yr	X: 0828024 Y: 1006818	E: 11.9838206° N: 009.0968357°	93.2

The sources of noise identified in Sheet 14 together with their corresponding mean prevailing values have been identified and tabulated in Table 2 in juxtaposition with the IEPA-recognised threshold value of 70dBA.

Table 2: Mean values of the sources of noise of Sheet 14

No.	Sources of Noise	Threshold Values (dBA)	Av. Noise Val.(dBA)
1	Welding machine	70	95.40
2	Vulcanising machine	70	92.46
3	Electric miller	70	97.06
4	Petrol generator	70	84.30
5	Diesel generator	70	93.10

The relationship of Table 2 is presented in visual format as Fig. 1.

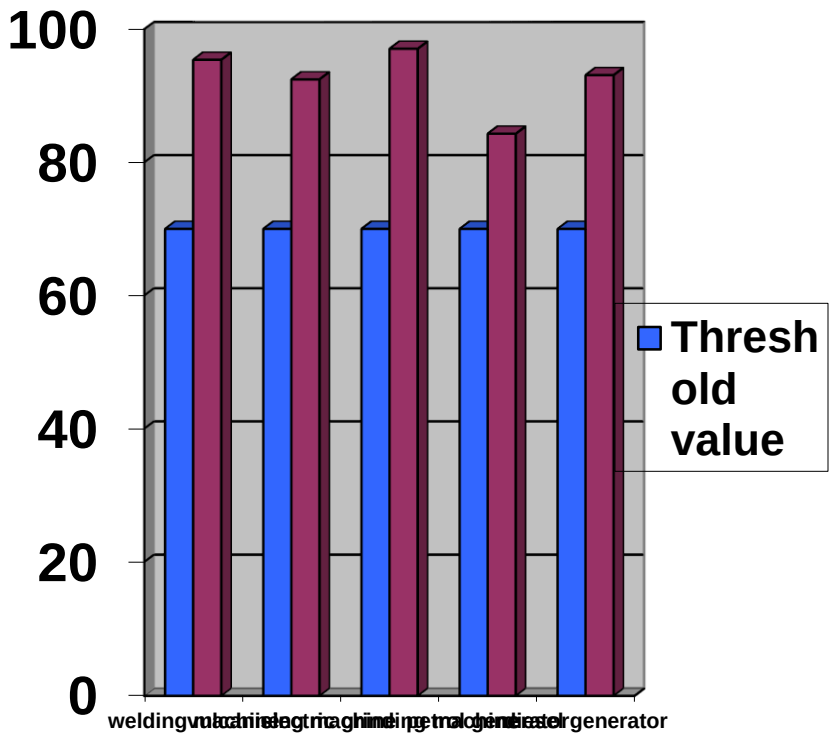

Fig. 1: Bar chart representation of the values of the sources of noise vis-à-vis the threshold values for Sheet14. Vertical axis is in dBA

Sheet 22: The noise level dataset for the stations of Sheet 22 that were recognised to suffer from significant noise pollution are presented in Table 3.

Table 3: Values of noise levels from various sources

	Description of Sources of Noise				GPS Values		Noise Level (1st)
	Sources of Noise	Mode/serial no.	Rating	Age	UTM Values	Local Coordinates	
1	Elemax generator	SH2900 DX	2kVA	1yr	X:0170525 Y:1003075	E: 06.003274 N: 009.0629154	87.3
2	Vulcanising machine	07116743BN	3hp	1 yr	X: 0170541 Y: 1003085	E: 06.0034186 N: 009.0630070	93.2
3	Tiger head generator	950	0.8kVA	8 mo	X: 0170553 Y: 1003068	E: 06.003529 N: 009.0628738	88.3
4	Birla Yamaha generator	LG 1000	0.8kVA	8 mo	X: 0170572 Y: 1003070	E: 06.0037015 N: 009.0628738	91.2
5	Milkano generator	MK658800I	27.5kVA	1 mo	X: 0170604 Y: 1003080	E: 06.0039915 N: 009.0629665	93.8
6	Birla Yamaha generator	LG 1000	0.8kVA	3 mo	X: 0170627 Y: 1003068	E: 06.0042014 N: 009.0628598	91.2

7	Vulcanising machine	07116743BN	3hp	1 yr	X: 0170675 Y: 1003090	E: 06.0042014 N: 009.0630621	93.2
8	Lister generator	251110 NM	10.5kVA 20W	2 yr	X: 0170724 Y; 1003063	E: 06.0050832 N: 009.0628219	90.0
9	Birla Yamaha	LG 1000	0.8kVA	6 mo	X: 0170773 Y: 1003052	E: 06.0055293 N: 009.0627261	91.2
10	Yamaha generator	DY9500 LXHB	2kVA	1 yr	X: 0170775 Y: 1003136	E:06.005523 N: 009.063485	95.5
11	Vulcanising machine	07116743BN	3hp	2 yr	X: 0170789 Y: 1003202	E: 06.0056634 N: 009.0640824	93.2
12	Elemax generator	SH2900 DX	3kVA	9 mo	X: 0170818 Y:1003252	E: 06.0059232 N: 009.0645362	87.3
13	Grinding machine	G200		3 mo	X: 0170848 Y: 1003321	E: 06.0061907 N: 009.0651617	95.5
14	Tiger head generator	TG 2700	0.8kVA	6 mo	X: 0170880 Y: 1003303	E: 06.0064828 N:009.0650015	88.3
15	Imec diesel engine	EC380CX	2.6kVA	1 yr	X: 0170922 Y: 1003289	E: 06.0068655 N: 009.0648782	86.3
16	Elemax generator	SH2900 DX	3kVA	9 mo	X: 0170970 Y: 1003270	E: 06.0068643 N: 009.0649172	87.3
17	Vulcanising machine	07116743BN	3hp	3 mo	X: 0171022 Y:1003125	E: 06.0077865 N: 009.0634041	93.2

18	Vulcanising machine	0711674 3BN	3HP	1 yr	X:0171006 Y:1003099	E: 06.007643 N:009.0631681	93.2
19	Yamaha generator	DY9500 LXHB	3kVA	9 mo	X: 0170987 Y:1003076	E:06.0074721 N: 009.0629589	95.5
20	Elemax generator	SH2900 DX	3kVA	6 mo	X: 0170955 Y: 1003045	E:06.0071836 N: 009.0626765	87.3
21	Sunico generator	HD5780 93K	8kVA	18 MT HS	X: 0170972 Y:1003003	E:06.0073412 N: 009.0622983	97.3
22	Tiger head generator	TG 2700	0.8kVA	6 mo	X: 0170971 Y:1002968	E: 06.0073348 N: 009.0619821	88.3
23	Birla Yamaha	LG 1000	0.8kVA	3 mo	X: 0170958 Y: 1002910	E:06.007221 N: 009.0614572	91.2
24	Himo gasoline generator	0987658 ET	10.5kVA	I yr	X: 0170919 Y: 1002832	E: 06.0068724 N: 009.0607497	95.5
25	Milkano generator	MK658 800I	10.5kVA	2 yr	X: 0170903 Y: 1002785	E: 06.0067306 N: 009.0603239	93.8

26	Corn milling machine	G200			X: 0170890 Y: 1002754	E: 06.0066147 N: 009.0600429	95.5
27	Birla Yamaha	LG 1000	0.8kVA	1 yr	X: 0170884 Y:1002737	E: 06.0065615 N: 009.0598889	91.2
28	Welding machine		87kVA	2 yr	X: 0170885 Y: 1002714	E: 06.0065723 N: 009.0596812	94.3
29	Tiger head generator	TG 2700	0.8kVA	9 mo	X: 0171024 Y: 1003027	E:06.007812 N: 009.062519	88.3
30	Yamaha generator	DY9500 LXHB	3kVA	6 mo	X: 0171069 Y: 1003024	E:06.0082211 N: 009.0624952	95.5
31	Tiger head generator	TG 2700	0.8kVA	6 mo	X: 0171080 Y:1003025	E: 06.008321 N: 009.0625051	88.3
32	Birla Yamaha	LG 1000	0.8kVA	3 mo	X: 0829066 Y: 1004525	E: 11.9931181 N: 009.0760444	91.2
33	Vulcanising machine	0711674 3BN	3hp	2 yr	X: 0829051 Y: 1004588	E: 11.9929956 N: 009.0766145	93.2
34	Vulcanising machine	0711674 3BN	3hp	1yr	X: 0829047 Y: 1004640	E: 11.992954 N: 009.0770846	93.2

The sources of noise identified in Sheet 22 together with their corresponding mean prevailing values have been identified and tabulated in Table 4 in juxtaposition with the IEPA-recognised threshold value of 70dBA.

Table 4: Mean values of the sources of noise of Sheet 22

S/N	Sources of Noise	Threshold Values (dBA)	Av. Noise Val.(dBA)
1	Welding machine	70	95.40
2	Vulcanising machine	70	92.46
3	Electric miller	70	97.06
4	Petrol generator	70	84.30
5	Diesel generator	70	93.10

The relationship of Table 4 is presented in visual format as Fig. 2.

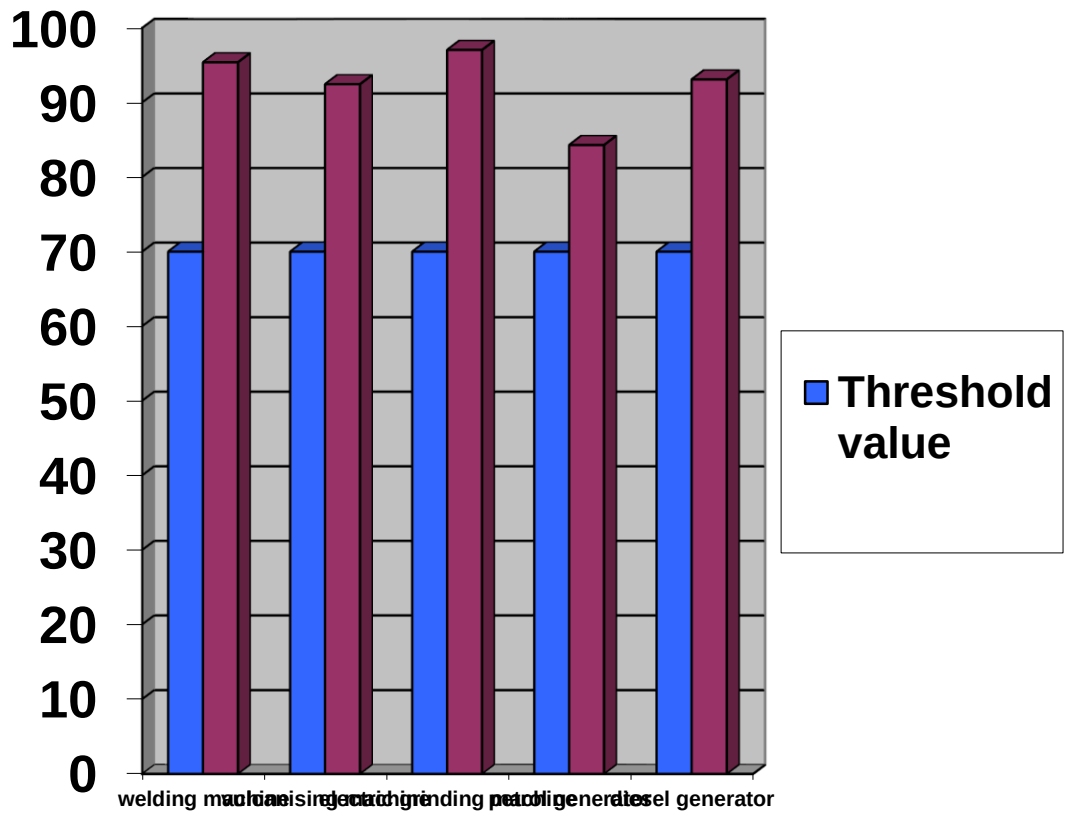

Fig. 2: Bar chart representation of the values of the sources of noise vis-à-vis the threshold values for Sheet 22. Vertical axis is in dBA

Sheet 16: The noise level dataset for the stations of Sheet 16 that were recognised to suffer from significant noise pollution are presented in Table 5.

Table 5: Values of noise levels from various sources

	Description of Sources of Noise				GPS Values		
	Sources of Noise	Model/ Serial No.	Rating	Age	UTM Values	Local Co-ord.	Noise Level
1	Vulcaniser's pump	07116743BN	5.5hp	2 yr	X-0171287 Y-1005560	N- $09^0$05.125' E- $006^0$00.600'	94.0
2	Diesel Generator	John Holt P60	60kVA	10 yr	X-0171292 Y-1005522	N- $09^0$05.105' E- $006^0$00.604'	95.3
3	Petrol Generator	Tiger Gen TG 2700	0.8KVA	7 mo	X-0171297 Y-1005493	N-$09^0$05.105' E-$006^0$00.606'	91.5
4	Vulcaniser's pump	Honda 07116142	8kVA	6 mo	X-0171199 Y-1005491	N-$09^0$05.087' E-$006^0$00.553'	94.0
5	Petrol Generator	Elemax SH2900DX	2.9kA	1.5yr	X-0171293 Y-1005459	N-$09^0$05.071' E-$006^0$00.605'	91.5
6	Diesel Generator	Diesel engine 5195	8.8kVA	2yr	X-0171286 Y-1005552	N-$09^0$05.013' E-$006^0$00.699'	95.3
7	Petrol Generator	Tiger TG 2760	0.8kVA	5yr	X-0171281 Y-1005264	N-$09^0$04.965' E-$006^0$00.699'	91.5
8	Petrol Generator	Cozily UB3000	2kVA	2yr	X-0171289 Y-1005271	N- $09^0$04.969' E- $006^0$00.603'	91.5
9	Vulcaniser's pump	Electric motor	5.5hp	3yr	X-0171291 Y-1005272	N- $09^0$04.969' E- $006^0$00.604'	94.0

10	Diesel generator	Suzuki SV 4500	8kVA	9 mo	X-0171268 Y-1005160	N-09^{0}04.908' E-006^{0}00.592'	95.3
11	Diesel Generators	Jinling DC2600	30kVA	3wk	X-0171263 Y-1005117	N-09^{0}04.885' E-006^{0}00.589'	95.3
12	Petrol Generator	Tiger generator TG 2700	0.8kVA	10mo	X-0171304 Y-1005099	N-09^{0}04.875' E-006^{0}00.612'	91.5
13	Welding Machine			6yr	X-0171376 Y-1005605	N-09^{0}05.150' E-006^{0}00.649'	95.5
14	Petrol Generator	Cozily UB3000	0.8kVA	1yr	X-0171408 Y-1005601	N-09^{0}05.148' E-006^{0}00.667'	91.5
15	Welding Machine		7kVA	2yr	X-0171292 Y-10052718	N- 09^{0}05.211' E- 006^{0}00.603'	95.5
16	Petrol Generator	Biryamaha LG1000	800W	4yr	X-0171296 Y-1005740	N- 09^{0}05.223' E- 006^{0}00.605'	91.5
17	Vulcaniser's pump	07116743BN	5.5hp	3 yr	X-0171308 Y-1005834	N-09^{0}05.274' E-006^{0}00.611'	94.0
18	Petrol milling machine		5.5hp	5 yr	X-0171322 Y-1005982	N-09^{0}05.354' E-006^{0}00.618'	93.5
19	Petrol Generator	Caterpenter G4C02470	500W	1 yr	X-0171355 Y-1006190	N-09^{0}05.467' E-006^{0}00.635'	91.5
20	Milling machines		5.5hp	8 mo	X-0171359 Y-1006245	N-09^{0}05.497' E-006^{0}00.637'	100.9
21	Diesel Generator	Carterpillar G4C02470	500kVA	4 mo	X-0171351 Y-1006375	N-09^{0}05.567' E-006^{0}00.632'	95.3
22	Speakers (video club)	Kenwood A-91	800W	4yr	X-0171344	N- 09^{0}05.594'	98.9

					Y-1006424	E- 006^{0}00.628'	
23	Vulcaniser's pump	Honda 07116142	5.5hp	3yr	X-0171337 Y-1006495	N- 09^{0}05.632' E- 006^{0}00.624'	94.0
24	Diesel Generator	Techno Diesel engine 251110NM	8kVA	10 yr	X-0171218 Y-1006307	N-09^{0}05.530' E-006^{0}00.560'	95.3
25	Petrol Generator	EC3800 CXE	3.5kVA	3.5 yr	X-0171223 Y-1006257	N-09^{0}05.503' E-006^{0}00.563'	91.5
26	Diesel Generator	John Holt P60	60kVA	10 yr	X-0171126 Y-1006238	N-09^{0}05.492' E-006^{0}00.510'	95.3
27	Diesel Generator	Diesel engine 5195ND	8.8kVA	2 yr	X-0171207 Y-1005961	N-09^{0}05.288' E-006^{0}00.556'	95.3
28	Petrol Generator	Cozily UB300	2kVA	5 yr	X-0171288 Y-1005670	N-09^{0}05.185' E-006^{0}00.601'	91.5
29	Petrol Generators	Tiger TG 2700	0.8kV	5.5 yr	X-0171403 Y-1005502	N- 09^{0}05.094' E- 006^{0}00.664'	91.5
30	Motorcycle garage	Motor 07116743BN	5.5hp	2 yr	X-0171665 Y-1005464	N- 09^{0}05.075' E- 006^{0}00.807'	94.0
31	Welding machines	Honda	7kVA	1 yr	X-0171793 Y-1005524	N-09^{0}05.108' E-006^{0}00.877'	95.5
32	Motorcycle garage	Honda	5.5hp	3 yr	X-0171938 Y-1005537	N-09^{0}05.116' E-006^{0}00.956'	94.0
33	Block making machine		7kVA	10 yr	X-01712276 Y-1005527	N-09^{0}05.112' E-006^{0}01.140'	98.3

34	Vulcaniser's pump	5.5hp	6 mo	X-01712393 Y-1005489	N-09^{0}05.092' E-006^{0}01.204'	94.0

The sources of noise identified in Sheet 16 together with their corresponding mean prevailing values have been identified and tabulated in Table 6 in juxtaposition with the IEPA-recognised threshold value of 70dBA.

Table 6: Mean values of the sources of noise of Sheet 16

	Sources of Noise	Threshold Values (dBA)	Av. Noise Val.(dBA)
1	Welding machine	70	88.60
2	Vulcanizing machine	70	94.00
3	Grinding machine	70	102.20
4	Petrol generator	70	92.70
5	Diesel generator	70	95.90
6	Loudspeakers	70	99.00

The relationship of Table 6 is presented in visual format as Fig. 3.

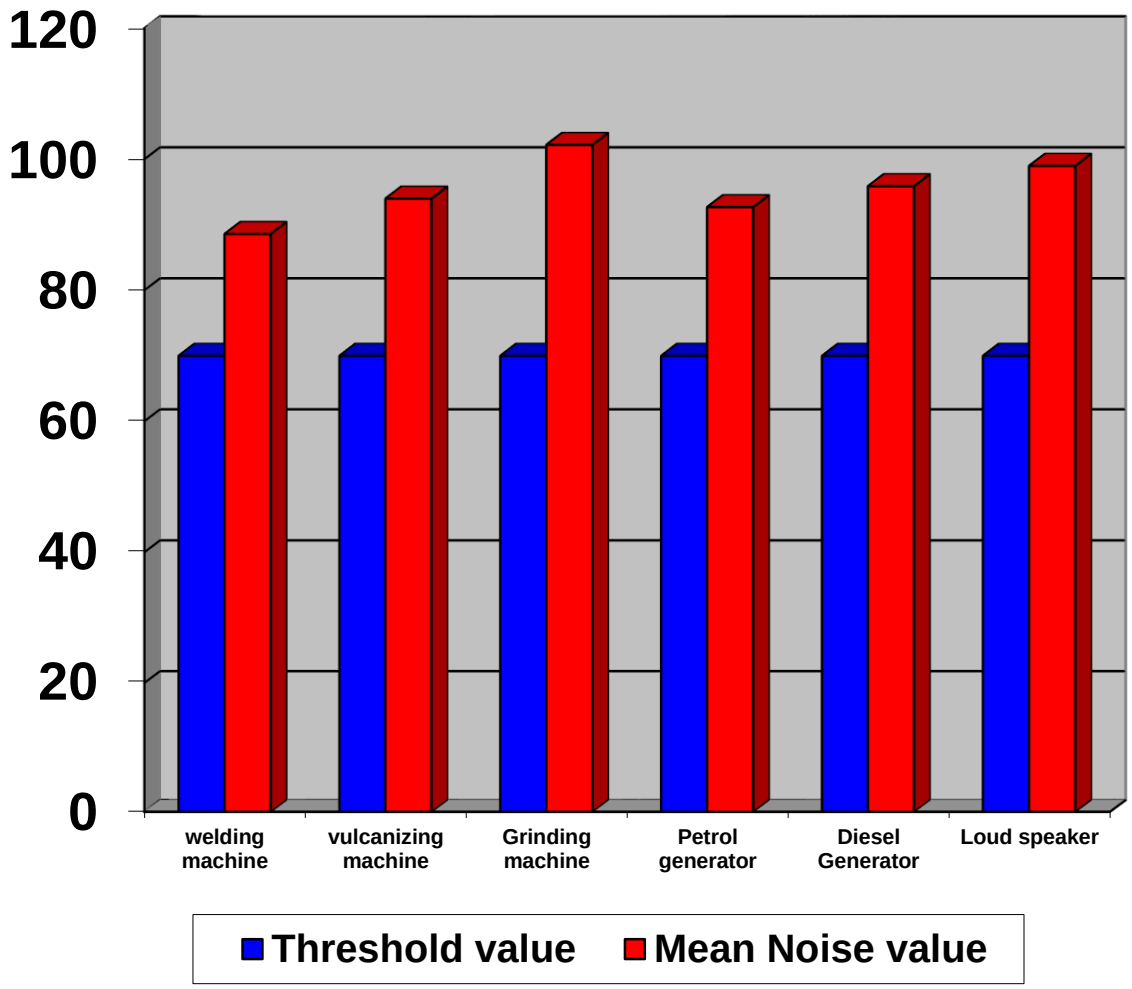

Fig. 3: Bar chart representation of the values of the sources of noise vis-à-vis the threshold values for Sheet 16. Vertical axis is in dBA

DISCUSSION

Of the fifty stations earmarked for survey in Sheet 14 (Table 1), only thirty-four stations were found of interest for noise level measurements; at each of these thirty-four stations, three values of the noise level meter measurements were recorded at two-minute intervals and the results are shown in Table 1. Next, the *sources of noise* identified in Sheet 14 together with their corresponding mean prevailing values have been identified and tabulated in Table 2 in juxtaposition with the IEPA-recognised threshold value of 70dBA. Fig. 1 shows the relationship between the values of noise emitted by the main noise culprits identified in Sheet 14 (welding

machine, vulcanizing machine, electric milling machine, petrol generator, and diesel generator) and the 70dBA value. Sheets 22 and 16 have also been analysed in like manner. However, the "loudspeaker" associated with outdoor music store was identified in Sheet 16 as an additional source of noise.

CONCLUSION

Nearly all of the stations considered in Sheet 14 are observed to suffer from comparatively high noise levels ranging from a peak of 97.06 dBA at stations 9, 13, and 26 to the coincident value of 70dBA at stations 23 and 32. All of the various sources of noise emit sound well above the 70dBA benchmark; of the various sources of noise, the electric milling machines produce the highest level of 97.06dBA.

From Sheet 22, we observe that all of the stations surveyed for noise are characterized by values greater than the 70dBA threshold; not surprising, though, is the fact that the electric milling machine produces the loudest sound in the neighbourhoods of this sheet (Fig. 2). All of the points surveyed in Sheet 16 also show noise level values above the threshold, with the peak of 102.2dBA seen at station 20; from Fig.3 we note that an electric milling machine was located at this point. Whilst not all of the one hundred and fifty stations originally selected were found to be of interest for noise measurements, the stations that were surveyed show predominance signature of high intensity noise at peak activity periods. All of the principal sources of noise in the three sheets considered for investigation can be appropriately termed "noisy".

RECOMMENDATION

Remedial measures that could be taken to mitigate the effects of high noise levels in the various neighbourhoods of Bida town should be built in into the overall local government urban development policy whereby (i) households and businesses should be encouraged to buy generators with high muffling capabilities, (ii) music and videos vendors should be discouraged from blaring tunes at unreasonably high volumes, (iii) as much as possible mechanic garages,

welding workshops should located a reasonably distance away from residential neighbourhoods and the workmen in these outfits should be encouraged to wear earmuffs when their machines are in operation, (iv) housewives should be encouraged to use quieter vegetable blenders instead of the unbearably loud electric milling machines that are a common sights in many households. It is recommended that, in the nearest future, a more detailed survey over longer exposure periods spread across several days should be conducted for Bida in order to define a broader noise signature picture for the town.

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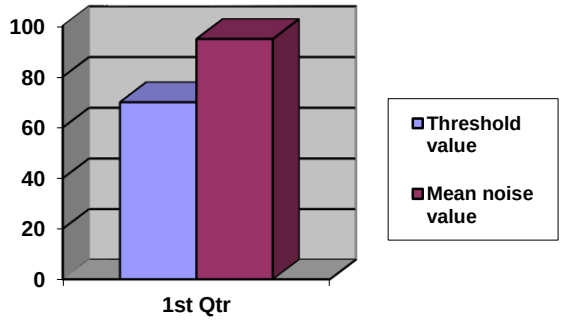
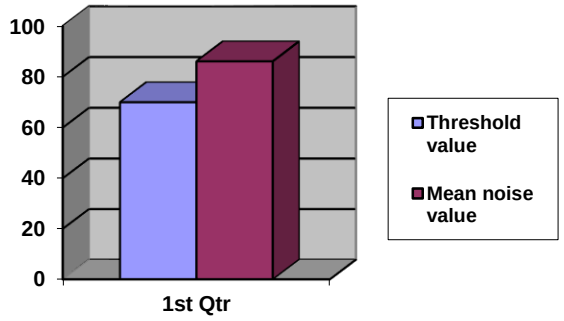
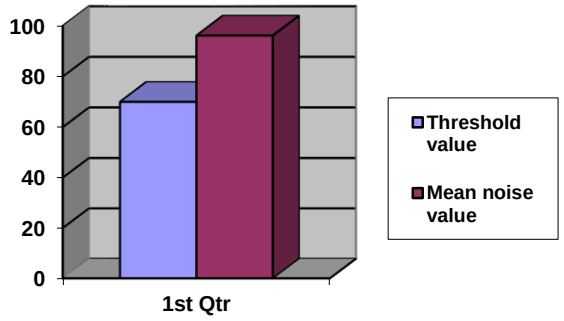
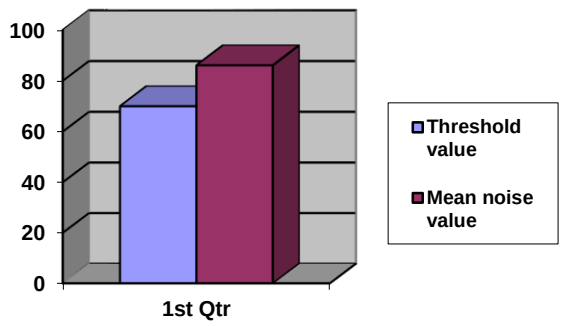
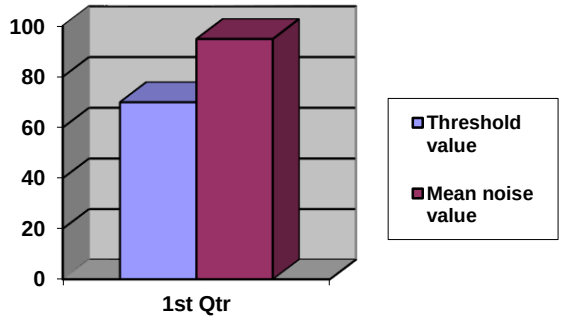
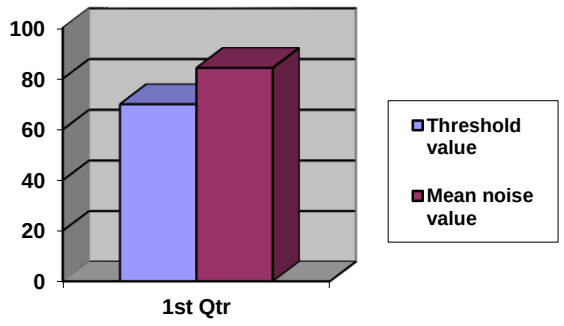
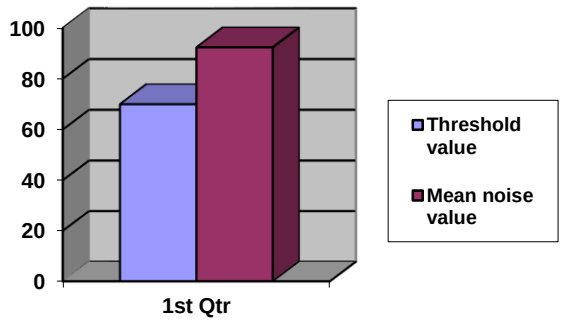
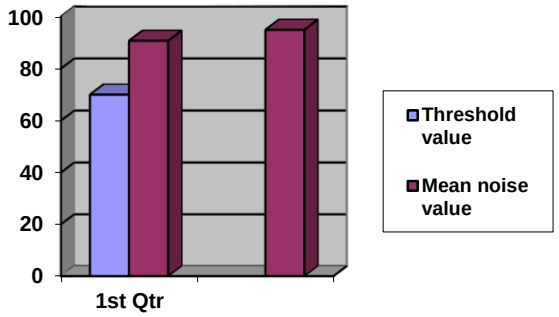
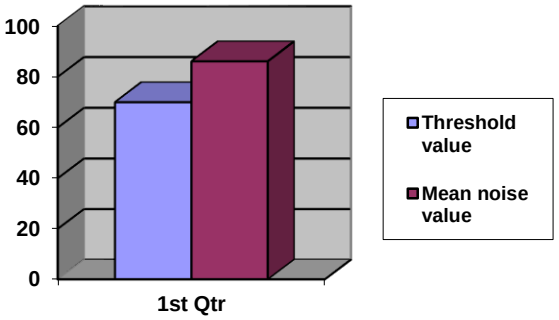
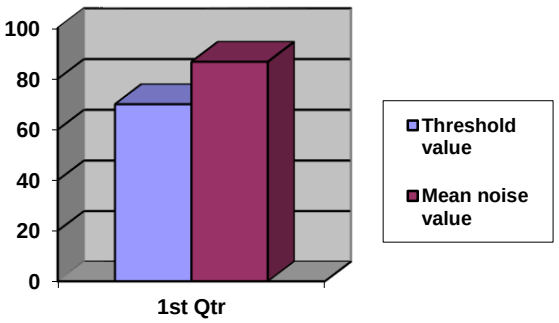
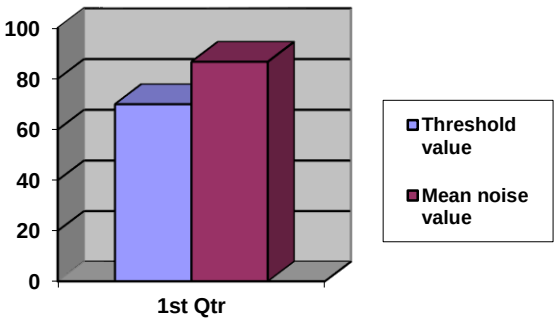
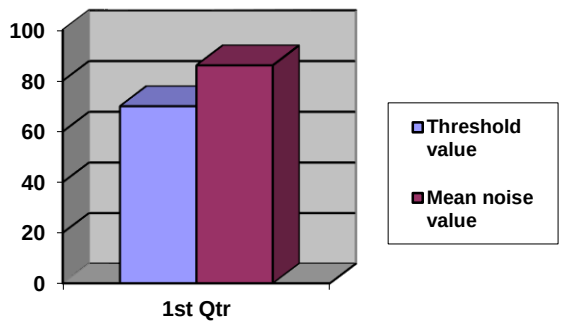
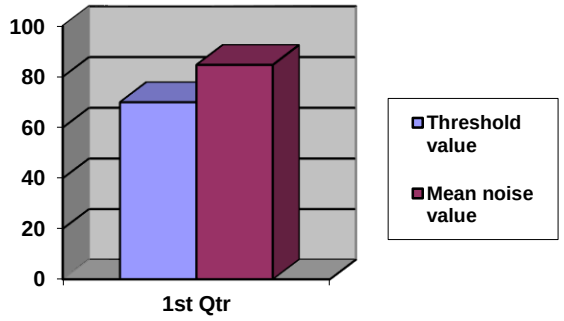
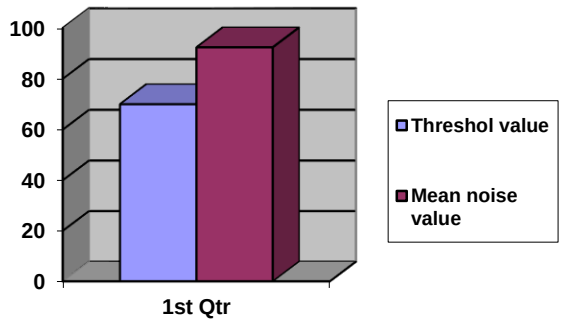
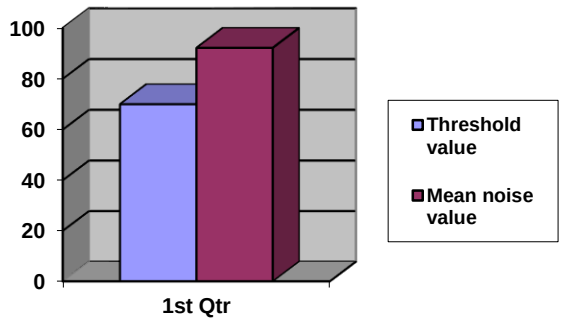
APPENDIX: MORE NOISE DATASET FOR BIDA TOWN

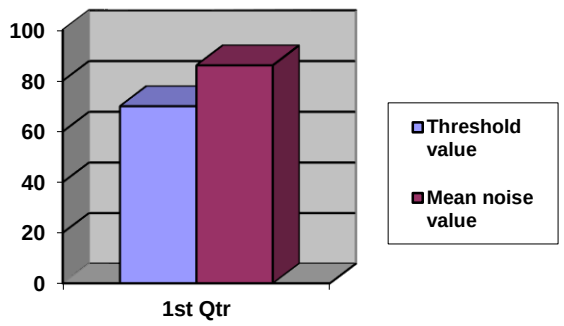
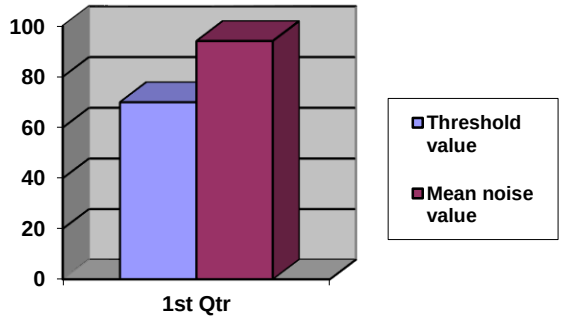
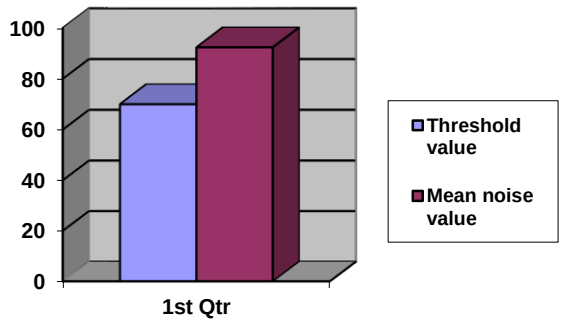
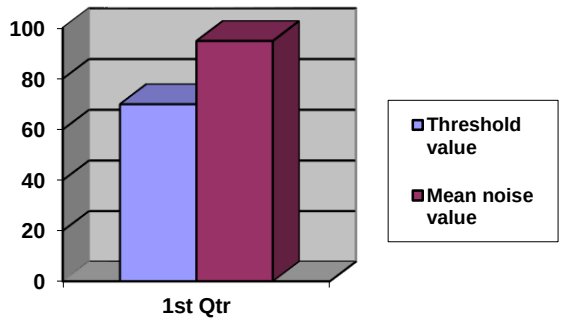
SHEET 5 OF BIDA MAP

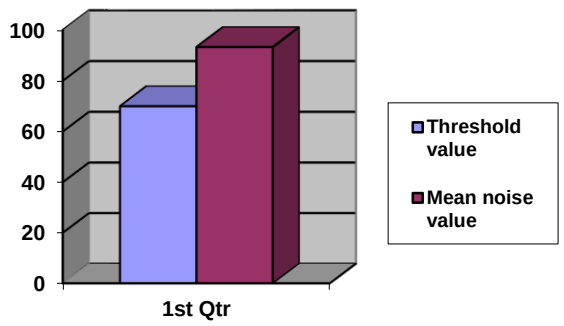
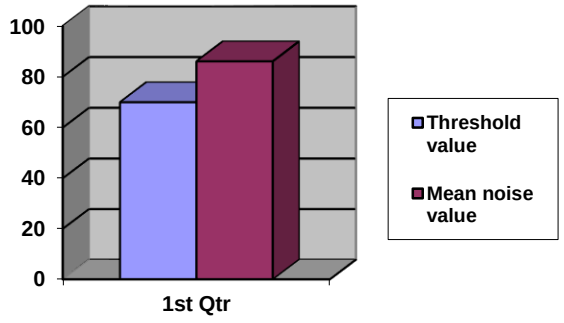
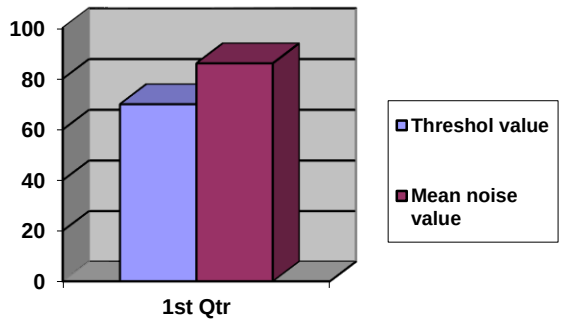
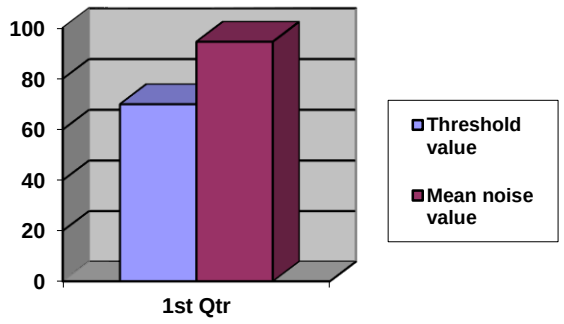
	GPS Values		Mean Noise Values (dBA)	Threshold Values (dBA)	Bar Chart Representation
	UTM	Local Coord			
1	X: 0171449 Y: 1003274	E: 06.0116056 N: 009.0639586	94.9	70	
2	X: 0171460 Y: 1003274	E: 06.0117058 N: 009.0639233	86.1	70	
3	X: 0171484 Y: 1003261	E: 06.0119246 N: 009.063843	96.2	70	

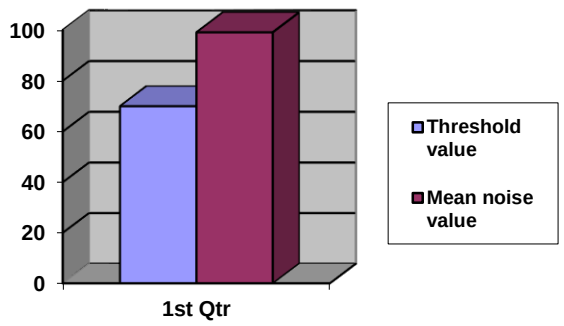
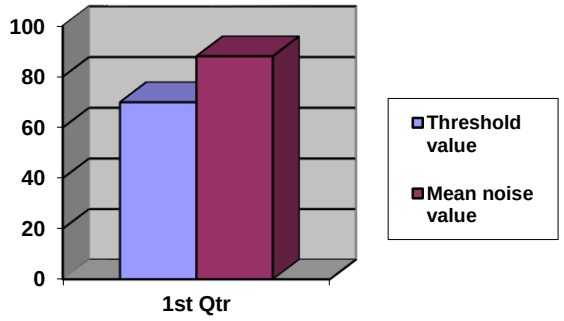
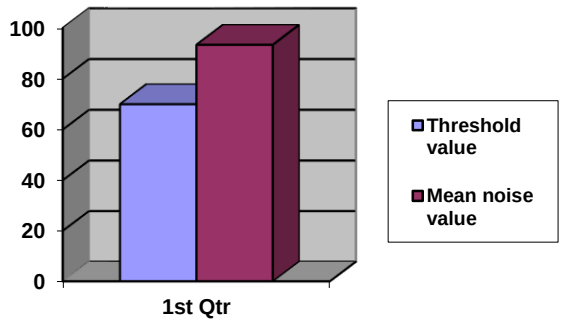
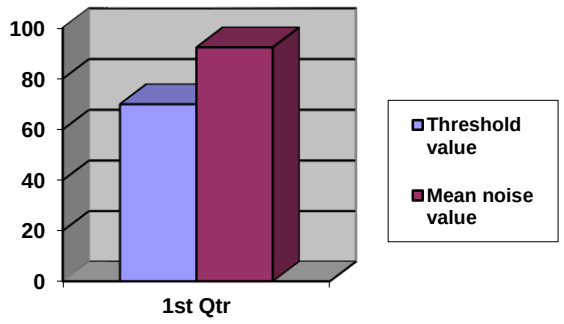
4	X: 0171526 Y: 1003258	E: 06.0123065 N: 009.0638198	86.1	70	
5	X: 0171551 Y: 1003252	E: 06.0125341 N: 009.0637675	94.9	70	
6	X: 0171587 Y: 1003241	E: 06.0128621 N: 009.0636708	84.3	70	
7	X: 0171623 Y: 1003227	E: 06.0131903 N: 009.063547	92.4	70	

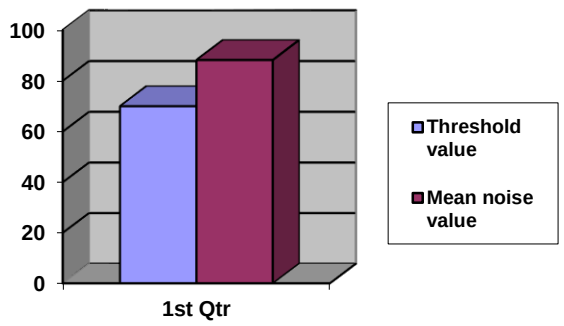
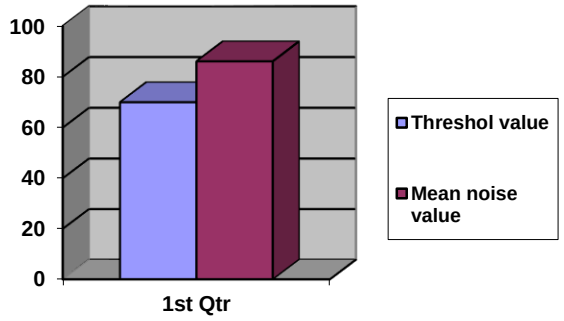
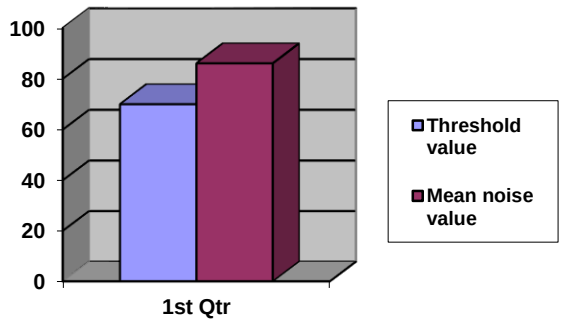
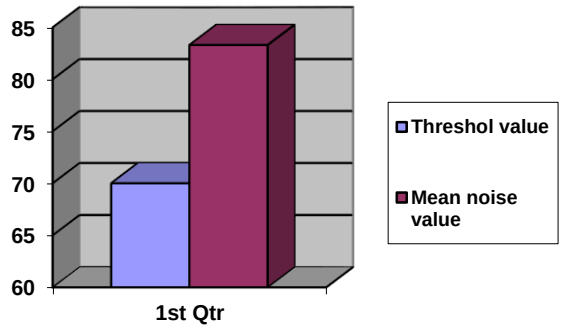
8	X: 0171687 Y: 1003134	E: 06.0137788 N: 009.0627117	94.9	70	
9	X: 0171708 Y: 1003086	E: 06.0139732 N: 009.0622797	86.1	70	
10	X: 0171682 Y: 1003041	E: 06.0137403 N: 009.0618713	86.7	70	
11	X: 0171807 Y: 1003858	E: 06.0148152 N: 009.0692603	86.1	70	

12	X: 0171776 Y:1003948	E: 06.0145268 N: 009.070071	86.1	70	
13	X:0171789 Y:1003924	E: 06.0146467 N: 009.0698552	84.7	70	
14	X: 0171820 Y:1003858	E: 06.0149333 N: 009.0692613	92.4	70	
15	X: 0171847 Y: 1003817	E: 06.0151817 N: 009.068893	92.2	70	

16	X: 0171939 Y: 1003680	E: 06.016028 N: 009.0676623	86.1	70	
17	X: 0171961 Y: 1003621	E: 06.0162323 N: 009.067131	94.1	70	
18	X: 0172028 Y: 1003392	E: 06.0168583 N: 009.0650675	92.4	70	
19	X: 0171971 Y:1003597	E: 06.016325 N: 009.066915	94.9	70	

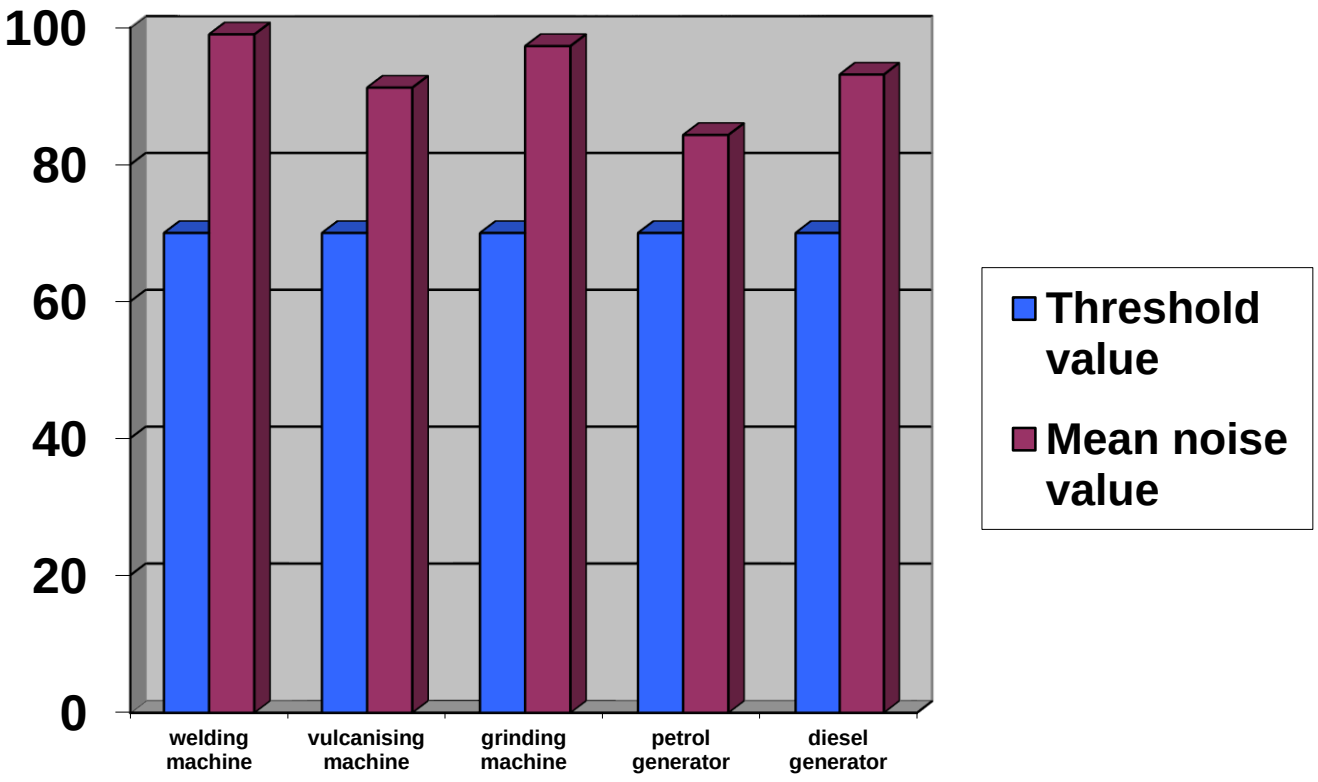
20	X: 0171978 Y: 1003570	E: 06.0163906 N: 009.0666716	93.3	70	
21	X: 0171988 Y: 1003543	E: 06.0164835 N: 009.0664285	86.1	70	
22	X: 0171997 Y: 1003544	E: 06.0165652 N: 009.0664382	86.1	70	
23	X: 0171999 Y: 1003495	E: 06.016587 N: 009.0659957	94.6	70	

24	X: 0171945 Y:1003656	E: 06.0160843 N: 009.067446	99.1	70	
25	X: 0172024 Y: 1003413	E: 06.0168203 N: 009.0652569	88.1	70	
26	X: 0171900 Y: 1003750	E: 06.0156684 N: 009.0682917	93.4	70	
27	X: 0172010 Y: 1003466	E: 06.0166892 N: 009.0657346	92.4	70	

28	X: 0172002 Y: 1003439	E: 06.0166185 N: 009.0654901	88.2	70	
29	X: 0172008 Y: 1003456	E: 06.0166717 N: 009.0656441	86.1	70	
30	X: 0172043 Y: 1003347	E: 06.0169979 N: 009.0646621	86.1	70	
31	X: 0172024 Y: 1003312	E: 06.0168279 N: 009.0643446	83.3	70	

SHEET 5 OF BIDA MAP

	Sources of Noise	Threshold Values (dBA)	Average Noise Values (dBA)
1	Amplifier	70	99.03
2	Vulcanising machine	70	91.25
3	Grinding machine	70	97.32
4	Petrol generator	70	84.33
5	Diesel generator	70	93.16



SHEET 10 OF BIDA MAP

	DESCRIPTION OF SOURCE OF NOISE				GPS VALUES		NOISE LEVEL VALUES (dBA)		
	SOURCE OF NOISE	MODEL/SERIAL NO	RATING	AGE	UTM VALUES	LOCAL COORDINATES	1ST READING	2ND READING	3RD READING
1	Lister generator	251110NM	75KVA	1 YEAR	X= 0828954 Y= 1006168	N= 013.582699 E= 07.4761978	90.0	91.2	90.9
2	Vulcanising machine	07116743BN	3HP	1 YEAR	X= 0828938 Y= 1006199	N= 013.582978 E= 07.4760506	93.2	92.4	92.4
3	Elemax generator		3KVA	6 MTHS	X= 0828921 Y= 1006203	N= 013.583012 E= 07.4758969	96.8	95.9	94.8
4	Birla Yamaha generator	LG 1000	0.8KVA	8 MTHS	X= 0828874 Y=1006203	N= 013.583396 E= 07.4754011	91.2	86.2	86.7
5	Milkano generator		27.5KVA	1 MTHS	X=0828867 Y=1006298	N= 013.583866 E= 07.4754011	95.4	95.8	96.2
6	Birla Yamaha generator	LG 1000	0.8KVA	3 MTHS	X=0828859 Y=1006358	N= 013.584407 E= 07.4753233	91.2	86.2	86.7
7	Vulcanising machine	07116743BN	3HP	1 YEAR	X=0828896 Y=1006275	N= 013.583661 E= 07.4756647	93.2	92.4	91.8
8	Lister generator	251110NM	10.5KVA 20watts	2 YEARS	X=0828915 Y=1006362	N= 013.584448 E = 07.4758279	90.0	91.2	90.9
9	Grinding machine	G200		6MTHS	X=0828939 Y=1006381	N = 013.584622 E = 007.476042	95.5	96.8	98.9

10	Yamaha generator		2KVA	1 YEAR	X=0828951 Y=1006378	N = 13.5845966 E = 007.47615	96.8	95.9	94.8
11	Vulcanising machine	07116743BN	3HP	2 YEARS	X=0829358 Y=1006169	N = 13.5827469 E = 007.479840	93.2	92.4	91.8
12	Elemax generator		3KVA	9 MTHS	X=0829362 Y=1006177	N = 13.5828196 E = 007.479876	96.8	95.9	94.8
13	Grinding machine	G200		3MTHS	X=0829371 Y=1006199	N = 13.5830192 E = 007.479955	95.5	96.8	98.9
14	Tiger head generator	TG 2700	0.8KVA	6MTHS	X= 0829401 Y=1006224	N = 13.5832478 E= 007.480223	88.3	86.7	85.5
15	Imec diesel engine		2.6KVA	1 YEAR	X= 0829447 Y=1006268	N = 13.5836497 E = 007.480634	90.3	95.6	98.9
16	Elemax generator		3KVA	9MTHS	X=0829482 Y=1006300	N = 13.5839421 E = 007.480946	96.8	95.9	94.8
17	Vulcanising machine	07116743BN	3HP	3 MTHS	X=0829462 Y=1006363	N = 13.5845186 E = 007.481644	93.2	92.4	91.8

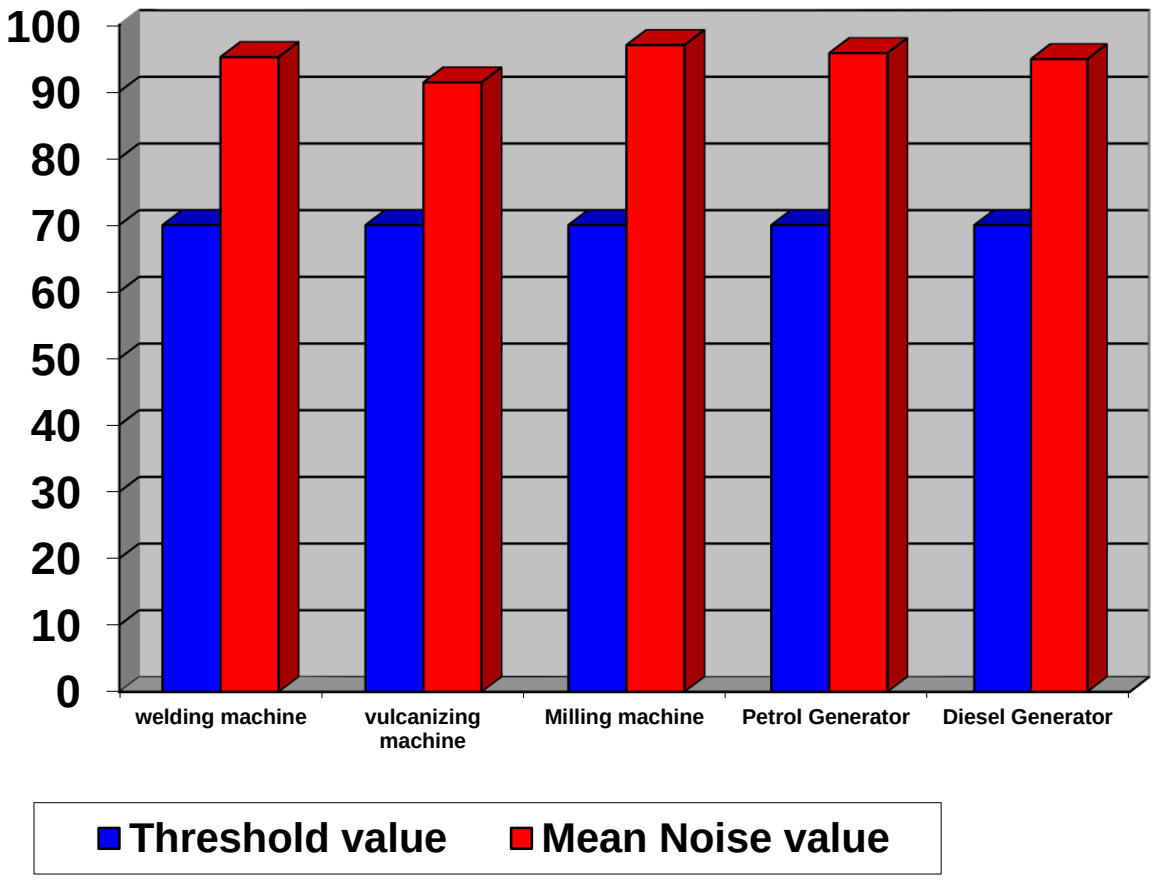
18	Vulcanising machine	07116743BN	3HP	1 YEAR	X=0829542 Y=1006383	N = 13.5846975 E = 007.481479	93.2	92.4	91.8
19	Yamaha generator		3KVA	9MTHS	X=0829572 Y=1006471	N = 13.5854954 E = 007.481742	96.8	95.9	94.8
20	Elemax generator		3KVA	6MTHS	X=0829623 Y=1006439	N = 13.5852111 E = 007.482205	96.8	96.8	94.8
21	Sunico generator		8KVA	18 MTHS	X=0829658 Y=1006478	N = 13.5855667 E = 007.482516	90.3	95.6	98.9
22	Tiger head generator	TG 2700	0.8KVA	6MTHS	X=0829668 Y=1006570	N = 13.5863988 E = 007.482598	88.3	86.7	85.5
23	Birla Yamaha	LG 1000	0.8KVA	3MTHS	X=0829675 Y=1006512	N = 13.5858755 E = 007.482598	91.2	86.2	86.7
24	Himo gasoline generator		10.5KVA	I YEAR	X=0829675 Y=1006556	N = 13.5862764 E = 007.482667	96.8	95.9	94.8
25	Milkano generator		10.5KVA	2 YEARS	X=0170202 Y=1006586	N = 13.5492903 E = 007.535126	95.4	95.8	96.2
26	Corn milling machine				X=0170758 Y=1006562	N = 13.5487633 E = 007.540142	95.5	96.8	98.9
27	Vulcanising machine	07116743BN	3HP	2 YEARS	X=0170779 Y=1006472	N = 13.5482797 E = 007.540332	93.2	92.4	91.8
28	Welding machine		7KVA	3YEARS	X=0170228 Y=1006503	N = 13.548547^{0} E = 007.535362	94.3	95.7	96.1
29	Tiger head generator	TG 2700	0.8KVA	9 MTHS	X=0170251 Y=1006618	N= 13.549578^{0} E = 007.535567	88.3	86.7	85.5
30	Yamaha generator		3KVA	6MTHS	X=0170238 Y=1006597	N = 13.5493896 E = 007.535450	96.8	95.9	94.8

31	Tiger head generator	TG 2700	0.8KVA	6MTHS	X=0170266 Y=1006610	N = 13.5495066 E = 007.535703	88.3	86.7	85.5
32	Birla Yamaha	LG 1000	0.8KVA	3MTHS	X=0170326 Y=1006637	N = 13.5497497 E = 007.536243	91.2	86.2	86.7
33	Vulcanising machine	07116743BN	3HP	2 YEARS	X=0170391 Y=1006670	N = 13.5500469 E = 007.536829	93.2	92.4	91.8
34	Vulcanising machine	07116743BN	3HP	1 YEAR	X=0170370 Y=1006665	N = 13.5500014 E = 007.536640	93.2	92.4	91.8

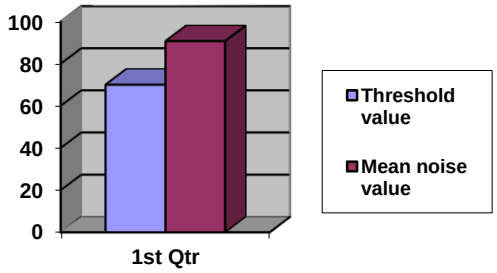
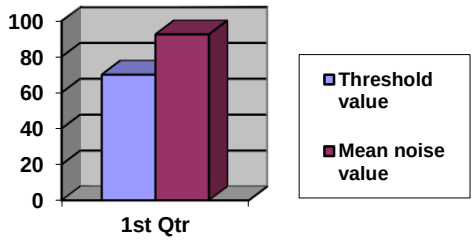
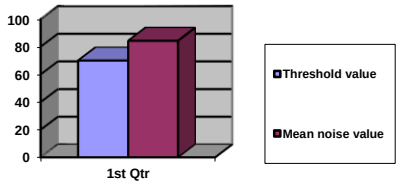
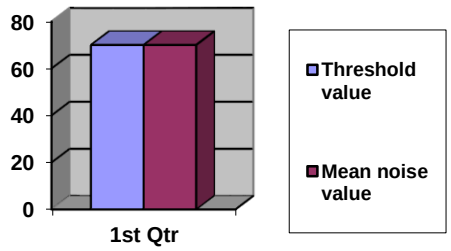
SHEET 10 OF BIDA MAP

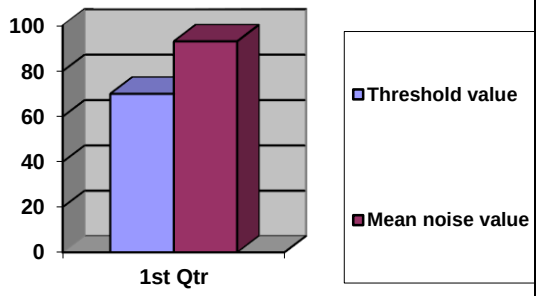
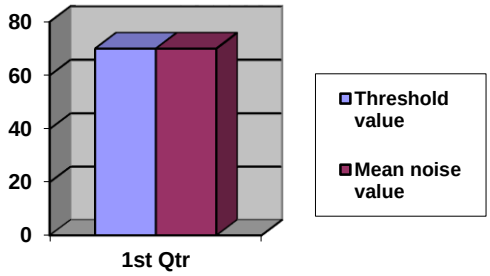
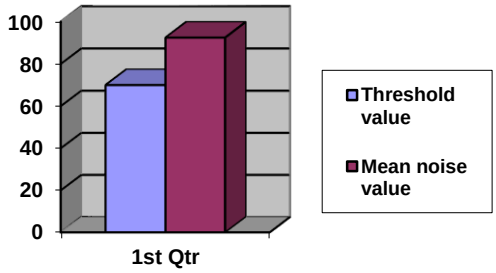
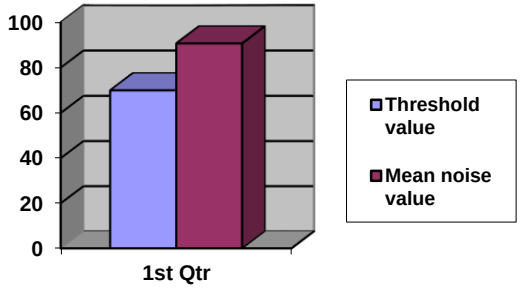
	Sources of Noise	Threshold Values (dBA)	Average Noise Values (dBA)
1	**Welding machine**	**70**	**95.2**
2	**Vulcanizing machine**	**70**	**91.4**
3	**Milling Machine**	**70**	**97.0**
4	**Petrol Generator**	**70**	**95.8**
5	**Diesel Generator**	**70**	**94.9**

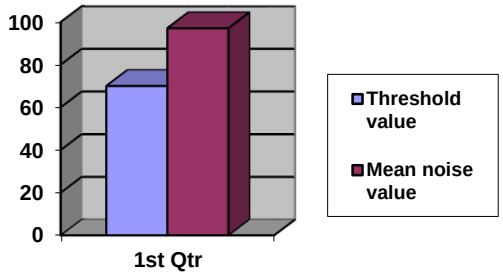
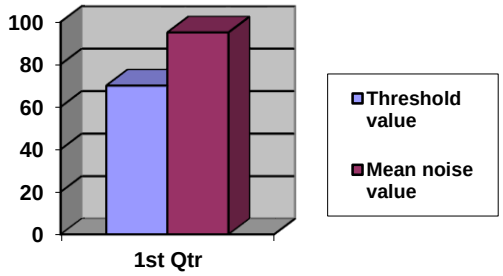
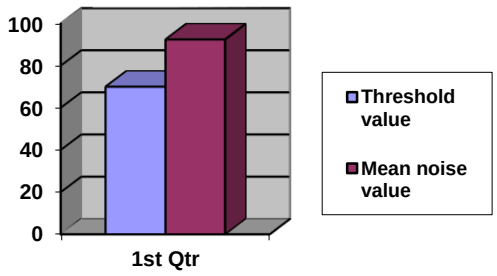
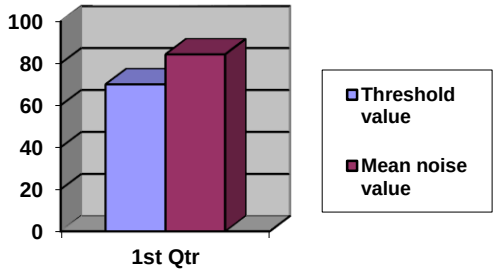
SHEET 10 OF BIDA MAP

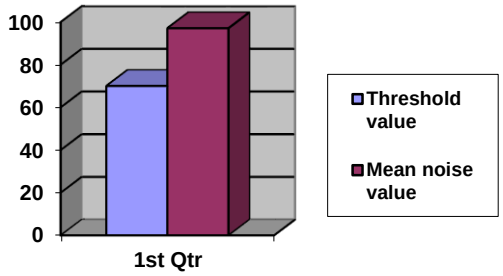
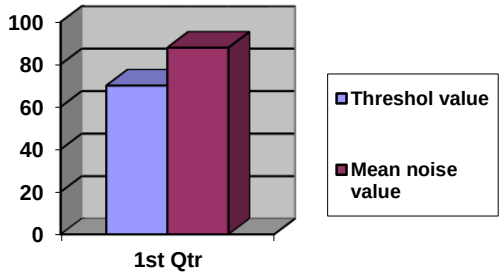
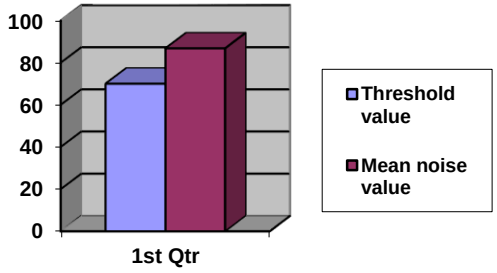
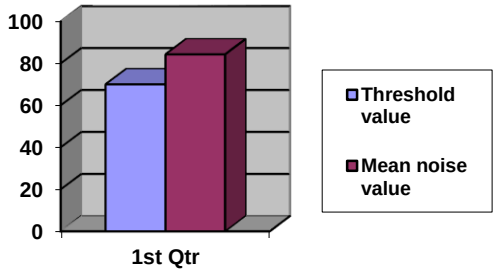


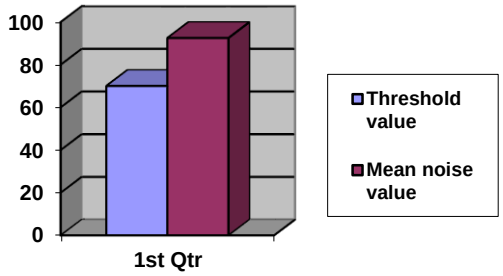
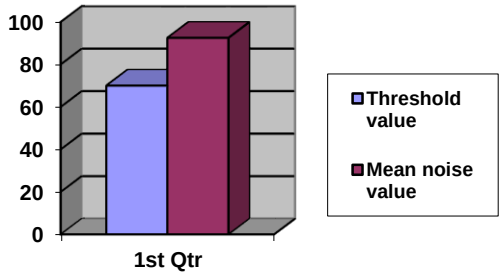
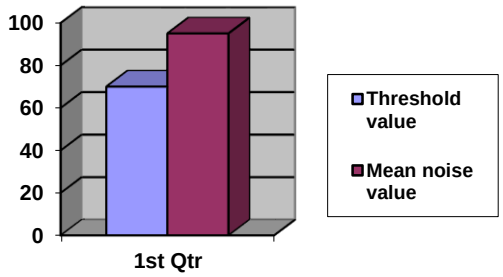
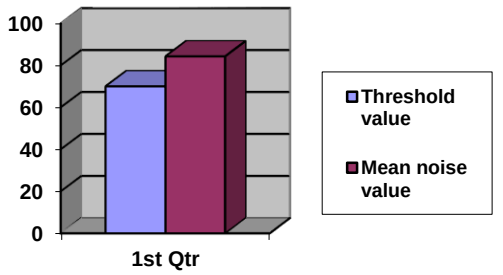
MEAN VALUES OF NOISE LEVELS IN RELATION TO THE THRESHOLD FOR SHEET 14

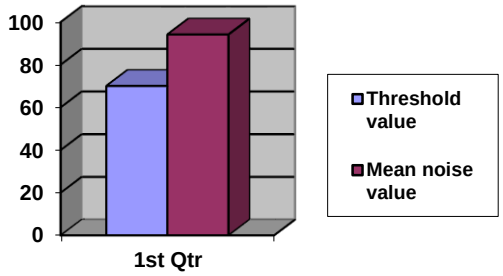
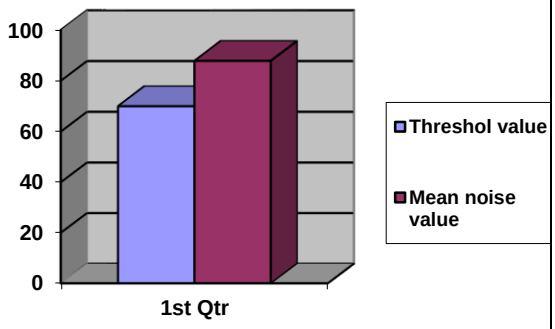
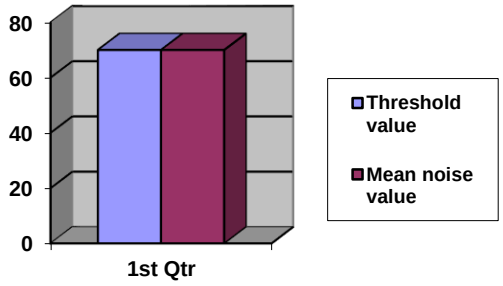
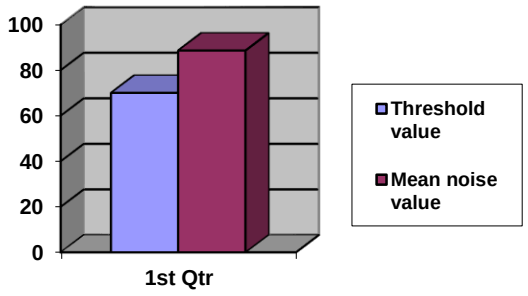
S/N	GPS Values		Mean Noise Values (dBA)	Threshold Values (dBA)	Bar Chart Representation
	UTM	Local Coordinates			
1	X: 0827656 Y: 1006328	E: 11.9804396° N: 009.0924367°	90.7	70	
2	X: 0827677 Y: 1006351	E: 11.9806322° N: 009.0926429°	92.46	70	
3	X: 0827726 Y: 1006415	E: 11.9810823° N: 009.0932174°	84.3	70	
4	X: 0827810 Y: 1006354	E: 11.9818411° N: 009.0926601°	70	70	

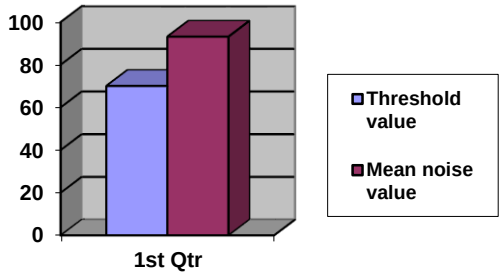
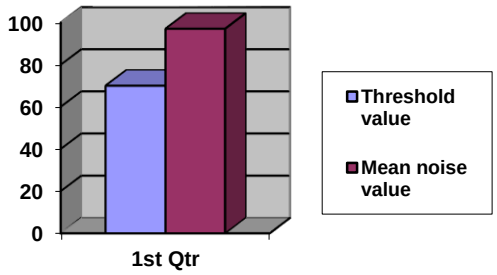
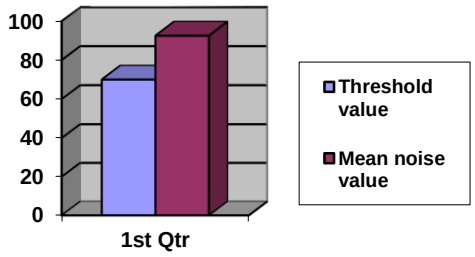
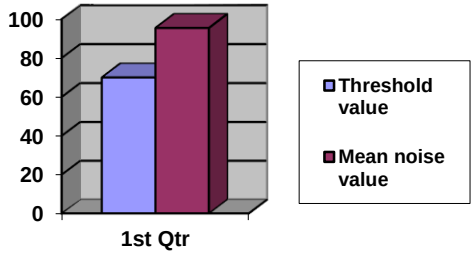
5	X: 0827814 Y: 1006218	E: 11.9818673° N: 009.0914312°	93.1	70	
6	X: 0827824 Y: 1006309	E: 11.981965° N: 009.0922525°	70	70	
7	X:0827867 Y:1006267	E:11.9823526° N: 009.0918699°	92.46	70	
8	X:0827935 Y:1006217	E: 11.9829668° N: 009.0914132°	90.7	70	

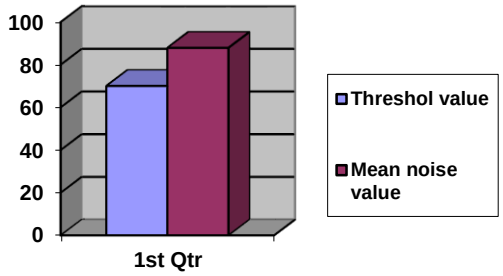
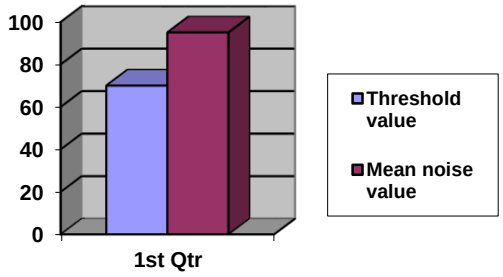
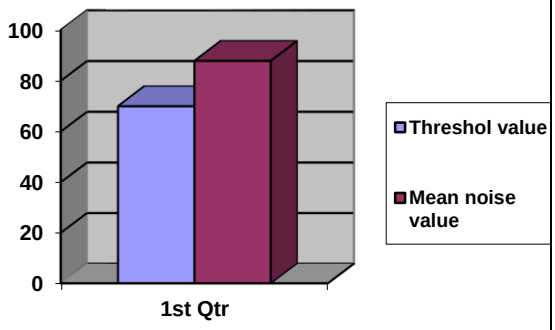
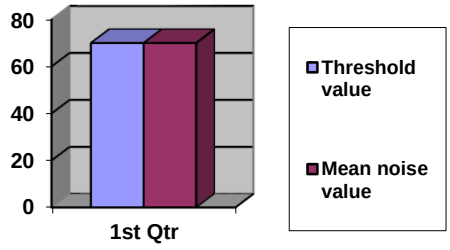
9	X: 0827018 Y: 1006193	E: 11.9746315° N: 009.0912645°	97.06	70	
10	X: 0828128 Y: 1006066	E: 11.984709° N:009.0900348°	95	70	
11	X:0828146 Y:1006156	E: 11.9848798° N: 009.0908465°	92.46	70	
12	X: 0828181 Y:1006070	E: 11.9851914° N: 009.090067°	84.3	70	

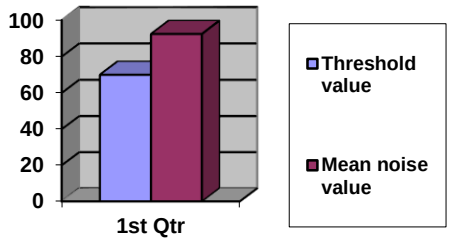
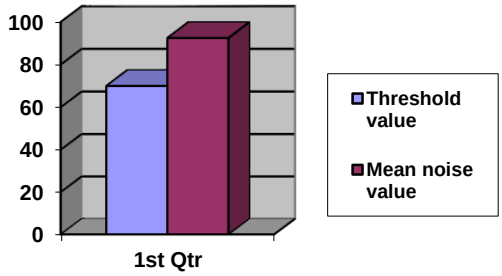
13	X: 0828105 Y:1006063	E: 11.9845002° N: 009.0900094°	97.06	70	
14	X: 0828357 Y: 1006097	E:11.9867928° N: 009.0902978°	87.86	70	
15	X: 0828364 Y:1006088	E:11.9868558° N: 009.090216°	86.8	70	
16	X: 0828433 Y: 1006037	E: 11.987479° N: 009.0897501°	84.3	70	

17	X: 0828437 Y: 1006014	E: 11.9875136° N: 009.089542°	92.46	70	
18	X: 0828522 Y: 1005981	E: 11.9882836° N: 009.0872306°	92.46	70	
19	X: 0828486 Y: 1005914	E: 11.9879514° N: 009.088635°	95	70	
20	X: 0828489 Y: 1005898	E:11.9879775° N; 009.0884903°	84.3	70	

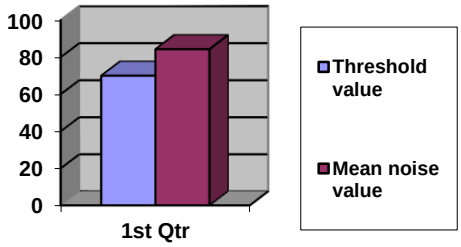
21	X: 0828525 Y: 1005880	E:11.9883033° N: 009.088325°	94.1	70	
22	X: 0828636 Y:1006848	E: 11.9893846° N: 009.0970611°	87.86	70	
23	X: 0828560 Y: 1006850	E: 11.9886941° N: 009.0970849°	70	70	
24	X: 0828617 Y: 1006851	E: 11.9892122° N: 009.0970896°	88.6	70	

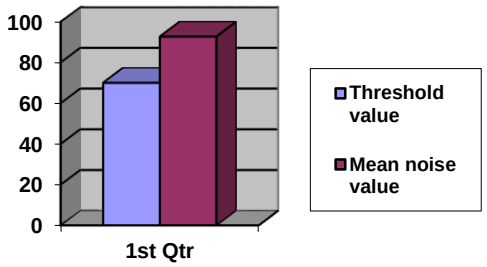
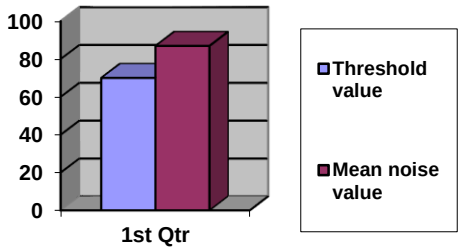
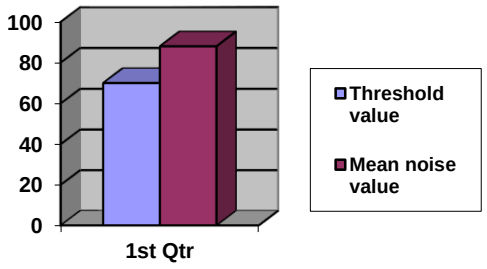
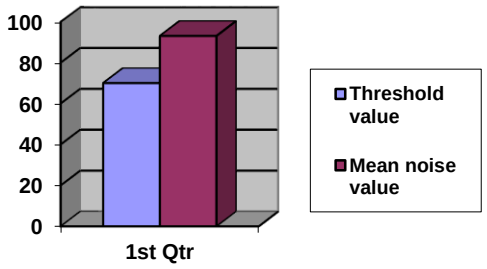
25	X: 0828683 Y: 1006907	E: 11.9898162° N: 009.0975906°	93.1	70	
26	X: 0828739 Y: 1006853	E: 11.990321° N: 009.0970986°	97.06	70	
27	X: 0828772 Y: 1006848	E: 11.9906206° N: 009.097051°	92.46	70	
28	X: 0828806 Y: 1006875	E: 11.9909302° N: 009.0971297°	95.4	70	

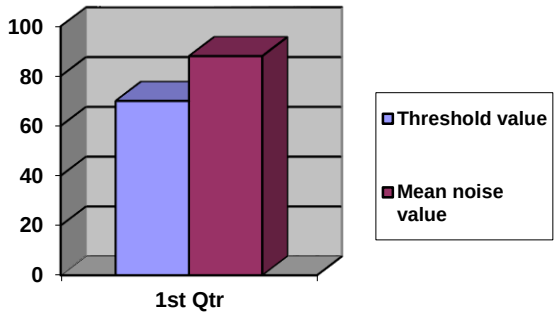
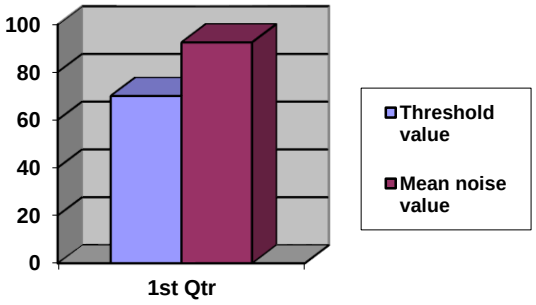
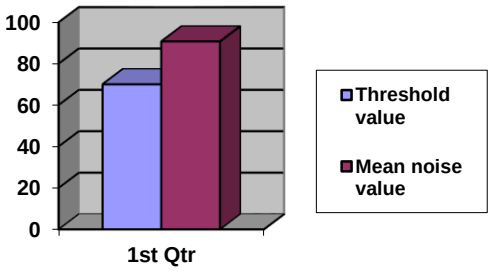
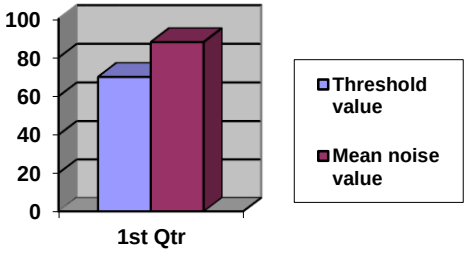
29	X: 0828917 Y: 1006821	E: 11.9919363° N: 009.0967962°	87.86	70	
30	X: 0828928 Y: 1006817	E: 11.9920359° N: 009.0967593°	95	70	
31	X: 0828941 Y:1006849	E: 11.9921565° N: 009.0970474°	87.86	70	
32	X: 0828972 Y: 1006801	E: 11.9924346° N: 009.0966115°	70	70	

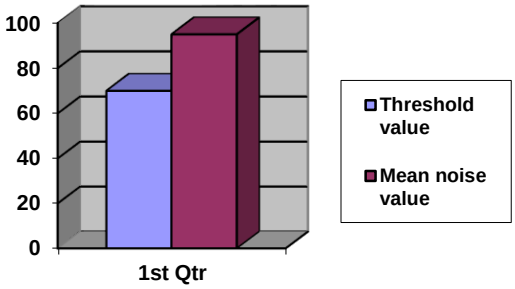
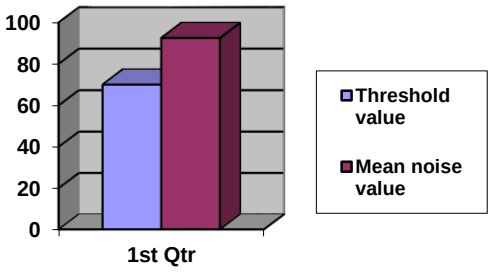
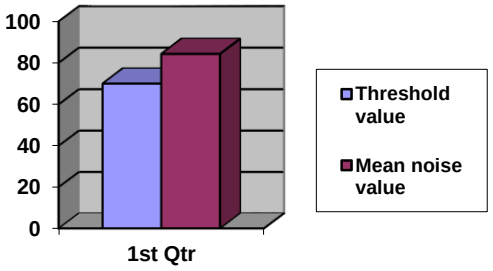
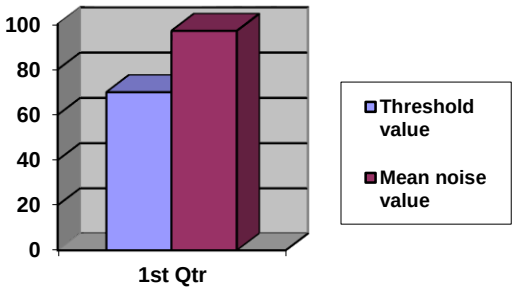
33	X: 0828995 Y: 1006813	E: 11.9926445° N: 009.0967182°	92.46	70	
34	X: 0828024 Y: 1006818	E: 11.9838206° N: 009.0968357°	92.46	70	

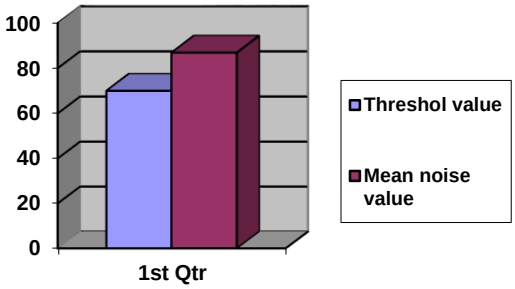
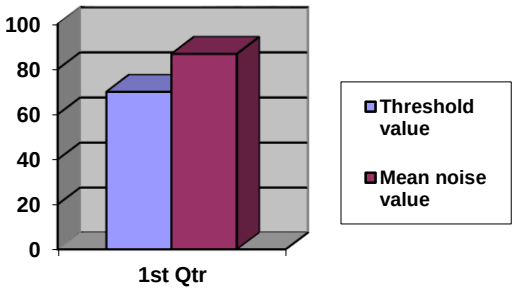
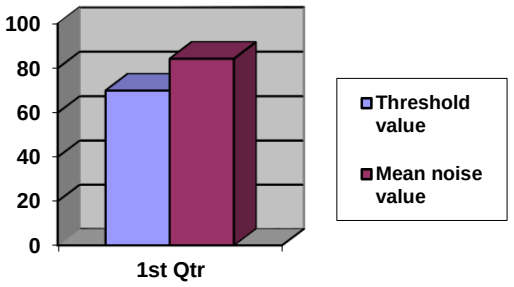
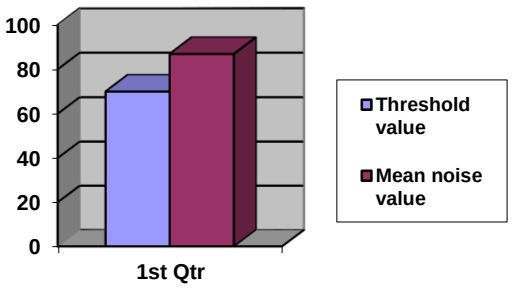
MEAN VALUES OF NOISE LEVELS IN RELATION TO THE THRESHOLD FOR SHEET 22

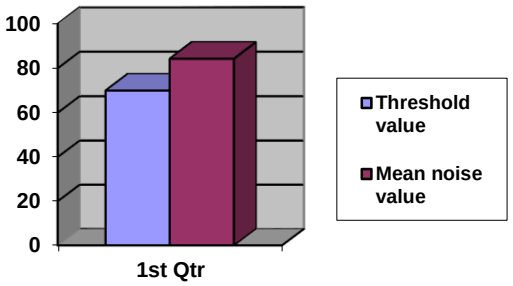
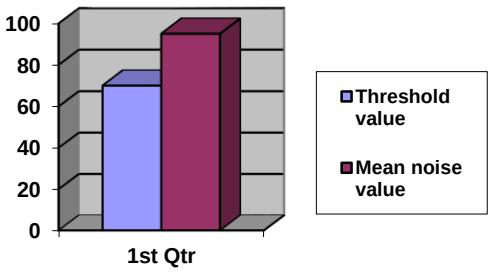
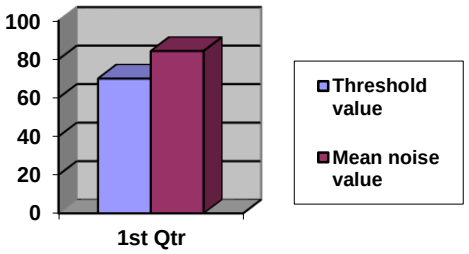
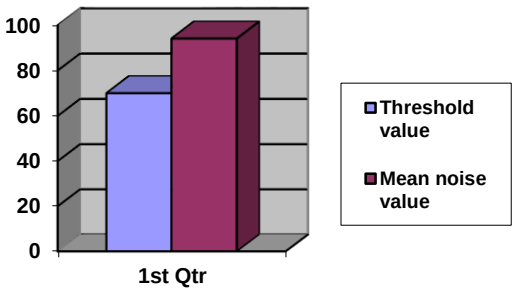
No.	GPS Values		Mean Noise Values (dBA)	Threshold Value (dBA)	Bar Chart Representation
	UTM	Local Coordinates			
1	X:0170525 Y:1003075	E: 06.003274 N: 009.0629154	84.3	70	

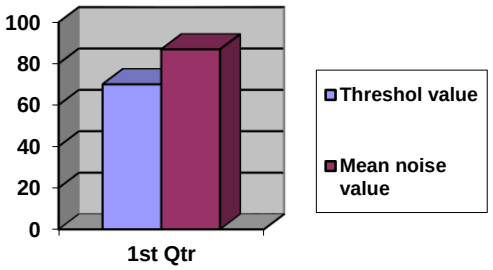
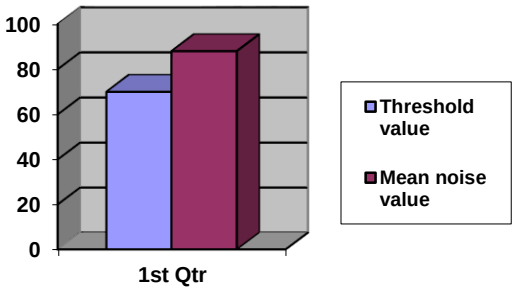
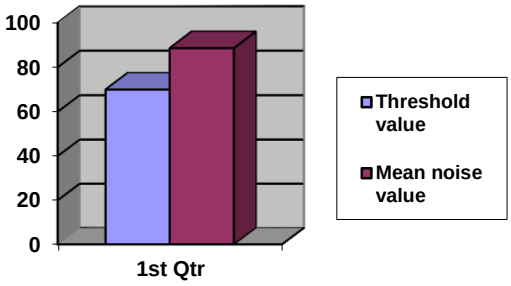
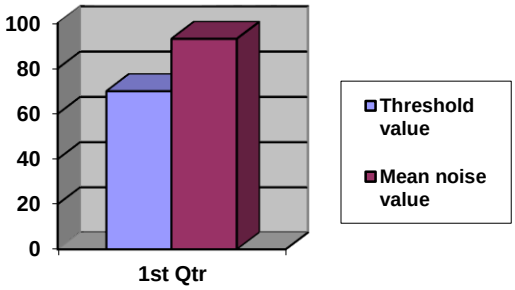
2	X: 0170541 Y: 1003085	E: 06.0034186 N: 009.0630070	92.7	70	
3	X: 0170553 Y: 1003068	E: 06.003529 N: 009.0628543	86.9	70	
4	X: 0170572 Y: 1003070	E: 06.0037015 N: 009.0628738	88.0	70	
5	X: 0170604 Y: 1003080	E: 06.0039915 N: 009.0629665	93.1	70	

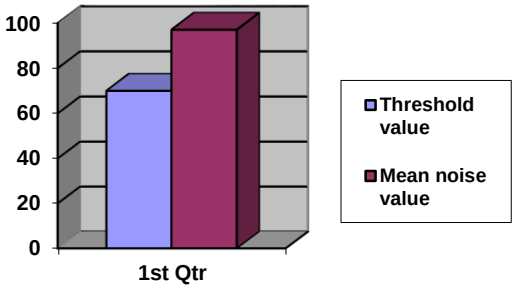
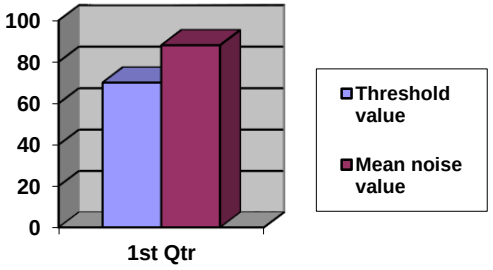
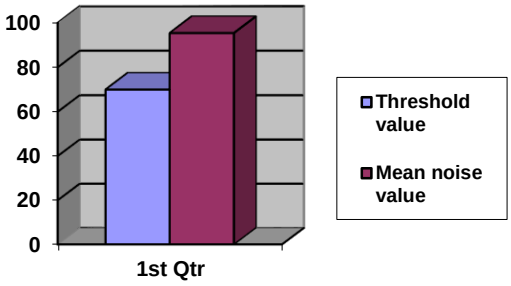
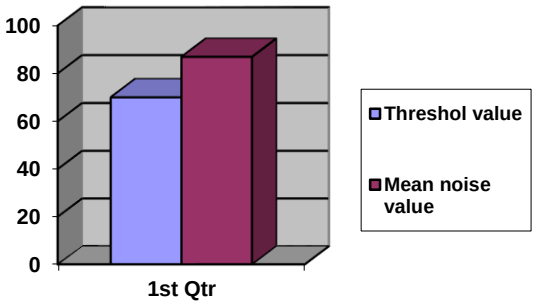
6	X:0170627 Y: 1003068	E: 11.981965 N: 009.0922525	88	70	
7	X:0170675 Y:1003090	E:06.0046359 N: 009.0630621	92.46	70	
8	X:0170724 Y:1003063	E: 06.0050832 N: 009.0628219	90.7	70	
9	X: 0170773 Y: 1003052	E: 06.0055293 N: 009.0627261	88.0	70	

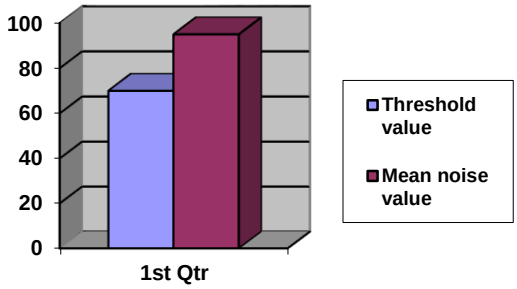
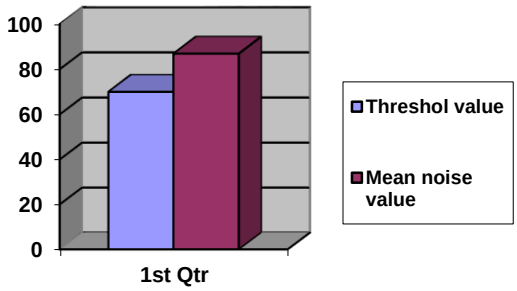
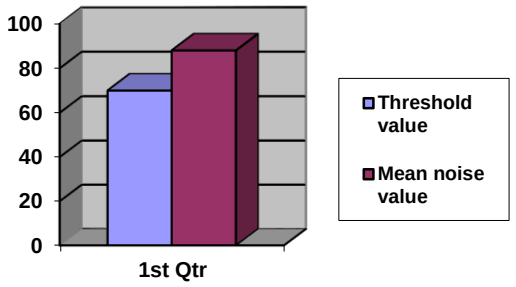
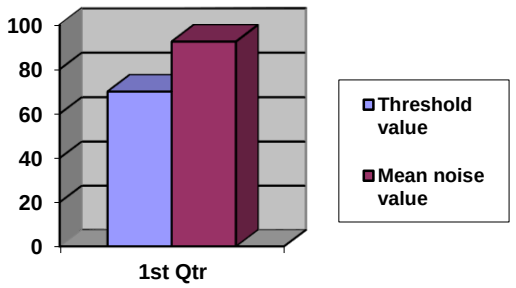
10	X: 0170775 Y: 1003136	E: 06.005523 N:009.063485	95	70	
11	X:0170789 Y:1003202	E: 06.0056634 N: 009.0640824	92.46	70	
12	X: 0170818 Y:1003252	E: 06.0059232 N: 009.0645362	84.3	70	
13	X: 0170848 Y:1003321	E: 06.0061907 N: 009.0651617	97.06	70	

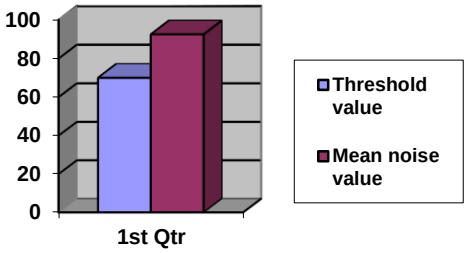
14	X: 0170880 Y: 1003303	E:06.0064828 N: 009.0650015	86.9	70	
15	X: 0710922 Y:1003289	E:06.0068655 N: 009.0648782	86.8	70	
16	X: 0170970 Y: 1003270	E: 06.0068643 N: 009.0649172	84.3	70	
17	X: 0171022 Y: 1003125	E:06.0077865 N: 009.0634041	86.9	70	

18	X: 0171006 Y: 1003099	E: 06.007643 N: 009.0631681	84.3	70	
19	X: 0170987 Y: 1003076	E: 06.0074721 N: 009.0629589	95	70	
20	X: 0170955 Y: 1003045	E:06.0071836 N; 009.0626765	84.3	70	
21	X: 0170972 Y: 1003003	E:06.0073412 N: 009.0622983	94.1	70	

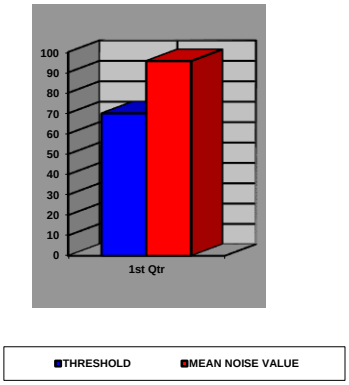
22	X: 0710971 Y:1003968	E: 06.0073348 N: 009.0619821	86.9	70	
23	X: 0170958 Y: 1002910	E: 06.007221 N: 009.0614572	88.0	70	
24	X: 0170919 Y: 1002832	E: 06.0068724 N: 009.0607497	88.6	70	
25	X: 0170903 Y: 1002785	E: 06.0067306 N: 009.0603239	93.1	70	

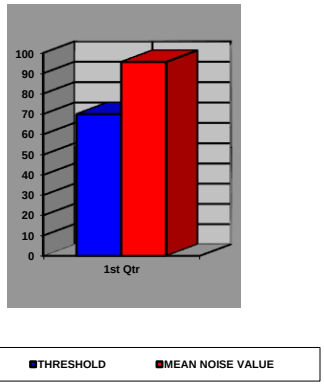
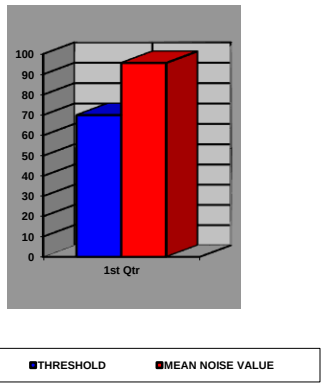
26	X: 0170890 Y: 1002754	E: 06.0066147 N: 009.0600429	97.06	70	
27	X: 0170884 Y: 1002737	E: 06.0065615 N: 009.0598889	88.0	70	
28	X: 0170885 Y: 1002714	E: 06.0065723 N: 009.0596812	95.4	70	
29	X: 0171024 Y: 1003027	E: 06.007812 N: 009.062519	86.9	70	

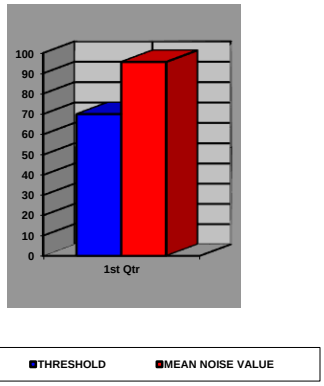
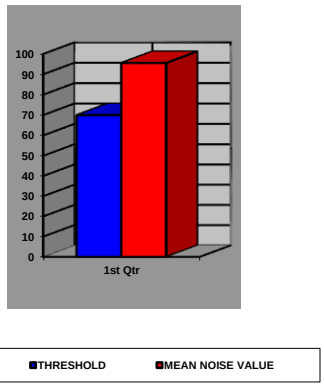
30	X: 0171069 Y: 1003024	E: 06.0082211 N: 009.0624952	95	70	
31	X: 0171080 Y:1003025	E:06.008321 N: 009.0625051	86.9	70	
32	X: 0829066 Y: 1004525	E: 11.9931181 N: 009.0760444	88.0	70	
33	X: 0829052 Y: 1004588	E: 11.9929956 N: 009.0766145	92.46	70	

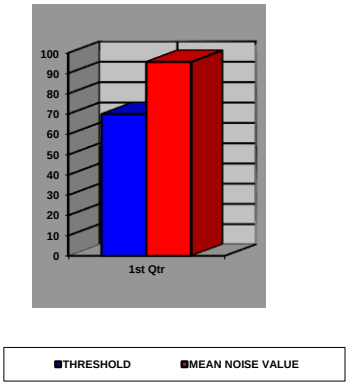
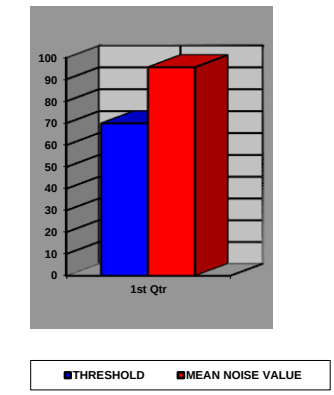
34	X: 0829047 Y: 1004640	E: 11.992954 N: 009.0770846	92.46	70	

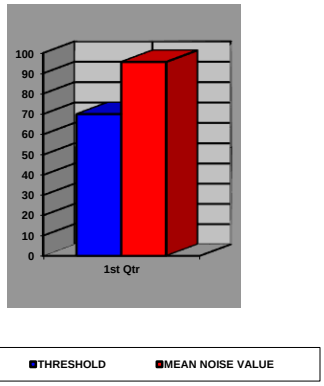
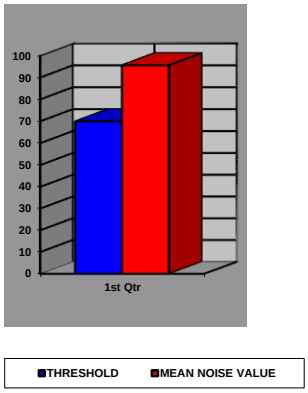
MEAN VALUES OF NOISE LEVELS IN RELATION TO THE THRESHOLD FOR SHEET 16

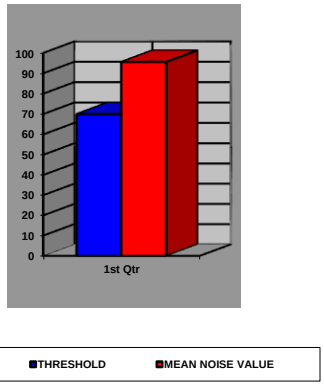
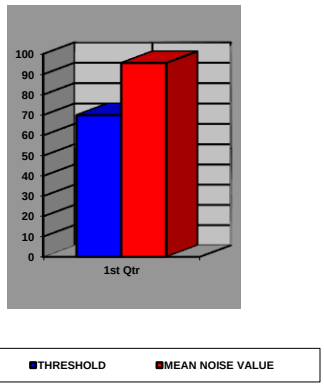
	GPS Values		Mean Noise Values	Treshold Value (dBA)	Bar Chart Representation
	UTM Values	Local Coordinates			
1	X-0171287 Y-1005560	N- $09^0$05.125' E- $006^0$00.600'	94	70	

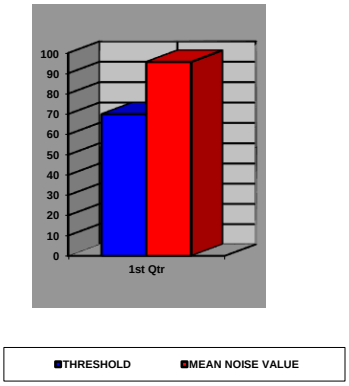
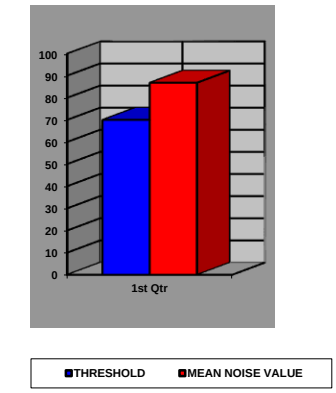
2	X-0171292 Y-1005522	N- $09^0$05.105' E- $006^0$00.604'	95.9	70	
3	X-0171297 Y-1005493	N-$09^0$05.105' E-$006^0$00.606'	92.7	70	

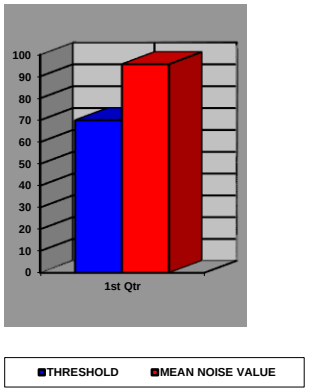
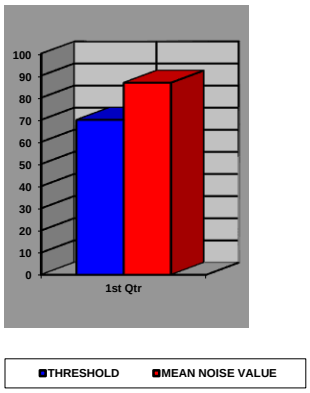
4	X-0171199 Y-1005491	N-09^{0}05.087' E-006^{0}00.553'	94	70	
5	X-0171293 Y-1005459	N-09^{0}05.071' E-006^{0}00.605'	92.7	70	

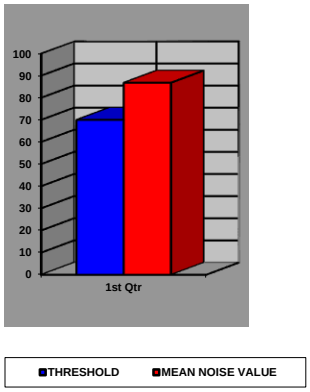
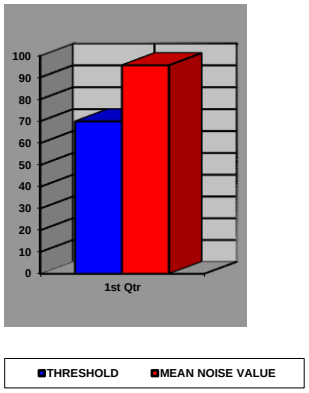
6	X-0171286 Y-1005552	N-09^{0}05.013' E-006^{0}00.699'	95.9	70	
7	X-0171281 Y-1005264	N-09^{0}04.965' E-006^{0}00.699'	92.7	70	

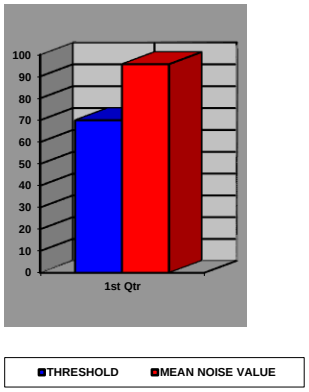
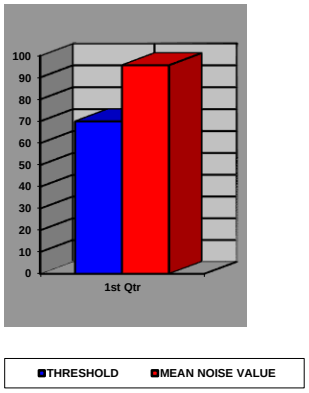
8	X-0171289 Y-1005271	N- $09^0$04.969' E- $006^0$00.603'	92.7	70	
9	X-0171291 Y-1005272	N- $09^0$04.969' E- $006^0$00.604'	94	70	

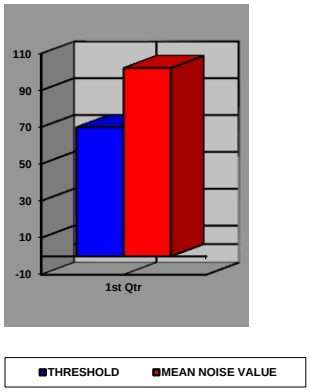
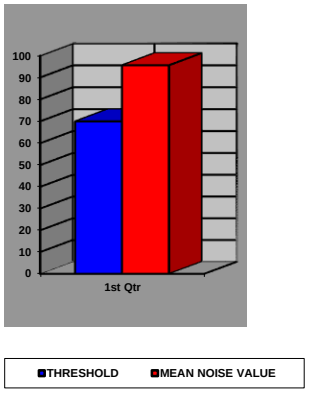
10	X-0171268 Y-1005160	N-09^{0}04.908' E-006^{0}00.592'	95.9	70	
11	X-0171263 Y-1005117	N-09^{0}04.885' E-006^{0}00.589'	95.9	70	

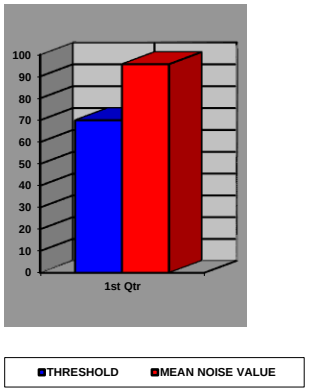
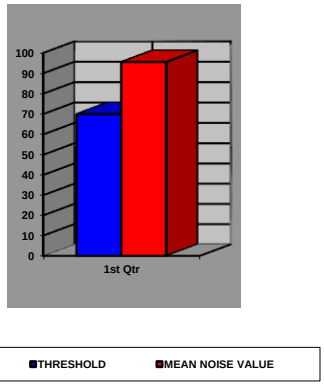
12	X-0171304 Y-1005099	N-09^{0}04.875' E-006^{0}00.612'	92.7	70	
13	X-0171376 Y-1005605	N-09^{0}05.150' E-006^{0}00.649'	88.6	70	

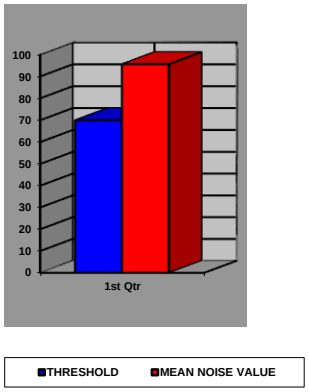
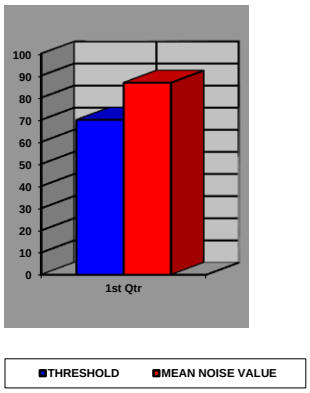
14	X-0171408 Y-1005601	N-09^{0}05.148' E-006^{0}00.667'	92.7	70	
15	X-0171292 Y-10052718	N- 09^{0}05.211' E- 006^{0}00.603'	88.6	70	

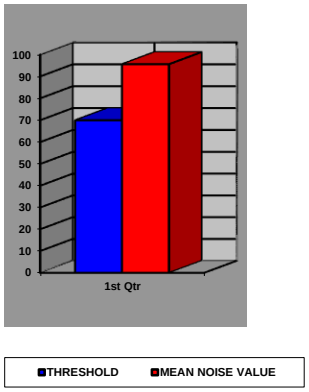
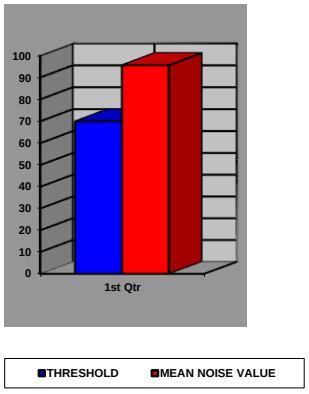
16	X-0171296 Y-1005740	N- $09^0$05.223' E- $006^0$00.605'	92.7	70	
17	X-0171308 Y-1005834	N-$09^0$05.274' E-$006^0$00.611'	94	70	

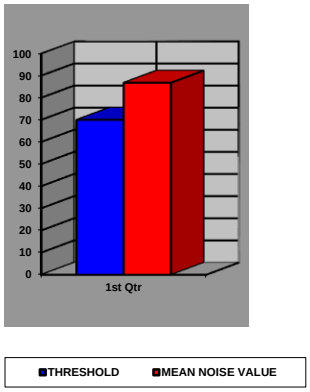
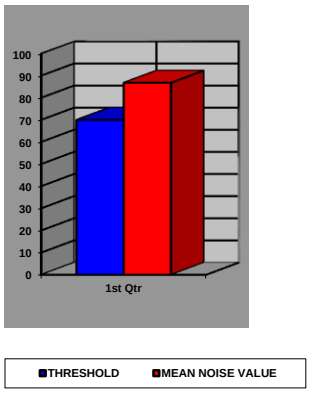
18	X-0171322 Y-1005982	N-09^{0}05.354' E-006^{0}00.618'	93.8	70	
19	X-0171355 Y-1006190	N-09^{0}05.467' E-006^{0}00.635'	92.7	70	

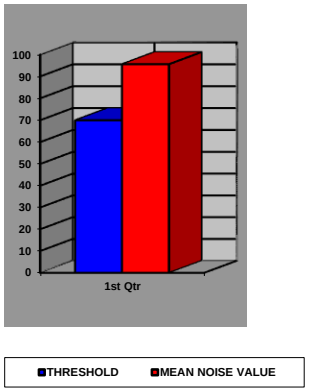
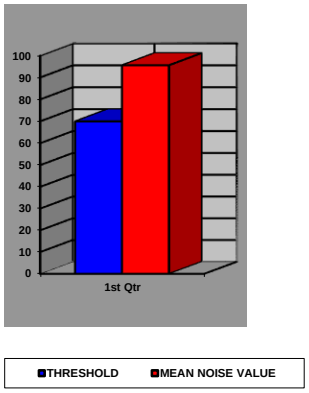
20	X-0171359 Y-1006245	N-09^{0}05.497' E-006^{0}00.637'	102.2	70	
21	X-0171351 Y-1006375	N-09^{0}05.567' E-006^{0}00.632'	95.9	70	

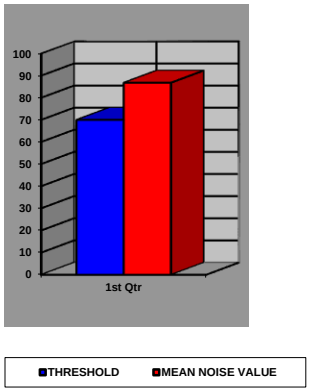
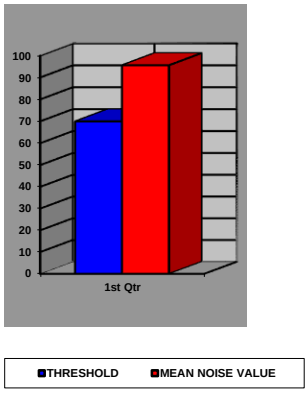
22	X-0171344 Y-1006424	N- $09^0$05.594' E- $006^0$00.628'	99	70	
23	X-0171337 Y-1006495	N- $09^0$05.632' E- $006^0$00.624'	94	70	

24	X-0171218 Y-1006307	N-09^{0}05.530' E-006^{0}00.560'	95.9	70	
25	X-0171223 Y-1006257	N-09^{0}05.503' E-006^{0}00.563'	92.7	70	

26	X-0171126 Y-1006238	N-09^{0}05.492' E-006^{0}00.510'	95.9	70	
27	X-0171207 Y-1005961	N-09^{0}05.288' E-006^{0}00.556'	95.9	70	

28	X-0171288 Y-1005670	N-09^{0}05.185' E-006^{0}00.601'	92.7	70	
29	X-0171403 Y-1005502	N- 09^{0}05.094' E- 006^{0}00.664'	92.7	70	

30	X-0171665 Y-1005464	N- $09^0$05.075' E- $006^0$00.807'	94	70	
31	X-0171793 Y-1005524	N-$09^0$05.108' E-$006^0$00.877'	88.6	70	

32	X-0171938 Y-1005537	N-09^{0}05.116' E-006^{0}00.956'	94	70	
33	X-01712276 Y-1005527	N-09^{0}05.112' E-006^{0}01.140'	98.3	70	

34	X-01712393 Y-1005489	N-09^{0}05.092' E-006^{0}01.204'	94	70	