

MEAC

MIDWEST ENVIRONMENTAL ASSISTANCE CENTER

Final Report

MEAC No. 01-11

**Community Noise Survey and Analysis
Lower Mount Bethel Township, PA**

January 31, 2002

**MEAC
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CONSULTANTS IN COMMUNITY NOISE CONTROL

MEAC

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Lower Mount Bethel Township
Board of Supervisors
P.O. Box 257
Martins Creek, PA 18063

January 31, 2002

Attention: Sue Jones
Chairwoman

Dear Ms. Jones;

SUBJECT: MEAC Final Report Project 01-18, Community Noise Survey and Analysis in Lower Mount Bethel Township (LMBT), Pennsylvania, November 30 - December 5, 2001.

Introduction

The Midwest Environmental Assistance Center (MEAC) is pleased to submit the following report documenting the results of the subject noise study for LMBT Board of Supervisors. The scope of work completed consisted of the following:

1. A Township meeting on October 18, 2001 with the LMBT Noise Committee and the Public. Meetings with LMBT officials also took place prior to the noise survey and during the field data analysis;
2. Field measurements of ambient and background noise at twenty six (26) measurement locations (five microphone locations were 24 hour dBA noise surveys), with octave band and dBA analyses performed at all 26 sites as agreed upon by MEAC and LMBT;
3. Data analysis of the octave band and dBA field measurements to determine the ambient noise levels in residential, commercial/tourist and industrial areas of LMBT; and
4. A submittal of the draft new proposed LMBT Noise and Vibration Regulation.

Meetings with LMBT and the Public

MEETING I

A Town meeting was held on October 18, 2001 to discuss community noise survey techniques, noise impact on humans and strategies set forth by the MEAC staff. The purposes and goals of a community noise survey were discussed with the public and LMBT officials. Typical

noise survey locations to determine the most representative locations to implement the noise study were also discussed. MEAC staff presented a technical overview of ordinances and their effectiveness, with emphasis on the Octave Band limits as a quantitative noise enforcement tool.

Subsequent to the October 18th meeting, teleconferences with LMBT officials determined the types of locations based on land use zoning and areas of prior noise complaints in LMBT. Representation by residential to residential, residential to commercial, residential to industrial zoning were chosen as site locations. A final criteria for selection was assurance that each of the 24 hour sampling locations had a "safe" site for the installation of the 24 hour continuous dBA monitoring equipment for the measurement period. A 24 hour study was performed before and during the October 18th meeting and is herein made part of the MEAC/LMBT noise survey. This measurement included octave band analyses over the period October 17th through 18th, 2001.

Meeting II

A second meeting was held November 30, 2001 before initiating the main survey to finalize the sites for the noise study and to provide for a smooth transition from the completion of each of the site surveys to begin the next site survey. MEAC staff met with LMBT officials and the chairman of the LMBT noise committee to make the selections. Four (4) sites were chosen for the 24 hour studies and twenty (22) other sites for octave band and dBA analyses. These sites are identified as X-1 through X-12 and Y-1 through Y-12 on the noise survey Maps #1 and #2 included in Appendix A of this report.

NOTE: Two copies of Maps #1 and #2 are included with this report, a smaller copy as a part of the report and a larger removable copy for easy reference.

NOISE STUDY

1. Field Measurement Methodology and Noise Equipment

Since the community survey was limited to only five sites representing all of the zoning areas (e.g. residential, commercial and industrial areas), it was proposed that during the 24 hour monitoring periods the MEAC survey team would complete 5 to 15 minute octave band and dBA analyses of ambient and background noise at various locations throughout LMBT. The additional measurement locations added over 175 additional noise sampling measurements of 5 to 15 minutes durations to the survey, providing a comparison to the 24 hour study data and assuring that the Proposed Noise Ordinance decibel limits represent compatible, enforceable levels throughout each property zone. The additional data also provided a broader picture of the ambient noise throughout the Township which has been utilized to provide a clearer average of ambient noise in each of the designated zoning areas. In reviewing the measurement locations, the number and selected measurement points "literally" saturated the Township. The following procedures were used for the field studies;

- a) 24 hour study - The 24 hour noise studies were conducted using a Larson-Davis Model 870 Statistical Analyzer. The data analysis provides minute by minute and

hourly averages of the ambient and background noise levels during the 24 hour period. The measurement microphones were placed outdoors at the property line of each site.

b) Octave band surveys use a Larson-Davis Model 2900 Realtime Analyzer - The series of octave band and dBA noise measurements at the 26 locations shown on Maps #1 and #2 were conducted to identify specific sound sources at each site during the monitoring periods, and assessed the daytime and nighttime existing noise levels in LMBT..

The following Table I provides a detailed list of the number of measurement locations and surveys that were completed during the six day LMBT community noise survey;

TABLE I

A-weighted - 24 hour (*) and Octave Band/dBA Satellite Survey Site Measurement Totals

Location			Location		
	Day	Night		Day	Night
*X-1	11	2	Y-1	4	1
X-2	2	3	Y-2	4	(See Y-2a)
X-3	3	1	*Y-2a	7	1
*X-4	10	5	Y-3	3	1
X-5	4	(See X-6)	Y-4	3	(See X-3)
X-6	1	2	*Y-5	16	9
+X-7	4	3	Y-6	4	4
X-8	5	(See X-7)	Y-7	4	5
X-9	4	3	Y-8	4	2
X-10	(See X-12)	2	Y-9	3	3
X-10a	1	2	Y-10	7	4
X-11	5	(See X-3)	Y-11	3	1
X-12	4	(See X-3)	Y-12	4	2

+ October 17th to 18th, 2001 24 hour study.

The following acoustic measurement standards were followed during the performance of the LMBT noise survey.

ANSI STANDARD

The ANSI Standards which apply to community noise measurements are;

1. S12.9 - 1993 - Quantities and Procedures for Descriptions and Measurement of Environmental Noise (Part 3 - short term).

2. S1.13 - 1971 (rev. 1986) - American National Standard Methods for the Measurement of Sound Pressure Levels.

2. FIELD MEASUREMENTS BY ZONING

The sites selected in the table above are listed below by zoning characteristics.

A. Sites selected

24 Hour Sites

Satellite sites

1) ZONING - Residential to Industrial (Two sites selected)

a) 4750 Lower Mud Run Road

X-7, X-9, X-10a; Y-2,
Y-2a.

b) 7751 De Pues Ferry Road

Y-3, Y-5, Y-6, Y-9

2) ZONING - Residential to Residential (Two sites selected)

a) 8915 Pleasantview Road

X-2, X-4, X-5, X-6,
X-8, X-10, X-11,
X-12, ; Y- 1,

b) 1147 Maple Street (10/17-18/01-24 hr. survey)

Y-4, Y-8, Y-9, Y-10,
Y-11, Y-12

3) ZONING - Commercial to Residential (One site selected)

a) 2004 Hutchinson

X-1, X-3, Y-7

B. NOISE MEASUREMENTS

In this section each measurement site will be identified by zoning characteristic with a brief description of the selected area, why it was chosen for either a 24 hour survey or satellite octave band site, and if possible the types of noise sources in the area.

24 Hour Survey #1

1. Commercial/Residential (LMBT Office) - 2400 Hutchinson-(X-1)

The Hutchinson 24 hour survey X-1 was a residential area near the Martins Creek business area. This survey was performed Saturday to Sunday (12/01 to 02) with typical Saturday commercial area traffic and typical quiet Sunday Commercial/Residential type zoning, low traffic conditions.

The major source of noise was traffic passby, the microphone being located approximately

100 feet from Hutchinson and 600 feet from Front Street. The only other noise source of significance measured during the monitoring period was an acoustic anomaly assessed in the 4:00pm hour on Saturday. This excess noise was probably due to an auto parked next to the measuring microphone or children playing in the alley behind the office building used for the survey.

2. Commercial to Residential (Pennsylvania Avenue; X-3)

The measurement site on Pennsylvania Avenue was across of a multifamily dwelling area, adjacent to single family properties, and a block from the Martins Creek commercial area. Traffic noise from Delaware Drive and Front Street intersection was the major source of ambient noise.

3. Commercial to Residential (Riverton Hotel/Riverside Trailer Park; Y-7)

The Riverton Hotel parking lot was selected as a measurement site since it is currently the only other Commercial Zoned area besides the Martins Creek, C-1 properties. It is also on the north boundary of LMBT, adjacent to the Trailer Park. Major noise sources include traffic on Martins Creek - Belvidere Highway and Riverton Road. Truck traffic occurs regularly on the Martins Creek - Belvidere Highway, even with the restriction banning heavy trucks from crossing the Delaware River into New Jersey.

4. 24 hour Survey #2, Residential (8917 Pleasantville Road; X-4)

This was a single family dwelling situated at the north end of a cul-de-sac in a R-1 subdivision. The Pleasantville Road cul-de-sac includes residential properties overlooking the PPL Plant about 2 miles away. PPL Plant operations are somewhat audible and measurable during nighttime hours. The major source of ambient noise measured at this site during the daytime hours was due to traffic passby on Delaware Road and surrounding farm area sources, e.g. farm tractors, chain saws, lawn equipment, etc.

The remaining Residential area satellite sites (15 total measurement site locations) were chosen to assess both residential zoned properties and residential use properties located in A-1 zoned areas. The distribution of the site location areas chosen, as shown on Noise Survey Maps #1 and 2, has provided a full acoustic description of the entire LMBT residential use existing daytime and nighttime ambient noise conditions.

5. 24 hour Survey #3; Industrial to Residential Area (4750 Lower Mud Run Rd; Y-2a)

The third 24 hour survey was performed in the southern portion of LMBT in the vicinity of a grain distribution plant and quarry industrial sources. Due to the proximity of Delaware Drive, traffic passby sources increase the daytime noise levels during rush hour (3-5pm, 7-9am). Nighttime noise levels do not drop off as in other areas of LMBT due to the 24 hour operation of the grain plant.

The measurement site for this 24 hour noise study was a single family dwelling, 300 feet from Delaware and 1000 feet from the grain plant. Octave band analyses assessed during nighttime hours indicated the presence of a discrete tone emanating from the plant.

6. Industrial to Residential - 8 Satellite Sites;

The remaining I-R1, 2 zone satellite site noise sources included Lower Mud Run Road traffic (Y-2, Y-2a), the residential area adjacent to the grain plant (Y-3), residential single family dwelling properties proximate to a pallet plant on Main Street (X-10a), and residential areas proximate to the PPL Plant (X-7, X-9, Y-5, Y-6).

Noise levels in the residential area adjacent to the grain plant were impacted by various noise sources from the plant and also from an idling diesel locomotive on the railroad track spur at the west boundary of the residential property line. The idling diesel operated 24 hours a day.

Noise levels in the residential sites proximate to the PPL site increased by 3 to 10 dB(A) due to operation of the existing PPL Plant sound sources (generator hum and Plant speaker communication intercom noise).

7. 24 Hour Survey #4; Industrial to Residential (7751 De Pues Ferry Road; Site Y-5)

The final 24 hour survey site (survey of December 4th to 5th) was chosen due to proximity to the PPL Plant. A new PPL facility is under construction approximately 600 feet of the residential properties off De Pues Ferry Road. Construction noise raises the daytime ambient by 5 to 10 dB(A) in this residential area. The PPL speaker intercom communication system and other existing PPL facility noise sources increase the nighttime ambient levels by 5 to 10 dB(A). Satellite data results for measurement sites north and south of the PPL Plant (Y-6, Y-9) indicate lesser noise impact due to operation of the existing PPL Plant facility.

As noted above, a 24 hour survey was completed during MEAC's October trip to LMBT to attend the Noise Committee Meeting of October 18th. This survey was measured at a residential site on Maple Street in an area south of the PPL, I-1 zoned property. It is important to note the PPL Plant was not operating during this survey; as such the noise levels given by the data included in this MEAC Survey Report document the true ambient level conditions for this residential area without the PPL facility in operation.

C. DATA ANALYSIS

A total of 120 hours of digital dBA measurements were performed and analyzed during the October and December 24 hour continuous monitoring surveys. These dBA data are useful in showing contours of daytime and nighttime sound, but were NOT the determining factor in creating the Octave Band Noise Levels of the proposed LMBT Noise Ordinance. The noise levels for each of the zoned areas were averaged from satellite data taken at all 26 measurement sites in order to determine the limits set forth in the new ordinance.

Note: All the data plotted on the octave band data figures discussed in the following sections are on graph paper which includes the new proposed noise standards as a guide which can be related to noise sources measured at each of the sites.

24 Hour Survey Data Results

The 24 hour surveys at each property and zoning site are plotted in 24 hour Charts 1-5, following noise survey Maps #1, 2 in Appendix A. Two sets of data points are plotted; the upper curve is the Leq (average ambient noise level) and the lower curve is the L90 (the background sound level during the measurement period). Analysis documentation for the 24 hour sound measurement periods of all five continuous monitoring dBA surveys are available upon request.

1. 24 Hour #1, 2004 Hutchinson; R-2 to C-1 Zone

This survey was performed over the weekend, starting Saturday, December 1st at 9:07 a.m. and ending Sunday, December 2nd at 9:07 a.m. As noted previously, an anomaly occurred in the 4:00 p.m. hour on Saturday. 24 Hour Chart #1 shows the Leq (Green Line) hourly ambient noise levels and L90 (Blue Line) background sound level results for this survey. Saturday Leq average was 58 dB(A) with the anomaly and 50 dB(A) subtracting this 5 minute extraneous noise source. Sunday Leq average was 42 dB(A). The 24 hour Leq average noise level was 48dB(A) for this R-2/C-1 zones area. The nighttime background sound levels ranged from 32 to 35 dB(A), a very quiet type residential environment.

2. 24 Hour Survey #2, 8911 Pleasantville Road; R-1 Zone

This residential survey site had line-of-sight to the PPL Plant approximately 2 miles to the northeast of the property. The survey began on Sunday, December 2nd at 10:00 a.m. and ran to Monday December 3rd at 10:00 a.m. The Sunday ambient, Leq levels (Green Line) averaged 44.1 dB(A) and the Monday Leq ambient noise levels averaged 44.7 dB(A) as shown in 24 Hour Chart #2. Background, L90 levels during nighttime hours ranged from 29 dB(A) to 33 dB(A), a very quiet residential environment. Any PPL Plant industrial noise sources, even at a 2 mile distance from this residential area, would be audible due to the very low background sound level condition.

As mentioned previously, the daytime Leq ambient noise levels due to traffic noise range from 40 to 48 dB(A) with a slight rise to 49 dB(A) due to early morning traffic in the 7-8:00 a.m. hour. These 24 hour survey results would be typical of any of the residential use areas in LMBT.

3. 24 Hour Survey #3, 4750 Lower Mud Run Road; Residential/I-1

Results of this 24 hour monitoring analysis are given in 24 Hour Chart #3. The 24 hour period began Monday, December 3rd at 11:00 a.m. and ended Tuesday December 4th at 10:00 a.m. Daytime Leq ambient noise levels ranged from 48 to 52 dB(A), the nighttime Leq levels ranged from 45 to 48 dB(A). The background L90 sound levels never fell below 42 dB(A) except for the 3:00 a.m. hour when a 41 dB(A) hourly average was recorded. The average daytime background, L90 sound level was 45 dB(A) except for the 11:00 a.m. to 3:00 p.m. time period when the L90

level fell to 40 dB(A).

This type of consistent noise level condition is typical of residential areas abutting industrial zoned property. In this instance, the daytime and nighttime noise is due to a grain plant to the north of the residential site. Truck and grain operations provide the consistent background and ambient noise climate shown in Chart #3. The average Leq for Monday was 49.2 dB(A); the average Tuesday Leq was 49.3 dB(A), the 24 hour Leq average was 49.3 dBA further attesting to the data analysis results given above.

4. 24 Hour Survey #4; 7751 De Pues Road; R-1 to I-1 Zone

This site is located approximately 600 feet north of the PPL Plant property. The survey began at 12:15 p.m. December 4th and ended 12:15 pm December 5th. The PPL construction noise is shown on 24 Hour Chart #4, with ambient levels in the 55 dB(A) range, on an average, peaking to 61 dB(A) for the 7:00 a.m. hour of December 5th. Nighttime background L90 sound levels without PPL Plant in operation ranged from 39 to 42 dB(A), with Leq levels of 41 to 45 dB(A) without construction noise.

The Tuesday Leq average noise level was 50.5 dB(A) and the Wednesday Leq average noise levels was 53.6 dB(A) due to more construction noise present in the daytime averaging. Nighttime noise levels taken on previous survey nights with the PPL Plant in operation indicated a Leq level of 50 to 52 dB(A) due to speaker intercom and the other Plant Facility noise source propagation.

5. October 17/18, 2001 Residential 24 Hour noise Survey, 1147 Maple Street

This 24 hour survey was completed in the R-1 Zone south of PPL Plant's I-1 Zone property. 24 Hour Chart #5 shows the 24 hour Leq average was 45 dB(A) without PPL in operation. The background L90 nighttime sound levels ranged from 30 to 35 dB(A) and the ambient Leq nighttime levels ranged from 35 to 42 dB(A).

The highest hourly daytime average was 53 dB(A) due to lawnmower equipment operating in the 4 to 5:00 p.m. hour. Typical ambient Leq daytime levels ranged from 42 to 45 dB(A). Depending upon prevailing wind conditions, current PPL Plant operations could be expected to increase the daytime and nighttime noise levels by 4 to 6 dB(A).

OCTAVE BAND ANALYSIS RESULTS AND Leq AVERAGING

Figures 1 - 10, following the 24 Hour Charts in Appendix A, show the octave band analysis averages of the data assessed at 26 sites in LMBT. The proposed Residential, Commercial and Industrial area noise limits for the new ordinance are given by the brown line in each of the graphs. The range of Leq octave band data are shown by the purple (for X survey sites) and blue (for Y survey sites) vertical lines in each of the nine octave bands (31.5 Hertz to 8,000 Hertz) and the equivalent A-weighted decibel level for each of the octave band noise limits is given at the lower right side of each figure.

Figures 1 - 4 shows the averages of data taken at residential areas, with daytime and nighttime for R-1 and R-2, as well as residential use areas. The description of the data sites is given at the bottom of each figure. The reader is directed to Noise Survey Site Maps #1 and 2 for the site locations, as well as dBA and Leq summaries, for each of the LMBT, MEAC noise survey sites.

The proposed daytime and nighttime octave band noise limits for these residential areas are all above each of the average octave band levels analyzed by the survey which assures for easy enforcement of the proposed noise ordinance limits since very little ambient noise correction, either daytime or nighttime, will be required to assess the impact of any residential sources.

Figures 5 -8 present the averaging results for R-1, 2 to C-1 Zone data measured in LMBT. The X and Y site data octave band ranges are given together in these graphs. Once again the proposed octave band noise limits are above the average ranges of measured data for each of the nine octave bands analyzed during the MEAC survey.

Figures 9 and 10 present the octave band noise limits for Residential to Industrial Zone property and the MEAC survey data site location ranges for each of the nine octave bands. The X survey site location data are given in purple and the Y survey site data are given in blue. Figure 9 shows the impact of construction noise (blue squares) on survey site Y5, and the impact of noise from the pallet facility on Main Street at survey site X-10a (red circles).

Once again the octave band noise limits have been chosen so as to assure that for most of the existing industrial sources in LMBT, the new noise ordinance Industrial to Residential octave band restrictions will have limited impact. It is only certain industrial source operations which may require 3 to 5 decibels of noise reduction to meet the LMBT Proposed Noise and Vibration Ordinance octave band limits.

The final Figure 11 shows the ANSI Standard S12.9-1993 suggested residential area octave band noise levels for daytime and nighttime hours for population density typical of LMBT. Comparing Figures 1 - 4 with Figure 11 octave data, it can be concluded that the MEAC survey results and the attendant proposed Noise Ordinance octave band limits are in keeping with established noise criteria of the American National Standards Institute.

C. PROPOSED LMBT NOISE AND VIBRATION REGULATION

Noise Ordinance

Developing a noise ordinance requires several important ingredients. First, knowledge of the existing background noise within a jurisdiction to determine the current noise climate to provide a "baseline" for regulation. Second, a social survey to ascertain the types of noise sources that are present in the community and are annoying to citizens (in LMBT a social survey was not considered since the population was only a few thousand and noise complaints could be used in

lieu of a social survey). Third a review of existing regulations for incorporation into a new LMBT ordinance to minimize a "re-invention of the wheel" in pursuit of a new ordinance. All of the above were considerations in developing the proposed LMBT Noise and Vibration Ordinance.

The New Proposed Noise and Vibration Ordinance is attached as Appendix B to provide LMBT with a strong foundation for a final ordinance. Although MEAC staff had only proposed to provide the noise data in tabular form for inclusion into a new noise ordinance, it was felt that this would leave LMBT in a difficult position in developing the language required to finalize a new ordinance and it would delay the final product by many months. Therefore MEAC staff have included an additional week of consulting in developing a document which will be more adaptable as a final ordinance.

The following discussion will address parts of the ordinance to provide the Township with some background on each section.

Property Line Standards

The major feature of the new proposed ordinance is the addition of an octave band noise standard for noise enforcement which could not be provided without the data analysis from the previous section of the report based on measured data from the Township. In Tables 1 and 2 are the proposed property line dBA and octave band noise limits for the New LMBT Noise Ordinance. As discussed in the previous section, these octave band numbers accurately reflect the existing conditions in the Township and will provide the basis for implementing an effective enforcement program once the ordinance is adopted. The limits in the Tables correspond to the noise survey data results of the MEAC noise survey and analysis for LMBT.

Vibration Section

The section in the LMBT Ordinance on Vibration limits (See Table III in the ordinance) was extracted from a vibration standard used by municipalities and counties in Illinois and Wisconsin. The vibration limits set forth for LMBT have been effective in several cases in the northern Illinois area.

It should be stated that MEAC staff did not include vibration measurements as a part of the noise study therefore no data from the Township is included as a part of this report.

Other Sections.

1. Section H - Operation of Vehicles ("Jake Brake" restrictions).

This section provide a mechanism for controlling noise from a motor vehicle on a Public Right-of-way by banning their use in residential or quiet zones, e.g. schools , hospitals, etc.

2. Section I - Operation of Off Road Vehicles.

This section will require the Township to consider the days of the week and the hours of the day in which the ban is to be in effect. There are many open areas within the Township and certain areas can be designated for Off-Road vehicles.

3. Section J. Prohibited Acts.

This section of the ordinance can be a version of the "old" nuisance" type regulation. Very difficult to enforce since it is usually very "subjective", however, it can be used for some sources.

In the USEPA "Model Noise Ordinance" the Township can review Article VI, Prohibited Acts to determine the sources which could best be addressed in the Township by a nuisance section.

Some of the sources listed include radio's, tv's, phono (today it would be cd's), musical instruments, (Section 6.2.1). Loading and unloading vehicles (Section 6.2.5). Note: This source can also be controlled by hours of operation.

4. Land Use Planning (A recommendation for the Township)

This MEAC noise study has provided LMBT with a valuable land use tool in the form of a daytime and nighttime noise maps of the whole Township. These maps should be retained for review on ALL future planning and zoning decisions to assure that all future land uses are compatible with the existing areas.

The Township can build on the tools they can utilize to incorporate noise as an element to be considered in land use planning. The Township can form a Land Use Noise Policy Committee after the Noise and Vibration Ordinance is passed. The Committee can review materials such as building codes, health codes, occupancy permits, permit procedures and zoning. MEAC can provide assistance to work with the committee.

The current report provides LMBT with the background for unlimited land use planning programs in relation to noise.

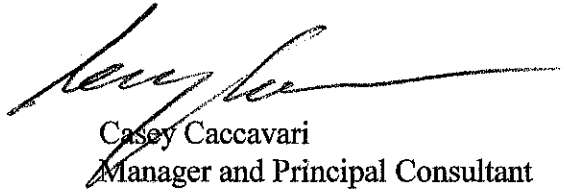
5. Enforcement

No matter how well or concisely any ordinance or regulation is written, it can only be as effective as it's enforcement policy. And, an enforcement policy rests on the commitment of the Administration to require compliance through resources provided for the enforcement. Equally important for effectiveness is the measurement procedure used to determine compliance with the ordinance, especially when the ordinance stipulates the noise and vibration limits which cannot be exceeded.

The LMBT project was a very challenging program for MEAC and we hope it will serve the Township for many years.

If there are any questions regarding any aspect of this final report please do not hesitate to call our Florida Office at (941) 573-6899 or Main Office in Chicago at (773) 973-4850.

Respectfully submitted,



Casey Caccavari
Manager and Principal Consultant
MEAC - South Florida Office

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MEAC

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APPENDIX A

NOISE SURVEY AND ANALYSIS DATA

24 HOUR AMBIENT SURVEY MEASURED 12/04/01 RD: RESID./I-1

24 HR CHART

