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May 16, 2016

Michael Donovan, AIA
Associate Principal
POPULOUS
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Kansas City, Missouri 64112

Subject: Minnesota United MLS Stadium
Preliminary Community Noise Review

Dear Mike:

This report is provided to present an assessment of potential community noise impact of the new Minnesota United MLS Stadium. The evaluation is based upon the current concept design for the new stadium featuring a distributed loudspeaker configuration with loudspeakers located on the stadium roof canopy. This loudspeaker system was modeled to be representative in performance and loudness capability when compared with other new MLS stadiums with similar sound system configurations. In addition to noise mitigation offered by the sound system design and architectural configuration of the stadium, operational noise mitigation measures may also be recommended, pending review of the project with the City of St. Paul, and Minnesota United.

This review is limited to sound from the stadium sound system and crowd noise. Roadway traffic noise is reviewed elsewhere, and it is premature to review sound levels from any stadium mechanical systems as they have not yet been designed. It is understood, however, that noise from stadium mechanical systems as well as construction activity will be required to be compliant with the applicable regulations.

PROJECT SITE DESCRIPTION

The new stadium is located at the south end of a parcel bounded by I-94 to the south, Snelling Avenue to the west, Pascal Street to the east and University Avenue to the north. The site and surrounding areas are relatively flat, with no large changes in elevation, hills, etc. that can be expected to block sound propagation from the proposed stadium site to the nearest residential areas.

There are long established residential and commercial properties to the west and north of the site. An existing retail development is to the east, with additional residential neighborhoods to the south of the site, across I-94.

The primary use of the stadium is for MLS soccer games, although other sporting events can be expected, along with limited amplified music as a pre-game activity (not concerts) for sports events.

Existing ambient noise levels for the properties in the environs of the site are primarily due to traffic operations on I-94 and the surrounding surface streets, which are busy during the daytime due to the existing commercial developments.

To the north, the nearest homes to the new stadium are approximately 850 ft. from the stadium. To the west, the nearest homes across Snelling Avenue are about 575 ft. (to backyards). To

the south, the homes across I-94 are about 380 ft. away. To the east, there is continuous commercial development from Pascal Street to Lexington Parkway; the residential neighborhoods to the northeast, across University Avenue, are much closer than are those due east of the site. The project site graphic is presented as Figure 1 below.

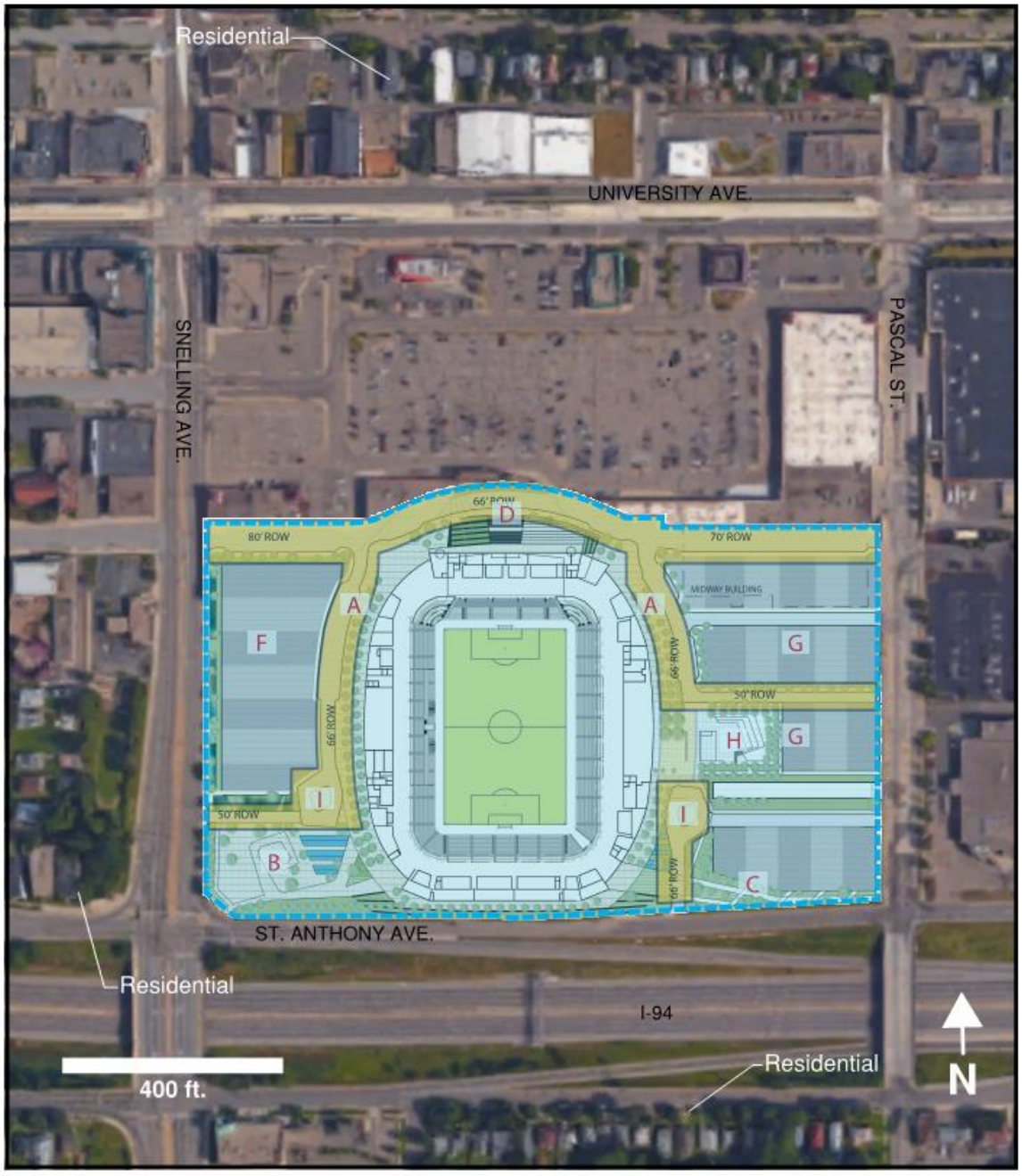


Figure 1. Project Site Location – Minnesota United MLS Stadium – St. Paul, MN

To the best of our knowledge, there is no significant development planned for the existing land uses surrounding the project site that could change the overall character of the adjacent areas

or alter noise propagation from the proposed stadium to the adjacent residential neighborhoods. As described, there is the potential for additional development on the stadium site to the north of the stadium perimeter.

As is described below, Interstate traffic, surface street traffic, and normal urban/suburban business and residential activity dominate the existing ambient noise environment during the daytime and evening hours when soccer games at the project stadium would typically occur.

CRITERIA FOR EVALUATION OF NOISE IMPACT

There are three common categories for determining community noise impact and response:

- **Audibility** – Many noises are audible in all built-up environments. The most common of these are expected, and do not give rise to substantial complaint activity. When unusual noises, or noises which do not meet the approval of residents, are audible, then annoyance is often registered. Depending upon the duration, loudness, and nature of the noise, community dissatisfaction may be registered. Clearly, noise that is not audible is not annoying. However, lowering noise levels to inaudibility can be difficult, as evidenced by modern, urban life. Despite this, some sounds are more intrusive than others, and are considered annoying by some residents even when the sound level of the offending noise is at or lower than other common sounds (such as traffic), and is well within the regulatory limits.
- **Change from Existing Conditions** – Many communities and states along with some Federal agencies define a noise impact in terms of the change in noise levels caused by an event or proposed new development. However, this does not apply under the City of St. Paul and State of Minnesota noise regulations. Therefore, this criterion is not relevant when determining noise impact.
- **Objective Noise Regulations** – Most communities, such the City of St. Paul (and the State of Minnesota), have noise ordinances and regulations which outline numerically quantified noise level limits. The objective standards generally determine what sound levels are Permissible by law, however these objective standards do not ensure inaudibility, but rather define what is considered "reasonable" for a particular land use or zoning at a particular time of day by that agency.

Noise Regulations

The applicable noise criteria for the project are established by the State of Minnesota Pollution Control Agency and the City of St. Paul Noise Ordinance (Code of Ordinances, Chapter 293). The objective noise level limits are based on the land use of affected properties and the time of day. The level exceeded 50% of the time (L_{50}) and the level exceeded 10% of the time (L_{10}) are the noise level descriptors used in the regulations. The L_{50} value is the sound level exceeded more than 30 minutes of any given hour, and the L_{10} value is the sound level exceeded more than 6 minutes of any given hour.

The State of Minnesota noise level limits include both L_{10} and L_{50} descriptors. All levels are A-weighted (dBA), which is appropriate for community noise. The applicable State standards are presented in Table 2 below.

Table 1. State of Minnesota Noise Level Limits

Noise Area Classification	Daytime (7 am-10 pm)		Nighttime (10 pm-7 am)	
	L_{10} (dBA)	L_{50} (dBA)	L_{10} (dBA)	L_{50} (dBA)
1 (residential)	65	60	55	50
2 (commercial)	70	65	70	65
3 (industrial)	80	75	80	75

The City of St. Paul noise level limits are based on the L_{10} descriptor. All levels are A-weighted (dBA), which is appropriate for community noise. The applicable City standards are presented in Table 2 below.

Table 2. City of St. Paul Noise Level Limits

Noise Receptor	Land Use Classification	Time of Day	Sound Level Limit (Hourly L_{10} dBA)
Class I	I-1, I-2 and I-3 (Industrial districts)	At all times (24 hr.)	80 dBA
Class II	R-1 through R-4, RT-1, RT-2 (single family, duplex and townhome residential) RM-1 through RM-3, P-1 and PD (low density and high rise multifamily)	7:00 am to 10:00 pm (daytime)	65 dBA
		10:00 pm to 7:00 am (nighttime)	55 dBA
Class III	B-1 through B-5, B-2C and OS-1 (business districts)	At all times (24 hr.)	70 dBA

The business (Class III) and residential (Class II) standards are the most relevant standards for the new MLS stadium project, as these are the closest land uses to the stadium site. Note that for residential noise receptors, the allowable limits is 10 dB less for nighttime hours compared to daytime hours due to lower nighttime ambient noise levels and the need for relative quiet (e.g., sleep).

The Minnesota Pollution Control Agency noise rules list both L50 and L10 noise level limits. The L10 values are identical to the City ordinance, the L50 values are 5 dBA lower than the L10 values in each category above.

Construction Noise Level Limits

The City noise level limits relative to construction activity is an Hourly L_{10} of 85 dBA at a distance of 50 ft. from the construction noise source. The sound level limits listed in the table above are applicable to operation of the project facility once constructed.

EXISTING AMBIENT NOISE ENVIRONMENT

As noted above, the ambient noise levels should be considered when both assessing compliance with objective standards and in any estimate of audibility. When ambient noise levels from a sound source are not substantially higher than the background (ambient) noise, it

can be difficult to determine the noise level of the subject source alone, as both the ambient and the noise that is to be measured contribute to the overall measured level. Calculation can remove the influence of background noise within 5 dB of the noise to be measured, provided the background noise levels are constant. However, to be confident that ambient noise will not contaminate a given measurement, it should be at least 10 dB or more below the noise source(s) being measured.

Ambient noise is also a very important factor in determining audibility of a sound. Sounds that are heard in very quiet conditions are likely to be judged as louder and easier to hear than the same sound at the same intensity in a noisier environment. Higher ambient noise levels tend to "mask" the perceptibility of other sounds.

Ambient noise levels were measured by David Braslau Associates on May 10, 2016. The following is a summary of the data included in the attached report. The three locations selected were in the existing residential neighborhoods closest to the stadium site. It can be assumed that the values for the commercial district to the east of the site will be at least a high as the location symmetrically to the west, with an expectation of higher levels due to increased traffic.

Figure 2 – Ambient Noise Level Measurement Locations (yellow dots)

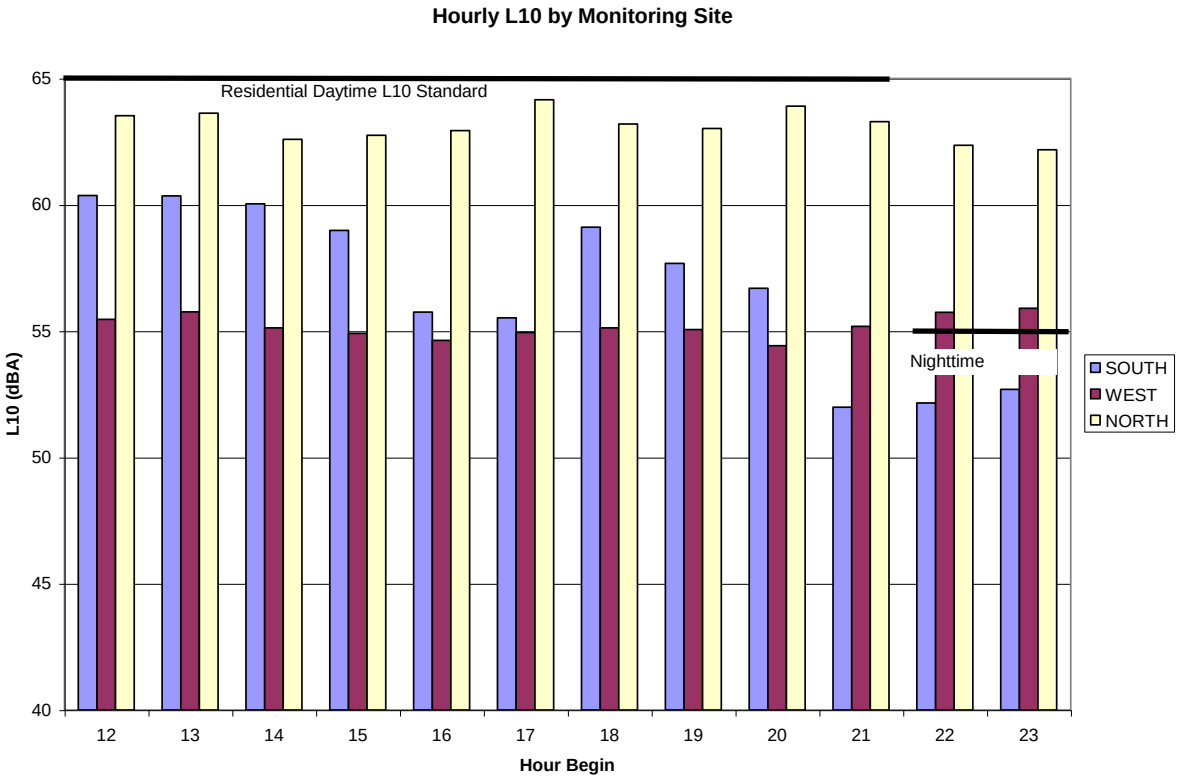


Figure 3. Hourly abmbient noise L10 values starting at 12 noon and extending until midnight

As can be seen, the L10 sound levels in all locations prior to 8 pm exceed the post 10 pm sound level limits and in all three locations are dominated by roadway noise. In all cases, the sound levels are below the pre 10 pm sound level limit. These levels are typical mixed use, urban/close suburban environments.

The measured ambient levels indicate that sound from stadium sporting events can be expected to be audible at homes and properties nearest the site, even if well within the City noise level limits. The factors that impact the degree of audibility are noted below.

ISSUES THAT AFFECT MEASURED AND PERCEIVED COMMUNITY NOISE LEVELS

In addition to the source sound levels and any reduction of sound offered by the stadium structure, the built environment, terrain, and weather conditions can affect measured sound levels and audibility. As regards to weather conditions, at locations within 1,000 ft. of an outdoor noise source, measured sound levels are primarily a function of the unimpeded sound levels associated with the source (e.g., stadium loudspeakers and crowd noise), distance from the source to the measurement location, and the presence of any barriers that can attenuate or otherwise alter sound propagation between the source and receiver. These factors are well understood and relatively easy to model and predict with good accuracy. The residential properties closest to the site are within 1,000 ft., and sound propagation between the stadium and these properties would not be significantly affected by the atmospheric conditions listed below; these conditions are mentioned, however, as they can significantly affect sound propagation at more distant receivers, occasionally producing complaints.

The following atmospheric conditions can affect stadium sound propagation and noise levels at distant receiver locations. These factors are well understood, but can be difficult to predict on a day-to-day or event basis.

- *Wind*

  Wind can have a large impact on sound level propagation (5-10 dB), and therefore perceptibility of amplified sound a great distance (i.e., over 1000 feet) from the site. At locations near the source of the sound, wind has a much smaller effect. The residential neighborhoods in the vicinity of the stadium site are close enough that significant changes in stadium sound levels in these neighborhoods due to wind are not expected.

- *Temperature Inversion*

  Normally, the temperature of air decreases with altitude/elevation. This is one reason why air is cooler in the mountains than at sea level. Under conditions where the air temperature near the ground is lower than that of the air above, a temperature inversion is said to exist. This condition is not unusual, and is often due to rapidly cooling landmass (as in the desert) or infiltration of cooler sea air on-shore in coastal areas. During a temperature inversion condition, effective sound propagation over large distances could be achieved, increasing stadium-related sound levels at more distant noise-sensitive receivers. Again, the proximity of the adjacent residential neighborhoods indicates that temperature inversion conditions would not significantly affect stadium sound levels.

TYPICAL MLS STADIUM PUBLIC ADDRESS AND CROWD NOISE LEVELS

To verify sound levels typical of an MLS game, reference sound level measurements were conducted at a purpose-built, MLS stadium (Sporting KC) with a similar (though not identical) sound system and architectural design. Sound level measurements were made both inside the stadium, within the spectator seating, and outside the stadium at a distances similar to the closest residential property locations near the proposed Minnesota United stadium site in St. Paul. The intent of measurements was to gain an understanding of how the sound system would be used in regards to level, program, and frequency of use during the game, as well as understanding how sound is attenuated in level from inside the stadium to outside. This data was used to inform the modeling of the anticipated sound levels associated with the proposed stadium in St. Paul. Additionally, the reference sound level measurements were used to evaluate crowd-related noise (i.e., cheering and drumming) and how it propagates outward from the stadium.

Noise level measurements were completed using a Norsonic Type 140 sound level meter (Class 1, precision system). The sound level meter was calibrated in the field immediately before the measurement session using a Norsonic Type 1251 Sound Calibrator. The measurement system was laboratory certified to be in proper working condition on December 31, 2015.

Atmospheric conditions during the reference noise level measurement session were typical of the MLS season – sunny, warm (65-70 deg. F), moderate humidity, and calm winds. The weather conditions were conducive to quality results.

Sound levels from the stadium sound system were nearly continuous prior to the game and during halftime. However, sound system use was very limited during game play, and only occurred in response to the most relevant action on the field (i.e., a goal, significant penalty), and was not used for every play as is common for other sports, such as American football. The frequency of use of the sound system is important, as the City noise regulations are percentile based, as noted above.

Crowd noise included cheering throughout the stadium and drumming from the supporters' section. Crowd noise was the primary stadium noise source during the game, and was also a contributing source of noise for the 30 minutes prior to the start of the game. Measured, noise levels are summarized in the table below.

Measured, existing MLS stadium noise levels are summarized in Table 3 below.

Table 3. Comparison Measurements at MLS Stadium (Sporting KC)

L_{10} (dBA)	L_{50} (dBA)	Specific Measurement Notes
Exterior		
70.4	66.9	Only pre-game PA, music, and crowd. PA=67 dBA, music=67-73 dBA, crowd-61-65 dBA, stadium fireworks=80 dBA (short duration)
71.5	66.3	Combination of pre-game and start of game. PA=67 dBA, music=67-73 dBA, and crowd=61-65 dBA.
66.2	62.5	Game play only (no PA or music).
Interior		
85.9	82.1	Upper seating area near concourse. PA=85-87 dBA, music=83-85 dBA.
91.7	87.2	Lower seating area near field. PA=87-90 dBA, music=82-86 dBA, crowd=95-105 dBA (short bursts)

General Notes:

- All exterior noise level measurements were completed at a distance of approximately 393 feet from the building façade. The measurement site was on the short side of the stadium adjacent to the primary fan section that included drums.
- All measurements were 10 minutes in duration. Therefore, the L_{10} measurement is the noise exceeded for 1 minute, and the L_{50} measurement is the noise exceeded for 5 minutes.
- Measurement results are expected to represent worst-case MLS game noise exposure associated with the proposed stadium.

PREDICTED NOISE FROM NEW STADIUM

House Sound/Public Address System

This is the permanently installed sound system for the seating bowl spectator seating that provides announcements, audio associated with the large video displays, and prerecorded audio programming. The calculations of community sound levels from this system are based on the following assumptions:

- The new stadium loudspeaker configuration is a distributed type system with multiple loudspeakers mounted on the roof canopy.
- The elevation of the primary speakers for the new stadium is not more than 90 ft. relative to the field.
- Public Address system sound levels at the new stadium will be no greater than 90 dBA as measured in the fixed seating areas.
- While the architectural configuration of the Sporting KC stadium is different than that proposed for St. Paul, and those differences have been accounted for in the computer model for St. Paul, the propagation (reduction in level) of sound over distance, from the stadium will be similar to that measured.

The primary speakers, with the longest speaker-to-listener distance, face nearly straight down to cover the bottom two thirds of the lower seating bowl. Additional canopy-mounted speakers cover the remainder of the lower bowl and the upper level seating. These ratios change as the seating bowl section varies around the circumference of the stadium.

The speaker configuration would not direct sound outside the stadium. In addition, the canopy roof, stadium seating and concessions buildings would act as barriers to sound escaping the seating bowl. The proposed fabric façade is minimal to provide minimal sound reduction, so was not included in the sound modeling to yield conservative values.

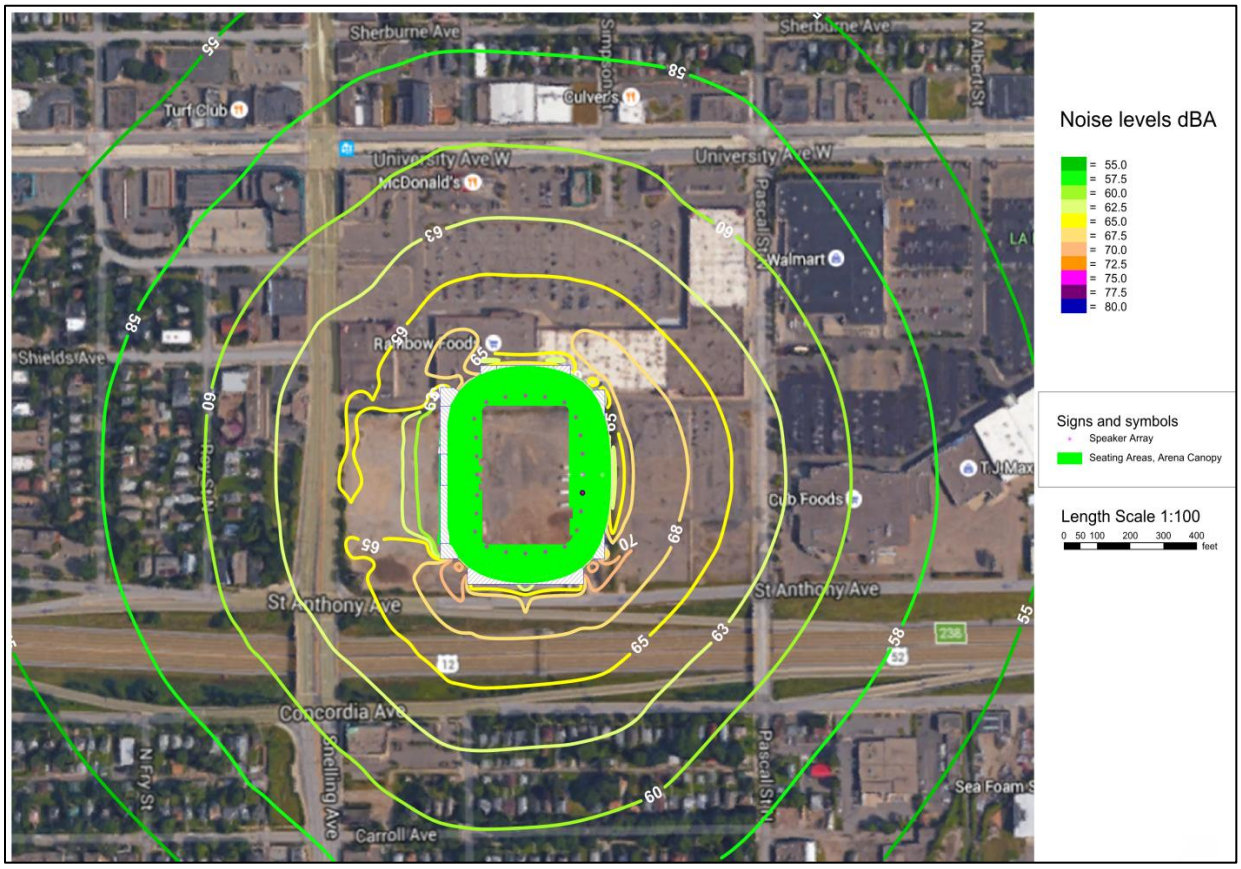


Figure 2. Noise Contours of Distributed Speaker System

Based on the current architectural design, proposed loudspeaker configuration and assumed sound levels in the bowl, sound levels at the nearest residential property are estimated to be a continuous 64 dBA, assuming a direct line of sight from the sensitive receptor to the stadium. Locations that are blocked by other structures, or are more distant from the stadium would experience lower sound levels.

Based on the reference sound level measurements presented in Table 3 above, we anticipate a maximum of 45 minutes of PA system noise during pre-game activities and 30 minutes at halftime, and 15 minutes of crowd noise with little contribution from the PA system, during gameplay. For these noise sources and at these durations, we anticipate an L_{10} and L_{50} of approximately 64 dBA at the closest existing residential uses. This level is in excess of the post 10:00 pm residential City of St. Paul sound level limit. For this reason, scheduled sporting events are recommended to end prior to 10:00 pm or operate with reduced source sound levels during nighttime hours.

The sound system source levels will also have to be carefully controlled during daytime hours to ensure that the applicable noise level limits are met.

Crowd Noise Sound Levels

Crowd noise is significantly different in character than the public address system; it consists of a collection of many, lower power level sources in comparison to the relatively few, higher-powered sound sources of the distributed loudspeaker system. For this reason, crowd-produced sound levels are typically lower than the house sound system outside the stadium. In addition, peak crowd noise levels are of shorter duration than the announcements and other program played through the public address system when also considering the pregame and halftime program. It is unlikely that maximum crowd noise would occur for as much as 6 minutes total in any given hour during an event (i.e., 10% of the hour).

During the measurements performed at the Sporting KC facility, described in Table 3 above, crowd noise levels were measured to be approximately 4 dBA less than the PA system noise outside the stadium. When comparing this data to the proposed St. Paul stadium, and accounting for the increased distance to the nearest residences on the south side of the stadium, we anticipate an L_{10} from crowd noise alone to be approximately 62 dBA. For this reason, crowd noise should not exceed the City noise level limits for daytime events.

Other Amplified Sound Sources

As can be seen in the site plan above (Figure 1), there is a plaza area to the north of the stadium proper. This type of plaza area can be expected to host small, pre-event functions that may feature musical performances or broadcaster pre-game shows, as well as a house public address system for making announcement to patrons in the area. In each case, these amplified sound sources have the potential to exceed the City noise level limits to the west and north of the site. As a practical matter, the sound levels for these sources are considerably lower than for the main stadium spectator seating sound system. This does not mean, however that these sound sources can be ignored. For reasons of compliance, any permanent speakers should be limited in scope or distributed throughout the plaza to minimize community sound levels. Portable sound systems and stages should be set up to direct sound away from residential areas, as well as being limited in loudness to ensure compliance.

Concert Sound Levels

Currently, there are no plans to host concerts at the stadium. Should there be a desire to promote outdoor, amplified music concerts at the venue in the future, further evaluation of sound levels may be needed.

Future Site Development

As noted above, there is the potential for development in addition to the stadium on the project site. Currently there is no approved plan or other projects, however a concept site plan has been provided that provides some insight to what might possibly be constructed.

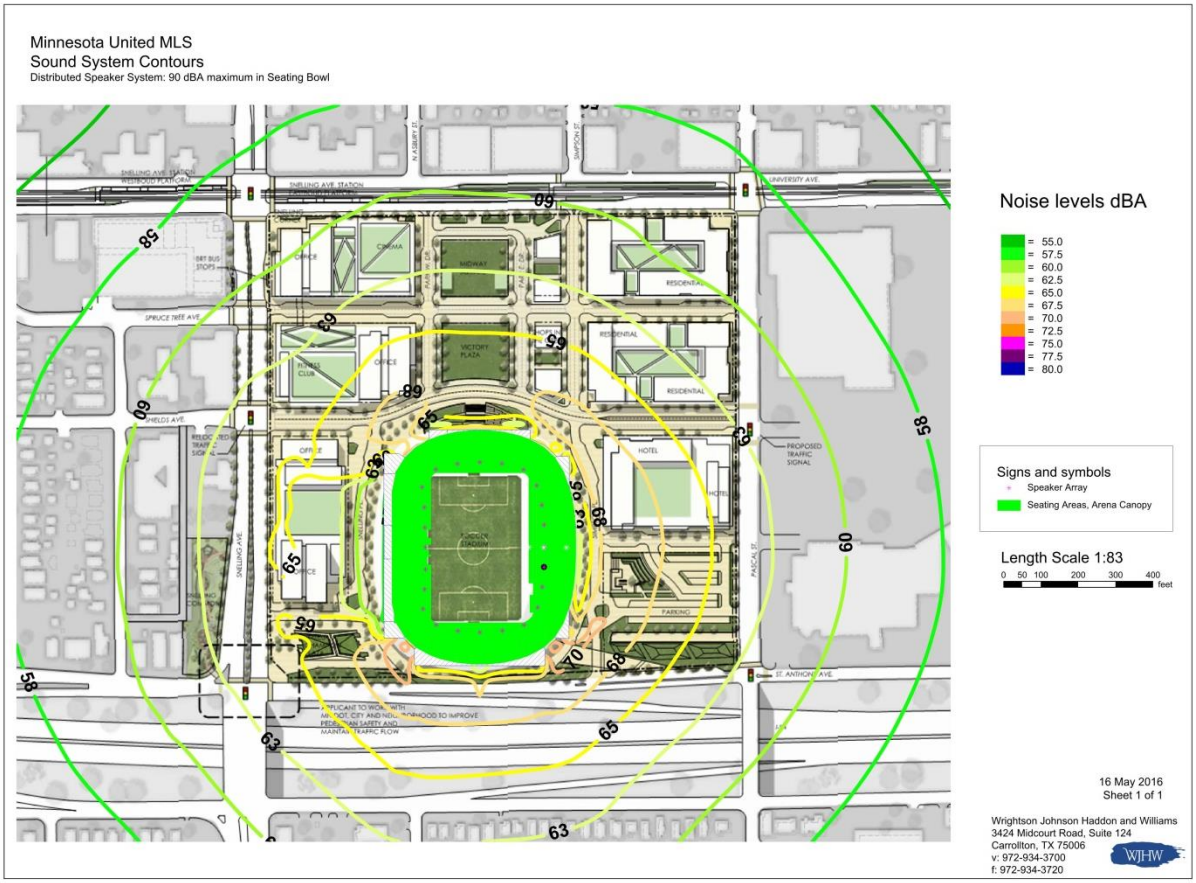


Figure 4 - Noise Contours of Distributed Speaker System with Concept Development Plan

As can be seen from the noise contour overlay on the concept development plan, there is a change for permanent and temporary (hotel) residential use. The distance of these potential developments indicates that, during soccer games, the City noise regulations will be exceeded. Construction of Class II receptor uses within the 65 dBA contour will require mitigation through decreased stadium sound levels or other means, including possible sound level variance.

OVERVIEW OF EXPECTED NOISE IMPACTS AND POTENTIAL MITIGATION MEASURES

Calculated sound levels from the stadium permanent seating bowl sound system and crowd noise, based on the typical MLS game presentation, the current sound system configuration, the current architectural design, and reference noise level measurements, are not expected to

exceed the City of St. Paul daytime noise level standard at the closest noise-sensitive uses. During nighttime hours, the sound system may exceed the applicable sound level limit, depending on how long an event extends beyond 10:00 pm and how loudly the sound system is operated. Crowd noise may also exceed the City's nighttime limits.

Large, amplified music concerts are expected to exceed both the daytime and nighttime City sound level limits at the nearest residential properties. While it is possible for concerts to be compliant with the City regulations, this would require reducing source sound levels at the assumed mix position of about 85 dBA, which is significantly lower than typical practice for large outdoor music concerts.

As the house sound system has the potential to exceed the City noise level limits, it is recommended that:

- The overall system loudness should be electronically limited so that levels in the spectator seating cannot exceed levels that are compliant with the City standards. The calculations assume a maximum of 90 dBA at the spectator seating to limit the noise level at the closest residences to 65 dBA L_{10}.
- Sporting events must be scheduled so that regulation play is completed by 10 pm.
- Plaza amplified sound sources are to be configured and operated at levels which are consistent with the City noise standards.
- Any amplified music associated with stadium events, such as small musical groups performing pre-game in the seating bowl or exterior plaza, must be limited in loudness to comply with the City noise ordinance.
- Continuous pre-game and half time stadium sound system levels will likely have to be lower than in game announcements, in order to meet the City noise regulations.
- Future development on the stadium site should be designed with the understanding of the activities occurring at and noise levels generated by the stadium.

Please call should you have any questions or need additional information.

Best Regards,
WRIGHTSON, JOHNSON, HADDON & WILLIAMS, INC.

Jack Wrightson
Principal

Cc; Bruce Miller - Populous
Tom Falgien - WJHW

MN United Stadium
Ambient Noise Measurements

David Braslau Associates, Inc.

10 May 2016

Results of ambient sound level monitoring at three locations near the proposed stadium are presented and discussed here.

Locations of the final monitoring sites are shown on page 3.

The originally identified south site was used to set up my meters, even though the neighbor was afraid it might be stolen.

The originally identified west site was relocated. (We had permission from the church to set up at the site, which I did -- but another church member saw the meter and picked it up since he thought it might be stolen!) Finally, the neighbor adjacent to the church lot let me set up in his fenced-in back yard, very close to the original site.

The originally identified north site owner never got back to me with permission to access the property. This was the only residential property with a site open the south. Luckily, I noticed the Culver's parking lot "islands" and got permission to set up there. Noise from traffic in the parking lot did not appear to a major problem, as was shown in the actual time history data.


North Site
West Site
South Site
Sherburne Ave
University Ave W
Spruce Tree Ave
Shields Ave
St Anthony Ave
Roblyn Ave
Carroll Ave
Snelling Ave & Carroll Ave
9.95 ACRES
10.90 ACRES
4.90 ACRES
PARCEL 3: OWNED BY RD MANAGEMENT
PARCEL 2: UNDER OPTION BY CITY OF SAINT PAUL HRA
Google earth

The oblique aerial photo on Page 5 shows the location of the south meter location.

The location was in a empty lot separated from the I-94 frontage road by one row of houses. Traffic noise from I-94 dominated the area. This site provided levels that the second row of homes would experience. Levels at the first row along the frontage road would probably be about 9 dBA higher (5 dBA for closer distance and 4 dBA for lack of attenuation from the row of houses). The third row of homes would probably be about 7-8 dBA lower.

Photos of the meter follow.


N
I-94
Meter South
© 2016 Google
Google earth
1991
44°57'02.72" N 93°09'51.05" W elev 931 ft eye alt 1786 ft

South-looking-South.jpg

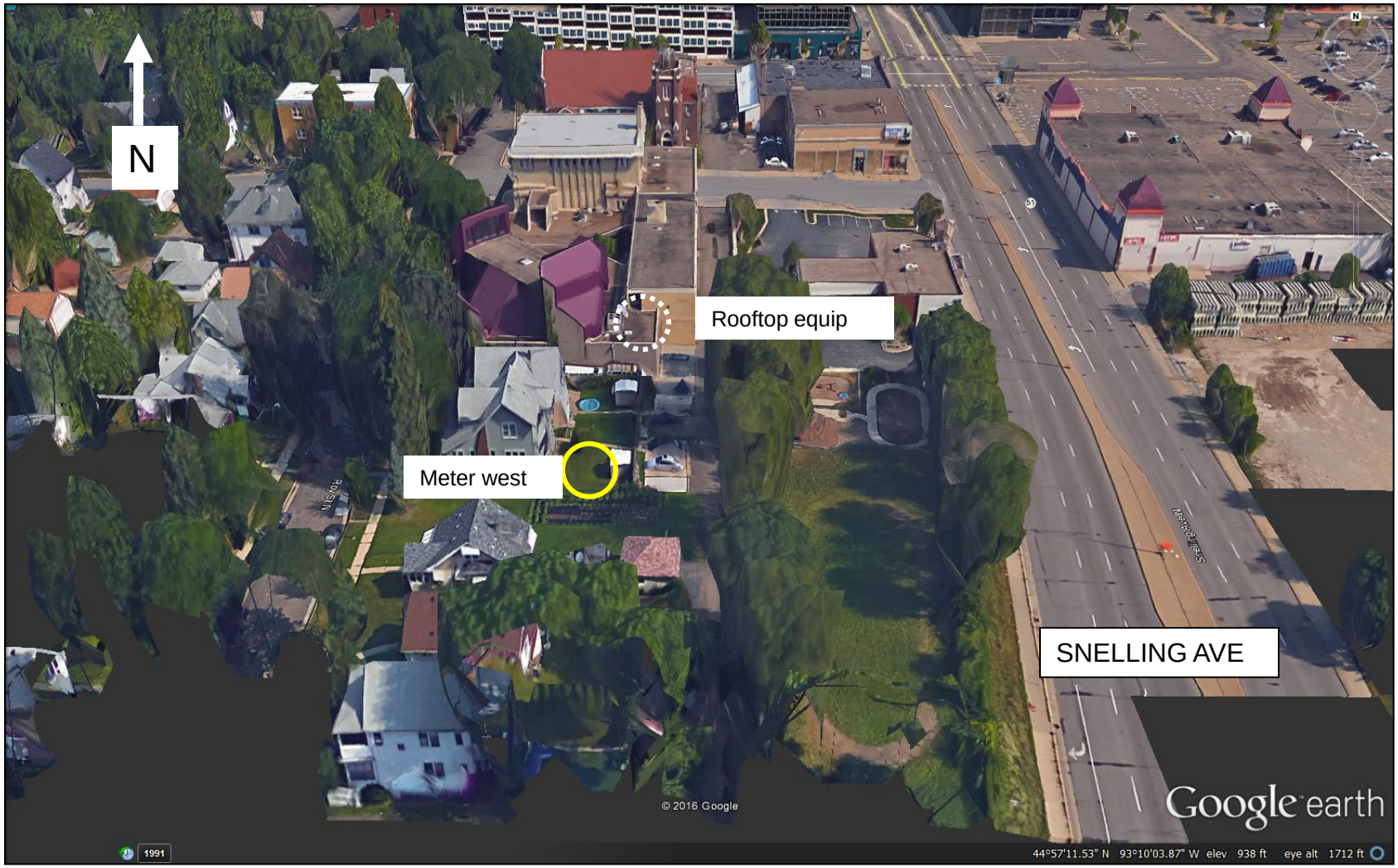
South-Looking-North.jpg

The aerial photo on Page 9 shows the location of the west meter location.

One would expect that noise level from Snelling Avenue would be higher but it is slightly depressed below the open green area, and often slow due to queuing a the I-94 ramp signals.

As will be seen from the data below, the rooftop unit at the church contributed to background level but only near the end of the monitoring period.

Photos of the meter follow. The fence was visual only and the small shed did not seem to have any effect on the traffic noise level.


N
Rooftop equip
Meter west
SNELLING AVE
© 2016 Google
Google earth
1991
44°57'11.53" N 93°10'03.87" W elev 938 ft eye alt 1712 ft

West-Looking-East.jpg

West-Looking-West.jpg

The aerial photo on Page 9 shows the location of the north meter location.

As explained above, a meter on the parking lot island provided one of the only sites open to the south, not blocked by buildings. The originally selected site was the home just north of the meter.

A photo of the meter looking towards the south (University Avenue) follows. .

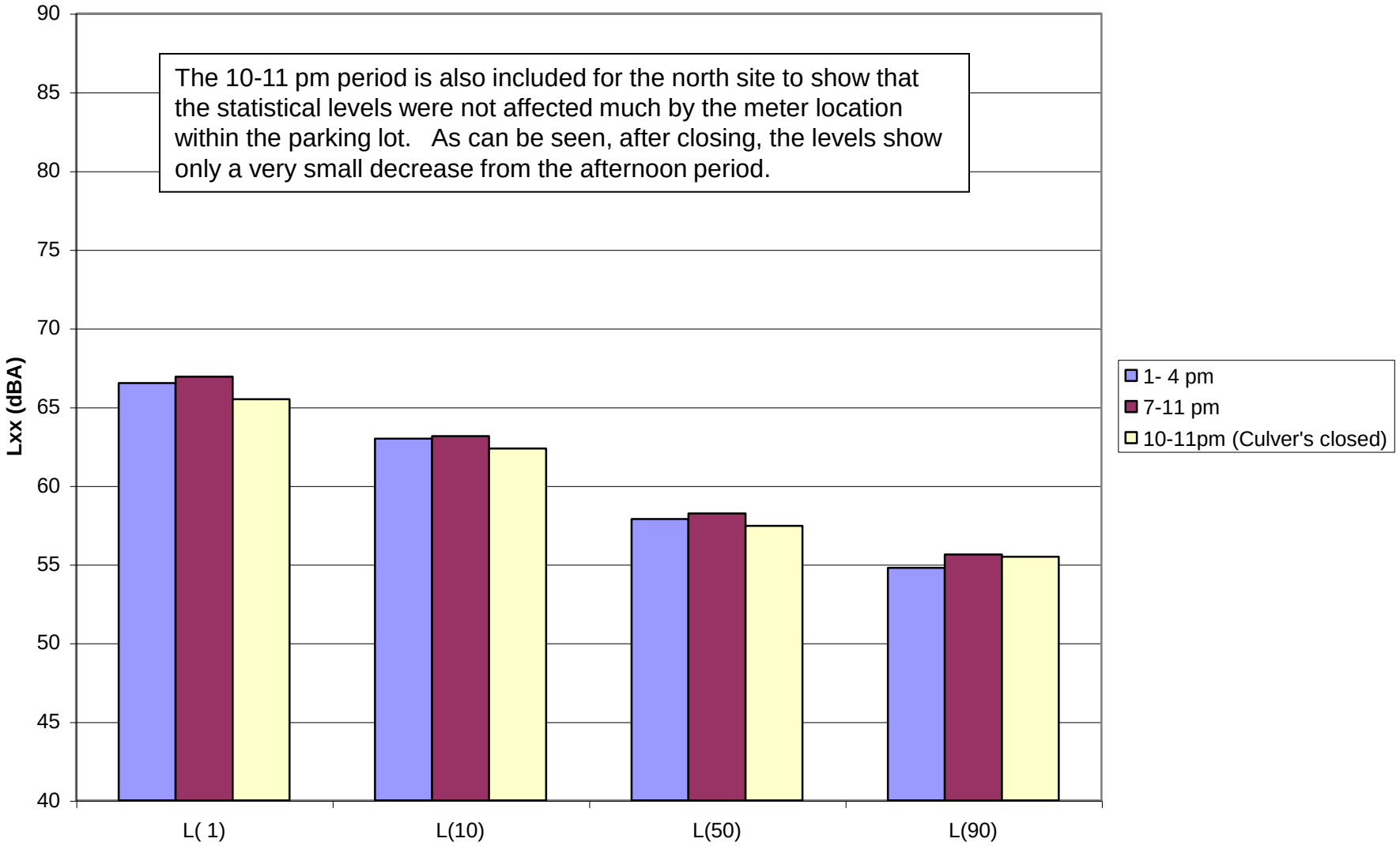

N
Culver's
Meter north
University Avenue
© 2016 Google
Google earth
1991
44°57'20.39" N 93°09'47.03" W elev 926 ft eye alt 1692 ft

North-Looking-South.jpg

Averaged statistical noise descriptors at the three monitoring sites for the event time periods you identified are presented below.

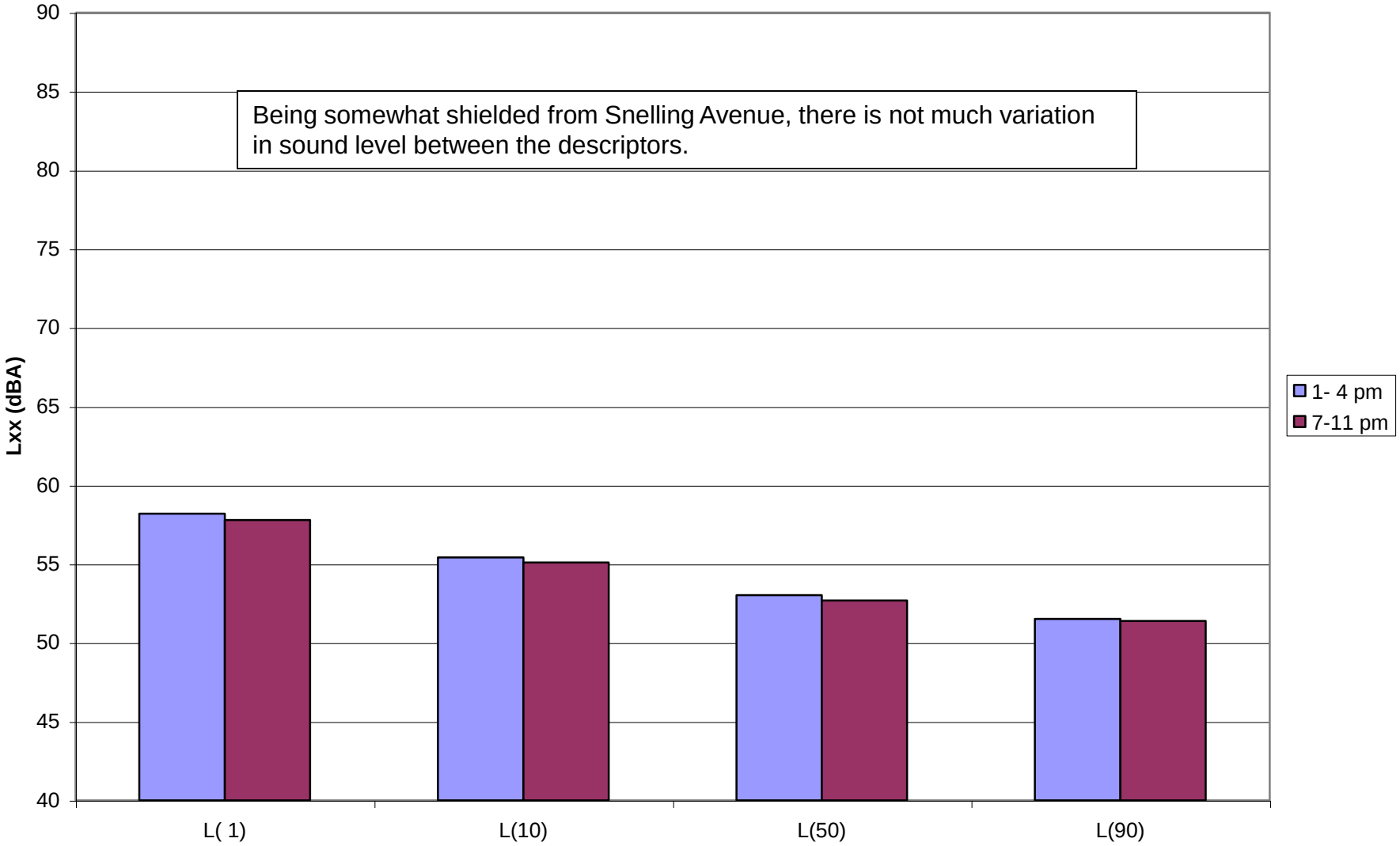
More detailed results for each of the meter sites are included after these three summary slides.

Event Time Lxx Averages - North



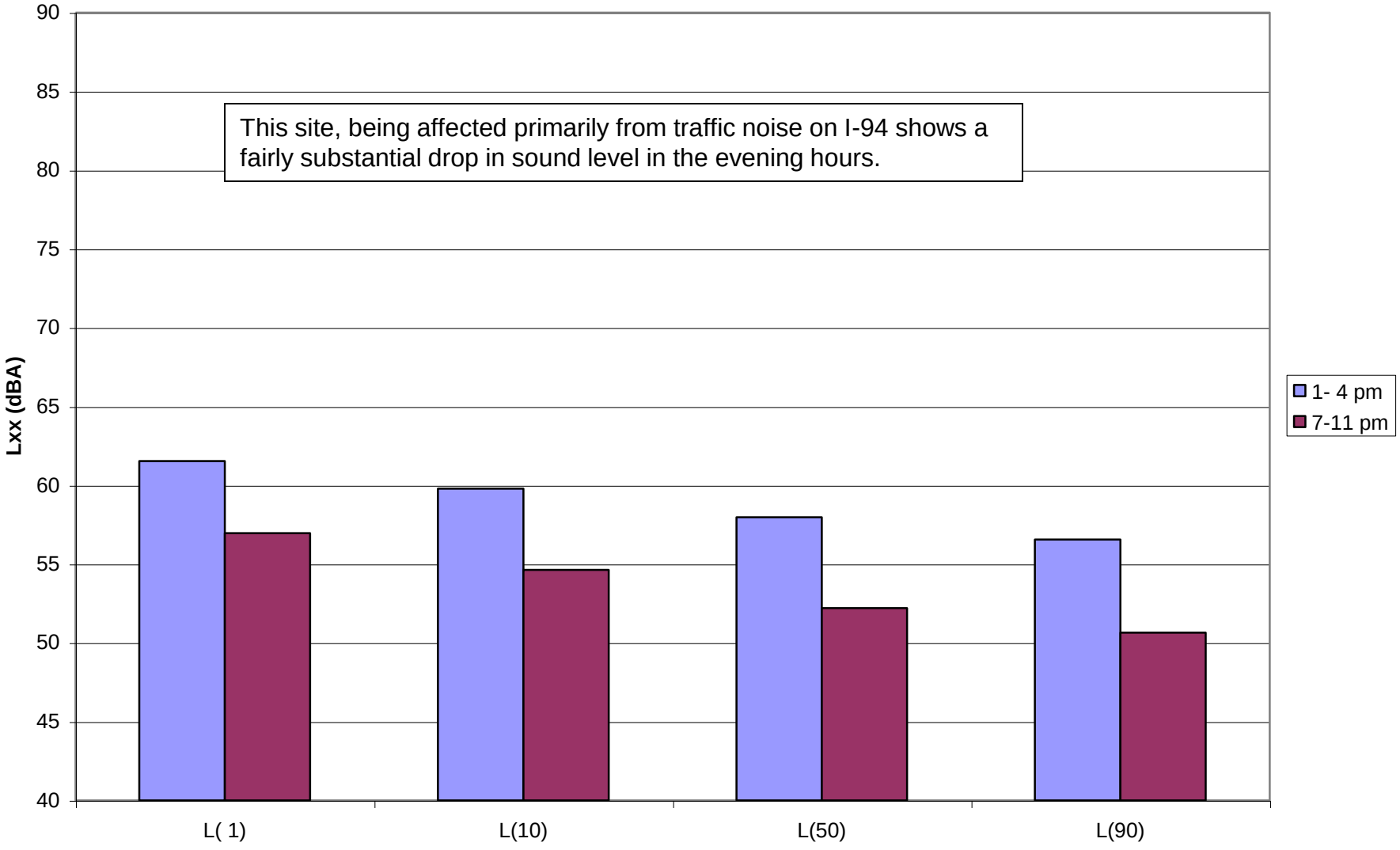
LD820-North\Int-07-xls C-Event-Time-Lxx-North

Event Time Lxx Averages - West



LD820-West\Int-06-xls C-Event-Time-Lxx-West

Event Time Lxx Averages - South

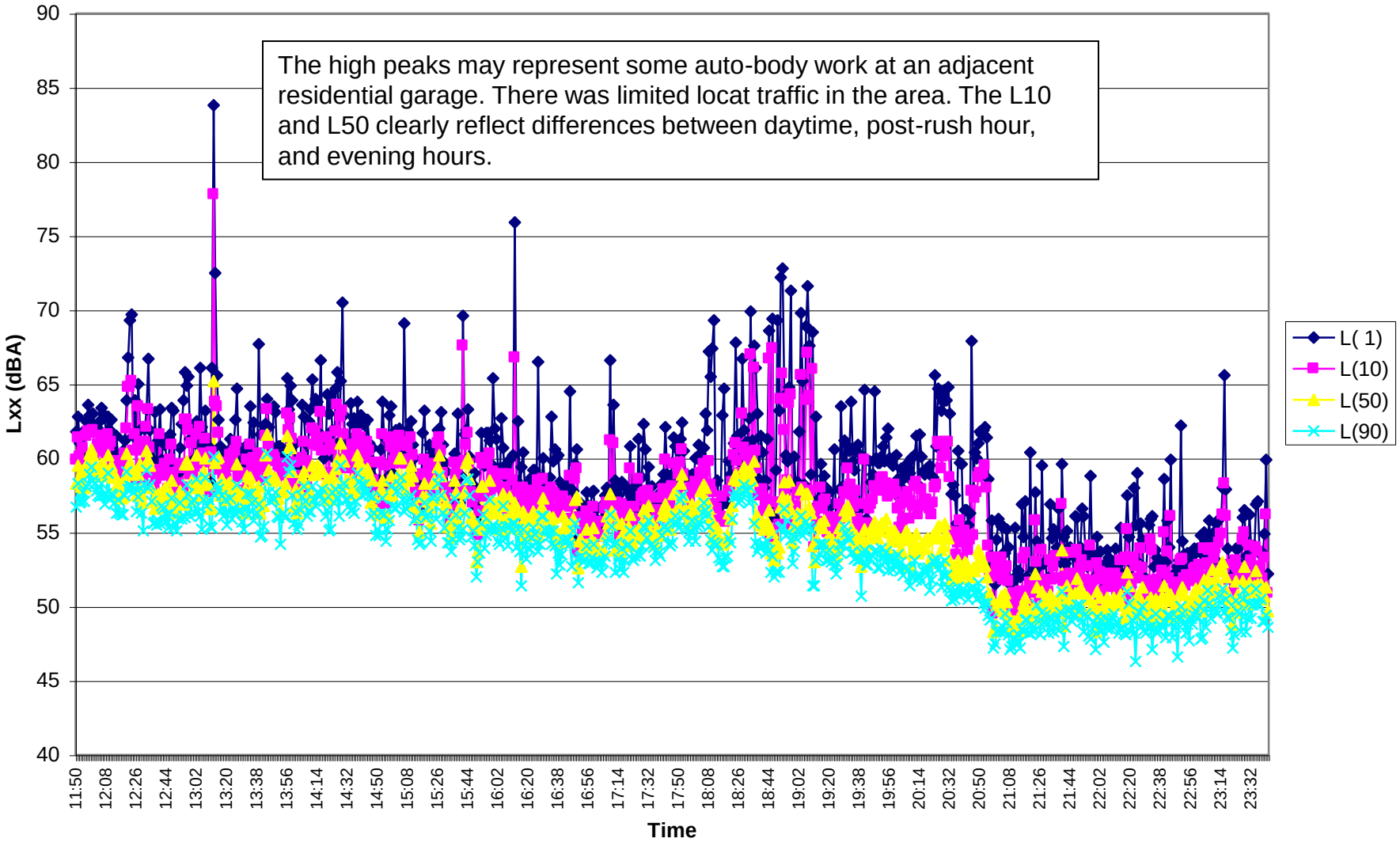


LD820-South\Int-07-xls C-Event-Time-Lxx-South

South Meter

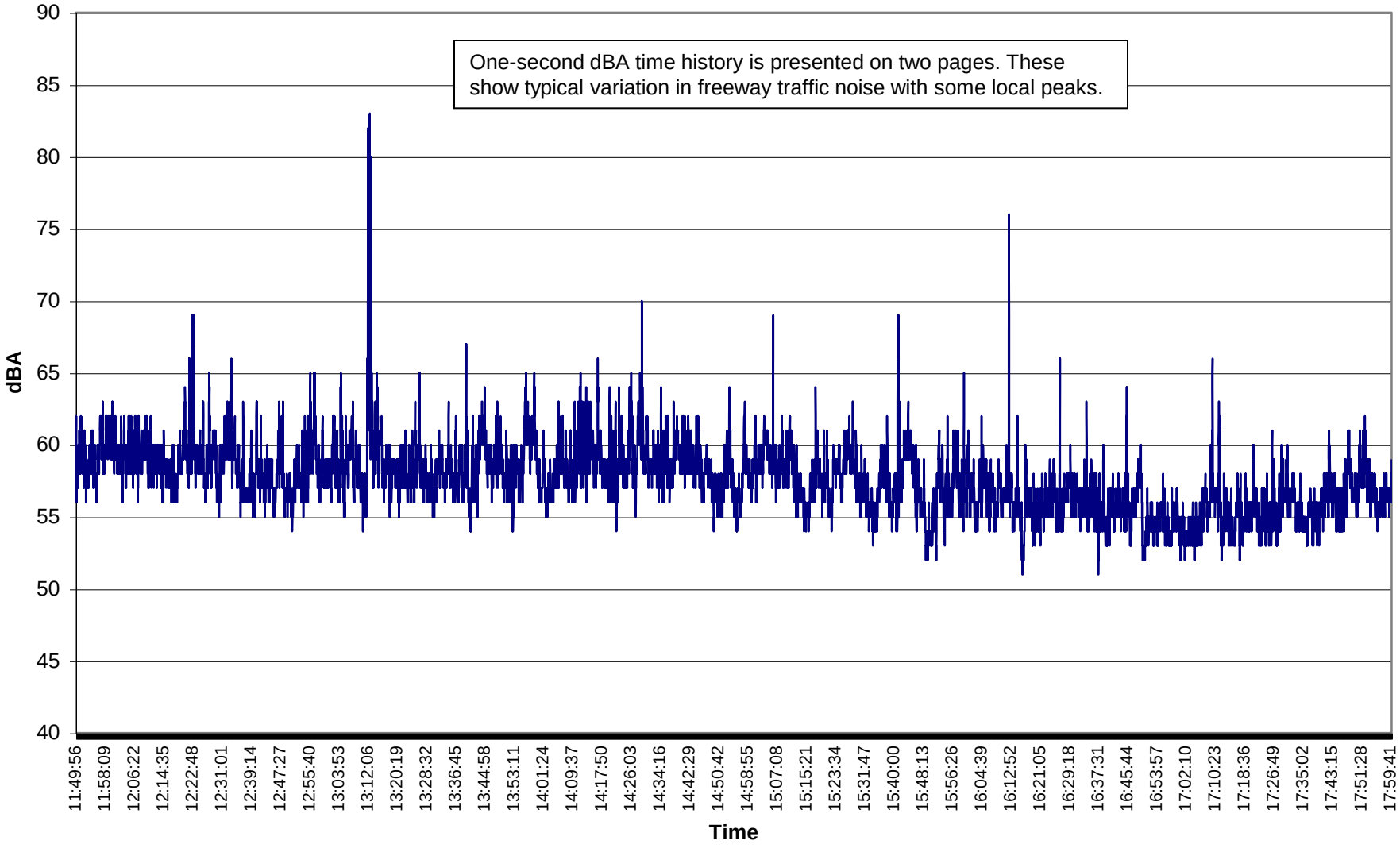
The following four charts present more detailed data from the south meter site

1-minute Intervals-South

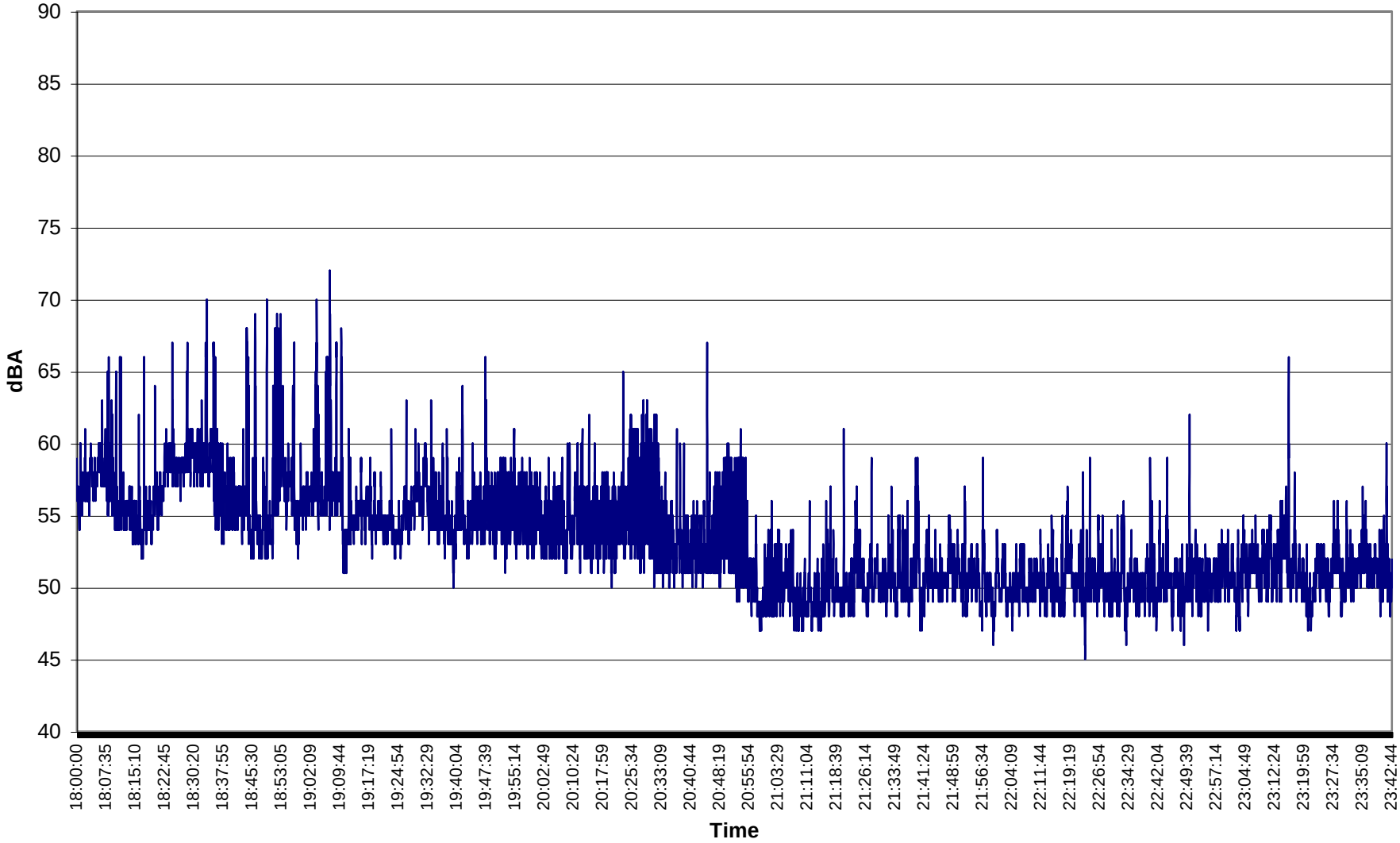


LD820-South\Int-07.xls

1-second Time-History-South (1200-1800)

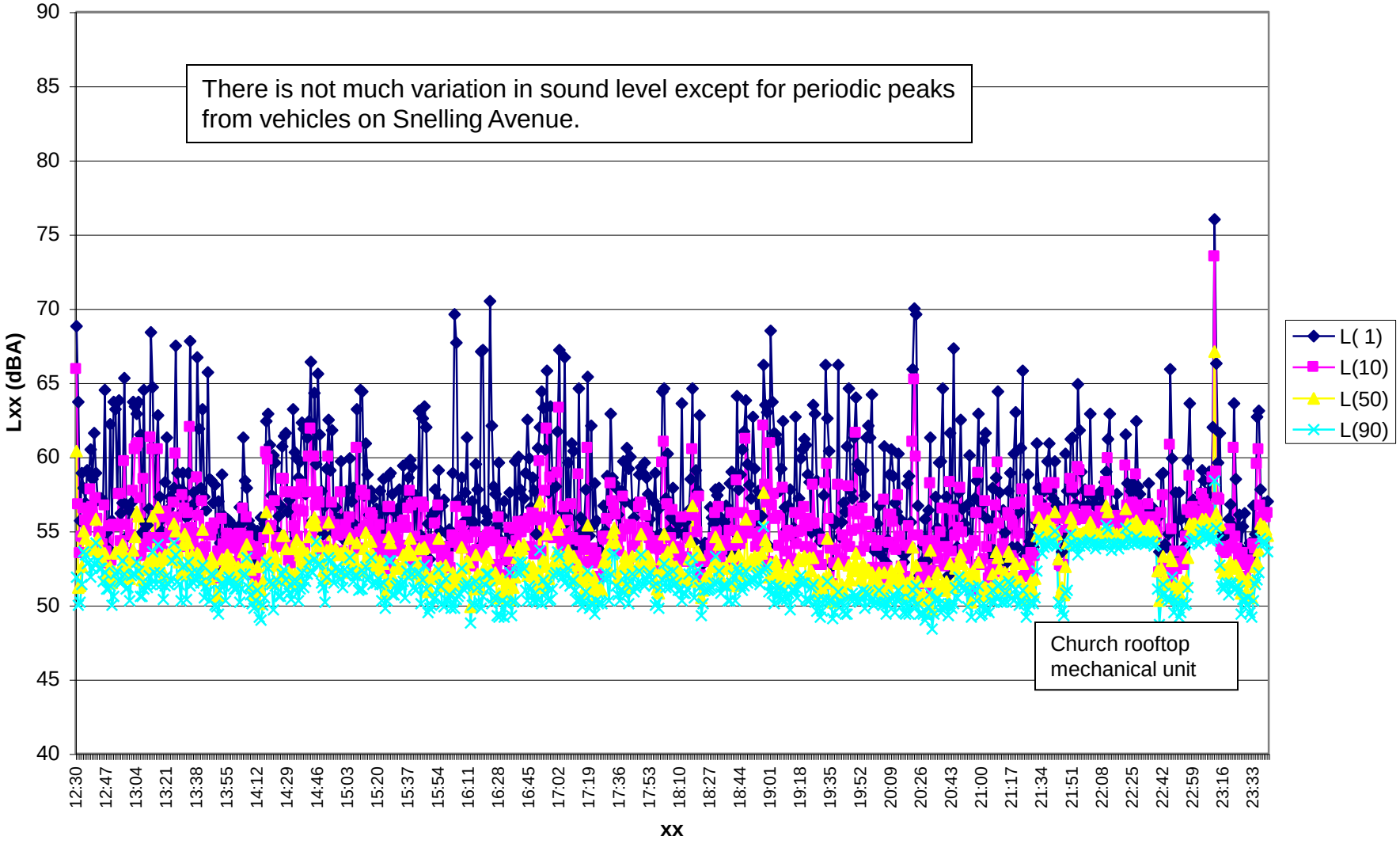


1-second Time-History-South (1800-2400)



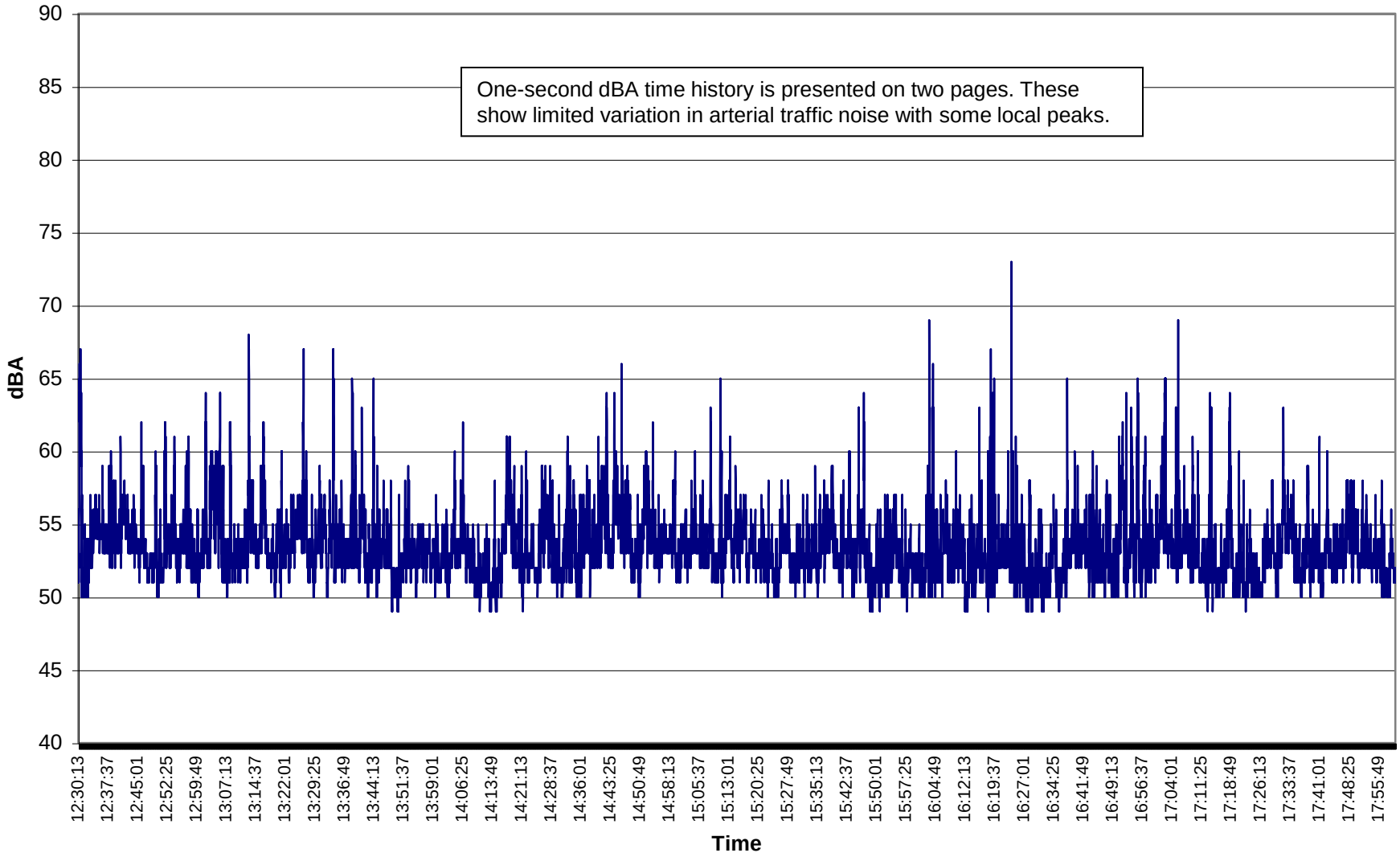
LD820-South\Time-Hist.xls

1-minute Intervals - West



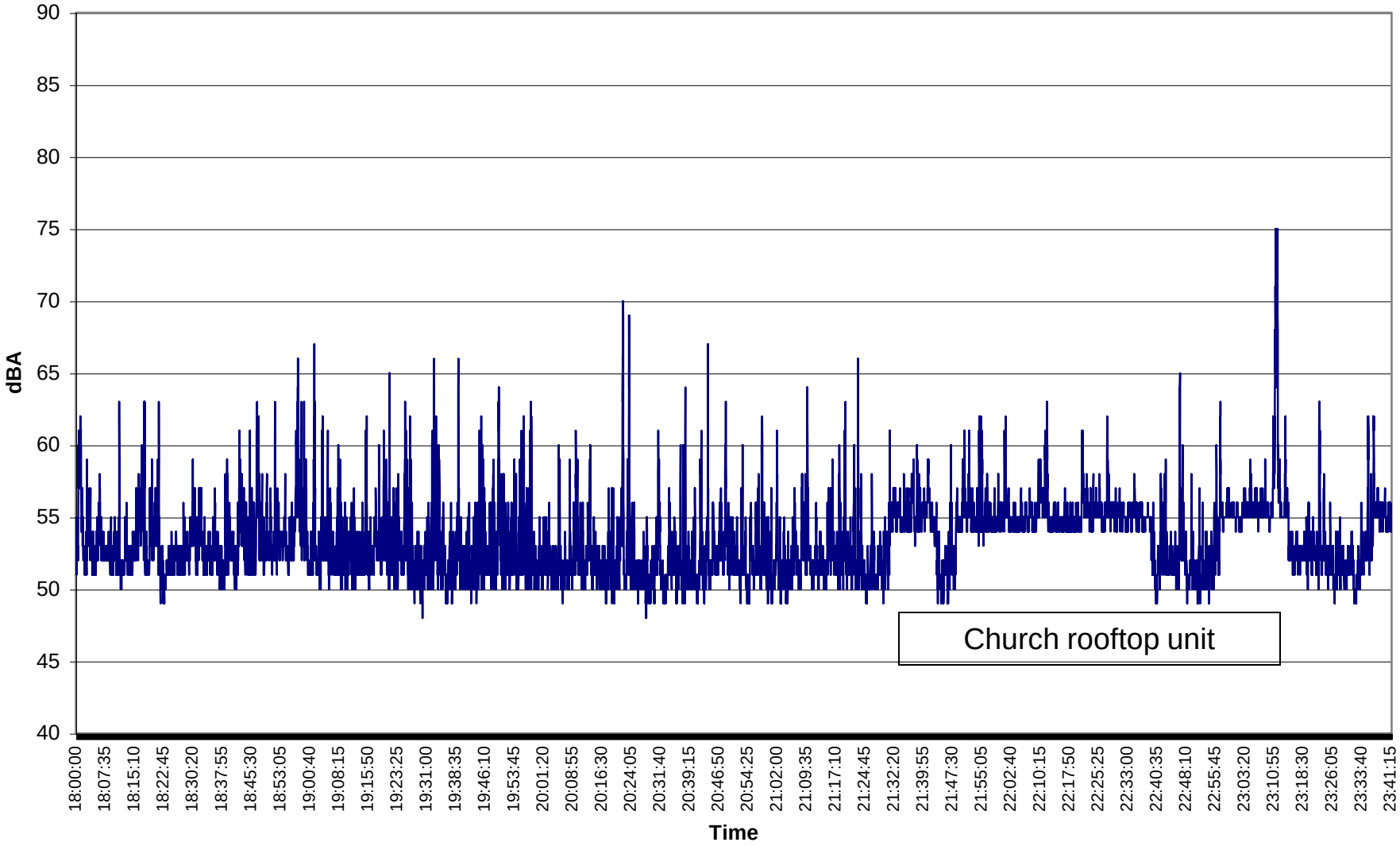
LD820-West\nt-06.xls

1-second Time History West 1230-1800



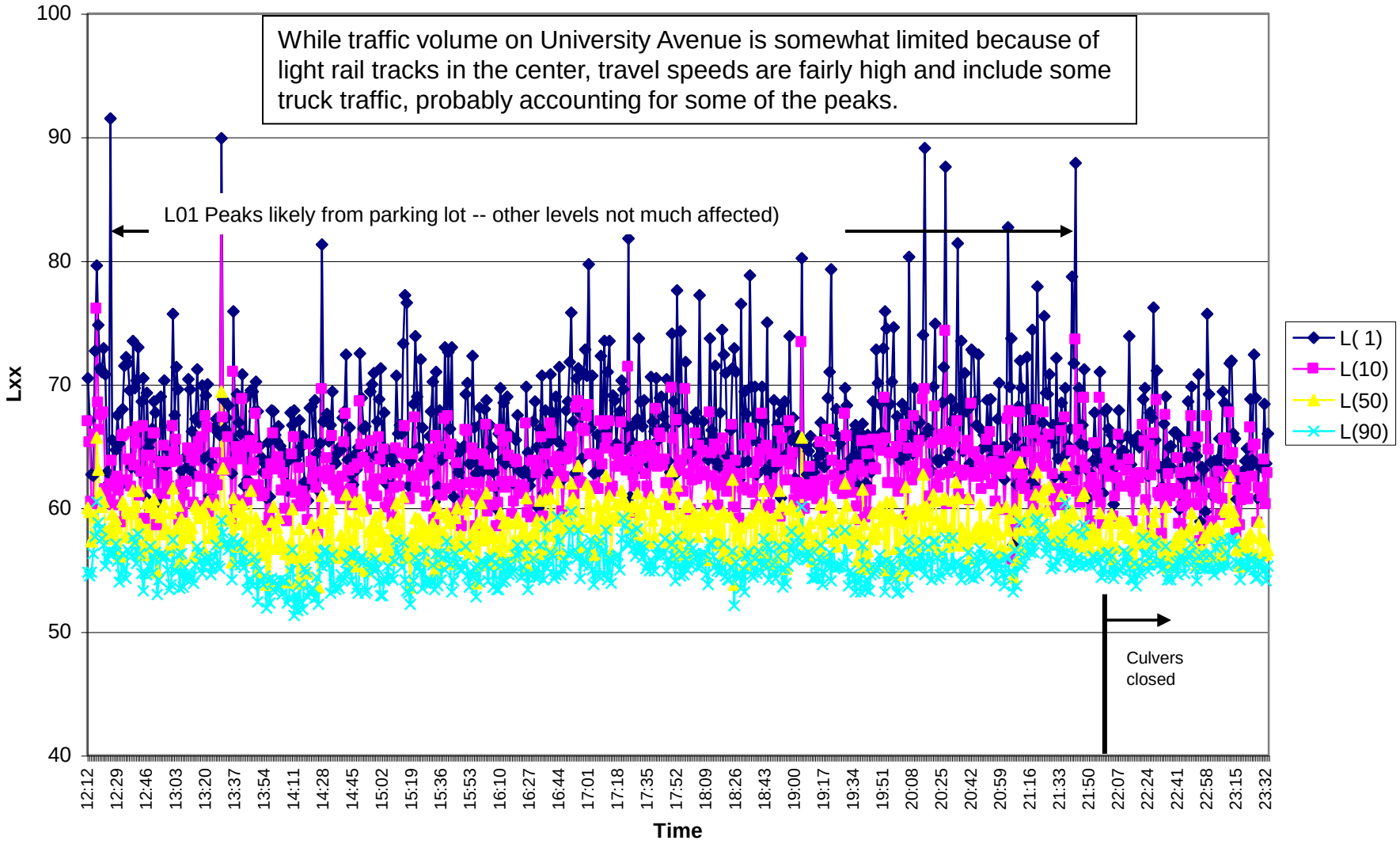
LD820-West\Time-Hist.xls

1-second Time History West-1800-2330



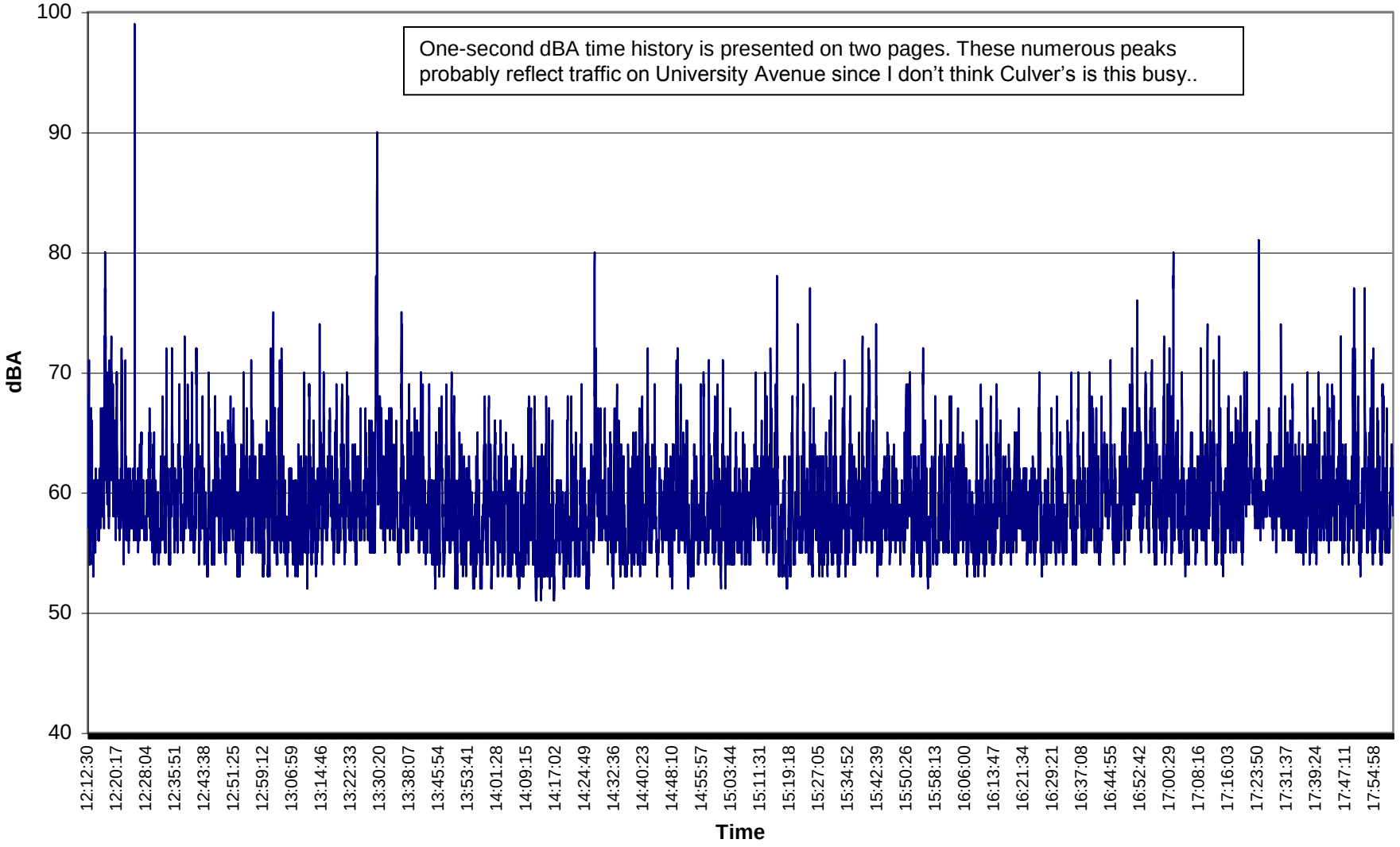
LD820-WestTime-Hist.xls

1-minute Intervals - North



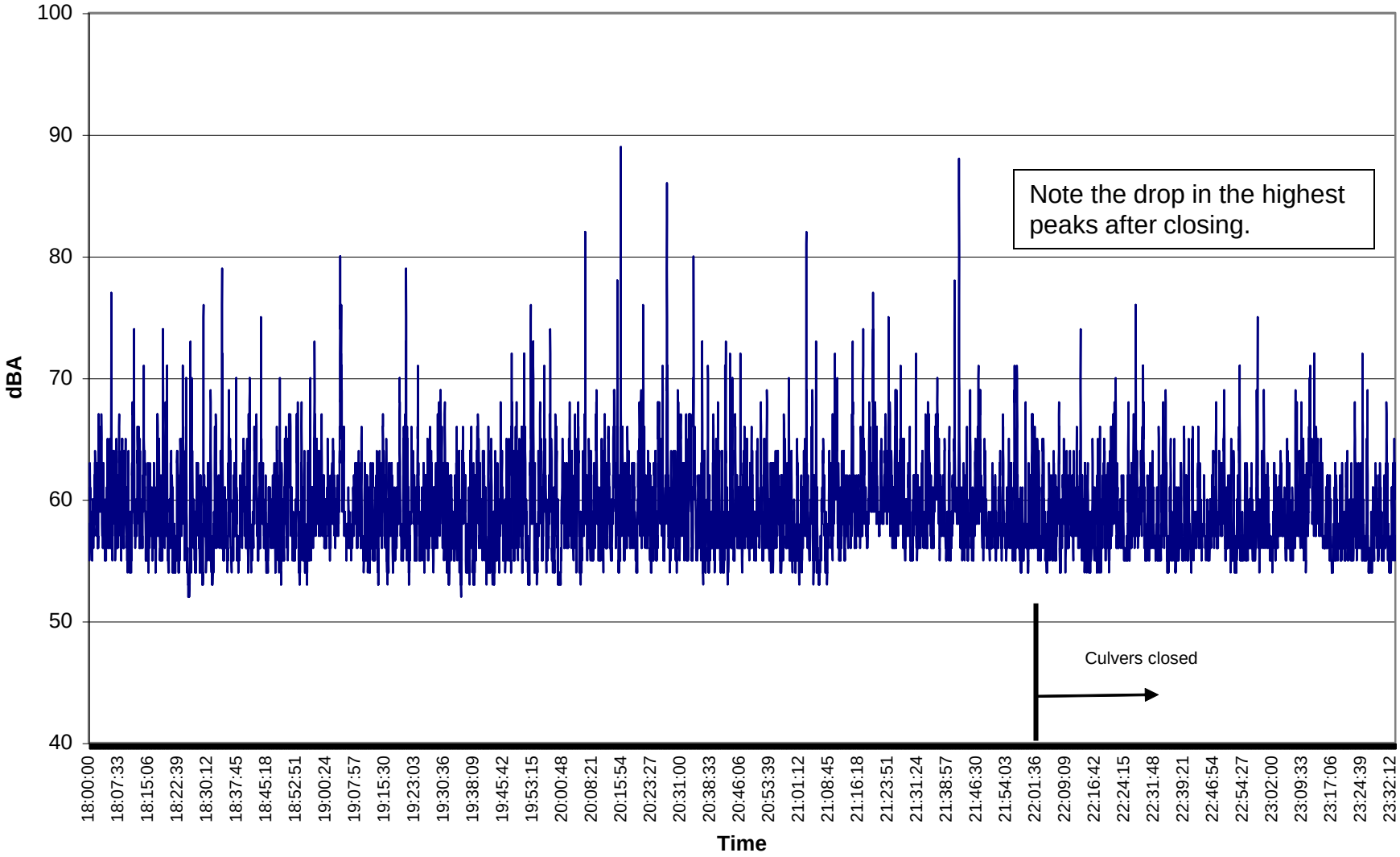
LD820-North\Int-07.xls

North Time History 1200-1800



LD820-North\Time-Hist.xls

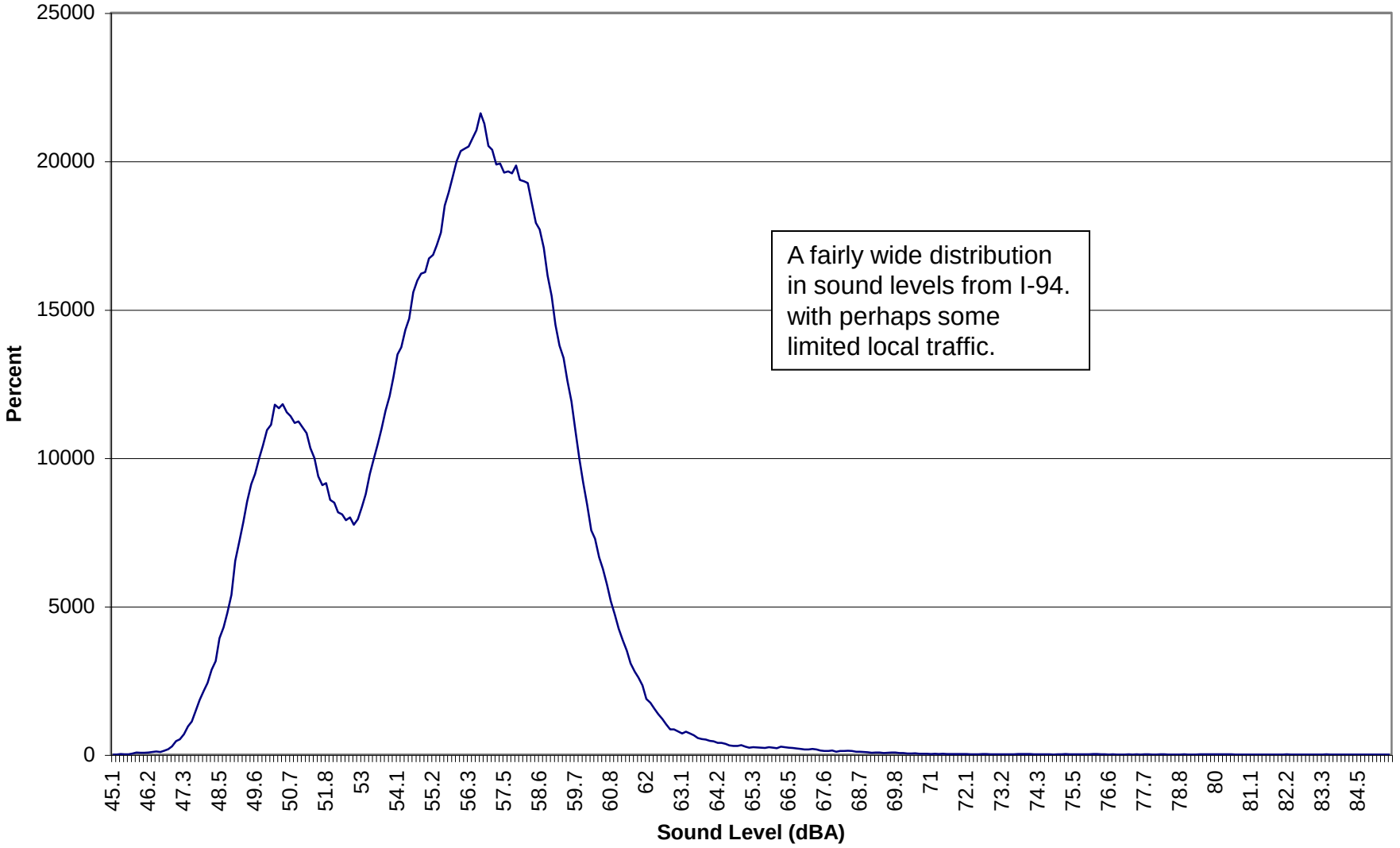
1-second Time History North - 1800-2330



LD820-North\Time-Hist.xls

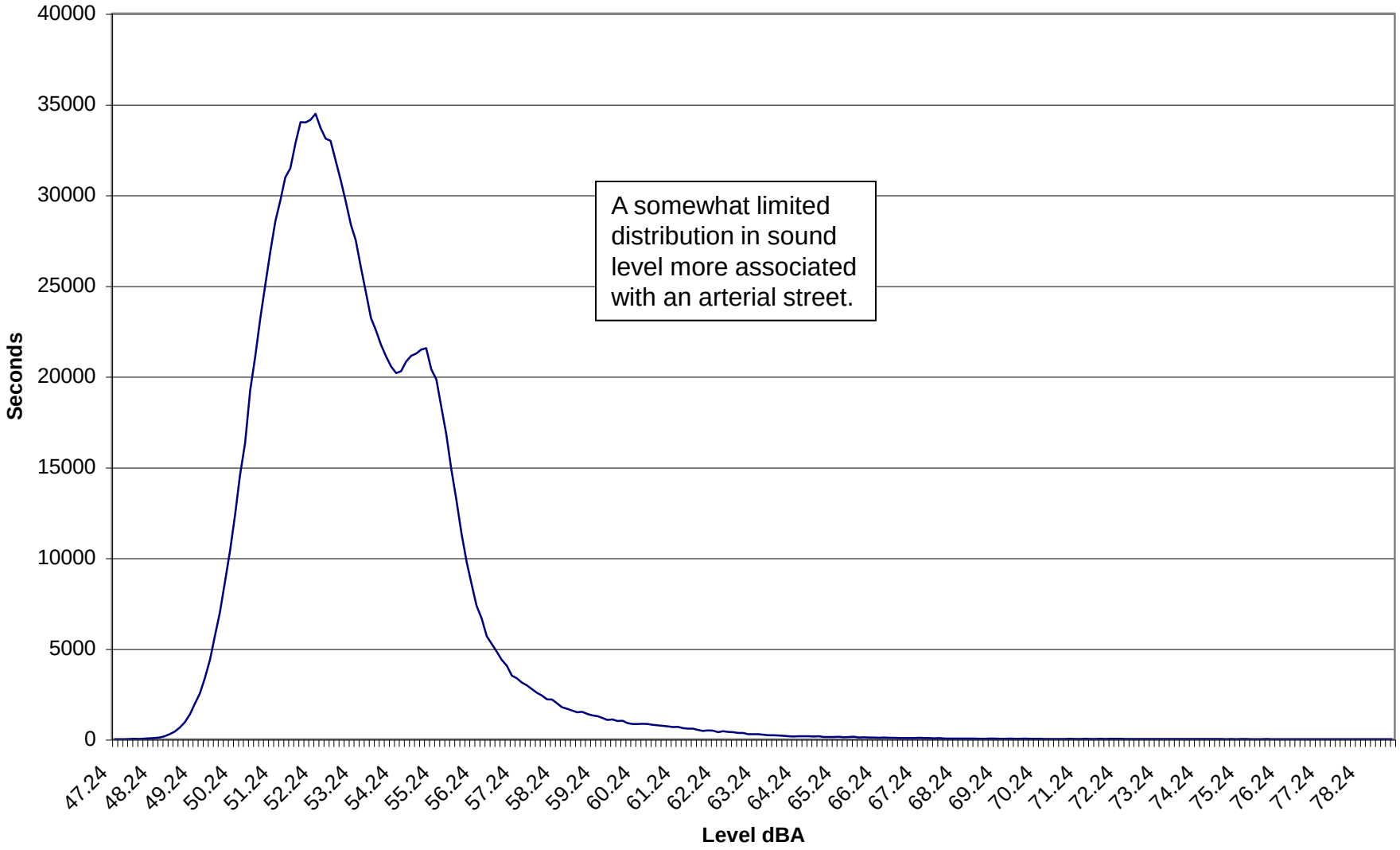
Overall dBA level histograms are presented below to give a general idea of the differences in sound level characteristics at the three sites.

South Site Histogram



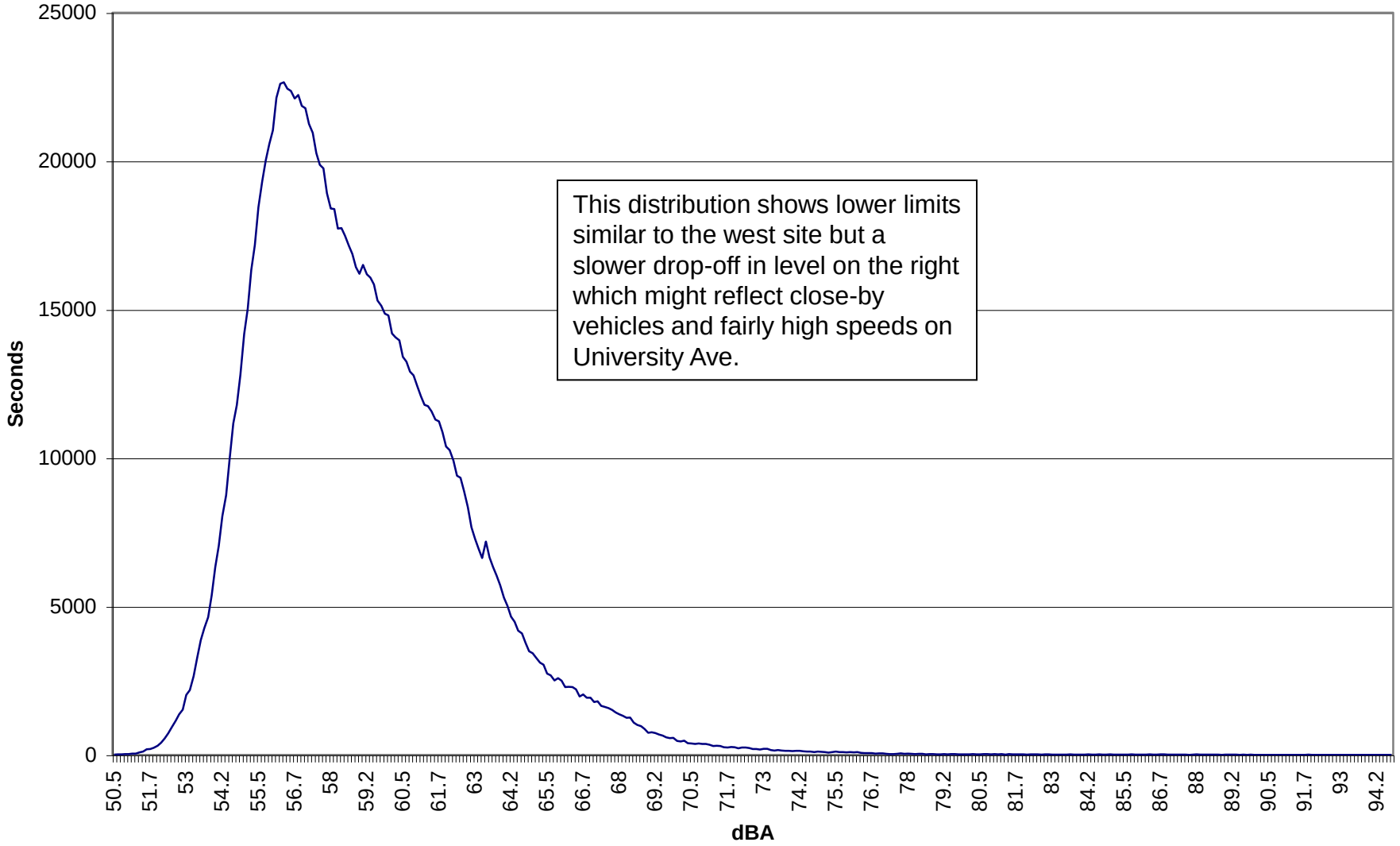
LD820-Southt\histogram.xls

West Site Histogram



LD820-West\histogram.xls

North Site Historgram



LD820-North\histogram.xls

Some summary observations

Ambient sound levels in the area are primarily associated with moving traffic on different types of roadways.

Except for the rooftop level captured at the West site, no unusual tonal or varying sound levels were observed in the area.

The spectrum associated with traffic is generally fairly broad band sound.

Spreadsheets of the data can also be provided.

Please direct questions to:

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