APPENDIX K-1

Environmental Noise Impact Assessment of the Proposed VMT Development, Vallejo, California

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ENVIRONMENTAL NOISE IMPACT ASSESSMENT OF THE PROPOSED VMT DEVELOPMENT, VALLEJO, CALIFORNIA

Technical Report Prepared For

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Our Reference

SS/13/6740NR02

Date Of Issue

15 March 2014

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Document History

Document Reference		Original Issue Date	
SS/13/6740NR02		15 March 2014	
Revision Level	Revision Date	Description	Sections Affected

Record of Approval

Details	Written by	Approved by
Signature		
Name	Dr Stephen Smyth	Damian Kelly
Title	Senior Acoustic Consultant	Principal Acoustic Consultant
Date	15 March 2014	15 March 2014

EXECUTIVE SUMMARY

AWN Consulting Limited (AWN) has been commissioned to by VMT to conduct an environmental noise and vibration impact assessment of the planned development at the former General Mills site, Vallejo, California. The site is currently not in operation and Vallejo Marine Terminal (VMT) is planning to develop a new dry bulk cargo import facility at the site. The terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets.

This document presents the results and conclusions of the noise impact assessment of the VMT development.

Baseline environmental noise surveys, during day and night-time periods, have been carried out at noise sensitive locations beyond the boundaries of the proposed facility. The purpose of the surveys was to establish the existing noise climate in the vicinity of the site. It was found that the dominant noise sources in the area were local and distant road traffic with occasional activity on the Napa River also noted.

The construction phase of the project has been assessed using the calculation methodology detailed in the *Roadway Construction Noise Model* (RCNM) developed by the Federal Highway Administration (FHWA). It has been found that the construction activity has the potential to generate a substantial temporary increase in ambient noise levels in the vicinity of the project. However, implementation of the following multi-part mitigation measures would reduce potential construction period noise impacts:

- All construction equipment must have appropriate sound muffling devices, which shall be properly maintained and used at all times such equipment is in operation.
- Where feasible, the project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate on-site equipment staging areas so as to maximize the distance between construction-related noise sources and noise-sensitive receptors nearest the project site.
- Except as otherwise permitted, construction activities shall be restricted to the hours of 7:00 a.m. to 9:00 p.m. daily.

Construction vibration is not expected to generate any significant impact due to the distance between the construction activities and the nearest sensitive properties.

The results of the operational phase assessment have found that there is a potentially significant and permanent noise increase at some properties as a result of the VMT facilities operation. In particular, loading activity to barge and rail transport options as well as rail movements were found to be the dominant noise sources. However, mitigation in the form of using Continuously Welded Track (CWR) and rubber linings to the rail and barge loading hoppers has been proposed.

No source of significant vibration is expected during the operational phase.

In conclusion, with appropriate noise mitigation measures the proposed VMT facility can operate without generating a significant and permanent noise impact on the surrounding environment.

CONTENTS

1.0 INTRODUCTION

This report addresses the potential noise and vibration impacts of the proposed marine terminal development at the site of the former General Mills facility, Vallejo, California. The site is currently not in operation and Vallejo Marine Terminal (VMT) is planning to develop a new dry bulk cargo import facility at the site. The terminal will act as a dry bulk aggregate receiving, storage and transfer facility, to operate as a distribution hub servicing local and regional markets.

The site in question is illustrated in Figure 1 below. The site is located adjacent to the Napa River and is bounded to the east by a steep incline with thick vegetation, to the west by the Napa River, to the south by undeveloped land and Sandy Beach residential development beyond and to the North by other industrial lands.

The nearest residential noise sensitive locations to the site are located to the south-east within the condominiums on Seawitch Lane overlooking the site at a distance of approximately 295' from the nearest site boundary.

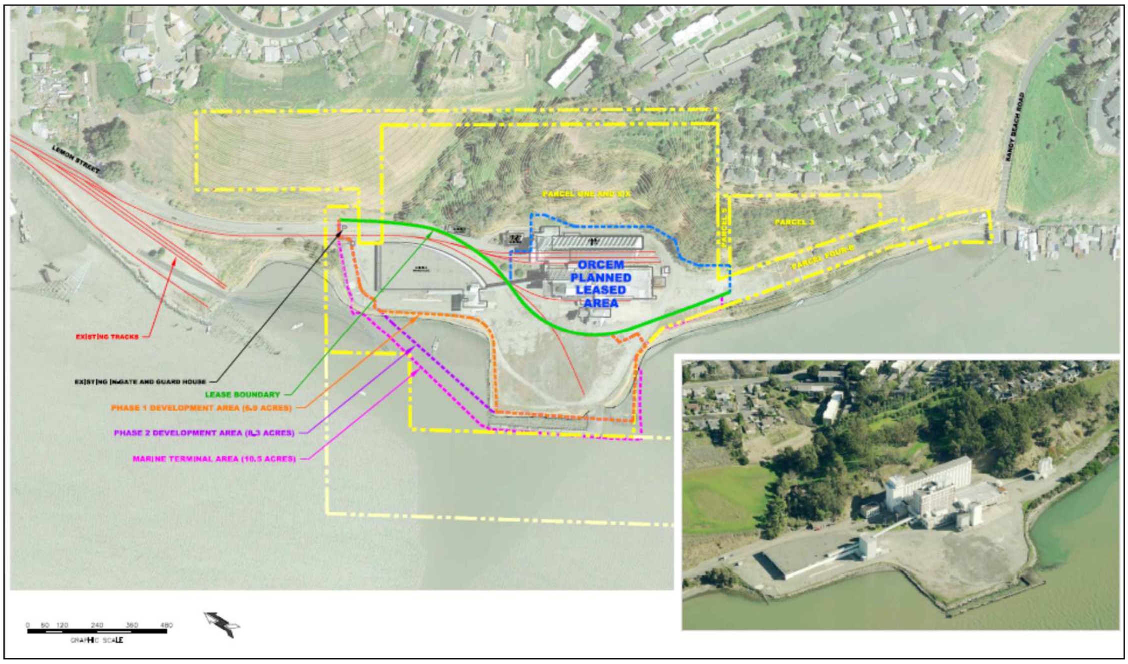

Figure 1 Site Location

As part of the overall development of the site there will be new noise sources introduced. These can broadly be described as follows:

- Vehicle movements on site;
- Truck movements on the local road network;
- Port activity, e.g. ship unloading, stockpiling etc., and;
- Rail activity.

This report discusses the potential noise impact of these elements using the following methodology:

- Review of appropriate guidance in order to derive appropriate noise criteria for the proposed operations;
- Determination of the existing baseline noise environment through a series of baseline noise surveys;

- Assessment of the various stages of the proposed development through the development of a detailed 3D noise model of the site and adjoining noise sensitive locations, and;
- Discussion of possible mitigation measures (where required).

2.0 PROJECT TEAM

This report has been prepared by AWN Consulting Ltd (AWN). The following paragraphs provide a brief company overview and also provide profiles of the key project team members.

2.1 Company Profiles

AWN Consulting is a multidisciplinary environmental consultancy specialising in Acoustics, Vibration, Air Quality and Water Quality. AWN Consulting is a wholly Irish owned company and has its Head Office in Dublin, Ireland. The staff of AWN Consulting represents Ireland's most experienced environmental and acoustic teams. AWN offers its clients a comprehensive package in respect of noise and vibration impact assessments using state of the art design and prediction tools. AWN's acoustics team comprises eight suitably qualified engineers with a total of over 100 man years spent working in the area, making it the largest and most experienced group of its type in Ireland, uniquely positioned to undertake a wide variety of projects.

2.2 Project Personnel

Eur Ing Chris Dilworth (Director) has responsibility for the Acoustics team in AWN Consulting. He is a European and Chartered Engineer with a BEng with First Class Honours in Electroacoustics from the Department of Applied Acoustics at the University of Salford. He is a corporate member of Engineers Ireland and the Institute of Acoustics with over twenty-five years' experience in the field of acoustics; he has been a consultant since 1989. Over that time he has specialized in building and architectural acoustics, having acted as acoustic consultant in respect of a large number of prestigious and landmark buildings. He has also been a contributor to official design guidance published by bodies such as the National Roads Authority, British Aviation Authority, UK National Health Service and Environmental Protection Agency.

Damian Kelly (Principal Acoustic Consultant) holds a BSc from DCU and an MSc from QUB. He has some fourteen years of experience as an acoustic consultant**.** He is a Member of the Institute of Acoustics and a sitting member of the Irish committee. He has extensive knowledge in the field of architectural and environmental acoustics and in the area of industrial, wind farm and infrastructural noise modeling and prediction, having developed many of the largest and most complex examples of proprietary noise models prepared in Ireland to date in those fields.

Dr Stephen Smyth (Senior Acoustic Consultant) holds a BAI and a PhD in Mechanical Engineering from TCD and is a Member of Engineers Ireland and a Member of the Institute of Acoustics. He has experience in both environmental and building acoustics, and has prepared detailed noise models for a variety of industrial and commercial facilities. He is also experienced at public hearings having given expert evidence to numerous planning hearings over the course of his career.

3.0 FUNDAMENTALS OF NOISE & VIBRATION

3.1 Noise

In order to provide a broader understanding of some of the technical discussion in this report, this section provides a brief overview of the fundamentals of acoustics and the basis for the preparation of this noise assessment. A sound wave travelling through the air is a regular disturbance of the atmospheric pressure. These pressure fluctuations are detected by the human ear, producing the sensation of hearing. In order to take account of the vast range of pressure levels that can be detected by the ear, it is convenient to measure sound in terms of a logarithmic ratio of sound pressures. These values are expressed as Sound Pressure Levels (SPL) in decibels (dB).

The audible range of sounds expressed in terms of Sound Pressure Levels is 0dB (for the threshold of hearing) to 120dB (for the threshold of pain). In general, a subjective impression of doubling of loudness corresponds to a tenfold increase in sound energy which conveniently equates to a 10dB increase in SPL. It should be noted that a doubling in sound energy (such as may be caused by a doubling of traffic flows) increases the SPL by 3dB, an increase that is just perceptible to the human ear.

The frequency of sound is the rate at which a sound wave oscillates, and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250Hz. In order to rank the SPL of various noise sources, the measured level has to be adjusted to give comparatively more weight to the frequencies that are readily detected by the human ear. Several weighting mechanisms have been proposed but the ‘A-weighting’ system has been found to provide one of the best correlations with perceived loudness. SPL’s measured using ‘A-weighting’ are expressed in terms of dB(A). An indication of the level of some common sounds on the dB(A) scale is presented in Figure 2.

The ‘A’ subscript denotes that the sound levels have been A-weighted. The established prediction and measurement techniques for this parameter are well developed and widely applied.

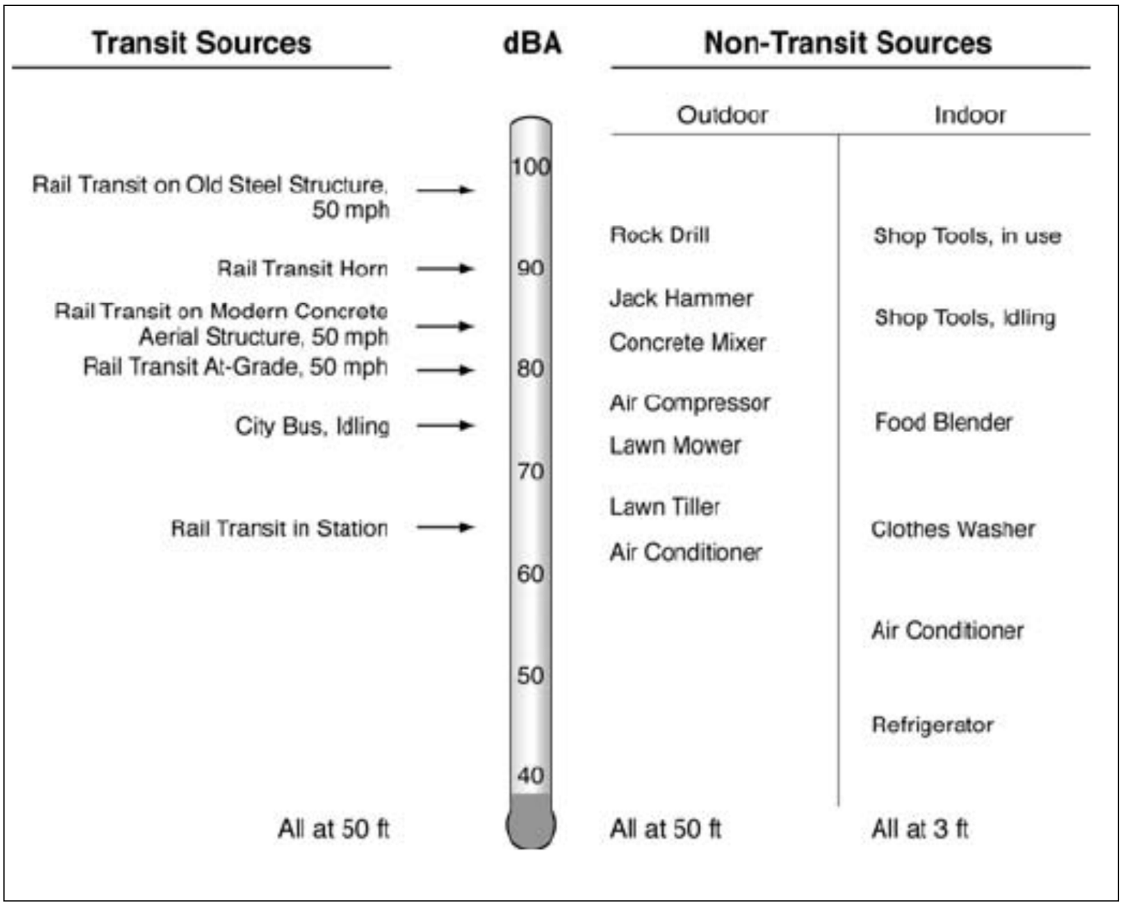

Figure 2 Level of Typical Common Sounds on the dB(A) Scale – (*FTA Noise & Vibration Manual, 2006*)

3.2 Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several methods are typically used to quantify the amplitude of vibration including Peak Particle Velocity (PPV) and Root Mean Square (RMS) velocity. PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. RMS velocity is defined as the average of the squared amplitude of the signal, usually measured in decibels referenced to 1micro-in/sec and reported in VdB. PPV and VdB vibration velocity amplitudes are used to evaluate human response to vibration.

Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where ground-borne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

In urban environments, sources of ground-borne vibration include construction activities, light and heavy rail transit, and heavy trucks and buses.

4.0 REVIEW OF RELEVANT GUIDANCE

The following section summarizes the regulatory framework related to noise, including federal, State and City of Vallejo requirements. Appendix A defines the noise parameters referenced throughout this report.

4.1 Federal Guidance

The U.S. Environmental Protection Agency (USEPA) is authorized under the Noise Control Act of 1972 to publish guidelines on the effects of noise and establish levels of noise which are "*requisite to protect the public welfare with an adequate margin of safety.*" Table 1 reproduces the levels published by the USEPA which have been separated into several categories.

Effect	Level	Area
Hearing Loss	$L_{eq(24)} \leq 70$dB	All areas.
Outdoor activity interference and annoyance	$L_{dn} \leq 55$dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq(24)} \leq 55$dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds etc.
Indoor activity interference and annoyance	$L_{dn} \leq 45$dB	Indoor residential areas.
	$L_{eq(24)} \leq 45$dB	Other indoor areas with human activities such as schools, etc.

Table 1 USEPA Noise Guidelines

It is important to note that the USEPA does not identify these levels as limit values as they do not take into account the cost or feasibility of adopting the levels.

4.2 State of California

As of 1 January 2014 the State of California has adopted the 2013 California Building Code. Chapter 12 of this document provides guidance on the interior environment of buildings. The current iteration of this document no longer regulates sound transmission from exterior sources to the interior of buildings.

The previous iteration of this document adopted noise control regulations that apply to new hotels, motels, apartments and dwellings other than detached single family dwellings. The purpose of these guidelines was to limit the extent of noise transmitted into habitable spaces. These requirements were published in the California Code of Regulations 2010, Title 24, Part 2, Appendix Chapters 12 and 12A and specified that for limiting noise from external sources, the sound insulation performance of the building façade should be such that an interior noise standard of 45dB CNEL is achieved in any habitable room with all doors and windows closed.

In addition to the California Building Code the Governor's Office of Planning and Research (OPR) has published land use compatibility guidelines which specify acceptable noise levels for a variety of land uses. These guidelines have been adopted by the City of Vallejo and are discussed in the following section.

4.3 City of Vallejo

The noise policy of the City of Vallejo is addressed in the Noise Element of the General Plan and in the zoning chapter of the Municipal Code. As discussed in Section 3.2 the city has adopted the land use compatibility guidelines published by the OPR. The land use compatibility chart is reproduced in Figure 3 below.

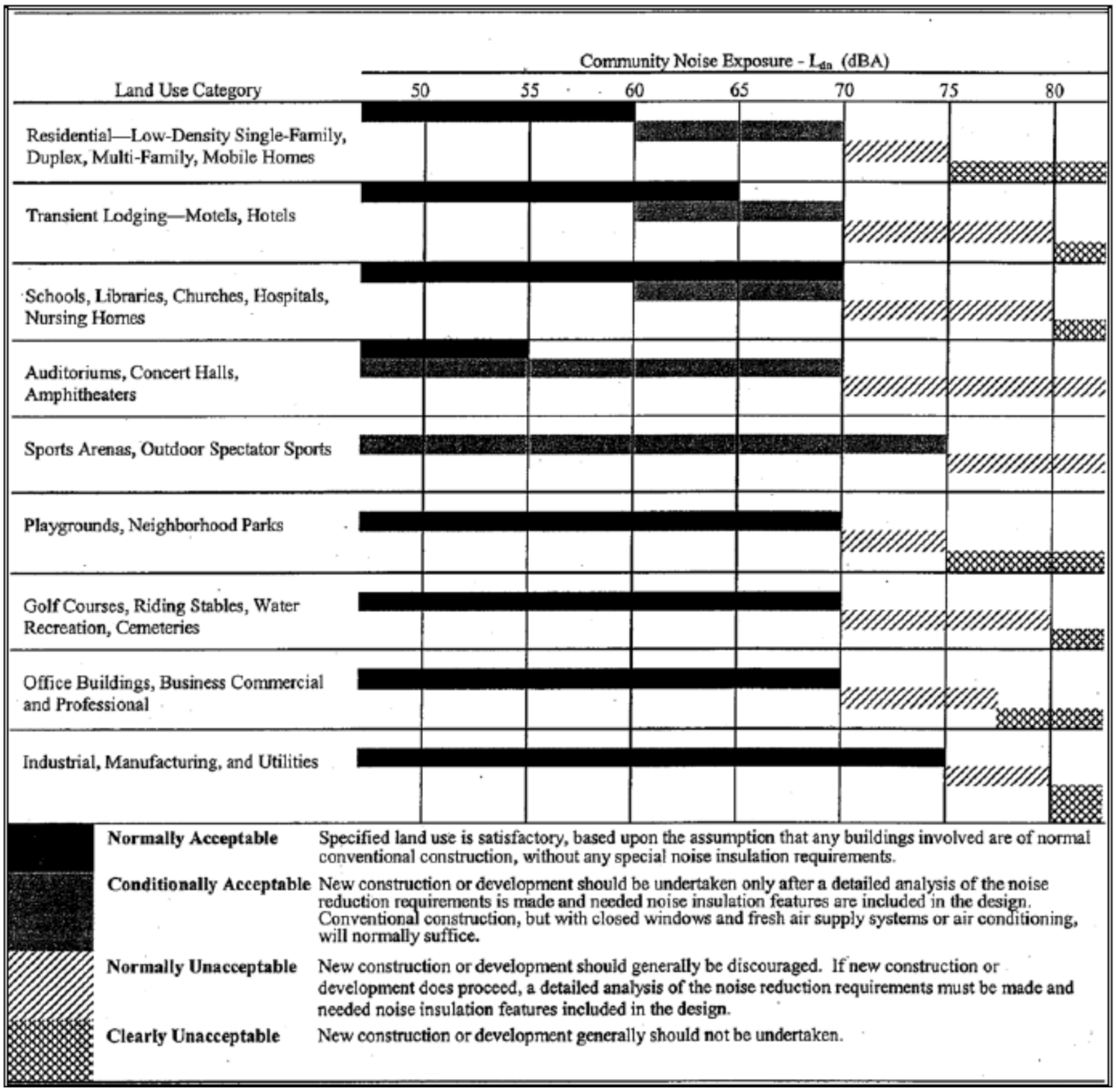

Figure 3 Land Use Compatibility Standards for Community Noise Environments

Referring to Figure 3 the normally acceptable noise level in low, medium and high density residential areas is 60dB L_{dn}. In areas zoned for business or commercial use the normally acceptable noise level is 70dB L_{dn}.

The General Plan specifies the City's policy with respect to noise control in order to achieve the following stated goal:

> *"Maintain noise compatibility in a manner that is acceptable to residents and reasonable for commercial and industrial uses."*

In achieving this goal the General Plan specifies two policies as follows:

Policy 1 – Apply the noise guidelines shown in Figure 3 to land use decisions and other City actions.

1a. The exterior noise level at primary outdoor use areas for residences should not exceed the maximum "normally acceptable" level in Figure 3 (L_{dn} of 60dB for residences). Small decks and entry porches do not need to meet this goal. Noise levels up to 65dB L_{dn} may be allowed at the discretion of the City where it is not economically or aesthetically reasonable to meet the more restrictive outdoor goal.

1b The interior noise standard shall be 45dB L_{dn} for all residential uses, including single and multi-family housing, hotels/motels and residential healthcare facilities.

Policy 2 – Avoid adverse effects of noise-producing activities on existing land uses by implementing noise reduction measures, limiting hours of operation or by limiting increases in noise.

2a Continue to enforce the noise regulations within the Vallejo Municipal Code, including Chapter 7.84 "Regulation of Noise Disturbances" and Chapter 16.72 "Performance Standards Regulations".

2b Where appropriate, limit noise generating activities (for example construction and maintenance activities and loading and unloading activities) to the hours of 7:00am to 9:00pm.

2c When approving new development limit project-related noise increases to no more than 10dB in non-residential areas and 5dB in residential areas where the with project noise level is less than the maximum "normally acceptable" level in Figure 3 (i.e. 60dB L_{dn} for residential areas up to 75dB L_{dn} for industrial or intensive use areas). Limit project related increases in all areas to no more than 3dB where the with project noise level exceeds the "normally acceptable" level.

The Noise Performance Standards Ordinance of the City of Vallejo's Municipal Code specifies maximum sound pressure levels by zoning district. These maximum noise levels are reproduced in Table 2 below.

Zoning District	Maximum Sound Pressure Levels, dB
Resource Conservation, Rural Residential and Medical Districts	55
Low, Medium and High Density Residential Districts	60
Professional Offices, Neighbourhood, Pedestrian and Waterfront Shopping and Service Districts	70
Freeway Shopping and Service, Linear Commercial and Intensive Use Districts	75

Table 2 Noise Performance Standards

The city's ordinance also allows for noise from temporary construction or demolition work, or sounds from transportation equipment used for the movement of goods or people to and from a given premises to exceed the maximum sound pressure levels listed in Table 2 once they comply with the State conditions.

4.4 State CEQA Guidelines

The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. CEQA asks the following applicable questions. Would the project:

a. Expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies;

b. Expose people to or generate excessive groundborne vibration or groundborne noise levels;

c. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

d. Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

e. For projects within an area covered by an airport land use plan or within two miles of a public airport or public use airport when such an airport land use plan has not been adopted, or within the vicinity of a private airstrip, expose people residing or working in the project area to excessive aircraft noise levels;

f. For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels?

CEQA does not define the noise level increase that is considered substantial. However, following the guidance contained within the Vallejo General Plan the following definitions have been adopted:

<u>Residential Areas</u>

An increase in the day-night average noise level greater than 3 dB L_{dn} at noise-sensitive receptors would be considered significant when projected noise levels would exceed those considered satisfactory for the affected land use.

An increase greater than 5 dB L_{dn} would be considered significant when projected noise levels would continue to meet those considered satisfactory for the affected land use.

<u>Non-residential Areas</u>

An increase greater than 10 dB L_{dn} would be considered significant when projected noise levels would continue to meet those considered satisfactory for the affected land use, i.e. 70dB L_{dn}.

5.0 NOISE SURVEY DETAILS AND MEASURED NOISE LEVELS

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted by Illingworth & Rodkin Inc. generally in accordance with *ISO 1996: 2007: Acoustics – Description, measurement and assessment of environmental noise*. Full details of the baseline noise survey are included in Appendix B of this document. The following sections summarize the findings.

5.1 Choice of Measurement Locations

A series of both unattended long-term and attended short-term surveys were conducted in order to determine the existing baseline noise environment.

A total of five unattended long-term monitoring positions were selected; each is described in turn below and shown on Figure 4.

LT1 was selected to represent the noise environment of Sandy Beach Road residential land uses located along the waterfront.

LT2 was on a bluff overlooking the project site and adjacent to condominium units located at the northwest terminus of Seawitch Lane.

LT3 was selected to represent the noise environment of residential land uses within the Harbor Park Apartments and along Winchester Street.

LT4 was selected to represent the noise environment of noise-sensitive land uses along Lemon Street, west of Sonoma Boulevard.

LT5 quantified ambient noise levels from vehicular traffic along Sonoma Boulevard.

In addition a total of four attended short-term monitoring positions were selected; each is described in turn below and also shown on Figure 4.

ST1 Lake Dalwigk Park, 70 feet from the center of Lemon Street at Sheridan Street. The measurement site represented the park and nearby residential land uses.

ST2 75 feet from the center of Sonoma Boulevard south of Solano Avenue. This location was selected to quantify ambient traffic noise levels along Sonoma Boulevard.

ST3 Center of Alden Park, Mare Island and was selected to represent the noise environment at noise-sensitive receptors on Mare Island.

ST4 Easternmost terminus of York Street and was selected to represent the noise environment at noise-sensitive receptors along the railroad corridor that leads to and from the project site.

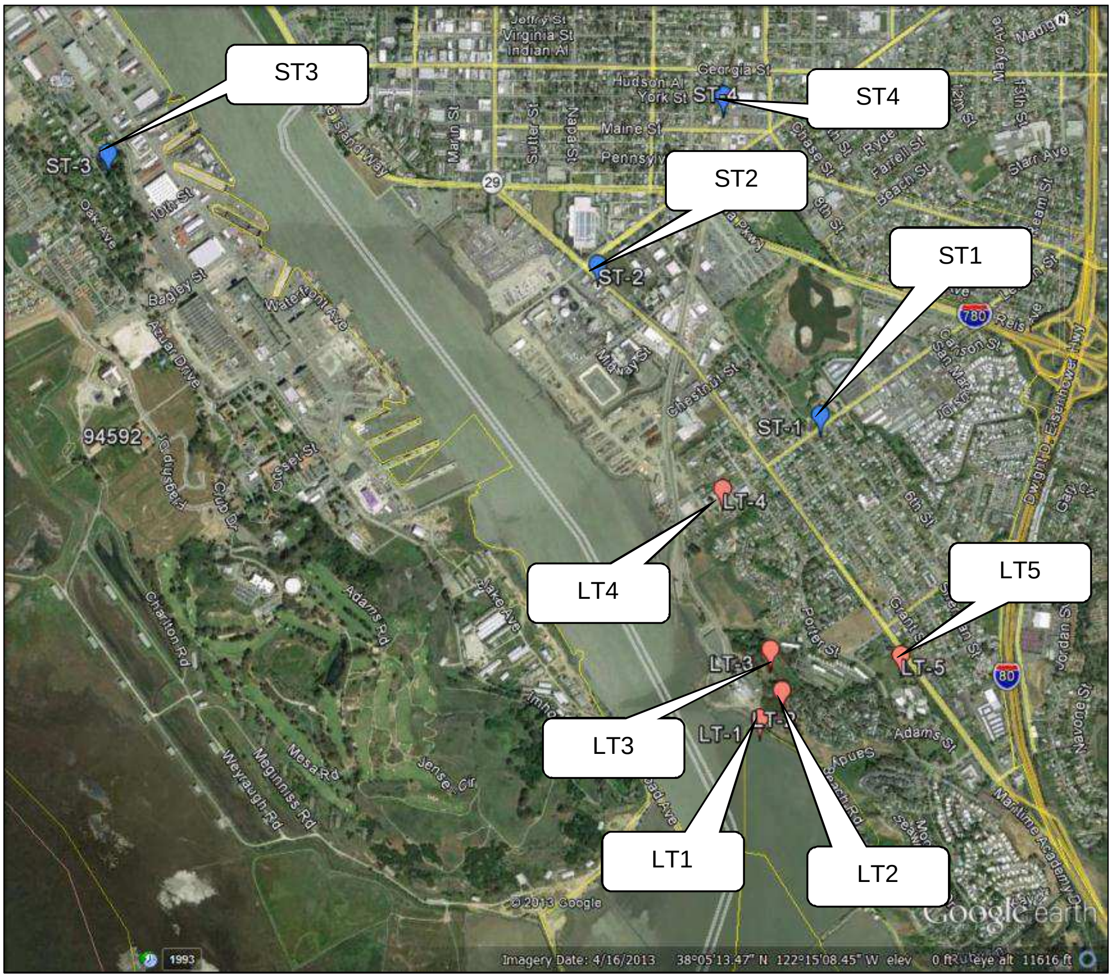

Figure 4 Survey Locations

5.2 Survey Periods

Measurements were conducted over the following periods:

- Unattended locations – 18 September to 25 September 2013, and;
- Attended locations – 14:50hrs to 15:40hrs on 18 September 2013, and; 11:00hrs to 12:00hrs on 25 September 2013.

Appendix C provides detailed meteorological data for the survey period. In general the weather was dry with wind speeds in the range of 4 to 14mph and mean temperatures in the range of 61 to 80°F.

5.3 Procedure

Sample periods for the unattended noise measurements were 10 minutes in duration.

Sample periods for the attended noise measurements were 10 minutes in duration, with two samples recorded at all locations.

The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted the primary noise sources contributing to noise build-up.

5.4 Measurement Parameters

Appendix A defines the measurement parameters used for presenting the noise data captured.

5.5 Results

5.5.1 Unattended Locations

The results for locations LT1 to LT5 are summarized in Table 3 below. Please note that the results summary excludes data measured on Saturday 21 September 2013 as there was a storm in the area which affected the measured results.

Location	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
	L_{day}	L_{night}	L_{dn}
LT1	54	48	55
LT2	52	45	53
LT3	49	45	52
LT4	57	48	57
LT5	60	56	63

Table 3 Summary of Results for Unattended Locations

5.5.2 Attended Locations

The results for locations ST1 to ST5 are summarized in Table 4 below.

Location	Start Time	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)					
		$L_{Aeq,T}$	$L_{A1,T}$	$L_{A10,T}$	$L_{A50,T}$	$L_{A90,T}$	L_{Amax}
ST1	1450	59	71	62	52	47	73
	1500	57	66	61	53	46	69
ST2	1520	62	72	66	59	53	74
	1530	63	70	67	61	53	72
ST3	1100	53	65	56	44	41	71
	1110	48	60	50	43	39	63
ST4	1140	51	61	55	48	46	61
	1150	49	54	51	49	47	57

Table 4 Summary of Results for Attended Locations

At monitoring location ST1 the primary source of noise was road traffic movement along Lemon Street. Ambient noise levels measured were in the range of 57 to 59dB $L_{Aeq,10 minutes}$.

At monitoring location ST2 the primary source of noise was road traffic movement along Sonoma Boulevard. Ambient noise levels measured were in the range of 62 to 63dB $L_{Aeq,10 minutes}$.

At monitoring location ST3 the primary source of noise was local road traffic. Ambient noise levels measured were in the range of 48 to 53dB $L_{Aeq,10 minutes}$.

At monitoring location ST4 the primary source of noise was local and distant road traffic. Ambient noise levels measured were in the range of 49 to 51dB $L_{Aeq,10 minutes}$.

5.6 Discussion of Results

Based on a review of the ambient long-term and short-term noise data and the relevant noise criteria discussed in Section 3.0, project-generated noise increasing the existing ambient by more than 5dB L_{dn} would be considered significant at Sandy Beach Road single-family residential land uses, multi-family residential units located along Seawitch Lane and within the Harbor Park Apartments, at single-family residences along Winchester Street, on Mare Island, or along the railroad corridor (receptors represented by LT1, LT2, LT3, ST3, or ST4).

Project-generated noise increasing the existing ambient by more than 3dB L_{dn} would be considered significant at noise-sensitive receptors represented by sites LT5, ST1, or ST2 (Lemon Street East of Sonoma Boulevard and Sonoma Boulevard).

Project-generated noise increasing the existing ambient by more than 10dB L_{dn} would be considered significant at receptors represented by site LT4 (Lemon Street West of Sonoma Boulevard) which are located within lands zoned for intensive use.

6.0 NOISE SENSITIVE LOCATIONS

For the purposes of the noise impact assessment the closest residential properties have been included in the noise modeling procedure in order to present the worst-case. Figure 5 indicates the location of the nearest noise sensitive locations assessed.

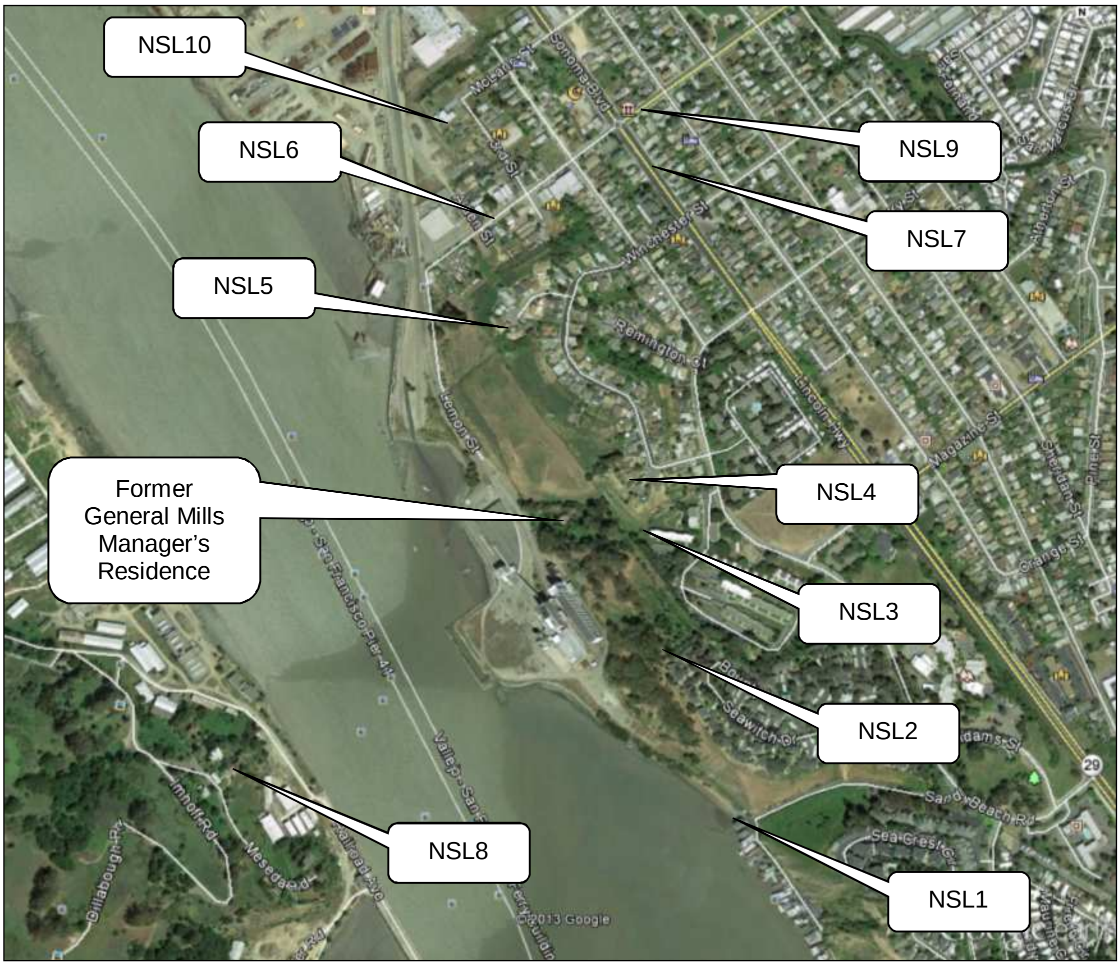

Figure 5 Noise Sensitive Locations

Table 5 describes each location in more detail.

Location	Description
NSL1	Sandy Beach Road Residences
NSL2	Seawitch Lane Residences
NSL3	Harbor Park Apartments
NSL4	Browning Way Residences
NSL5	Colt Ct Residences
NSL6	Lemon Street Residences West of Sonoma Blvd
NSL7	Sonoma Boulevard Residences
NSL8	Mare Island
NSL9	Lemon Street Residences East of Sonoma Blvd
NSL10	Residential Property near Rail Tracks on 3rd Street

Table 5 Noise Sensitive Locations

Please note that the former General Mills manager's residence located within the site boundary is no longer a habitable residence.

7.0 CONSTRUCTION PHASE ASSESSMENT

7.1 Construction Noise

Short-term noise impacts will occur during the site preparation and construction phases of the project. To assess the construction noise levels the Roadway Construction Noise Model (RCNM) developed by the Federal Highway Administration (FHWA) has been used. Each phase of the construction activity has been assessed for the three closest noise sensitive locations to the development site, i.e. NSL1, NSL2 and NSL3.

It should be noted that the Vallejo Noise Ordinance does not specify limit values for construction noise. Instead the City proposes allowable hours for construction activity within the Noise Element in Policy 2b. The recommended allowable hours are 7:00am to 09:00pm.

Furthermore, Section 16.72.050 if the Vallejo Code of Ordinances states that in relation to the maximum permissible sound levels within the Performance Standard Regulations, sounds from temporary construction or demolition work may exceed these maximum sound pressure levels upon compliance with state conditions.

Two types of short-term noise impacts would occur during site preparation and project construction. The impacts will include:

- Increase in traffic flow on local streets associated with the transport of workers, equipment and materials to and from the project site, and;
- Heavy construction equipment operating on the project site.

The first type would result from the increase in traffic flow on local streets, associated with the transport of workers, equipment, and materials to and from the project site. The transport of workers and construction equipment and materials to the project site would incrementally increase noise levels on access roads leading to the site. Because workers and construction equipment would use existing routes, noise from slow moving passing trucks (75 dBA L_{max} at 50 feet) would be similar to existing vehicle- generated noise. For this reason, short-term intermittent noise from trucks would be minor when averaged over a longer time period. In addition, according to the City's noise ordinance, noise from temporary transportation of goods or people to and from a given premises is exempt from the City's noise standards. It should also be noted that noise emission levels from vehicles themselves (such as muffler requirements) are regulated by federal and State governments and are exempt from local government regulations. Therefore, short-term construction-related noise associated with worker and equipment transport to the proposed project site would result in a less-than-significant impact on receptors along the access routes leading to the proposed project site.

The second type of short-term noise impact is related to the noise generated by heavy construction equipment operating on the project site. Noise generated during demolition, excavation, grading, site preparation, and building erection on the project site would result in potential noise impacts on offsite uses. Existing receptors in the vicinity, as discussed in Section 5.0, would be subject to short-term noise generated by construction equipment and activities on the project site when construction occurs.

Construction is performed in discrete steps, each of which has its own mix of equipment and, consequently, its own noise characteristics. These phases would change the character of the noise generated on the project site and, therefore, the noise levels surrounding the site as construction progresses. Despite the variety in the type and size of construction equipment, similarities in the dominant noise sources and patterns of operation allow construction related noise ranges to be categorized by work phase. Table 6 lists construction equipment noise levels for the types of equipment likely to be used on this project. The noise levels are based on a distance of 50 feet between the equipment and a noise receptor. Appendix D presents the calculation sheets for each activity and location.

Type of Equipment	Acoustical Usage Factor (%)	L_{max} @ 50 feet (dBA, slow)
All Other Equipment > 5 HP	50	85
Backhoe	40	80
Clam Shovel (dropping)	20	93
Compactor (ground)	20	80
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Concrete Pump Truck	20	82
Concrete Saw	20	90
Crane	16	85
Dozer	40	85
Drum Mixer	50	80
Dump Truck	40	84
Excavator	40	85
Flat Bed Truck	40	84
Front End Loader	40	80
Generator	50	82
Grapple (on backhoe)	40	85
Impact Pile Driver	20	95
Jackhammer	20	85
Man Lift	20	85
Mounted Impact Hammer (hoe ram)	20	90
Pickup Truck	40	55
Pneumatic Tools	50	85
Pumps	50	77
Roller	20	85
Tractor	40	84
Vacuum Street Sweeper	10	80
Welder/Torch	40	73

Table 6 Typical Construction Noise Levels

Typical noise levels range up to 95 dBA L_{max} at 50 feet during the noisiest construction phases. The site preparation phase, which includes piling, and the demolition phase, which includes impact hammers to break concrete, tends to generate the highest noise levels. Earthmoving equipment includes excavating machinery such as backhoes, bulldozers and front loaders. Earthmoving and compacting equipment includes compactors, scrapers, and graders. Typical operating cycles for these types of construction equipment may involve one or two minutes of full-power operation followed by three or four minutes at lower power settings.

Demolition of existing structures and construction of the proposed project is expected to require the use of earthmovers such as bulldozers and scrapers, loaders and graders, water trucks, and dump trucks. As shown in Table 6, the typical maximum noise level generated by mounted impact hammers on the proposed project site is assumed to be 90 dBA L_{max} at 50 feet from the operating equipment. The maximum noise level generated by excavators and bulldozers is approximately 85 dBA L_{max} at 50 feet.

Table 7 presents the predicted maximum noise levels at these nearest noise sensitive locations for a range of expected construction activities. Appendix D presents the calculation sheets for each activity and location.

Construction Activity	Type of Equipment	Predicted dBA L_{max} Levels		
		NSL1	NSL2	NLS3
Demolition	Front End Loader	47	52	56
	Excavator (x2)	52	57	61
	Crane	49	54	57
	Mounted Impact Hammer (hoe ram)	58	64	67
	Grapple (on backhoe)	55	60	64
	Dump Truck	45	50	53
Ground Works & Excavation	Backhoe	56	60	55
	Excavator (x2)	62	67	61
	Front End Loader	57	62	56
	Roller	57	63	57
	Tractor	62	67	61
	Vacuum Street Sweeper	60	64	59
Piling	Impact Pile Driver	72	75	74
Concrete & Steel Works	Concrete Mixer Truck	57	61	56
	Concrete Pump Truck	60	64	59
	Concrete Saw	68	72	67
	Crane	59	63	58
	Drum Mixer	59	62	57
	Flat Bed Truck	53	56	51
	Pneumatic Tools	64	67	62
	Welder/Torch	53	56	51

Table 6 Typical Construction Noise Levels

The closest noise sensitive land uses to the project construction areas are NSL1, NSL2 and NSL3 which overlook the project site. These properties are located between 360 and 1427 feet from the construction activity. At these distances, maximum noise levels from construction activities at the building site could range from 47dBA up to 75dBA L_{max} at the property line of the nearest sensitive locations.

In summary the construction phase has the potential to generate a substantial temporary increase in ambient noise levels in the vicinity of the project. However, implementation of the following multi-part mitigation measure would reduce potential construction period noise impacts.

- All construction equipment must have appropriate sound muffling devices, which shall be properly maintained and used at all times such equipment is in operation.
- Where feasible, the project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate on-site equipment staging areas so as to maximize the distance between construction-related noise sources and noise-sensitive receptors nearest the project site.

- Except as otherwise permitted, construction activities shall be restricted to the hours of 7:00 a.m. to 9:00 p.m. daily. (LTS)
- The following mitigation measures are specific to pile driving:
  - Use a timber cushion block between the pile and hammer head to reduce impact noise;
  - Correct alignment of pile and rig to reduce noise from pile guides and attachments, and;
  - Use acoustic screens or efficient sound reducing exhausts to power units.

7.2 Construction Vibration

Construction activities associated with implementation of the proposed project could temporarily expose persons in the vicinity of the project site to excessive groundborne vibration or groundborne noise levels. Typical vibration source levels for construction equipment are shown in Table 8.

Type of Equipment		V_{dB} @ 25 feet
Pile Driver (impact)	Upper Range	112
	Typical	104
Pile Driver (sonic)	Upper Range	105
	Typical	93
Clam shovel drop (slurry wall)		94
Hydromill (slurry wall)	In Soil	66
	In Rock	75
Vibratory roller		94
Hoe ram		87
Large bulldozer		87
Caisson drilling		87
Loaded trucks		86
Jackhammer		79
Small bulldozer		58

Table 8 Typical Construction Ground Vibration Levels (Federal Transit Administration, 2006. *Transit Noise and Vibration Impact Assessment.* May.)

Typical groundborne vibration levels measured at a distance of 25 feet from heavy construction equipment in full operation, such as impact pile drivers, range up to approximately 112 VdB. The proposed piling activity required during the construction of the VMT facility is located at the waters edge at the position of the new concrete pile supported wharf. This is located at a distance of over 900 feet from the nearest noise sensitive residence.

The Vallejo City Performance Standards (Chapter 16.72 of the Code of Ordinances) restrict any land use from producing vibration levels that are discernible without instruments at any point on the property line on which the use is located. Groundborne vibration levels from the operation of heavy construction equipment that will be used in demolition or construction of the proposed project would not be expected to cause damage to residential buildings of normal northern California construction.

In this instance given the location of the nearest sensitive receptors to the site and the distance between them and the construction activity, in particular piling activity on the dock at the waters' edge, it is not considered likely that there will be any perceptible vibration during construction activity.

8.0 OPERATIONAL PHASE ASSESSMENT

The following sections will assess the noise impacts of their operations separately and cumulatively as a result of the following noise generating activities:

- Bulk Terminal Operations;
- Rail activity, and;
- Additional vehicular traffic on the public road network.

VMT is proposing to construct a multi-phased bulk aggregate import and distribution facility on the existing terminal footprint. The general transportation method is to unload dry bulk cargo from vessels, temporarily store, and reclaim from storage to cargo trucks and railcars for local and regional distribution. In addition, the terminal design allows re-loading cargo to barges to enable VMT to engage in short-sea shipping initiatives using inland and inter-coastal waterways.

Sand and aggregates would be received from self-unloading, clam-shell crane equipped vessels and delivered to the storage area by covered conveyors where it will be stored in open stockpiles. The terminal will be designed to also discharge self-unloading, conveyor-equipped vessels using the same receiving hoppers and conveying equipment when throughput volumes increase.

During initial project stages trucks will be loaded using front-end loaders to load cargo directly in the truck trailers. Transport of materials using rail is also planned to take place from the proposed VMT development based upon commercial demands of potential clients. Railcars will ultimately be loaded via a surge bin to improve operational efficiency and reduce the use of wheel loaders. Wheel loaders would then be used only in the stockyard to reclaim the cargo to receiving hoppers that feed conveyors leading to the rail loading stations and to maintain the stockpiles. Truck load-out is assumed to remain mobile during both Phase 1 and Phase 2 operations.

The development is proposed to be implemented on a scaled basis over two phases. The phases are identified as:

Phase 1: Wharf 1 only with rail and truck transport options.
Phase 2: Wharf 2 constructed allowing rail, truck and barge transport options.

8.1 Bulk Terminal Operations

VMT is primarily expected to receive and discharge self-unloading, Handimax to Panamax class ships in loads of up to approximately 40,000 metric tons (t). During Phase 2 there is also the potential that material will be exported using barges. It is assumed that there will be a 5-6 day loading/unloading time per vessel. During the time that vessels are moored at the facility, 24-hour operations will be conducted for off-loading or loading of cargo.

The proposed aggregate import system is comprised of two portable shared-use receiving hoppers to receive cargo from the vessel discharge systems and transfer it to the dock for truck load-out and/or a shared-use reversible dock conveyor for material repositioning to the storage stacks.

For aggregates destined for the VMT Terminal area, the aggregate would be transported from the receiving conveyor at the dock by portable link conveyors. The link conveyors will carry the cargo to a yard stacking conveyor, which will create open storage stockpiles. The function of the storage area would be to receive and store finished product for outbound load-out by rail, truck and/or barge. No crushing or screening would take place at the Terminal

There will also be mobile plant operating on the VMT site managing the stockpiles and loading trucks and rail cars. The mobile plant will be:

- 2 x diesel powered wheeled loaders during Phase 1 with a bucket capacity of approximately $7yd^3$. This will increase to 3 loaders during Phase 2. The loaders will transfer material from the stockpile directly to trucks and rail cars or to hoppers for distribution via conveyor, and;
- In Phase 1 two electrically powered portable link conveyors will be used to connect the dock conveyor with the stacking conveyor which will create the stockpile. An additional link conveyor will be required during Phase 2.

Figure 6 illustrates where the mobile plant will operate.

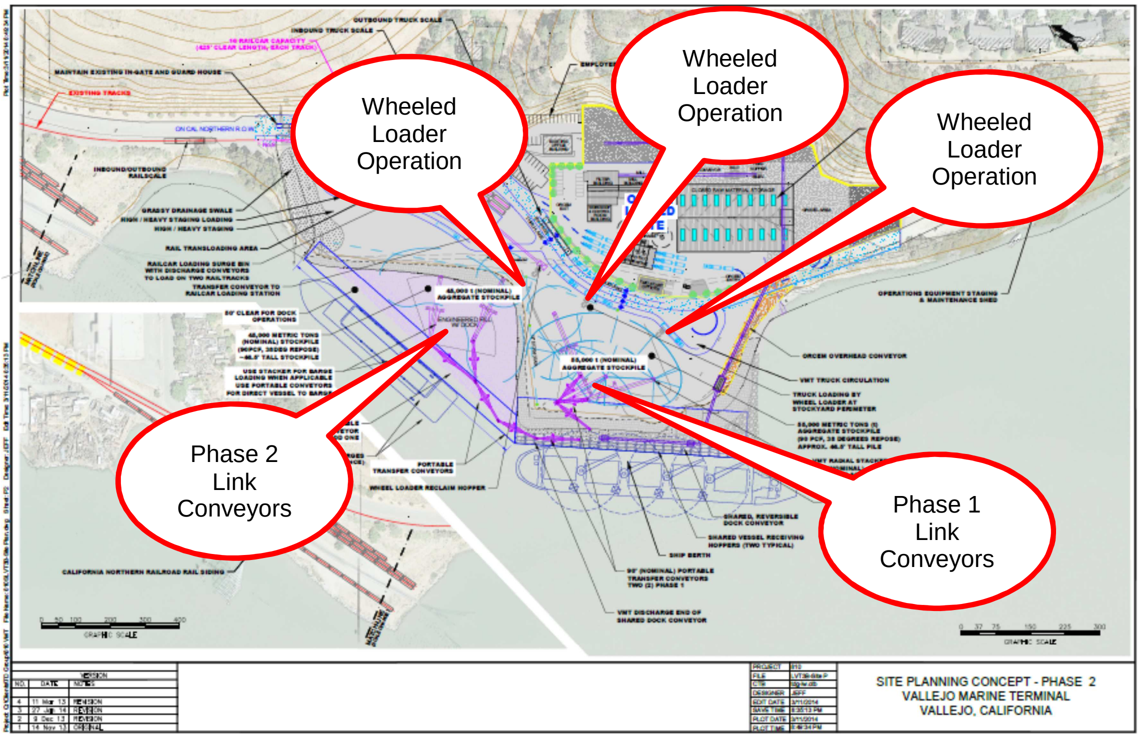

Figure 6 Mobile Plant Operation

For the purposes of the noise impact assessment the following assumptions have been made:

- Wheeled Loader Guaranteed Sound Power Level (L_{WA}) – 113dB(A)[1];
- Vehicle velocity on site – 10mph;
- Ship 20,000 – 60,000 tons – Sound Power Level 95dB L_{WA}[7];
- Loading trucks/hoppers with gravel or stone aggregate – 85dB L_{Aeq} @ 50feet[2];
- Transloading from dock to stockpile Sound Power Level ($L_{WA/m2}$) – 65dB(A)[3].

1 Noise Emission from Outdoor Equipment Database http://ec.europa.eu/enterprise/sectors/mechanical/noise-outdoor-equipment/database/index_en.htm

2 British Standard BS 5228-1: 2009: *Code of Practice for Noise and Vibration Control on Construction and Open Sites: Noise*

3 SourceDB v2.02 (note an 80% on-time is assumed for the transloading activity)

Wheeled Loaders

During Phase 1 there will be 2 wheeled loaders serving the site, increasing to 3 in Phase 2. It is assumed that each truck load will require approximately 3 bucket loads to be filled. Based on the expected 4 truckloads per hour during all phases of the operation this equates to 6 bucket loads per front loader per hour or one bucket load every 10 minutes.

When loading railcars there will be approximately 1,260 loads required to fill the 100-car train. Averaging this over 24hours gives 53 loads per hour.

When loading a barge there will be approximately 1,008 loads required to fill the barge. Averaging this over 24hours gives 42 loads per hour.

Vessel Engines

It is assumed that Handimax and Panamax vessels engines will be running continuously when moored in order to power auxiliary systems used in the loading and unloading activity, this is known as hoteling. Barge engines are assumed to be off while the vessel is moored.

Loading Hoppers/Trucks

As discussed, there will be up to 8 bucket loads per front loader each hour to load trucks, 53 loads per hour to load rail cars and 42 loads per hour to load a barge. The duration of each bucket load being emptied into a truck/hopper is approximately 20 seconds (including maneuvering). Taking this into account the loading activity only occurring for a fraction of each hour as follows:

- Truck loading – 3%;
- Rail loading – 30%, and;
- Barge loading – 23%.

In order to present a worst-case assessment it has been assumed that gravel and stone is the material being handled as this material generates higher noise levels when dropped into trucks and hoppers.

Transloading Activity

It is assumed that when a vessel is moored there will be transloading activity occurring 24/7 with an on-time of 80%.

The VMT unloading activities are based on conveyor systems from the dock side to the storage areas. The difference between Phase 1 and Phase 2 is the additional number of link conveyors and the additional berth for exporting material by barge. Ship unloading, mechanical plant operations and site consolidation have been modeled using the methodology outlined in *ISO 9613-2:1996 Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation*.

Table 9 presents the predicted noise level at each location for each phase as a result of the bulk terminal operations on the VMT site. Note that for Phase 1 the following scenarios have been modeled:

- Truck only – i.e. all material leaves site by truck;
- Truck and Rail – a mixed mode operation where material leaves site by truck and rail.

For Phase 2 truck, rail and barge operations are included.

Please note that the rail activity included in the results in Table 9 excludes the noise from rail movements, including shunting railcars. This is assessed separately in the following sections.

Appendix E gives the detailed breakdown of each noise sources contribution to the overall L_{dn} level at each receiver location. Appendix F gives details on the noise model used.

Location	Phase 1						Phase 2		
	Truck Only			Truck & Rail			Truck, Rail and Barge		
	L_{day}	L_{night}	L_{dn}	L_{day}	L_{night}	L_{dn}	L_{day}	L_{night}	L_{dn}
NSL1	38	38	45	39	39	46	41	41	47
NSL2	43	43	49	48	48	54	48	48	54
NSL3	35	35	41	41	41	47	43	43	50
NSL4	38	38	45	44	44	50	46	46	52
NSL5	33	33	39	36	36	43	41	41	47
NSL6	25	25	31	28	28	35	32	32	39
NSL7	21	21	27	25	25	32	29	29	35
NSL8	41	41	48	44	44	51	48	48	54
NSL9	15	15	21	20	20	27	25	25	31
NSL10	29	29	35	32	32	39	36	36	42

Table 9 Noise Levels due to VMT Bulk Terminal Operations

8.2 Truck Movements on Local Road Network

During the operational phase of the VMT facility there will be additional heavy truck movements using the local road network. The maximum monthly VMT truck volume will be limited to 2,000 truck movements. Completion of the rail improvements and the operation of the truck and rail mode will reduce this monthly maximum to 1,000 truck movements.

However, for the purposes of this assessment it is assumed that the maximum daily number of truck movements from the site will be 83 for all modes and phases of operation. When this maximum volume is considered over the course of a 24hr period there will be approximately 4 truckloads per hour from the site. This equates to 8 movements (i.e. 4 trucks in/ 4 trucks out) during each hour.

Table 10 below lists the average hourly two-way truck movements to the site during the day and night-time periods for all phases of operation:

Period	Phase 1 & 2
Daytime (07:00hrs to 22:00hrs)	8
Night-time (22:00hrs to 07:00hrs)	8

Table 10 Hourly Average Truck Movements to the VMT Site

All trucks will access the site from Derr Avenue coming from Lemon Street. Southbound trucks will travel along State Route 29 to Interstate 80, while northbound and eastbound trucks will travel along Lemon Street west of State Route 29 before splitting for Northbound Interstate 80 or Eastbound Interstate 780. It has been assumed that the split in traffic between northbound and southbound traffic is 50/50.

Taking all of this into account and assuming an average truck speed of 20mph on all routes the predicted noise levels from truck movements serving the VMT site are presented in Table 11. Please note that some receivers are not influenced by truck movements on the local road network as they are positioned away from the road network.

Location	Phases 1 & 2		
	L_{day}	L_{night}	L_{dn}
NSL1	--	--	--
NSL2	--	--	--
NSL3	31	31	37
NSL4	32	32	38
NSL5	43	43	49
NSL6	55	55	61
NSL7	54	54	61
NSL8	--	--	--
NSL9	55	55	61
NSL10	--	--	--

Table 11 Noise Levels due to Truck Movements Serving the VMT Site

8.3 Rail Activity

Transport of materials using rail is planned to take place from the proposed VMT development based upon commercial demands of potential clients. The following sections discuss the noise impact of rail activity.

8.3.1 Noise Impact Calculations

The existing railway serving the site will be used by VMT to transport materials. The volume of material to be transported by train per month will depend on the phase of operation; however, regardless of the monthly volume throughput a maximum of two 100-car trains could access the site per week. Please note that this assessment is based on this worst-case, however, smaller 80 car trains may also be used depending the client.

Therefore, it is likely that a single 100 car train movement to and from the site during any single 24 hour period is representative of the worst-case for all phases and modes. The following narrative outlines the export methodology by rail for the VMT site:

- Arriving trains, either laden or unladen, will be parked in the proposed rail yard area to be located on the existing tracks outside the site boundary. It is expected that trains will arrive with 100 railcars;
- The railcars will then be shunted from this yard area to the rail transloading area on the VMT site where there is capacity for 16 railcars, two train movements per hour between the rail transloading area and the yard area are assumed (i.e. one movement in and one movement out);
- Locomotive will not idle within the yard while waiting to shunt railcars;
- A low emission genset switcher is proposed which has a noise emission level 10dB below a standard freight locomotive (Appendix G);
- Product export will be transloaded to or from the railcars using a surge bin system that has been included in the assessment of bulk terminal operations discussed previously in Section 8.1, and;
- Loaded or unloaded railcars will be shunted back to the rail yard area outside the site boundary to await collection by the locomotive.

Figure 7 illustrates the location of each area discussed above.

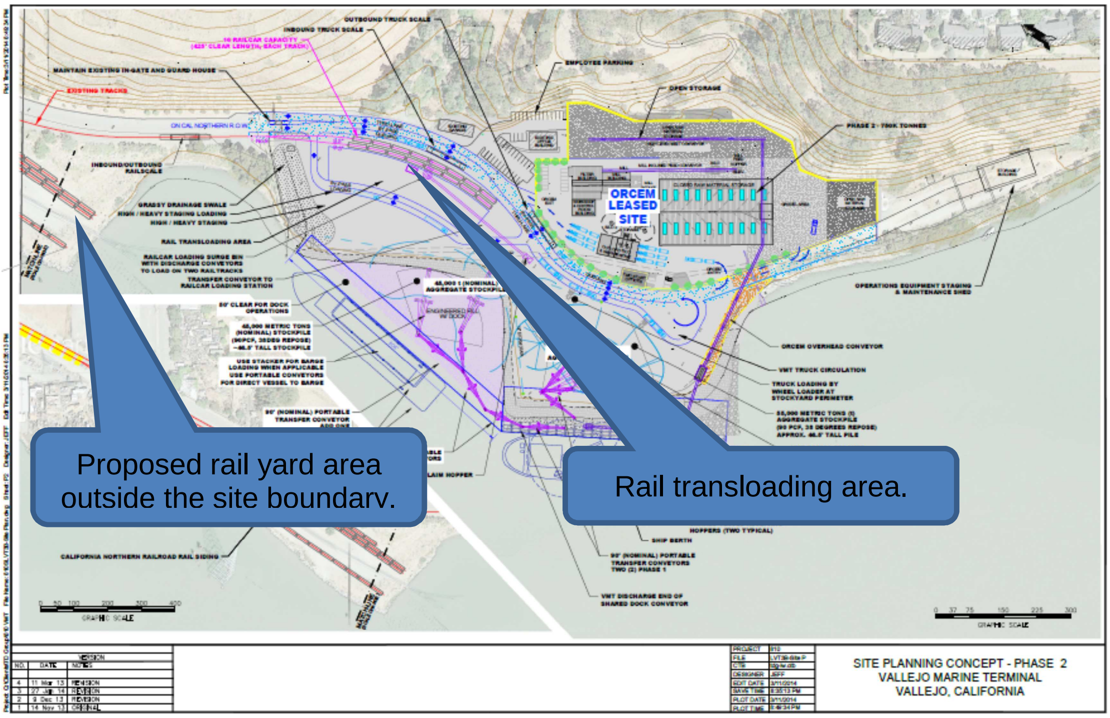

Figure 7 Rail Activity on Site

When assessing the noise impact of rail activity use was made of the Chicago Rail Efficiency and Transportation Efficiency (CREATE) railroad noise modelling spread sheet which is based on the Federal Transit Administration (FTA) procedures for the assessment of transit noise and vibration. Table 12 lists the model inputs used in this instance.

Model Input	Rail Yard Area	Trains Arriving/Leaving			Shunting Between Yard and Site		
	Rail Yard	Freight Loco	Hopper Cars	Cross-over Tracks	Freight Loco	Hopper Cars	Cross-over Tracks
Trains per hour	2	1	1	1	2	2	2
Speed (mph)	n/a	5	5	n/a	5	5	n/a
Duration of 1 train (secs)	n/a	n/a	n/a	715	n/a	n/a	33
Locos/train	n/a	3	n/a	n/a	1	n/a	n/a
Length of cars/train (ft)	n/a	n/a	5,000	n/a	n/a	220	n/a
Wheel Flats?	n/a	n/a	Yes	n/a	n/a	Yes	n/a
% of Cars with Wheel Flats	n/a	n/a	3%	n/a	n/a	3%	n/a
Jointed Track?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Embedded Track?	No	No	No	No	No	No	No
Aerial Structure?	No	No	No	No	No	No	No
Barrier Present?	No	No	No	No	No	No	No
Intervening Rows of Buildings	0	0	0	0	0	0	0

Table 12 CREATE Noise Model Inputs for VMT

Table 13 lists the predicted noise level from all rail sources discussed above at the nearest noise sensitive locations.

Location	Rail Yard Activity (including layover)		Shunting Between Yard and Site		Trains Arriving/Leaving	
	Distance to Activity, feet	L_{Aeq}	Distance to Activity, feet	L_{Aeq}	Distance to Activity, feet	L_{Aeq}
NSL1	2,920	28	2,015	36	3,100	44
NSL2*	2,000	28	1,080	35	2,660	40
NSL3	1,455	36	690	43	2,065	47
NSL4	1,280	37	655	43	1,935	47
NSL5	460	48	460	45	790	53
NSL6	575	46	575	44	575	55
NSL7	1,600	35	1,600	37	1,600	48
NSL8	2,100	32	2,100	35	2,100	46
NSL9	1,600	35	1,600	37	1,600	48
NSL10	1,080	39	790	42	240	61

Table 13 Noise Levels due to VMT Rail Activity

Note * 1 row of intervening buildings has been included for NSL2 to account for the proposed Orcem facility.

Note that the noise levels presented here are representative of the worst-case noise level that may occur over an hour long period. In order to present the results in terms of L_{day}, L_{night} and L_{dn} as per the other impact assessments the overall noise levels have been calculated making the following assumptions:

- A 100 car train is loaded over the course of a two 10 hour shifts;
- 2 switches per hour are required between the rail yard outside the site boundary and the rail transloading area which has been modeled assuming that railcar loading occurs over the course of 20 hours (i.e. two 10 hour shifts);
- When switches are not occurring there will be no idling locomotive permitted in the rail yard area;
- A worst-case of 1 train movement during the daytime (i.e. 07:00hrs to 22:00hrs) and 1 train movement at night (i.e. 22:00hrs to 07:00hrs) occurs in any 24 hour period, each 100 car train is assumed to have 3 locomotives, and;
- The same intensity of activity over any 24hour period is assumed for both Phase 1 and Phase 2.

Table 14 presents the calculated noise levels at each location based on these assumptions.

Location	Calculated Noise Level, dB		
	L_{day}	L_{night}	L_{dn}
NSL1	38	38	43
NSL2	36	36	41
NSL3	44	43	49
NSL4	44	43	49
NSL5	50	49	55
NSL6	49	49	54
NSL7	40	41	46
NSL8	38	39	44
NSL9	40	41	46
NSL10	50	52	57

Table 14 Noise Levels due to VMT Rail Activity

Please note that the noise from locomotive warning horns has not been included in this assessment as it is considered to be a sound made in the interest of public safety. Such sounds are considered to be exempt from noise impact assessments as per the guidance contained within Chapter 16 of the City of Vallejo's Municipal Code regarding exceptions to the City's noise performance standards

8.4 Operations Equipment Staging Area

A small metal framed equipment storage and Maintenance Building of approximately 6,000 square feet will be located as shown in Figure 8. The internal Port Access Road will be extended south in VMT Phase 1 to allow access to this building by equipment used at the wharf. The area between the Maintenance Building and the southerly Orcem Site boundary will be used to park equipment when not in use at the wharf. The equipment storage area and Maintenance Building are located approximately 200 feet west of the nearest residential land use boundary. These facilities will not be operated between the hours of twelve midnight and six a.m.

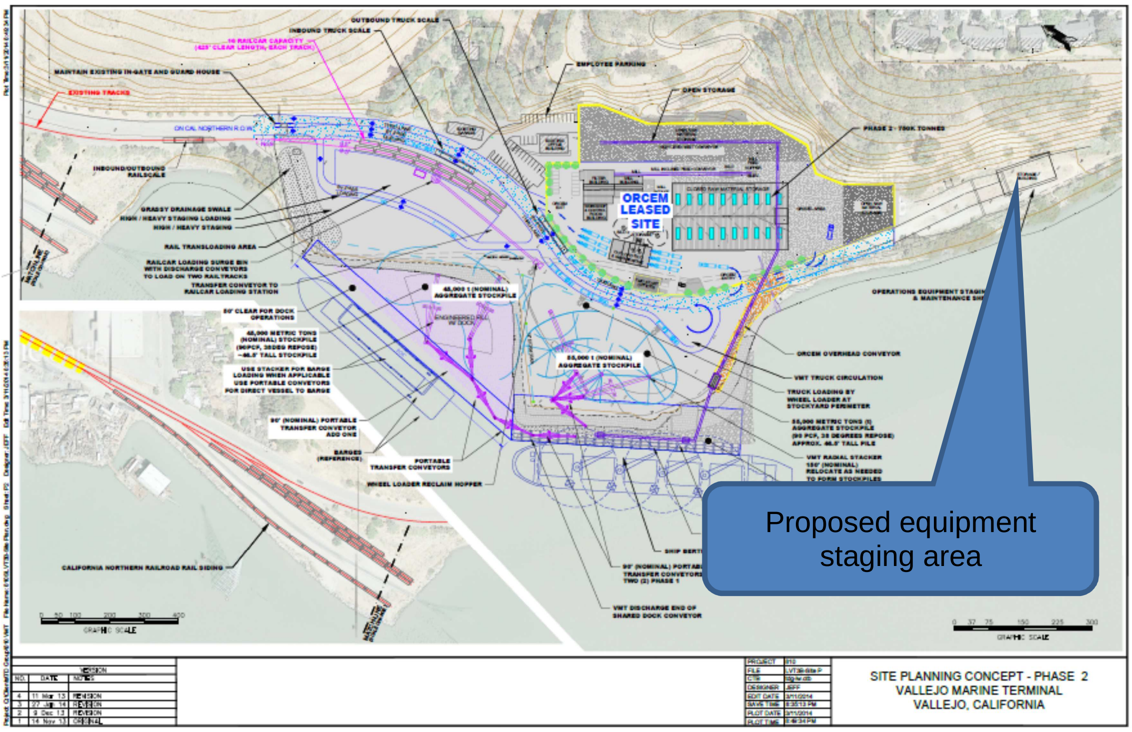

Figure 8 Equipment Staging Area

The noise impact of this equipment staging area will be limited to the noise generated by site equipment starting and warming up for 5 minutes in the morning and then returning to park in the evening. This activity is likely to result in noise levels at the nearest noise sensitive locations of NSL1 and NSL2, of 33dB $L_{Aeq,1hr}$ and 38dB $L_{Aeq,1hr}$ respectively.

This noise level is well below the existing ambient noise levels measured in this area and therefore the noise impact is not significant.

8.5 Overall VMT Noise Impact

When assessing the overall noise impact of the VMT activity each noise source discussed in the previous sections must be added logarithmically to determine the cumulative noise impact. However, in assessing the overall impact it is important to note the following:

- Ship loading/unloading activity will occur continuously, i.e. 24/7, when a vessel is moored, and;
- Truck movements on the local road network will increase gradually as the facilities production increases. The results presented here are representative of the worst-case scenarios at peak production for Phases 1 and 2 respectively;

The cumulative noise level is presented for each noise sensitive location in the following sections.

In order to present as realistic an assessment as possible the following scenario has been assessed:

- VMT Activity includes truck and train activity during Phase 1 operations;
- VMT Activity includes truck, train and barge activity during Phase 2 operations.

This represents the worst-case for both Phase 1 and Phase 2. Table 15 presents the calculated results for this scenario.

NSL	Phase	VMT Activity, dB L_{dn}	VMT Rail, dB L_{dn}	VMT Trucks, dB L_{dn}	Project Noise, dB L_{dn}	Existing Baseline dB L_{dn}	Total Noise Level dB L_{dn}	Increase in Noise Level, dB L_{dn}
1	1	46	43	n/a	48	55	56	1
	2	47	43	n/a	49		56	1
2	1	54	41	n/a	54	53	57	4
	2	54	41	n/a	54		57	4
3	1	47	49	37	51	52	55	3
	2	50	49	37	53		55	3
4	1	50	49	38	53	52	55	3
	2	52	49	38	54		56	4
5	1	43	55	49	56	52	58	6
	2	47	55	49	57		58	6
6	1	35	54	61	62	57	63	6
	2	39	54	61	62		63	6
7	1	32	46	61	61	63	65	2
	2	35	46	61	61		65	2

Table 15 Total Noise Levels due to VMT Activity

NSL	Phase	VMT Activity, dB Ldn	VMT Rail, dB Ldn	VMT Trucks, dB Ldn	Project Noise, dB Ldn	Existing Baseline dB Ldn	Total Noise Level dB Ldn	Increase in Noise Level, dB Ldn
8	1	51	44	n/a	52	54*	56	2
	2	54	44	n/a	54		57	3
9	1	27	46	61	61	63	65	2
	2	31	46	61	61		65	2
10	1	39	57	n/a	57	52*	58	6
	2	42	57	n/a	57		58	6

Table 15 cont.. Total Noise Levels due to VMT Activity

Note * The L_{dn} levels at these properties have been estimated based on the short term measurements taken. The estimate was arrived at by assuming a 7dB difference in L_{Aeq} level between day and night-time periods. This was derived from an analysis of the long-term unattended monitors used during the survey period.

Table 16 summarizes the noise impacts and identifies those locations where a significant increase in the existing ambient noise level may occur.

NSL	Predicted Increase in Noise	Comment	Mitigation Required
1	1dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
2	4dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
3	3dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
4	3 – 4dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
5	6dB	This is a significant permanent increase in the noise level according to the CEQA checklist	Yes
6	6dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist. Note this property is located in an area zoned for industry.	No
7	2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
8	2 – 3dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
9	2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
10	6dB	This is a significant permanent increase in the noise level according to the CEQA checklist	Yes

Table 16 Comparison of Noise Levels to CEQA Thresholds of Significance

Mitigation is required for two locations as follows:

- NSL5 (Colt Ct Residences), and;
- NSL10 (3^{rd} Street Residence).

On review of the predicted noise levels the dominant noise source impacting on these locations are related to rail activity and also to loading activity via the rail and barge loading hoppers.

When the noise emission from rail activities is examined in more detail it can be determined that one of the major noise sources is the noise generated by rolling stock on the existing jointed track. The presence of jointed track results in an additional noise source as each wheel runs over the discontinuity in the track. The presence of a jointed track increases the noise level generated by rolling stock by 5dB[4].

Similarly the noise from loading material into the rail and barge hoppers is generated due to the impact of stone/gravel on the metal walls of the hopper. This can be mitigated by 10dB by lining the hopper with a rubber wearing sheet. Appendix H provides details of a typical product that can achieve this.

In order to mitigate the noise generated by the jointed rail track it is recommended that all new track and the existing track is upgraded to a Continuous Welded Rail (CWR) which will remove the joints and provide a smooth continuous surface for rolling stock. By applying this measure the noise levels generated by rolling stock movements will reduce by 5dB. It is recommended that the CWR is provided to all tracks as far as the junction with Chestnut Street to the north of the site. Figure 9 illustrates the extent of the CWR that is recommended.

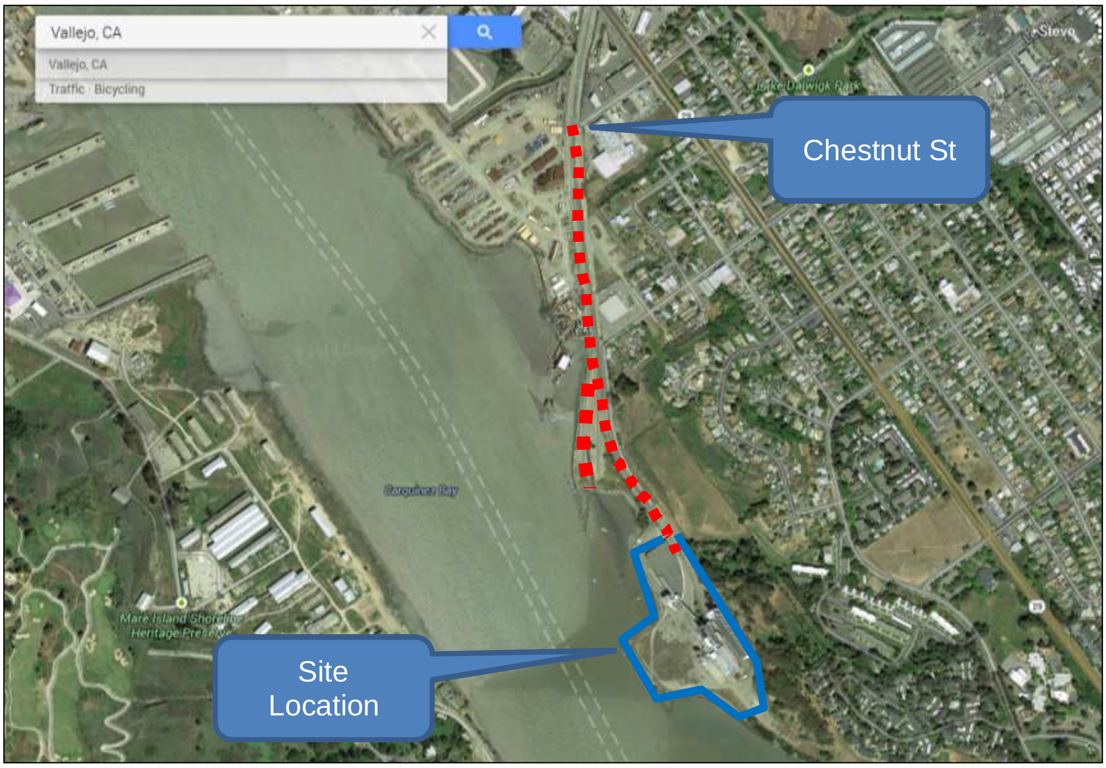

Figure 9 Recommended Extent of CWR Mitigation

8.6 Overall VMT Noise Impact – Including Mitigation

Table 17 presents the calculated results for the VMT operation, including the mitigation discussed.

4 This level of reduction is as per the guidance contained within the CREATE railroad noise model user guide, published by Harris Miller Miller & Hanson Inc.

NSL	Phase	VMT Activity, dB L_{dn}	VMT Rail, dB L_{dn}	VMT Trucks, dB L_{dn}	Project Noise, dB L_{dn}	Existing Baseline dB L_{dn}	Total Noise Level dB L_{dn}	Increase in Noise Level, dB L_{dn}
1	1	46	39	n/a	46	55	56	1
	2	46	39	n/a	47		56	1
2	1	51	37	n/a	51	53	55	2
	2	51	37	n/a	51		55	2
3	1	44	45	37	48	52	53	1
	2	46	45	37	49		54	2
4	1	47	46	38	50	52	54	2
	2	49	46	38	51		55	3
5	1	41	53	49	55	52	57	5
	2	44	53	49	55		57	5
6	1	32	52	61	62	57	63	6
	2	36	52	61	62		63	6
7	1	29	43	61	61	63	65	2
	2	31	43	61	61		65	2
8	1	49	40	n/a	50	54*	55	1
	2	51	40	n/a	51		56	2
9	1	23	43	61	61	63	65	2
	2	26	43	61	61		65	2
10	1	37	52	n/a	53	52*	55	3
	2	40	52	n/a	53		55	3

Table 17 Total Noise Levels due to VMT Activity – with mitigation

Note * The L_{dn} levels at these properties have been estimated based on the short term measurements taken. The estimate was arrived at by assuming a 7dB difference in L_{Aeq} level between day and night-time periods. This was derived from an analysis of the long-term unattended monitors used during the survey period.

Table 18 summarizes the noise impacts and identifies those locations where a significant increase in the existing ambient noise level may occur.

NSL	Predicted Increase in Noise	Comment	Mitigation Required
1	1dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
2	2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
3	1 – 2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
4	2 – 3dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
5	5dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
6	6dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist. Note this property is located in an area zoned for industry.	No
7	2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
8	1 – 2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
9	2dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No
10	3dB	This is not considered to be a significant permanent increase in the noise level according to the CEQA checklist	No

Table 16 Comparison of Noise Levels to CEQA Thresholds of Significance

With the mitigation in place all locations are now below the threshold where a significant permanent noise impact would occur. Therefore, no further mitigation is required.

8.7 Operational Vibration

Unlike sound, which can travel over distance, vibrations from transportation sources have a localized effect. When assessing vibration Chapter 16 of the City of Vallejo's Municipal Code specifies that,

> *"No use shall be operated in a manner which produces vibrations discernible without instruments at any point on the property line of the lot on which the use is located."*

In 2002 the California Department of Transport (Caltrans) conducted vibration studies on several transportation sources[5]. This document includes measurements of heavy freight rail in the Sacramento area which found that a single train pass-by at approximately 50 mph drops below the perception threshold beyond 280 feet from the center of the guideway. In this instance the nearest property to the rail line (NSL10) is approximately 240 feet from the rail line. Given that the train speed this close to the development site is likely to be much lower than 50mph and that vibration magnitude is expected to be lower at lower train speeds, it is considered likely that there will be no perceptible vibration at NSL10 as a result of train activity.

9.0 CONCLUSION

The potential noise impact of the proposed VMT facility has been assessed. The noise impact assessment was carried out for both the construction and operational phases of the development.

For the operational phase the noise impact has been determined through a comparison of the predicted project noise levels against the existing ambient noise levels determined through a baseline survey. For residentially zoned lands in the vicinity a significant noise impact has been identified for areas where the project related noise causes a greater than 5dB increase above the existing ambient or a greater than 3dB increase in areas where the with project noise level exceeds the normally acceptable noise level proposed in the Vallejo General Plan. In addition, for locations within non-residentially zoned lands a significant noise impact is defined as a greater than 10dB increase above the existing ambient.

The construction phase of the project has been assessed using the calculation methodology detailed in the Roadway Construction Noise Model (RCNM) developed by the Federal Highway Administration (FHWA). It has been found that the construction activity has the potential to generate a substantial temporary increase in ambient noise levels in the vicinity of the project. However, implementation of the following multi-part mitigation measure would reduce potential construction period noise impacts.

- All construction equipment must have appropriate sound muffling devices, which shall be properly maintained and used at all times such equipment is in operation.

[5] Transportation Related Earthborne Vibrations (Caltrans Experiences), TAV-02-01-R9601, February 2002

- Where feasible, the project contractor shall place all stationary construction equipment so that emitted noise is directed away from sensitive receptors nearest the project site.
- The construction contractor shall locate on-site equipment staging areas so as to maximize the distance between construction-related noise sources and noise-sensitive receptors nearest the project site.
- Except as otherwise permitted, construction activities shall be restricted to the hours of 7:00 a.m. to 9:00 p.m. daily.

Construction vibration is not expected to generate any significant impact due to the distance between the construction activity and the nearest properties.

The results of the operational phase assessment have found that there is a potentially significant and permanent noise increase at some properties as a result of the VMT facilities operation. In particular, loading activity to barge and rail transport options as well as rail movements were found to be the dominant noise sources. However, mitigation in the form of using Continuously Welded Track (CWR) and rubber linings to the rail and barge loading hoppers has been proposed.

With this measure in place the noise impact of the regular operation of the VMT facility is not significant.

No source of vibration is expected during the operational phase.

In conclusion, with appropriate noise mitigation measures the proposed VMT facility can operate without generating a significant and permanent noise impact on the surrounding environment.

APPENDIX A

Glossary of Acoustic Terminology

Term	Description
dB	'Decibel' – Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	'A-Weighted Decibel' – The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
$L_{Aeq,T}$	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period. This parameter is indicative of the "average" noise level occurring over the sample period (T).
$L_{A1,T}$	This is the sound level that is exceeded for 1% of the sample period. It is typically used as a descriptor for infrequent loud noise events of short duration, e.g. truck pass-bys.
$L_{A10,T}$	This is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.
$L_{A50,T}$	This is the sound level that is exceeded for 50% of the sample period.
$L_{A90,T}$	This is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.
L_{AMax}	This is the maximum sound level that is exceeded during the sample period.
L_{WA}	The A-weighted sound power level. Unlike sound pressure, sound power is neither room dependent nor distance dependent. Sound power belongs strictly to the sound source. Sound pressure is a measurement at a point in space near the source, while sound power is the total power produced by the source in all directions.
$L_{eq(24hr)}$	The average noise level over 24hours based on the A-weighted L_{eq} noise levels
L_{dn}	The day-night average noise level is a weighted average based on the A-weighted noise levels during the daytime (07:00hrs to 22:00hrs) and night-time (22:00hrs to 07:00hrs) with a 10dB weighting applied during the night-time period.
CNEL	The Community Noise Equivalent Level is a weighted average based on the A-weighted noise levels during the daytime (07:00hrs to 19:00hrs), evening time (19:00hrs and 22:00hrs) and night-time (22:00hrs to 07:00hrs) with a 5dB weighting applied during the evening time and a 10dB weighting applied during the night-time period.

APPENDIX B

Baseline Noise Report

ORCEM VALLEJO GGBFS PLANT NOISE BASELINE CONDITIONS REPORT VALLEJO, CALIFORNIA

October 10, 2013

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Introduction

This report presents background information on the existing noise environment in the vicinity of the Orcem Vallejo GGBFS Plant site located in Vallejo, California. The purpose of the report is to present and characterize the sources of ambient noise and the different noise settings near the project site. This background information will serve as the basis for completing the first and fundamental step in analyzing potential noise impacts attributable to the project.

This section has been organized to provide information on the fundamentals of environmental noise and vibration, definitions of technical terms to assist the reader in understanding these issues and the City's current noise guidelines, and a summary of the results of the noise monitoring survey.

Fundamentals of Environmental Noise

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Sound levels are usually measured and expressed in decibels (dB) with 0 dB corresponding roughly to the threshold of hearing. Decibels and other technical terms are defined in Table 1.

Most of the sounds that we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies, with each frequency differing in sound level. The intensities of each frequency add together to generate a sound. The method commonly used to quantify environmental sounds consists of evaluating all of the frequencies of a sound in accordance with a weighting that reflects the facts that human hearing is less sensitive at low frequencies and extreme high frequencies than in the frequency mid-range. This is called "A" weighting, and the decibel level so measured is called the A-weighted sound level (dBA). In practice, the level of a sound source is conveniently measured using a sound level meter that includes an electrical filter corresponding to the A-weighting curve. Typical A-weighted levels measured in the environment and in industry are shown in Table 2 for different types of noise.

Although the A-weighted noise level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of noise from distant sources that create a relatively steady background noise in which no particular source is identifiable. To describe the time-varying character of environmental noise, the statistical noise descriptors, L_{01}, L_{10}, L_{50}, and L_{90}, are commonly used. They are the A-weighted noise levels equaled or exceeded during 1%, 10%, 50%, and 90% of a stated time period. A single number descriptor called the L_{eq} is also widely used. The L_{eq} is the average A-weighted noise level during a stated period of time.

In determining the daily level of environmental noise, it is important to account for the difference in response of people to daytime and nighttime noises. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes very noticeable. Further, most people sleep at night and are very sensitive to noise intrusion. To account for human sensitivity to nighttime noise levels, a descriptor, L_{dn} (day/night average sound level), was developed. The L_{dn} divides the 24-hour day into the daytime of 7:00 AM to 10:00 PM and the nighttime of 10:00 PM to 7:00 AM. The nighttime noise level is weighted 10 dB higher than the daytime noise level. The Community Noise Equivalent Level (CNEL) is another 24-hour average that includes both an evening and nighttime weighting.

Fundamentals of Groundborne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several methods are typically used to quantify the amplitude of vibration including Peak Particle Velocity (PPV) and Root Mean Square (RMS) velocity. PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. RMS velocity is defined as the average of the squared amplitude of the signal, usually measured in decibels referenced to 1micro-in/sec and reported in VdB. PPV and VdB vibration velocity amplitudes are used to evaluate human response to vibration.

Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage. In high noise environments, which are more prevalent where ground-borne vibration approaches perceptible levels, this rattling phenomenon may also be produced by loud airborne environmental noise causing induced vibration in exterior doors and windows.

In urban environments, sources of ground-borne vibration include construction activities, light and heavy rail transit, and heavy trucks and buses.

Construction Vibration

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related ground-borne vibration levels. Because of the impulsive nature of such activities, the use of the peak particle velocity descriptor (PPV) has been routinely used to measure and assess ground-borne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life are evaluated against different vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec, PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels such as people in an urban environment may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to a building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity (e.g., impact pile driving) occurs immediately adjacent to the structure.

Table 3 displays continuous vibration impacts on human annoyance and on buildings. As discussed previously, annoyance is a subjective measure and vibrations may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying.

Rail Vibration

Rail operations are potential sources of substantial ground-borne vibration depending on distance, the type and the speed of trains, and the type of railroad track. People's response to ground-borne vibration has been correlated best with the velocity of the ground. The velocity of the ground is expressed on the decibel scale. The reference velocity is 1 x 10^{-6} in. /sec. RMS, which equals 0 VdB, and 1 in. /sec. equals 120 VdB. Although not a universally accepted notation, the abbreviation "VdB" is used in this document for vibration decibels to reduce the potential for confusion with sound decibels.

One of the problems with developing suitable criteria for ground-borne vibration is the limited research into human response to vibration and more importantly human annoyance inside buildings. The U.S. Department of Transportation, Federal Transit Administration has developed rational vibration limits that can be used to evaluate human annoyance to ground-borne vibration. These limits are summarized in Table 4. These criteria are primarily based on experience with passenger train operations, such as rapid transit and commuter rail systems. The main difference between passenger and freight operations is the time duration of individual events; a passenger train lasts a few seconds whereas a long freight train may last several minutes, depending on speed and length.

Vibration from Heavy Trucks and Buses

Ground-borne vibration levels from heavy trucks and buses are not normally perceptible, especially if roadway surfaces are smooth. Buses and trucks typically generate ground-borne vibration levels of about 63 VdB at a distance of 25 feet when traveling at a speed of 30 mph. Higher vibration levels can occur when buses or trucks travel at higher rates of speed or when the pavement is in poor condition. Vibration levels below 65 VdB are below the threshold for human perception.

Table 1: Definitions of Acoustical Terms Used in this Report

Term	Definitions
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e.g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, Leq	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 pm and 7:00 am.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 pm to 10:00 pm and after addition of 10 decibels to sound levels measured in the night between 10:00 pm and 7:00 am.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

Table 2: Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), Caltrans, November 2009.

Table 3: Reaction of People and Damage to Buildings From Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation- and Construction-Induced Vibration Guidance Manual, California Department of Transportation, June 2004.

Table 4: FTA Groundborne Vibration Impact Criteria

Land Use Category	Impact Levels (VdB re 1 micro-inch /sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Notes:

1. "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
2. "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.
3. "Infrequent Events" is defined as fewer than 30 vibration events per day. This category includes most commuter rail systems.
4. This limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes.

Source: US Department of Transportation Federal Transit Administration 2006

Regulatory Background

The State of California and the City of Vallejo establish guidelines, regulations, and policies designed to limit noise exposure at noise sensitive land uses. Appendix G of the State CEQA Guidelines, the City of Vallejo Noise Element of the General Plan, and the City of Vallejo Municipal Code present the following:

State CEQA Guidelines. The California Environmental Quality Act (CEQA) contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. CEQA asks the following applicable questions. Would the project:

a. Expose people to or generate noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies;

b. Expose people to or generate excessive groundborne vibration or groundborne noise levels;

c. Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

d. Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

e. For projects within an area covered by an airport land use plan or within two miles of a public airport or public use airport when such an airport land use plan has not been adopted, or within the vicinity of a private airstrip, expose people residing or working in the project area to excessive aircraft noise levels;

f. For a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels?

CEQA does not define the noise level increase that is considered substantial. Typically, an increase in the day-night average noise level of 3 dBA L_{dn} or greater at noise-sensitive receptors would be considered significant when projected noise levels would exceed those considered satisfactory for the affected land use. An increase of 5 dBA L_{dn} or greater would be considered significant when projected noise levels would continue to meet those considered satisfactory for the affected land use

City of Vallejo General Plan. The Vallejo General Plan establishes noise and land use compatibility guidelines for new development. In residential areas the maximum exterior noise level goal at primary outdoor use areas is 60 dBA L_{dn}. Noise levels up to of 65 dBA L_{dn} may be allowed at the discretion of the City where it is not economically or aesthetically reasonable to meet the more restrictive outdoor goal. The interior noise standard is 45 dBA L_{dn} for all residential uses, including single and multi-family housing, hotels/motels and residential healthcare facilities.

Policy 2b limits, where appropriate, noise generating activities (for example, construction and maintenance activities and loading and unloading activities) to the hours of 7:00 am to 9:00 pm.

The Noise Element also addresses "increase in the ambient" resulting from a proposed project. That is the amount by which a new project would cause noise levels in a community to increase above existing levels. When approving new development, project related noise increases shall be limited to 5 dBA in quiet residential areas and to no more than 3 dBA in residential areas where noise levels currently exceed 60 dBA L_{dn}.

City of Vallejo Noise Ordinance. The Vallejo Municipal Code establishes noise performance standards for noise sources and receptors in Vallejo. Section 7.84.010 generally prohibits loud unnecessary noises, but does not provide quantifiable noise level limits. Section 7.84.020 defines a "noise disturbance" as any sound which (1) endangers or injures the safety or health of humans or animals; (2) annoys or disturbs a reasonable person of normal sensitiveness; or (3) endangers or injures personal or real property. Section 12.40.070 addresses excavating, grading and filling related to construction: All grading and noise there from, including but not limited to, warming of equipment motors, in residential zones or within 1,000 feet of any residential occupancy, hotel, motel or hospital shall be limited to between the hours of 7:00 am to 6:00 pm.

Chapter 16.72 establishes noise performance standards for land use generated noise. When sound is received at a rural residence the maximum allowable level is 55 dBA. The maximum allowable level is 60 dBA L_{eq}[1] at low, medium, and high density residential districts. Correction factors are applied for time of day that the noise is generated and the character of the noise. If noise is only generated during the daytime (7:00 am to 10:00 pm) the allowable limit would be raised 5 dBA to 65 dBA L_{eq}. If the noise source is impulsive such as hammering or screeching, the allowable level would be reduced 5 dBA. Sounds from transportation equipment used exclusively in the movement of goods and people to and from a given premises are exempted from the code.

Existing Noise Environment

An ambient noise monitoring survey was made between September 18, 2013 and September 25, 2013 to document existing noise conditions at or near noise-sensitive receptors (e.g., residences) adjoining the project site. The noise monitoring survey included five long-term measurements (LT-1 through LT-5) and four short-term measurements (ST-1 through ST-4). An overview of the project site, vicinity, and noise measurement locations are shown on Figure 1a. Figure 1b shows the locations of long-term noise measurement sites nearest the project site.

Noise levels were measured with Larson Davis Model 820 Integrating Sound Level Meters (SLMs) set at "slow" response. The Model 820 Sound Level Meters were equipped with G.R.A.S. Type 40AQ ½ - inch random incidence microphones. A windscreen was placed over the microphone during all measurements. The sound level measuring assemblies were calibrated

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[1] Section 16.72.060 – Noise level measurement. D. Measured Sound Levels. The measurement of sound level limits shall be the average sound level for a period of one hour.

prior to each measurement using a Model CAL200 acoustical calibrator. The responses of the systems were checked after the measurement session and no calibration adjustments were made to the sound levels measured by the SLM. At the completion of the monitoring event, the measured interval noise level data were obtained from the SLM using the Larson Davis SLM utility software program. All instrumentation meets the requirements of the American National Standards Institute (ANSI) SI.4-1983 for Type 1 use. Meteorological conditions during the measurements were generally acceptable for noise monitoring, primarily consisting of clear to partly cloudy skies, calm to light winds, and seasonable temperatures. A brief storm was noted on Saturday, September 21, 2013, yielding higher ambient noise levels during periods of wind and precipitation.

The hourly trends in noise levels at LT-1 through LT-5 are shown on Figures 2 through 41. Included in each figure are the energy equivalent noise level ($L_{eq(hr)}$), the maximum instantaneous noise level (L_{max}), the minimum instantaneous noise level (L_{min}), and statistical noise levels (L_n - noise levels exceeded 1, 10, 50, and 90 percent of the time).

Site LT-1 was selected to represent the noise environment of Sandy Beach Road residential land uses located along the waterfront. The measurement site was approximately 1,200 feet (365 meters) northwest of Sandy Beach Road in an area of the project site considered acoustically equivalent to the Sandy Beach Road vicinity. Continuous noise measurements were made at Site LT-1 from about 1:00 p.m., September 18, 2013 to 12:00 p.m., September 25, 2013. The day-night average noise level calculated based on the measured data ranged from 51 to 59 dBA L_{dn} (excluding weather-affected data collected on Saturday, September 21, 2013) with an average L_{dn} of 55 dBA. These data are summarized on Figures 2-9.

Noise measurement location LT-2 was on a bluff overlooking the project site and adjacent to condominium units located at the northwest terminus of Seawitch Lane. The day-night average noise level calculated based on the measured data ranged from 49 to 56 dBA L_{dn} (excluding weather-affected data) with an average L_{dn} of 53 dBA. These data are summarized on Figures 10-17.

Long-term noise measurement site LT-3 was selected to represent the noise environment of residential land uses within the Harbor Park Apartments and along Winchester Street. The measurement site was located at the top of the hill east of the project site. The day-night average noise level calculated based on the measured data ranged from 50 to 54 dBA L_{dn} (excluding weather-affected data) with an average L_{dn} of 52 dBA. These data are summarized on Figures 18-25.

Site LT-4 was selected to represent the noise environment of noise-sensitive land uses along Lemon Street, west of Sonoma Boulevard. The measurement site was approximately 25 feet (8 meters) from the centers of Lemon Street and 3rd Street on the northwest corner of the intersection. The day-night average noise level calculated based on the measured data ranged from 56 to 59 dBA L_{dn} (excluding weather-affected data collected on Saturday, September 21, 2013) with an average L_{dn} of 57 dBA. These data are summarized on Figures 26-33.

Site LT-5 quantified ambient noise levels from vehicular traffic along Sonoma Boulevard. The measurement site was approximately 90 feet from the center of Sonoma Boulevard at the Norman C. King Community Center. The day-night average noise level calculated based on the measured data ranged from 62 to 65 dBA L_{dn} (excluding weather-affected data) with an average L_{dn} of 63 dBA. These data are summarized on Figures 34-41.

Short-term noise measurements were made at four additional locations to complete the ambient noise survey. The locations of the short-term noise measurements are shown on Figure 1a. Table 5, below, summarizes the noise level data collected at each of the sites.

Table 5: Summary of Short-Term Noise Measurement Data

Noise Measurement Location (Date)	Time Begin	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	10-min. L_{eq}
ST-1: Lake Dalwigk Park, 70 feet from the center of Lemon Street at Sheridan Street. (9/18/2013)	1450	73	71	62	52	47	59
	1500	69	66	61	53	76	57
ST-2: 75 feet from the center of Sonoma Boulevard south of Solano Avenue. (9/18/2013)	1520	74	72	66	59	53	62
	1530	72	70	67	61	53	63
ST-3: Center of Alden Park, Mare Island. (9/25/2013)	1100	71	65	56	44	41	53
	1110	63	60	50	43	39	48
ST-4: Easternmost terminus of York Street. (9/25/2013)	1140	61	61	55	48	46	51
	1150	57	54	51	49	47	49

Short-term noise measurement site ST-1 was approximately 70 feet from the center of Lemon Street in Lake Dalwigk Park. The measurement site represented the park and nearby residential land uses. The primary noise source affecting measured noise levels was vehicle traffic along Lemon Street. The ten-minute average noise level during the two measurements ranged from 57 to 59 dBA L_{eq}.

Noise measurement ST-2 was made at a distance of 75 feet from the centerline of Sonoma Boulevard south of Solano Avenue. This location was selected to quantify ambient traffic noise levels along Sonoma Boulevard. The ten-minute average noise level during the two measurements ranged from 62 to 63 dBA L_{eq}.

Short-term measurement sites ST-3 and ST-4 were selected to represent the noise environment at noise-sensitive receptors on Mare Island and along the railroad corridor that leads to and from the project site, respectively. Ambient noise levels at both short-term measurement sites were the result of local and distant vehicle traffic, with typical daytime noise levels ranging from 48 to 53 dBA L_{eq}.

Based on a review of the ambient long-term and short-term noise data, project-generated noise increases exceeding 5 dBA L_{dn} would be considered significant at Sandy Beach Road single-family residential land uses, multi-family residential units located along Seawitch Lane and within the Harbor Park Apartments, at single-family residences along Winchester Street, within Mare Island, or along the railroad corridor (receptors represented by LT-1, LT-2, LT-3, ST-3, or ST-4). Project-generated noise increases exceeding 3 dBA L_{dn} would be considered significant at noise-sensitive receptors represented by sites LT-4, LT-5, ST-1, or ST-2 (Lemon Street and Sonoma Boulevard).

Figure 1a Overview of Project Area Showing Noise Monitoring Locations

Figure 1b Project Vicinity Showing Long-Term Noise Monitoring Locations

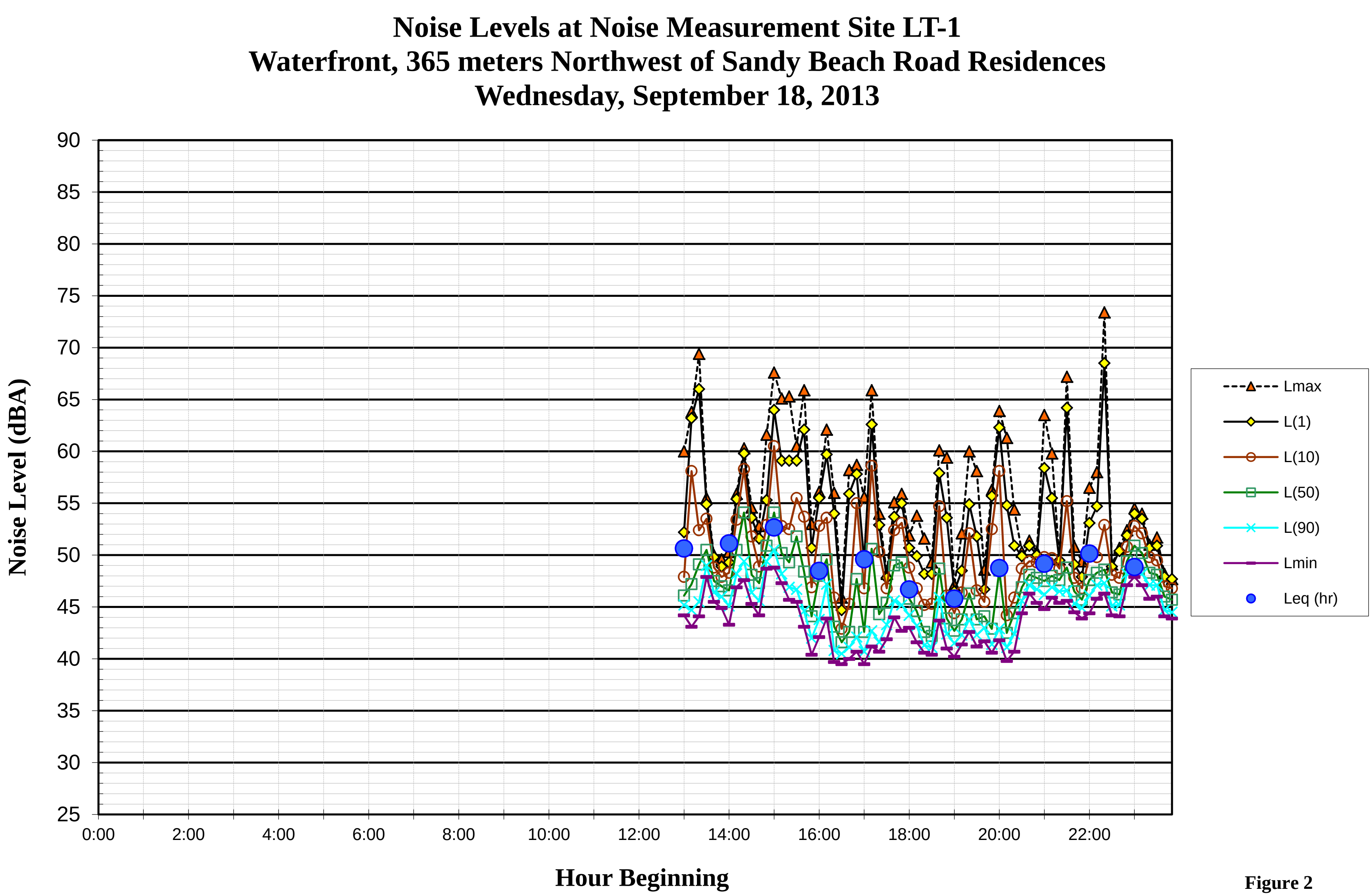

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Wednesday, September 18, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 2

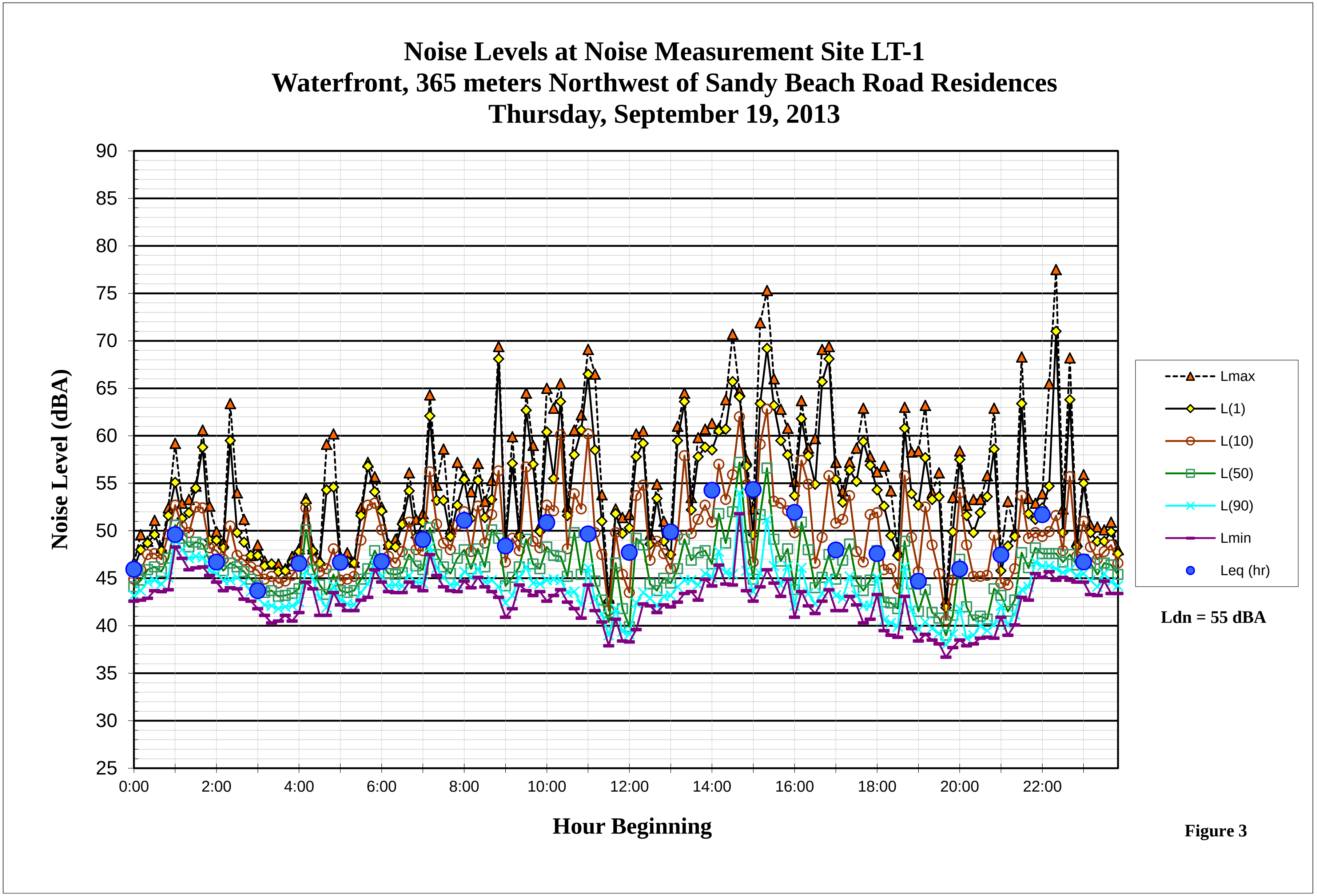

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Thursday, September 19, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 55 dBA

Figure 3

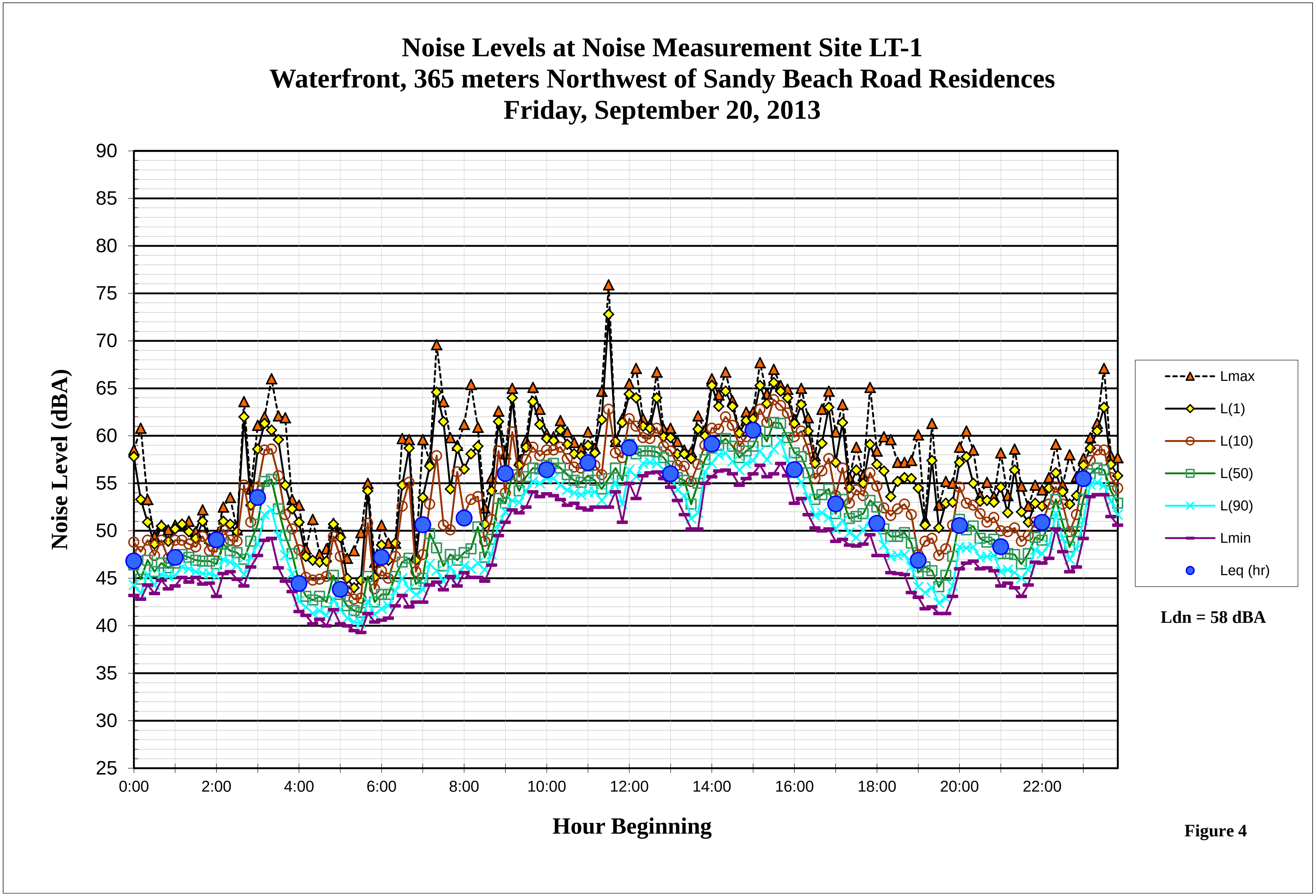

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Friday, September 20, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 58 dBA

Figure 4

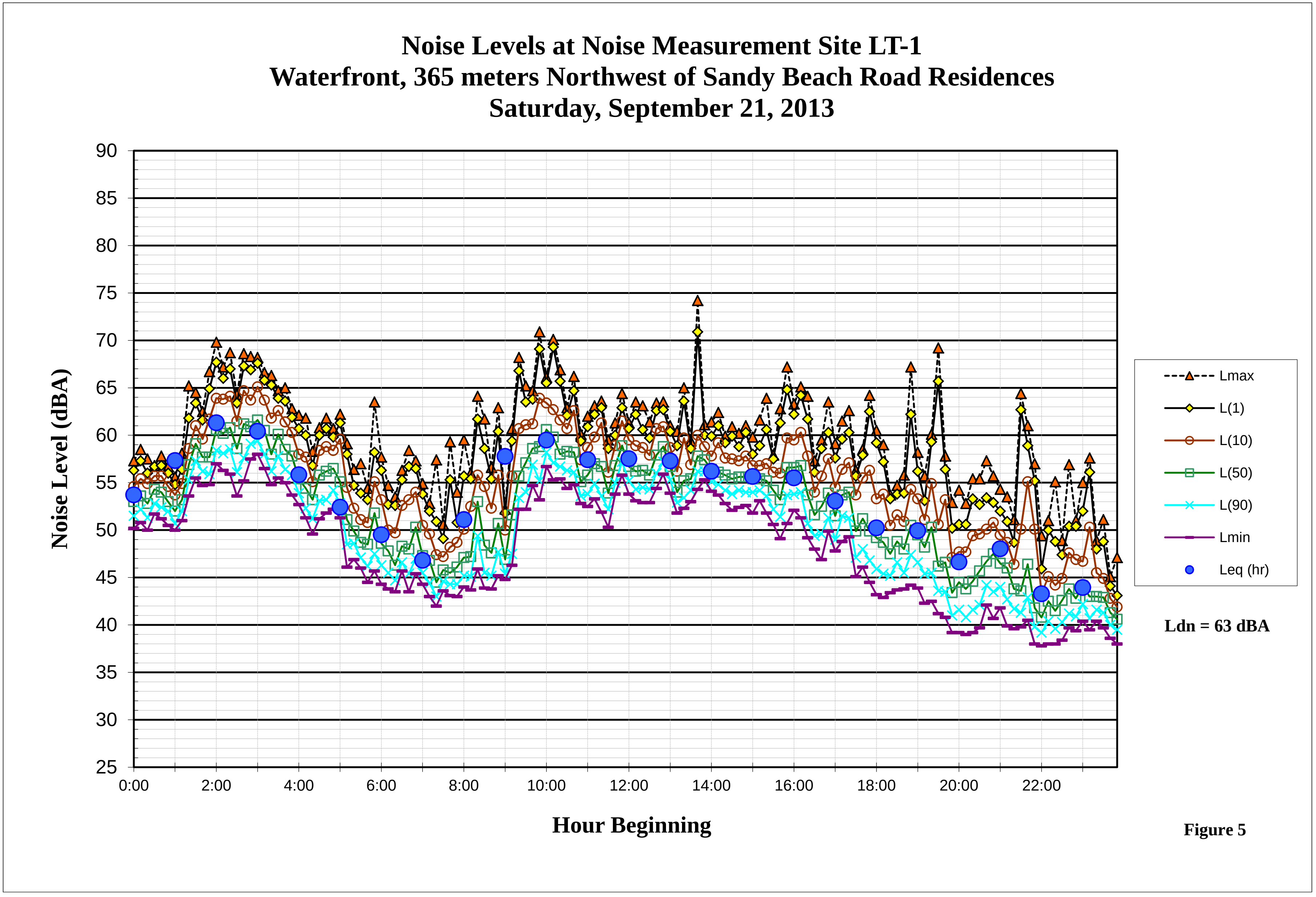
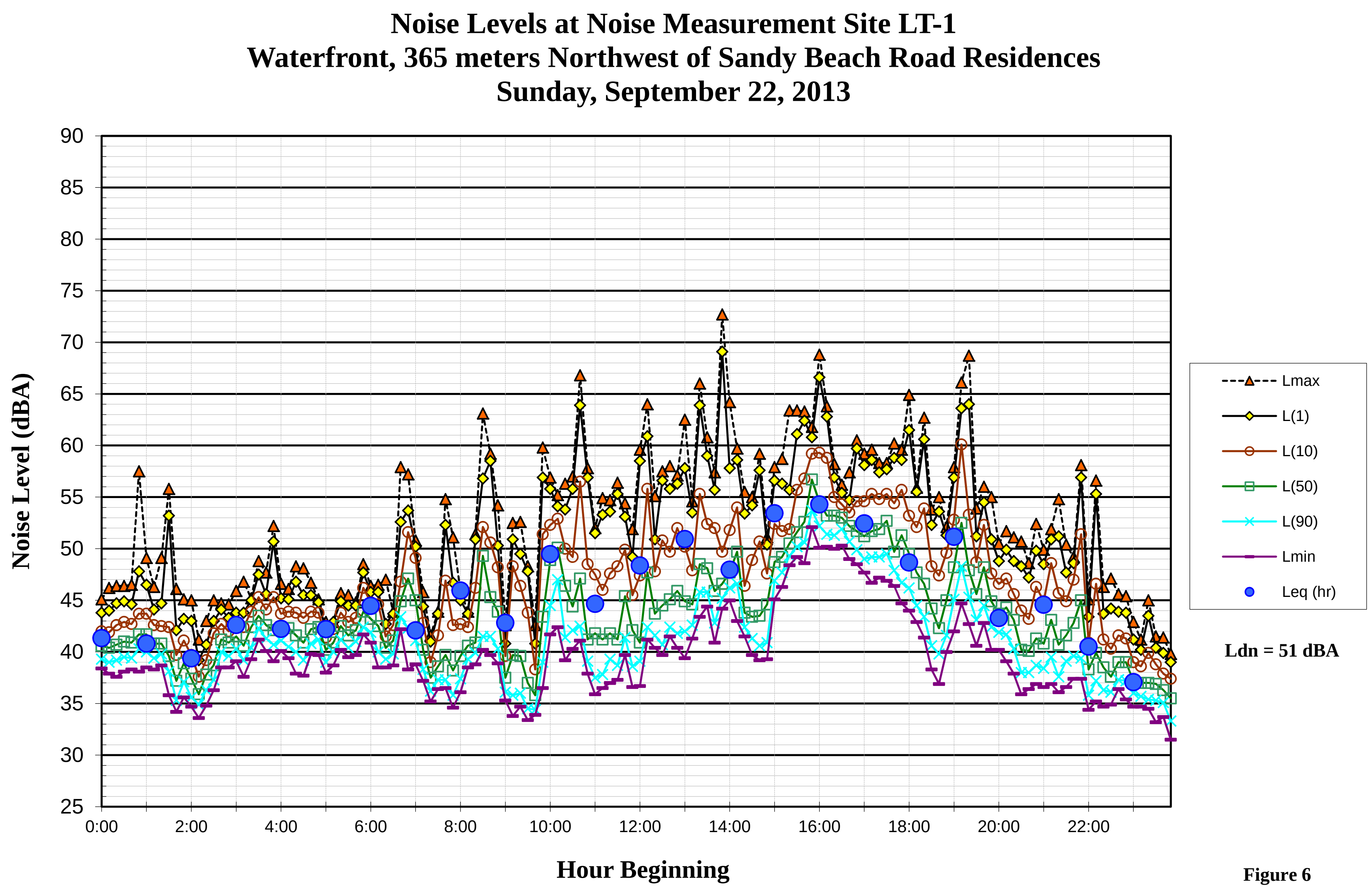

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Saturday, September 21, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 63 dBA

Figure 5



Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Sunday, September 22, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 51 dBA

Figure 6

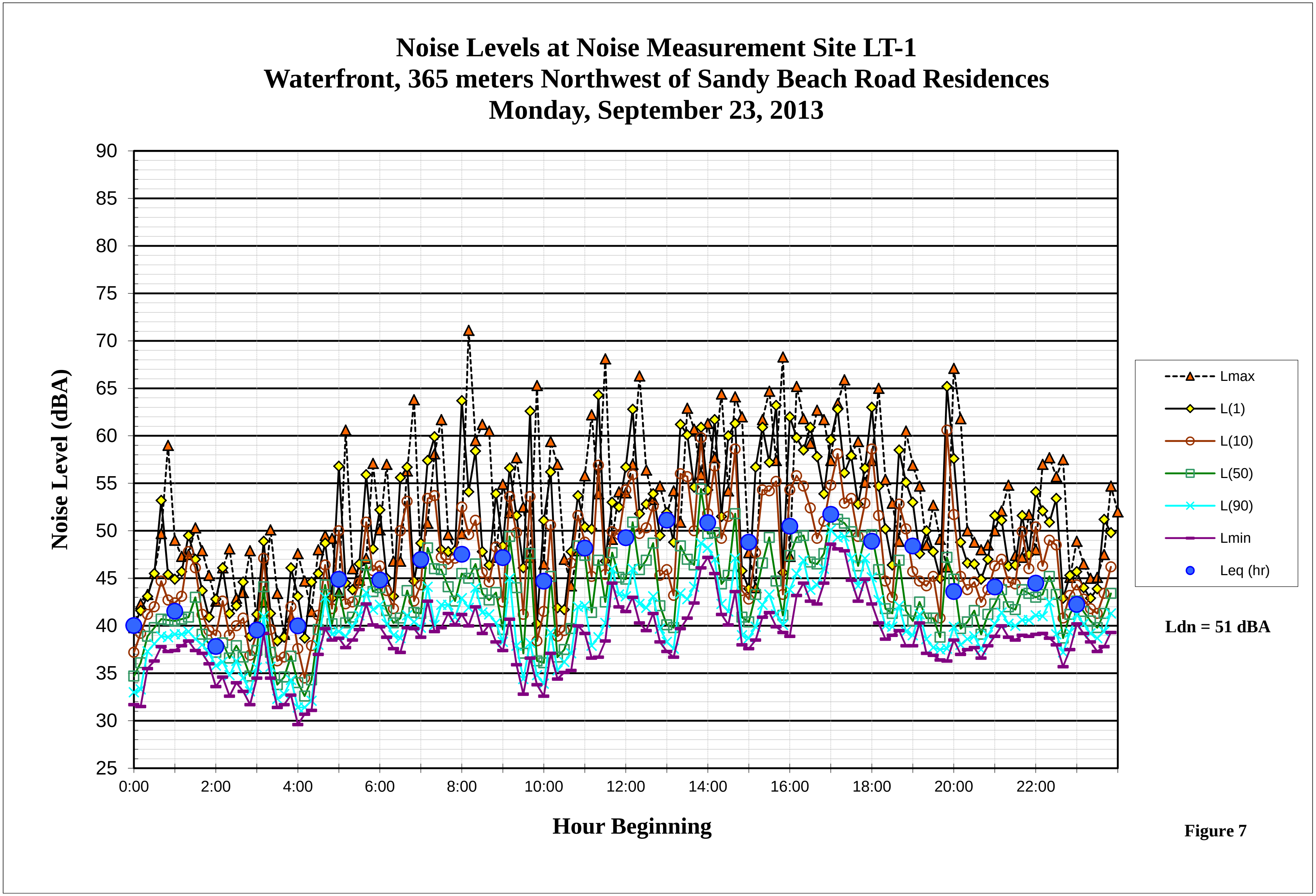

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Monday, September 23, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 51 dBA

Figure 7

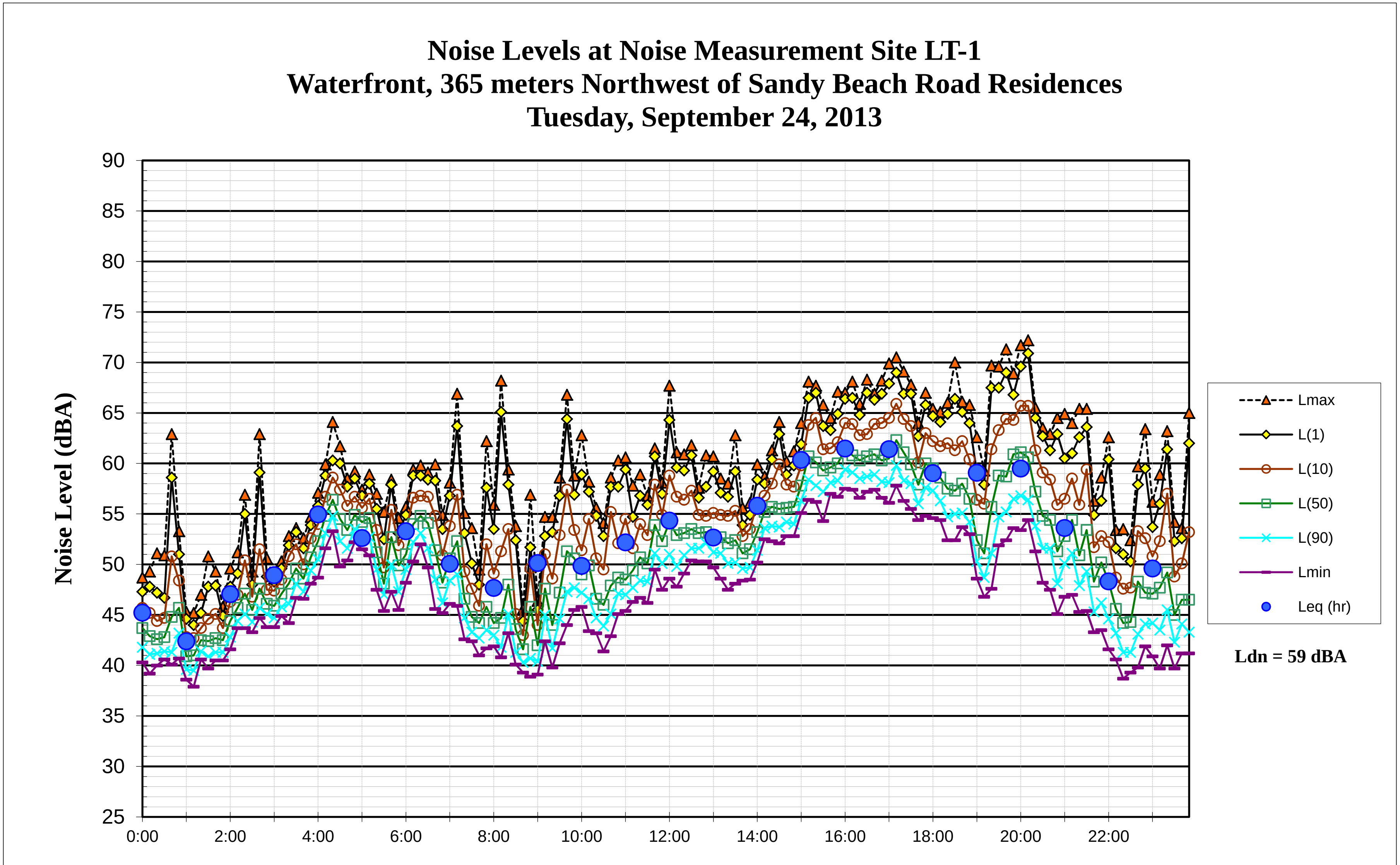

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Tuesday, September 24, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 59 dBA

Figure 8

Noise Levels at Noise Measurement Site LT-1
Waterfront, 365 meters Northwest of Sandy Beach Road Residences
Wednesday, September 25, 2013

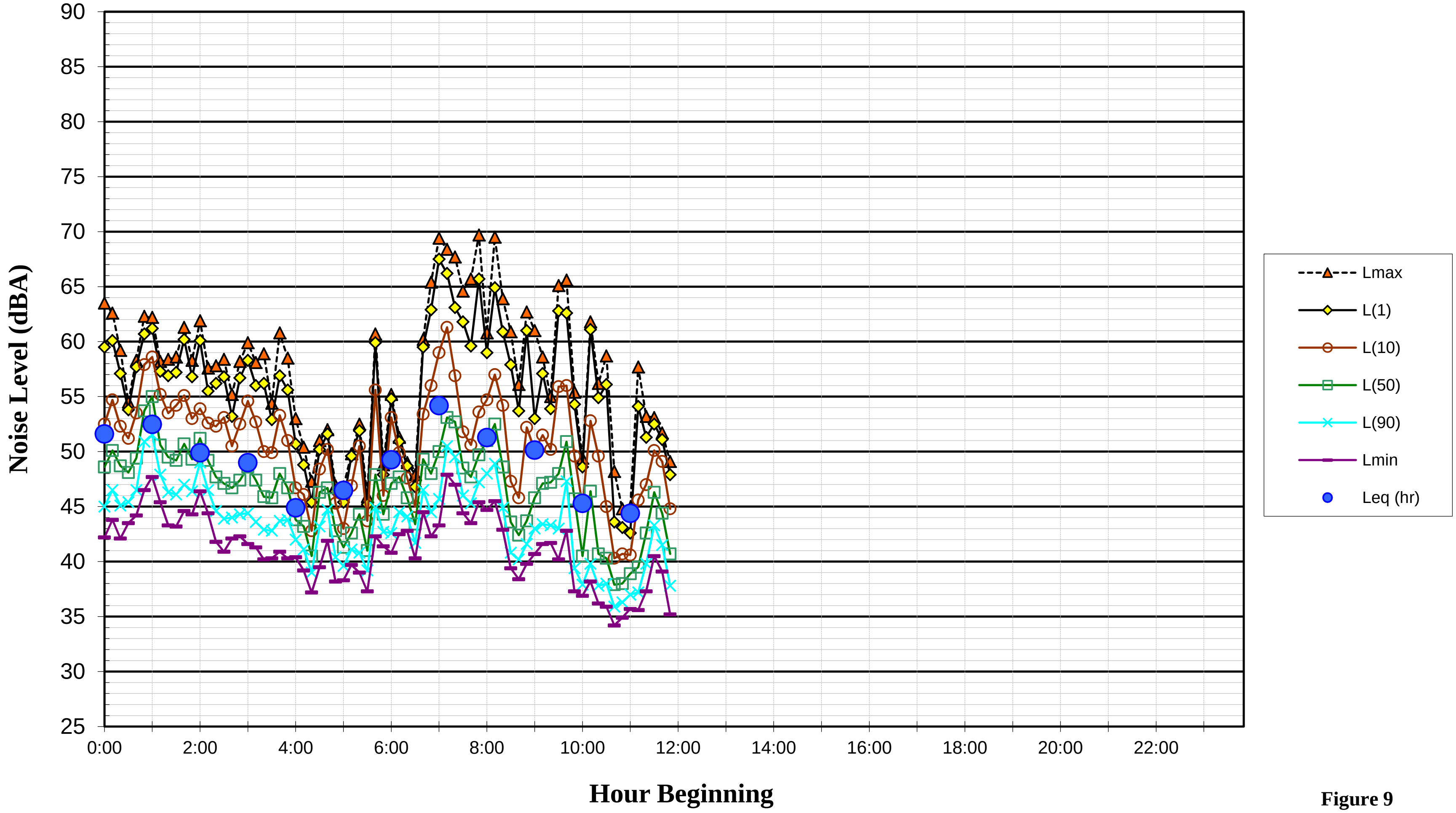
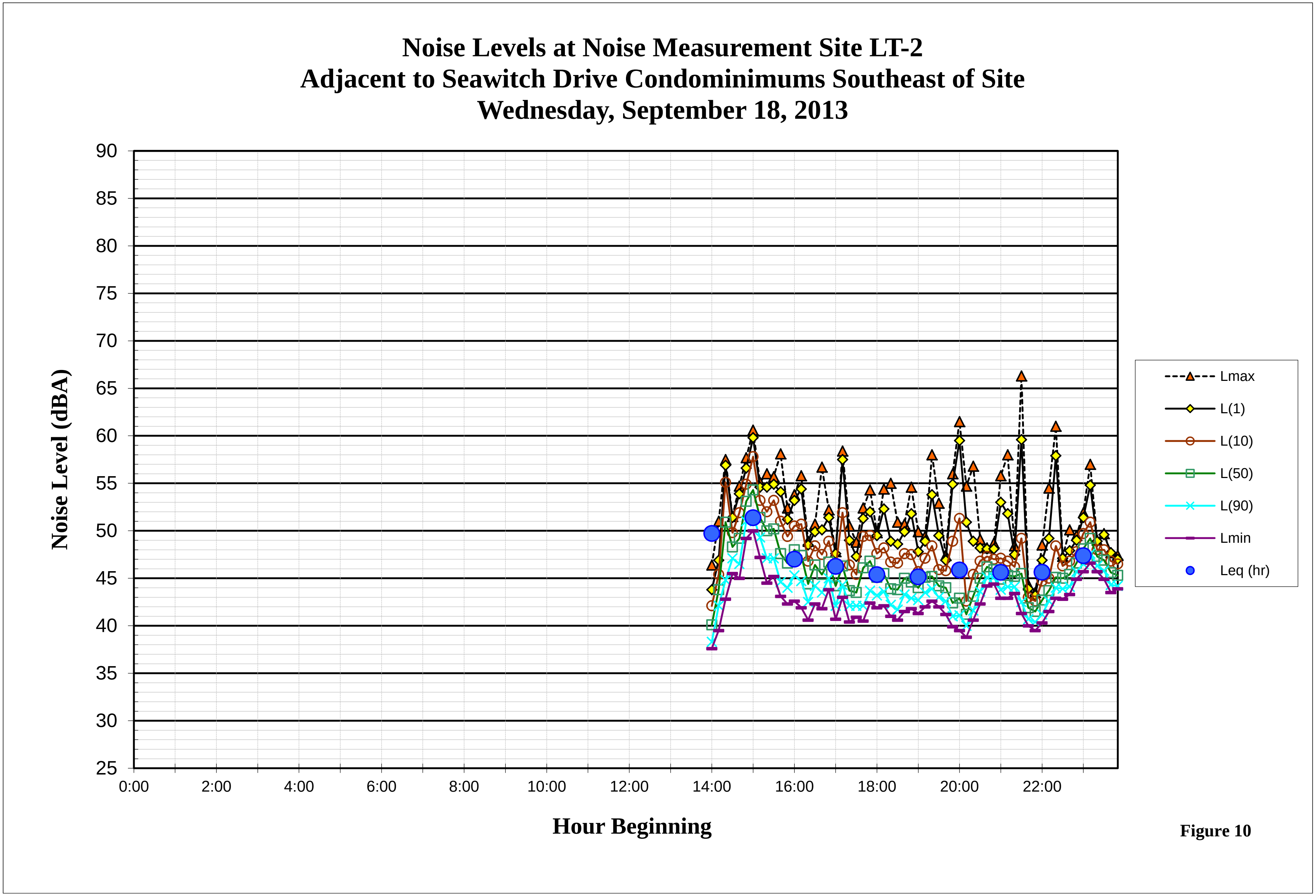
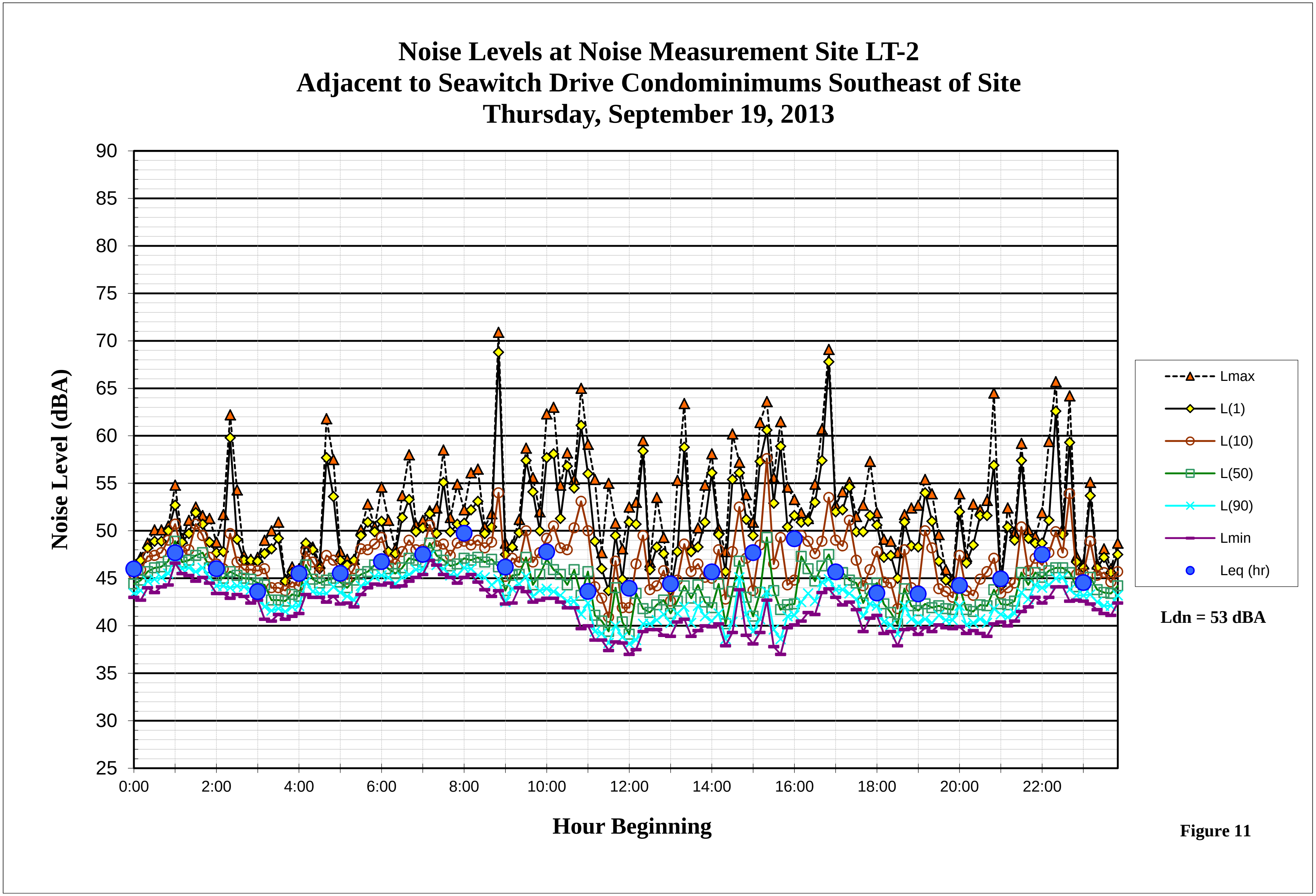


Figure 9



Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Wednesday, September 18, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

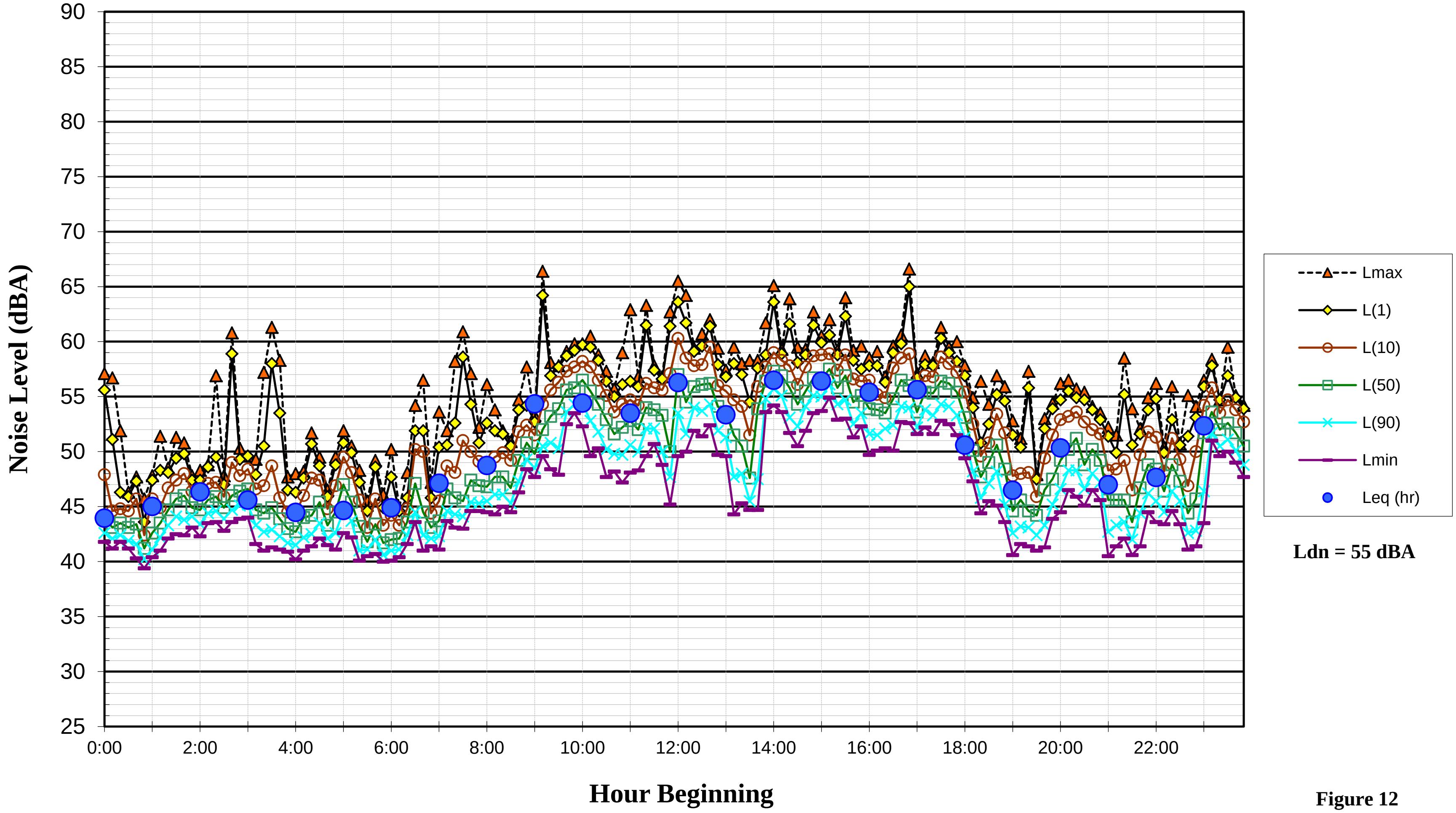
Figure 10



Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Thursday, September 19, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 53 dBA

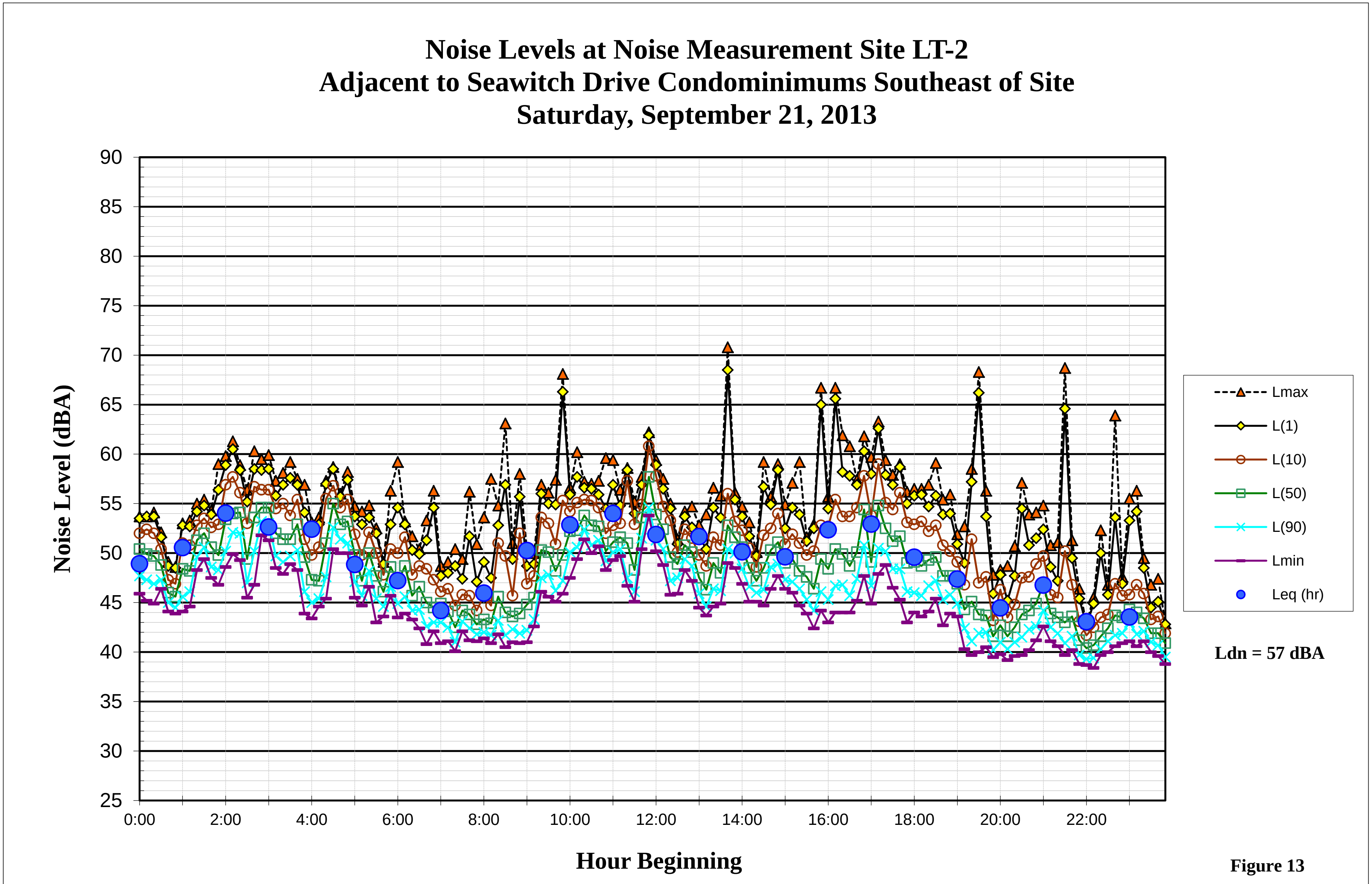
Figure 11

Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Friday, September 20, 2013



Ldn = 55 dBA

Figure 12



Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Saturday, September 21, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 57 dBA

Figure 13

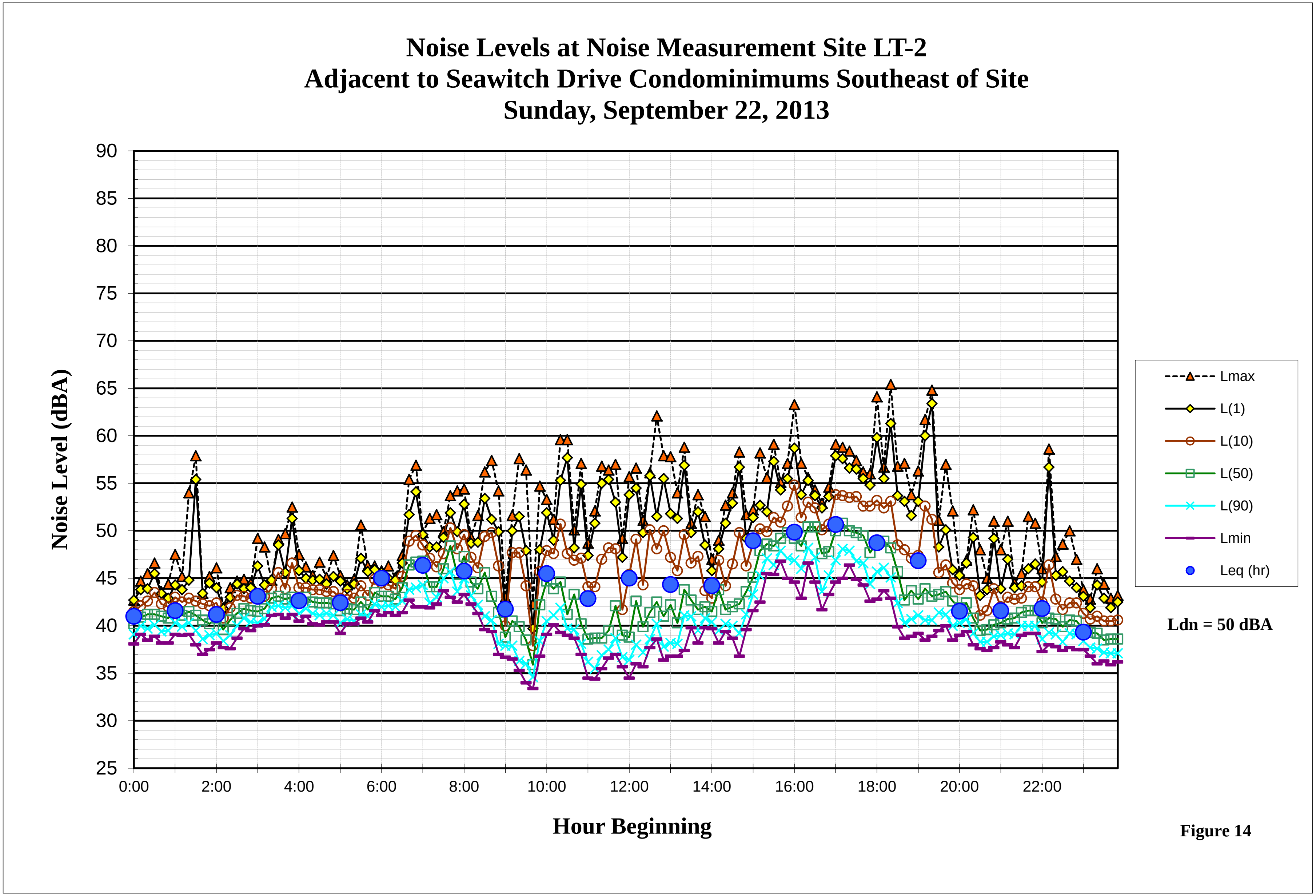
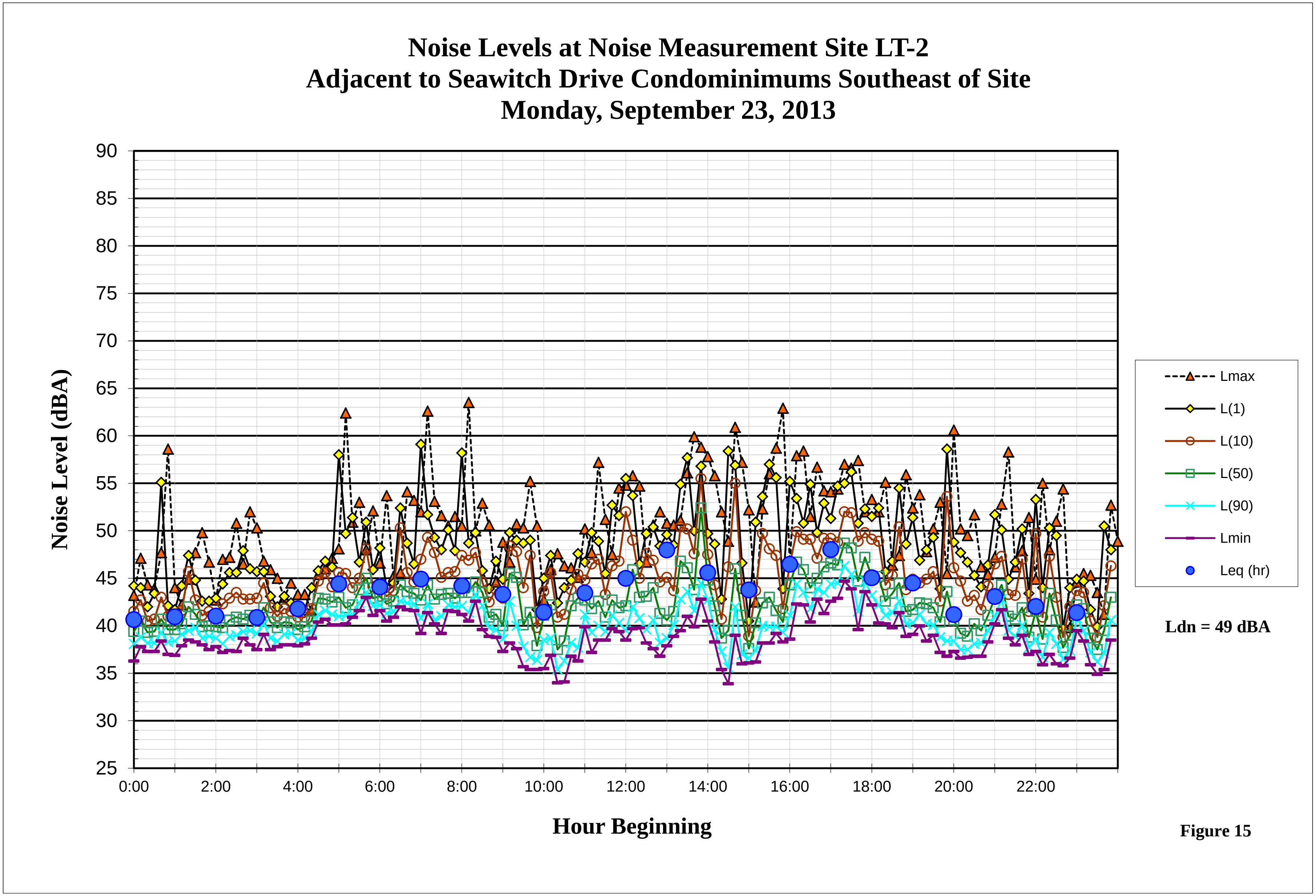

Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Sunday, September 22, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 50 dBA

Figure 14


Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Monday, September 23, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 49 dBA
Figure 15

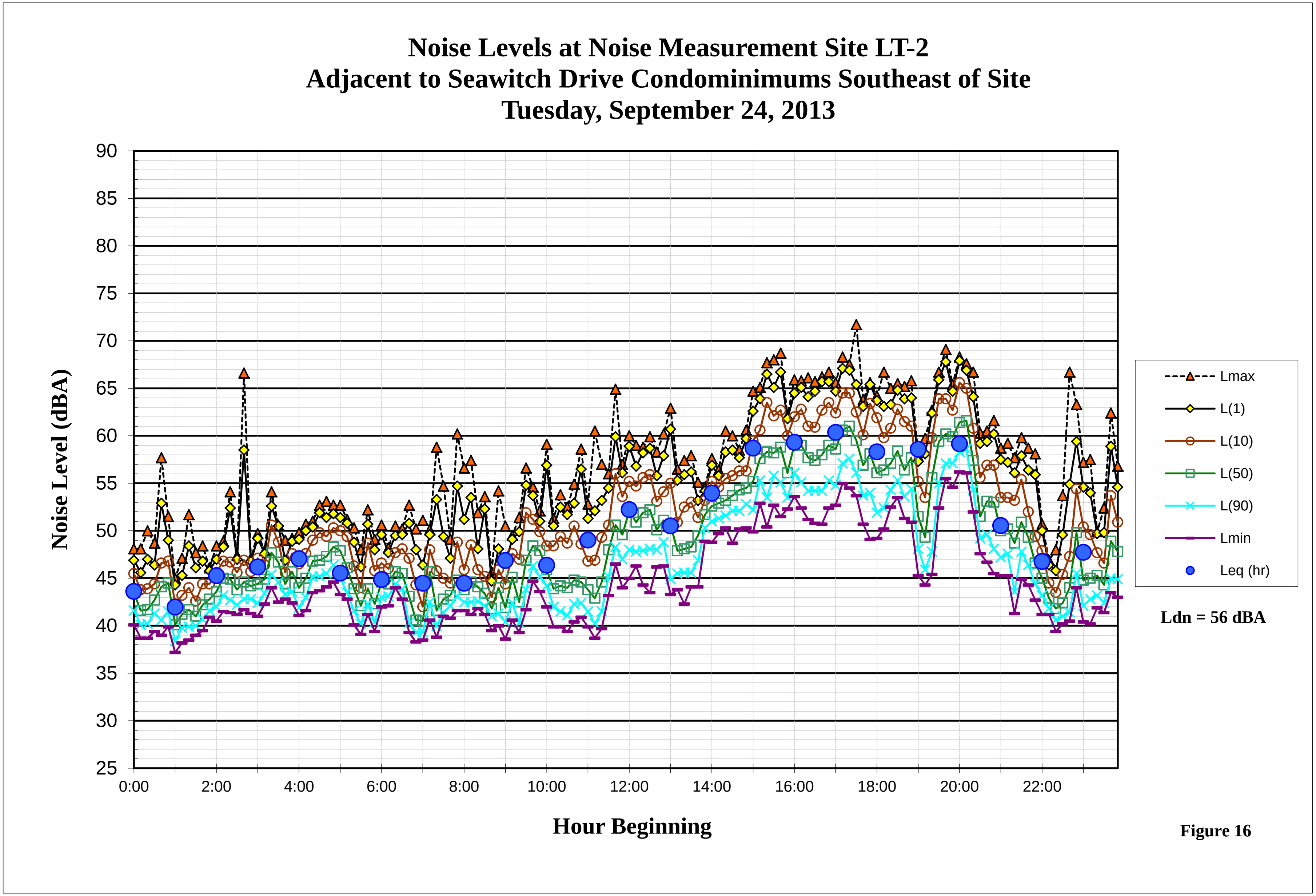

Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Tuesday, September 24, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 56 dBA

Figure 16

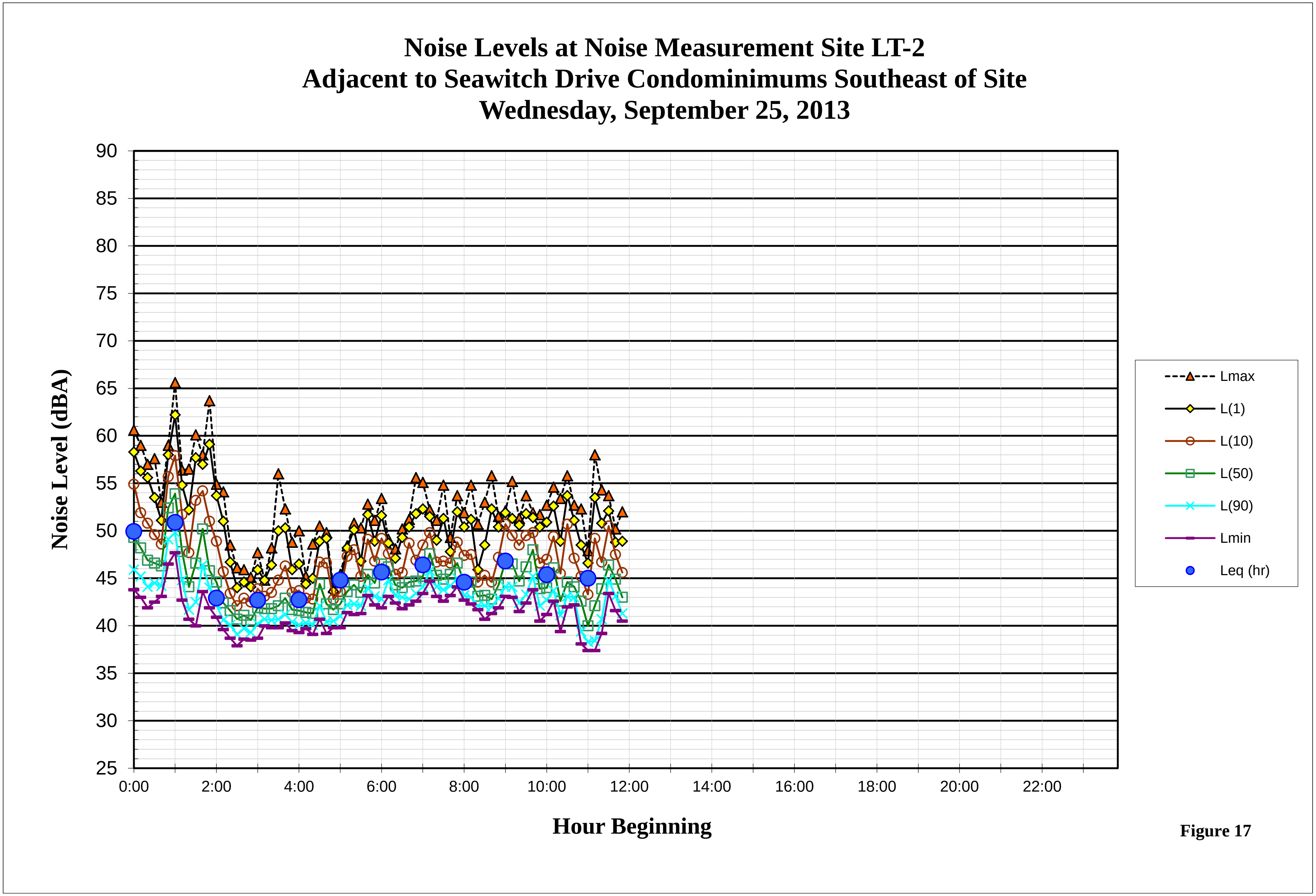

Noise Levels at Noise Measurement Site LT-2
Adjacent to Seawitch Drive Condominimums Southeast of Site
Wednesday, September 25, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 17

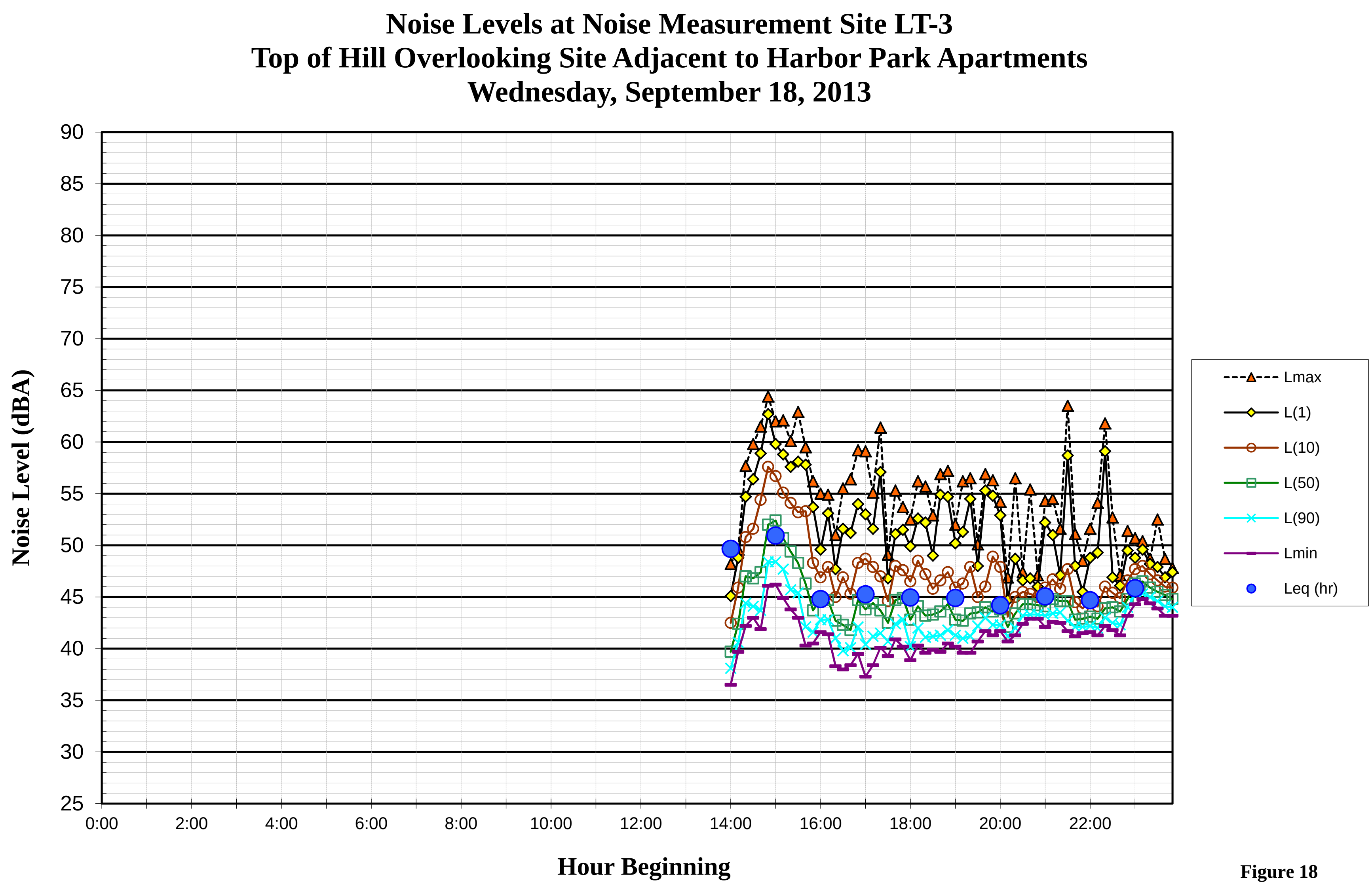

Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Wednesday, September 18, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 18

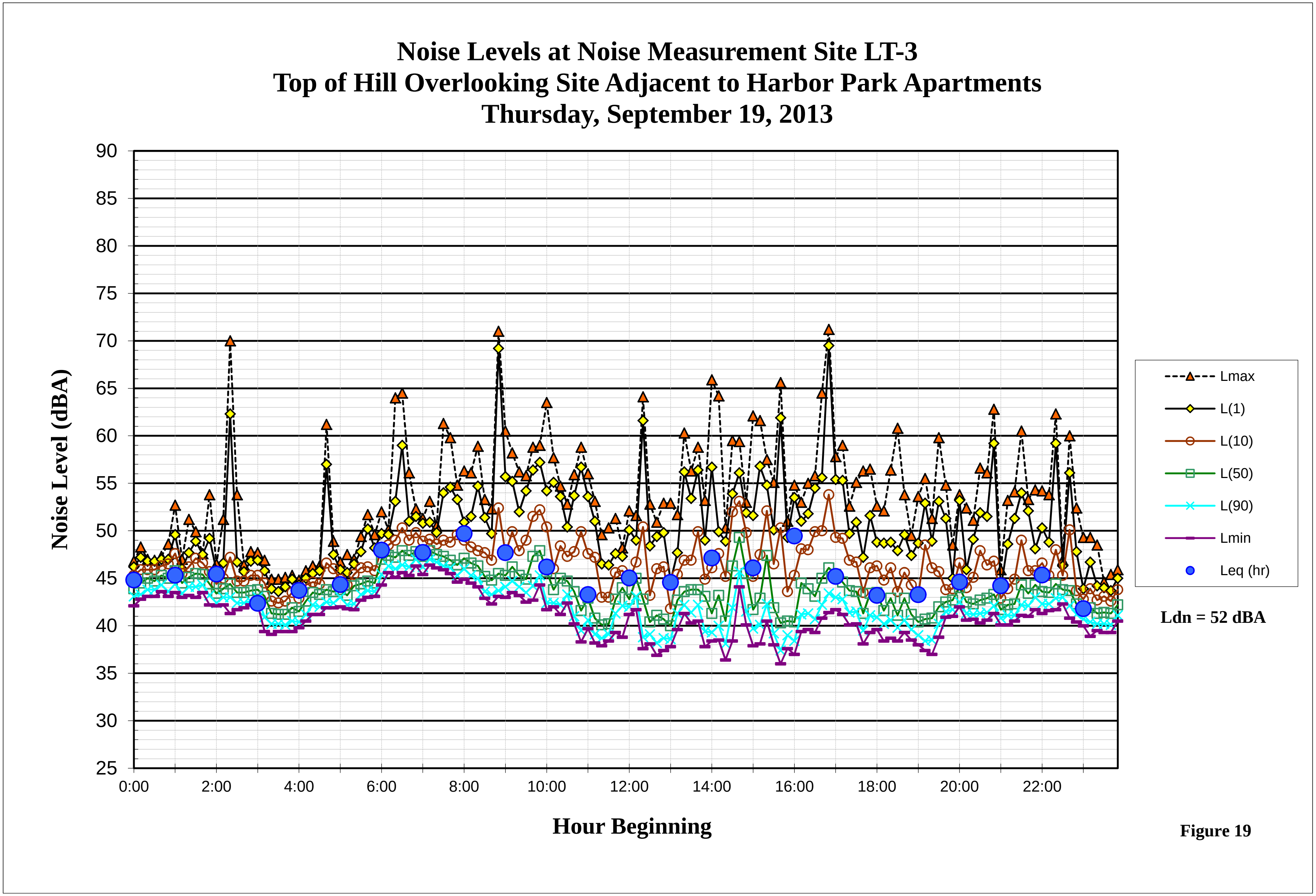

Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Thursday, September 19, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 52 dBA

Figure 19

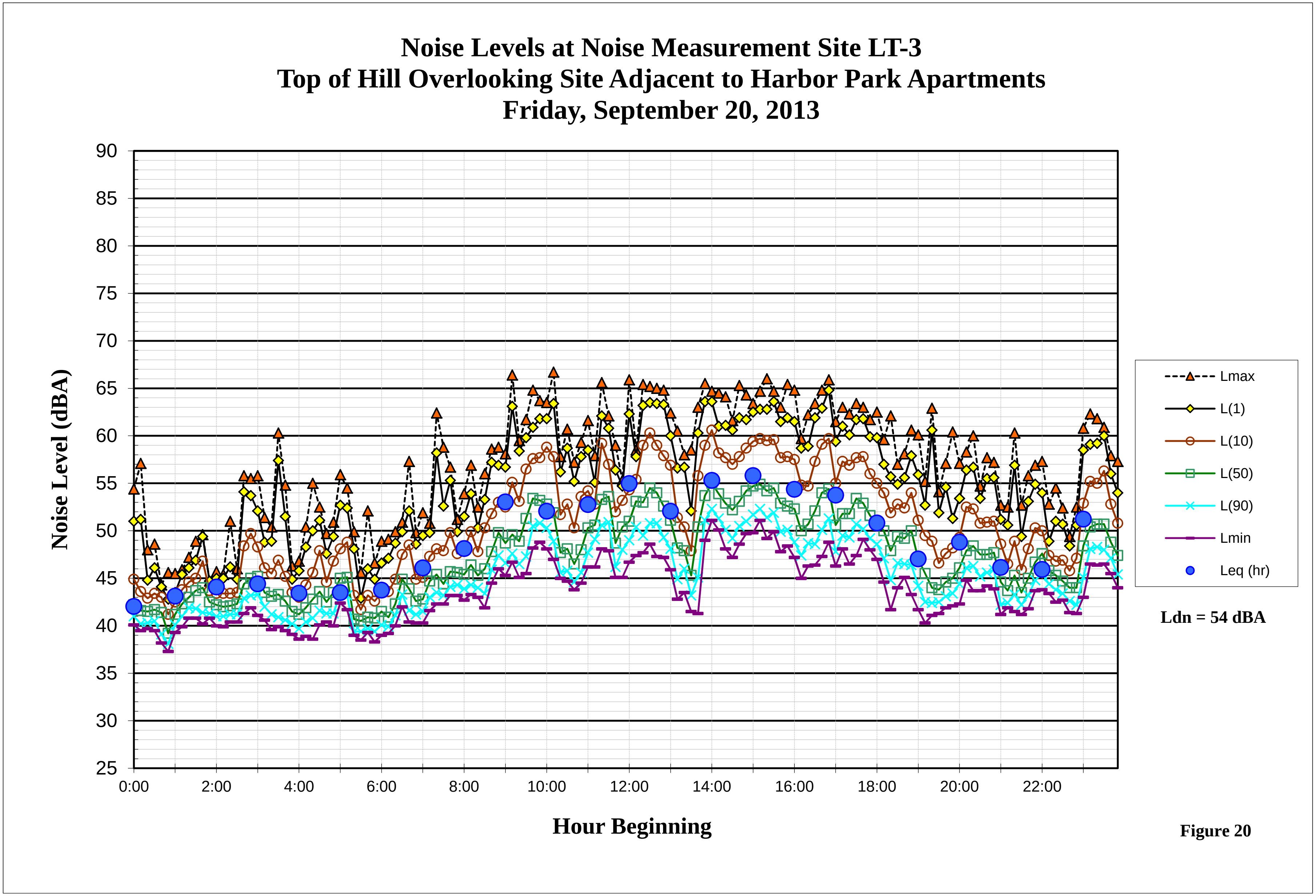
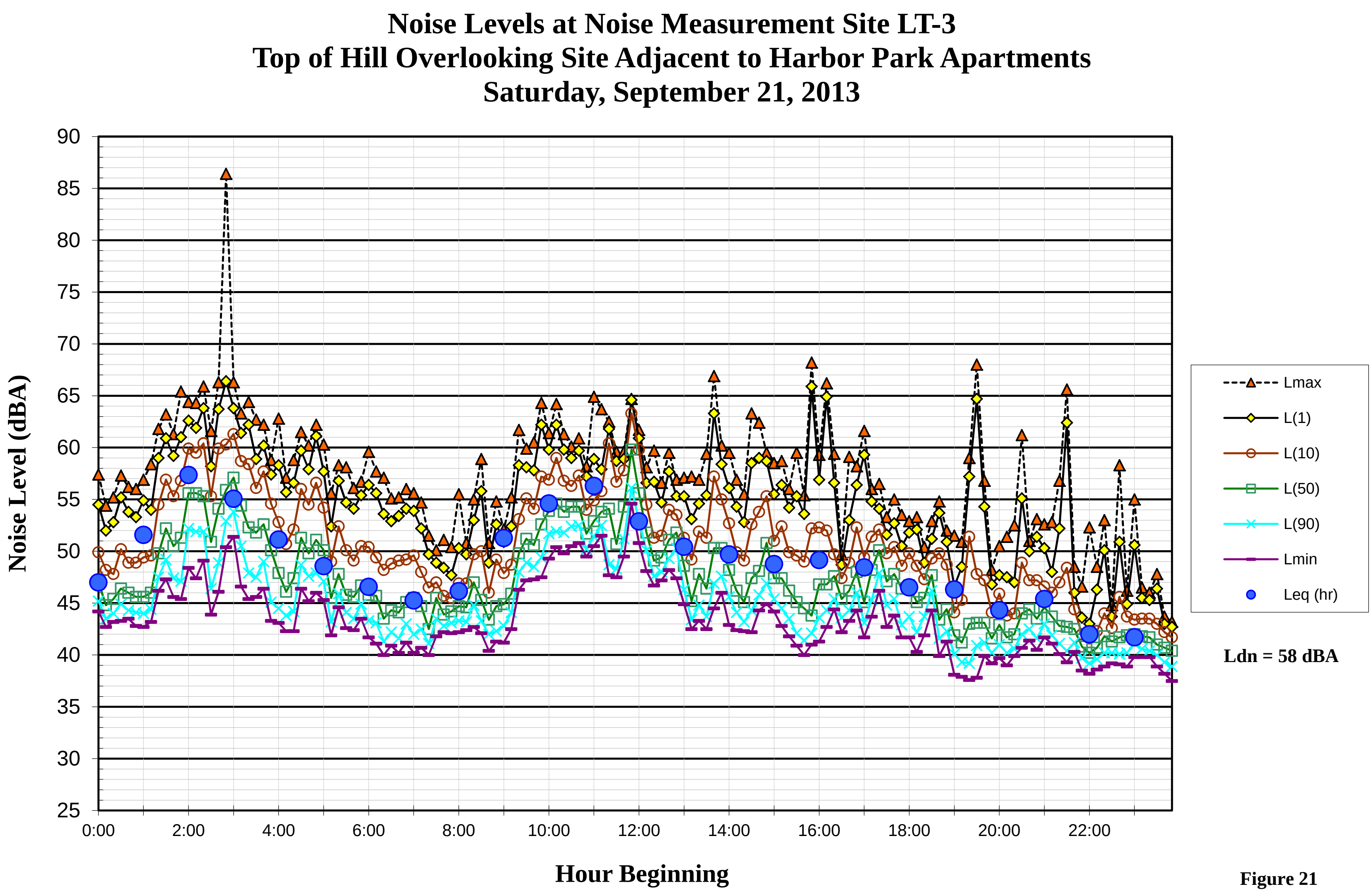
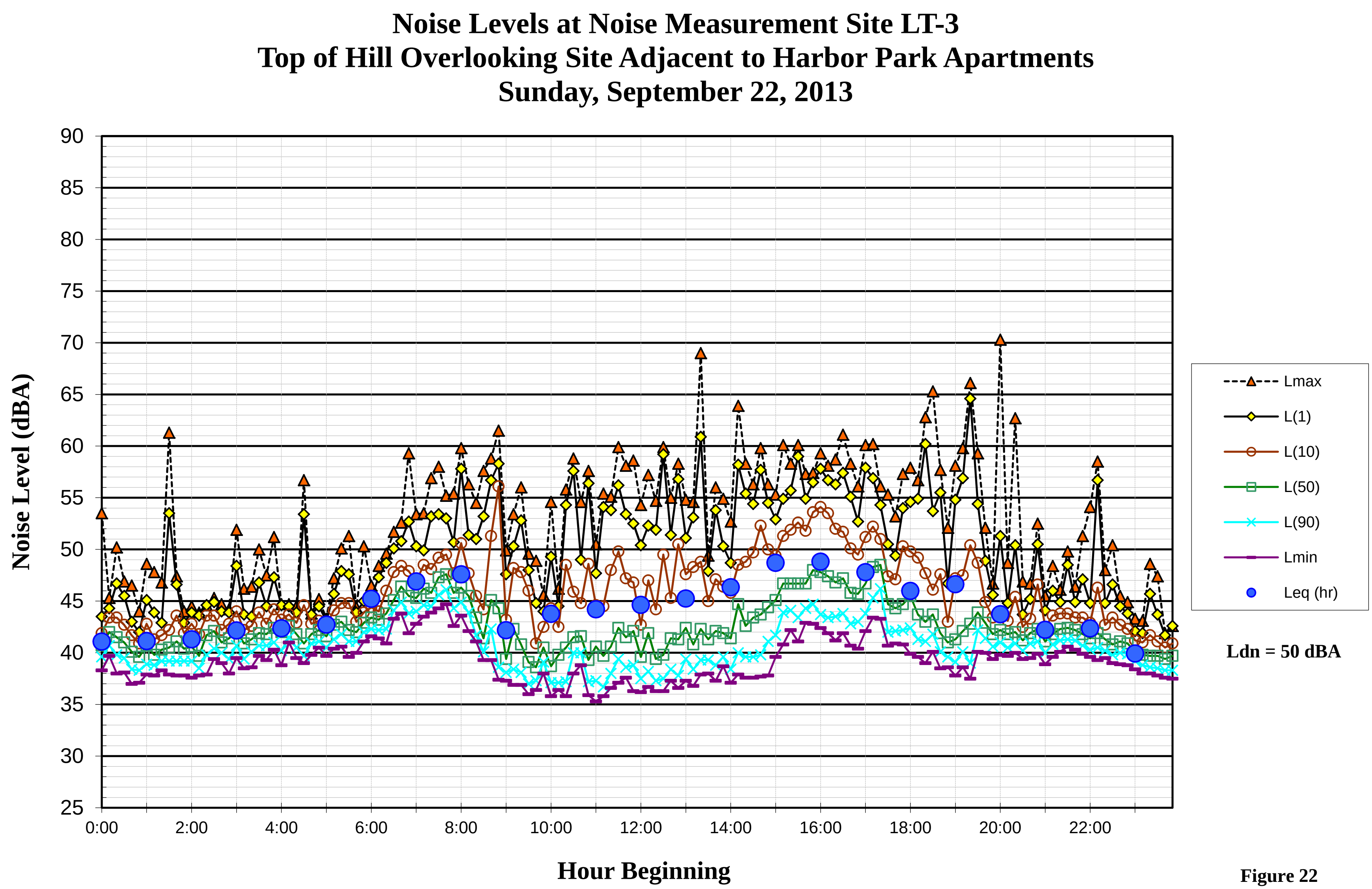

Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Friday, September 20, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 54 dBA

Figure 20



Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Saturday, September 21, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 58 dBA

Figure 21



Ldn = 50 dBA

Figure 22

Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Monday, September 23, 2013

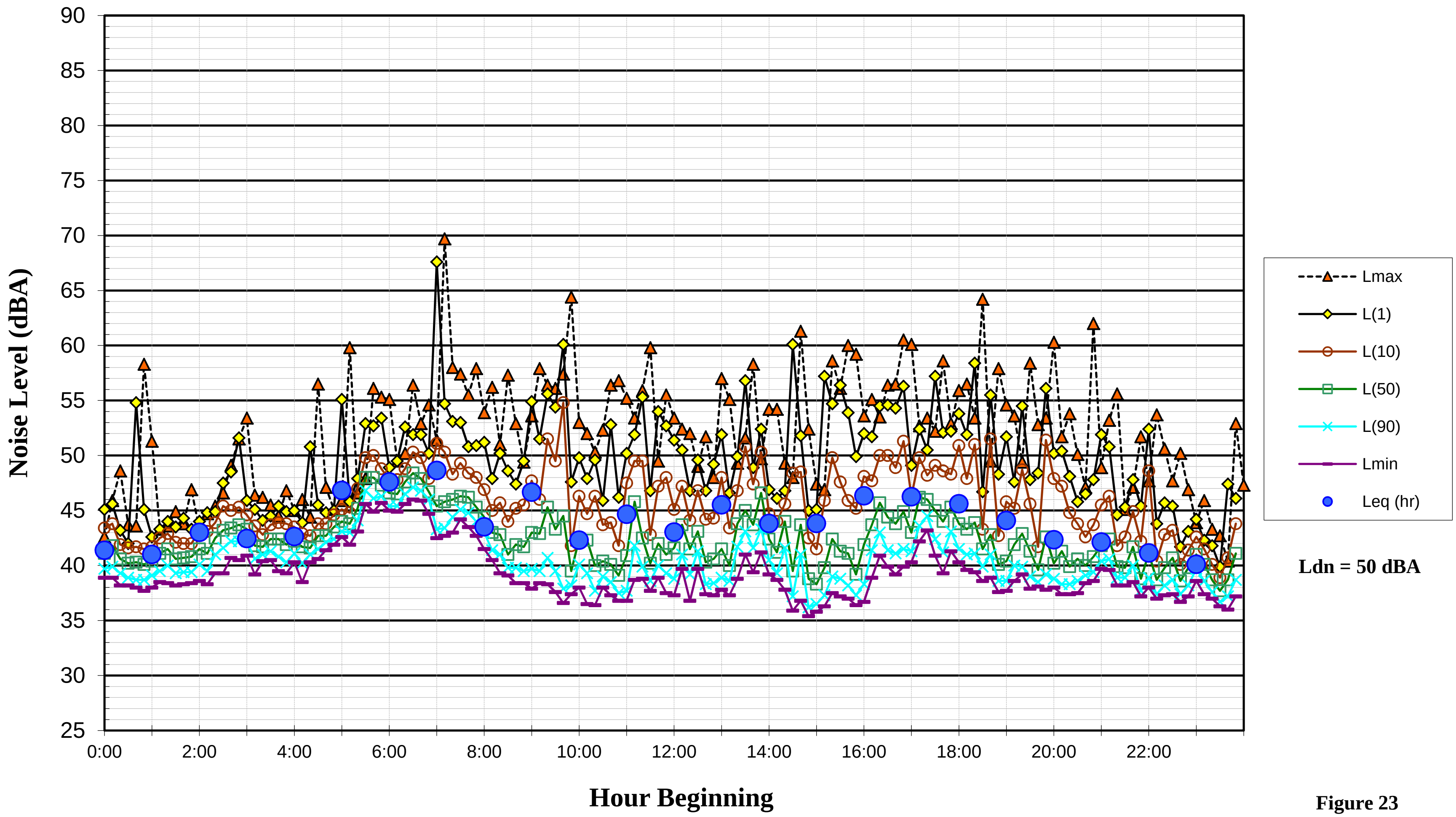
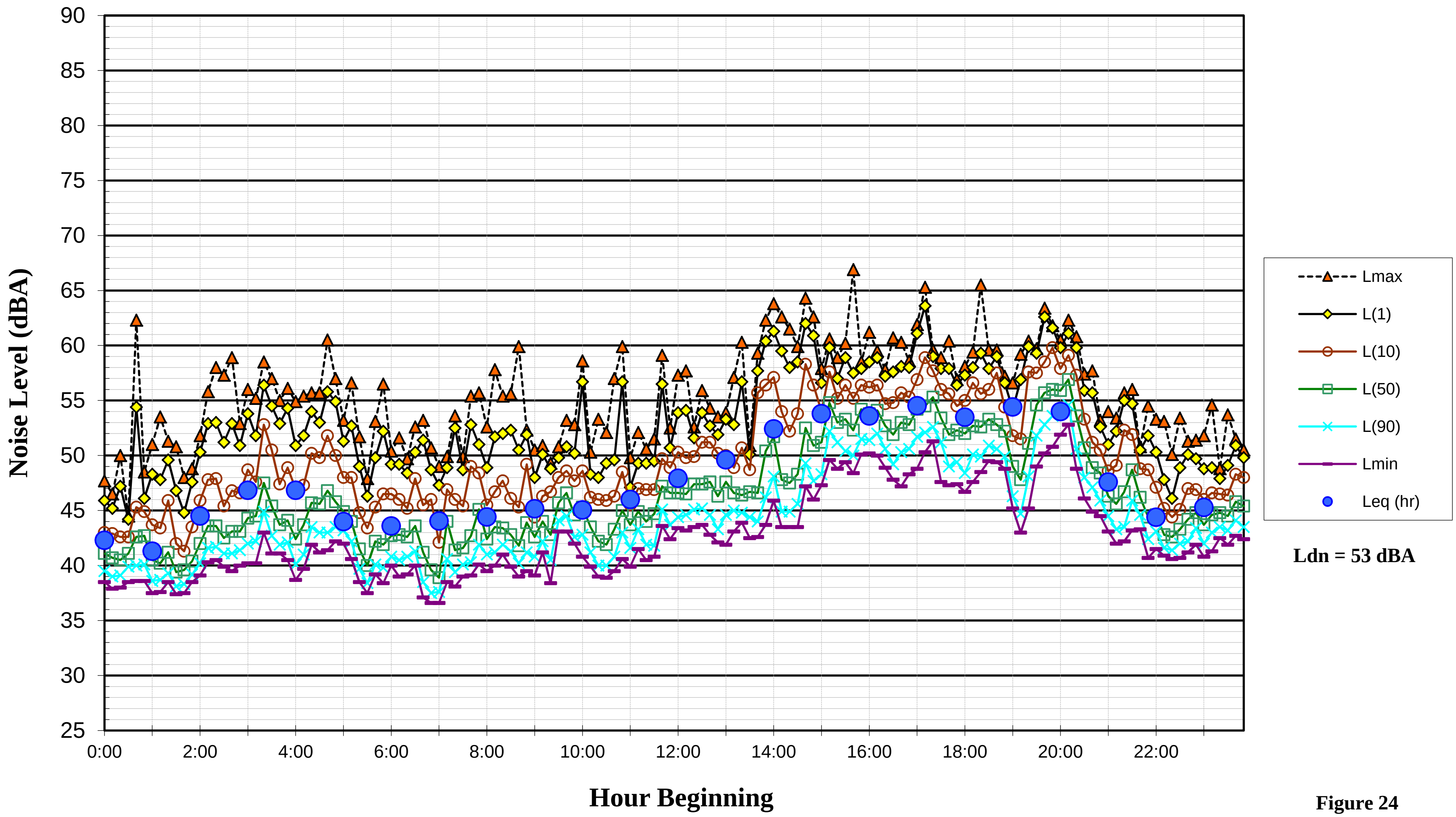


Figure 23

Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Tuesday, September 24, 2013



Ldn = 53 dBA

Figure 24

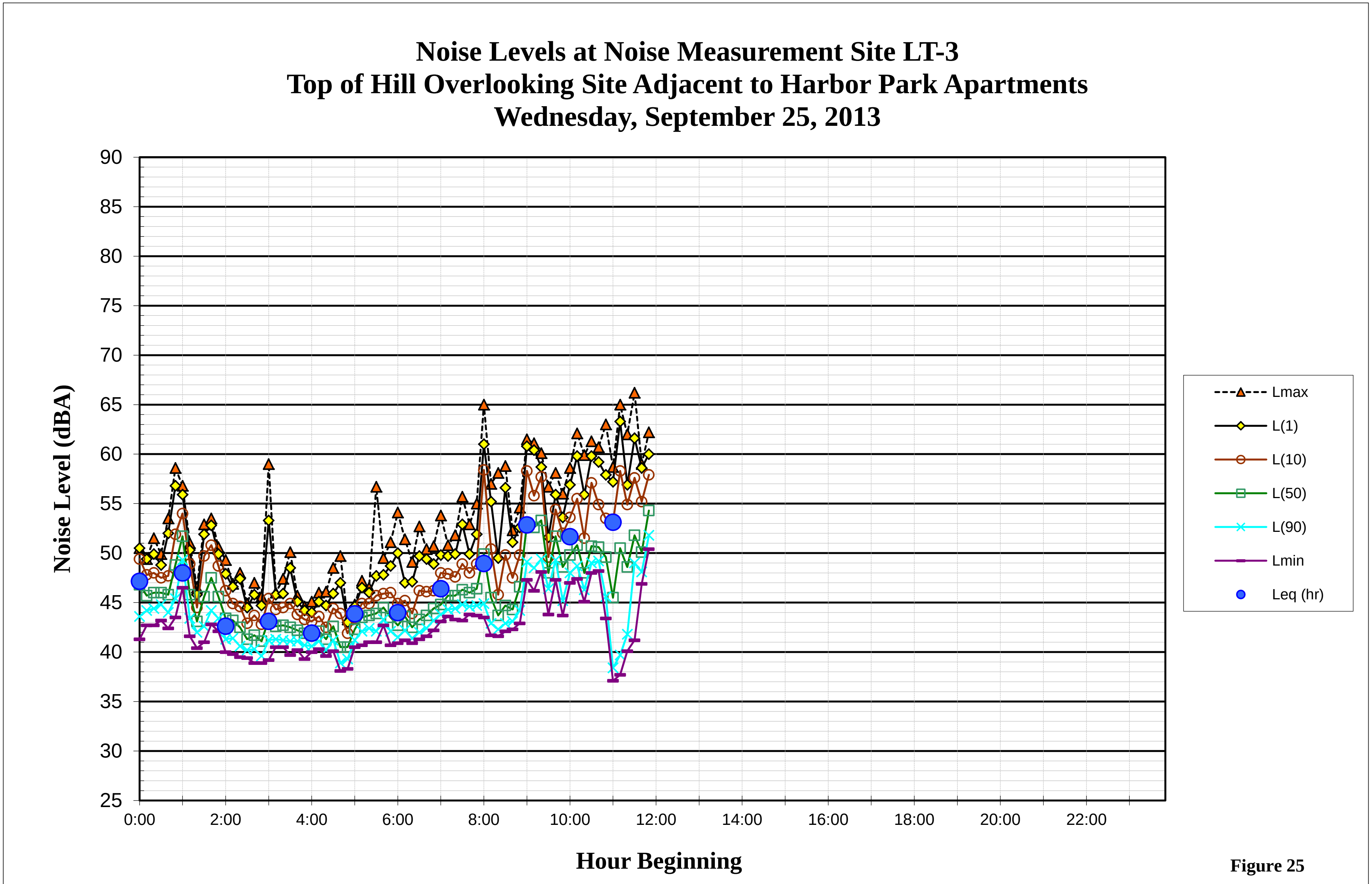

Noise Levels at Noise Measurement Site LT-3
Top of Hill Overlooking Site Adjacent to Harbor Park Apartments
Wednesday, September 25, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 25

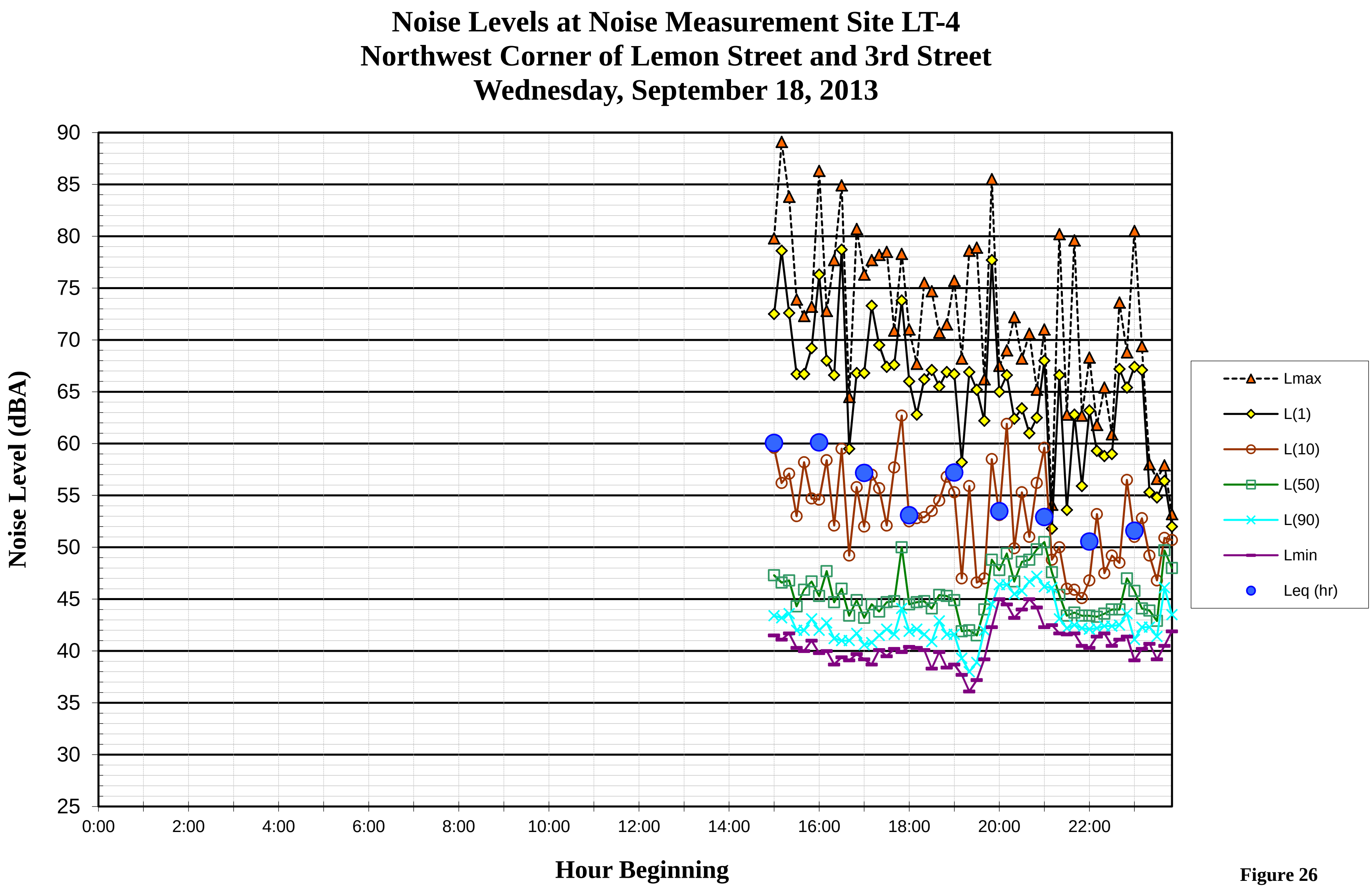
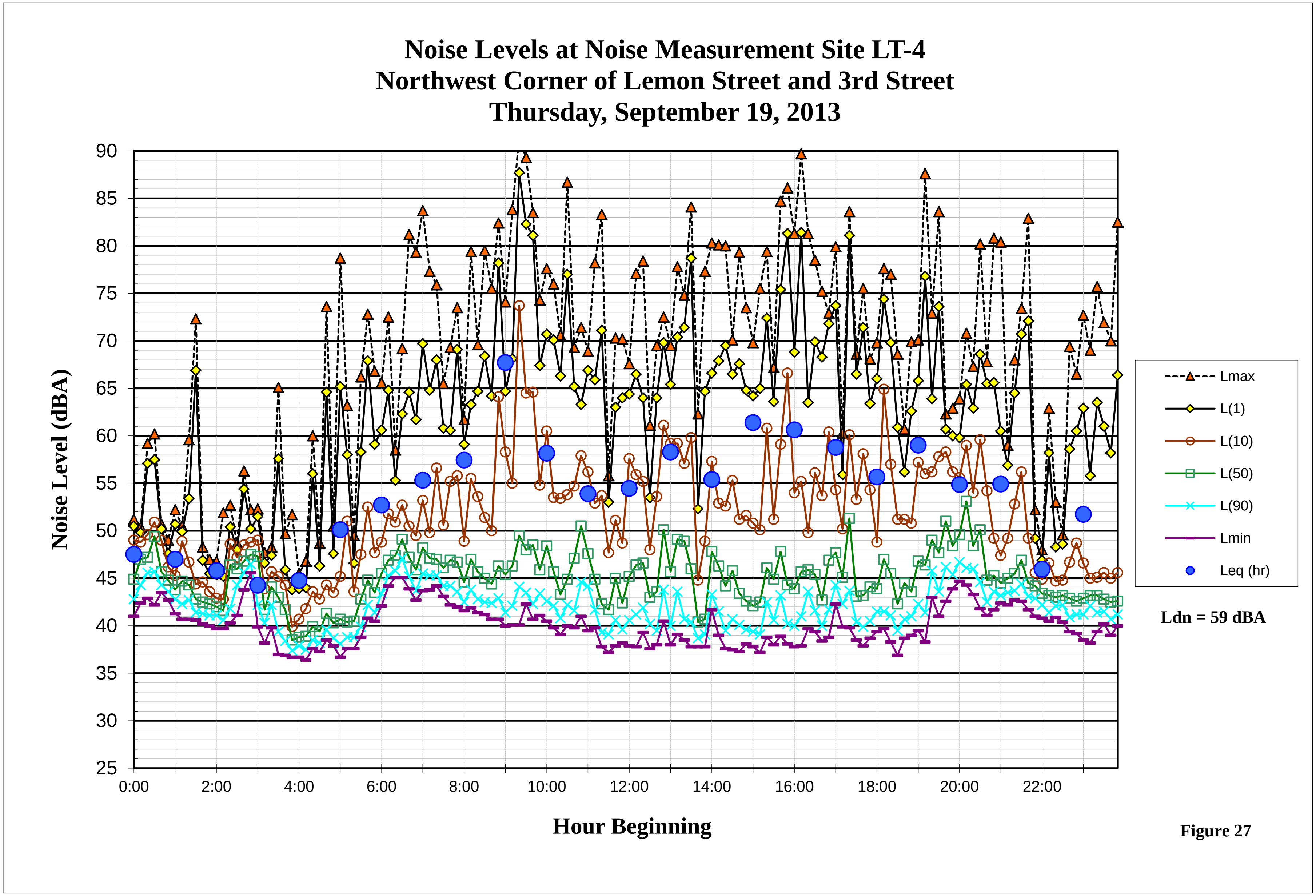

Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Wednesday, September 18, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 26



Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Thursday, September 19, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 59 dBA

Figure 27

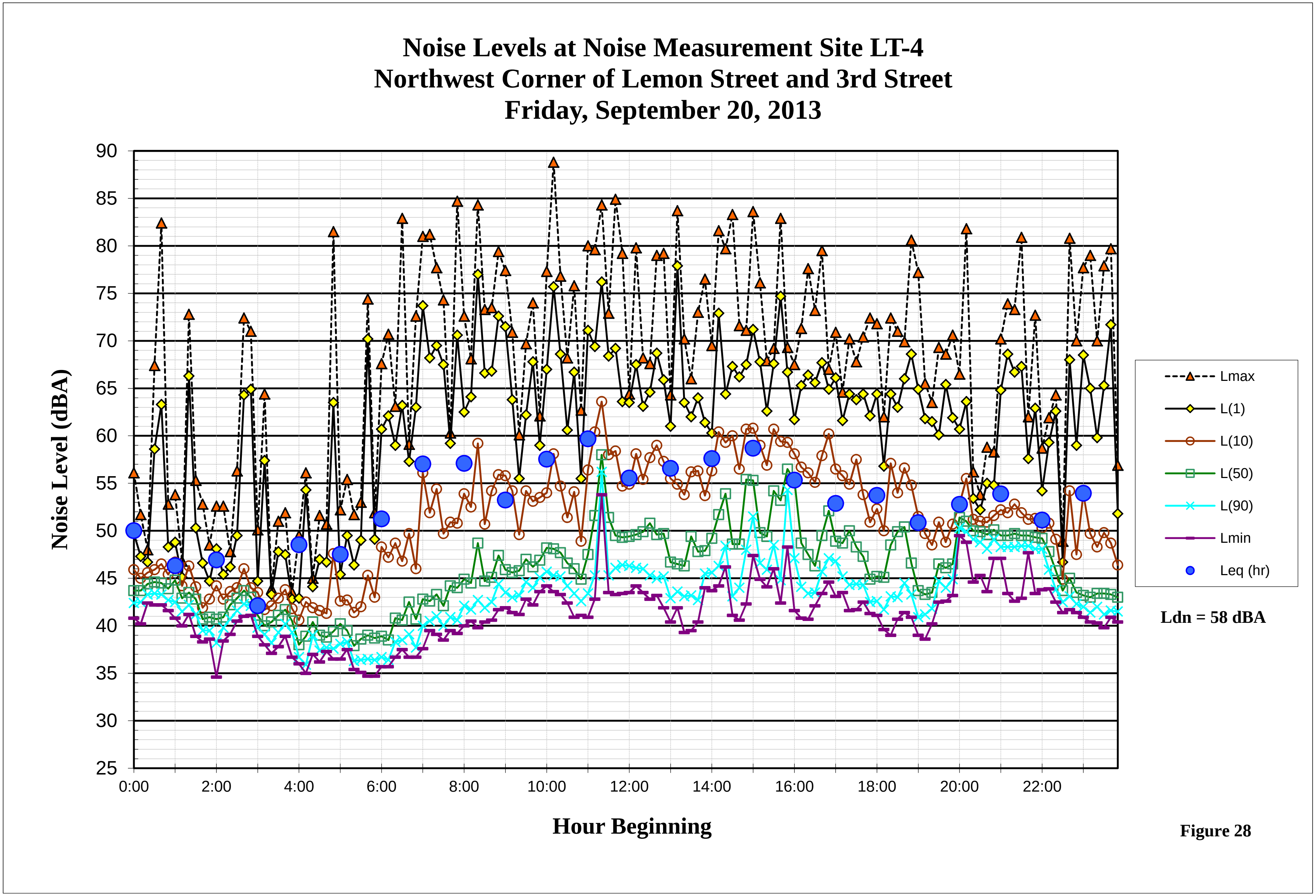

Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Friday, September 20, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 58 dBA

Figure 28

Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Saturday, September 21, 2013

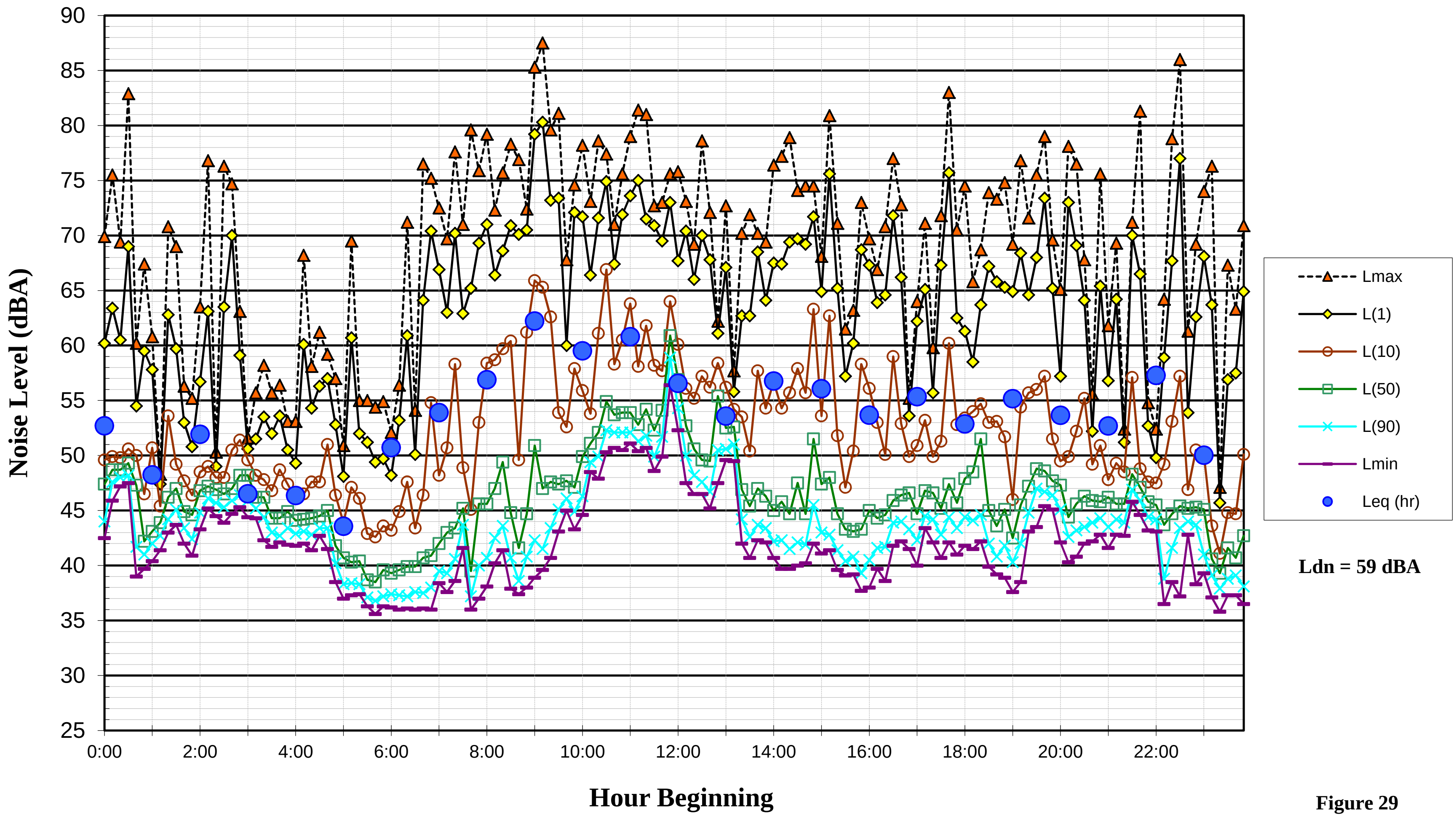
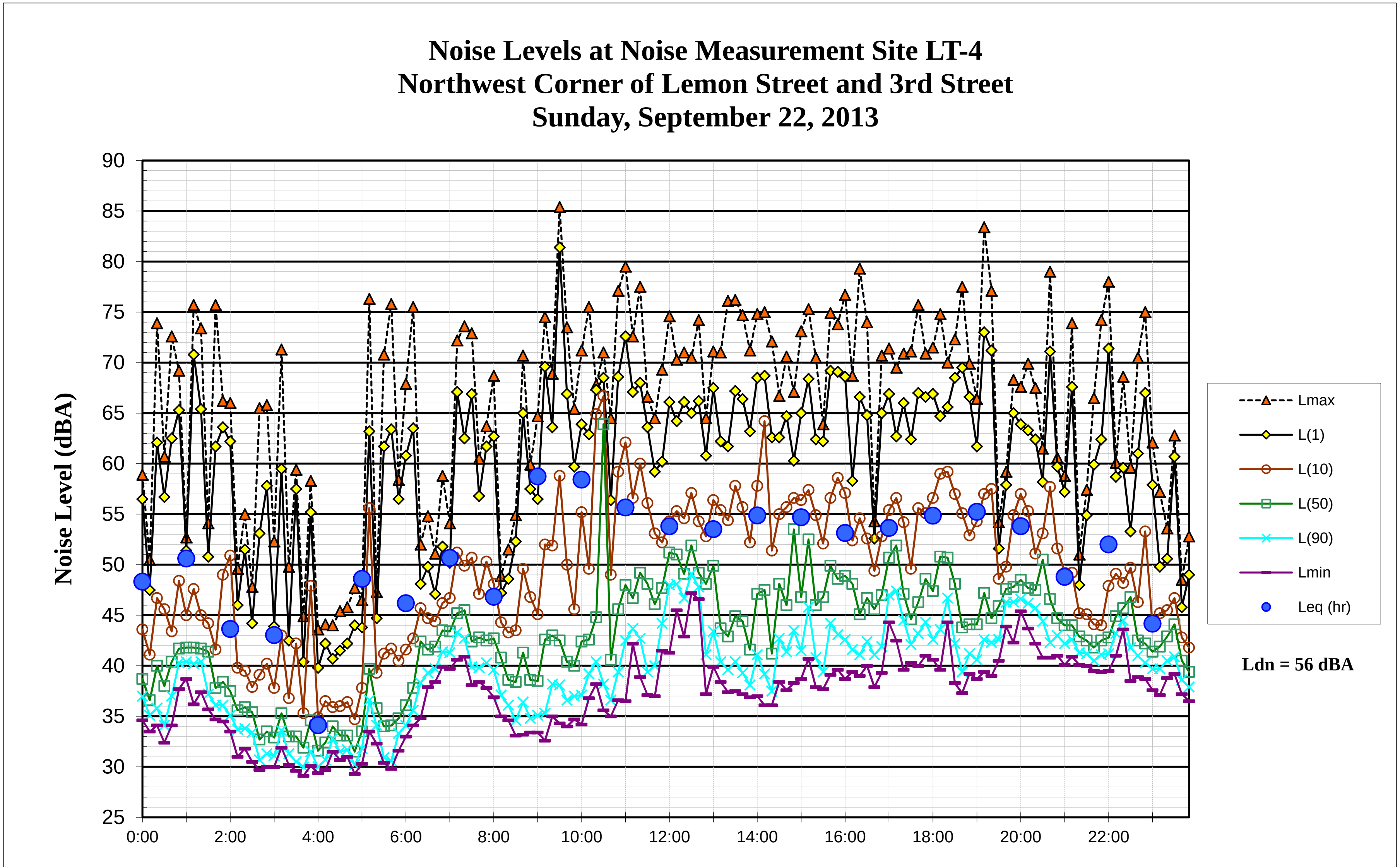
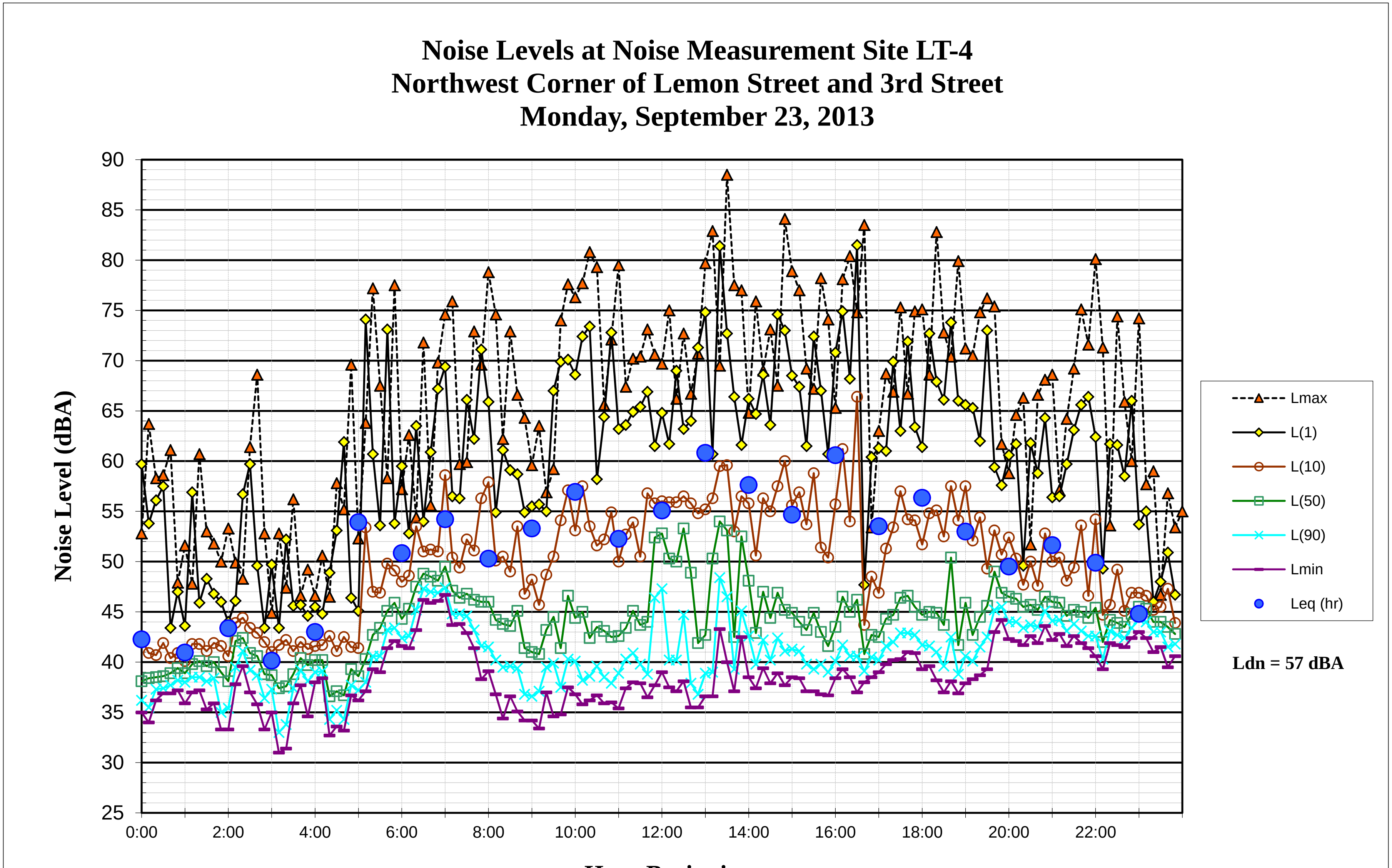


Figure 29



Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Sunday, September 22, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 56 dBA

Figure 30


Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Monday, September 23, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 57 dBA
Figure 31

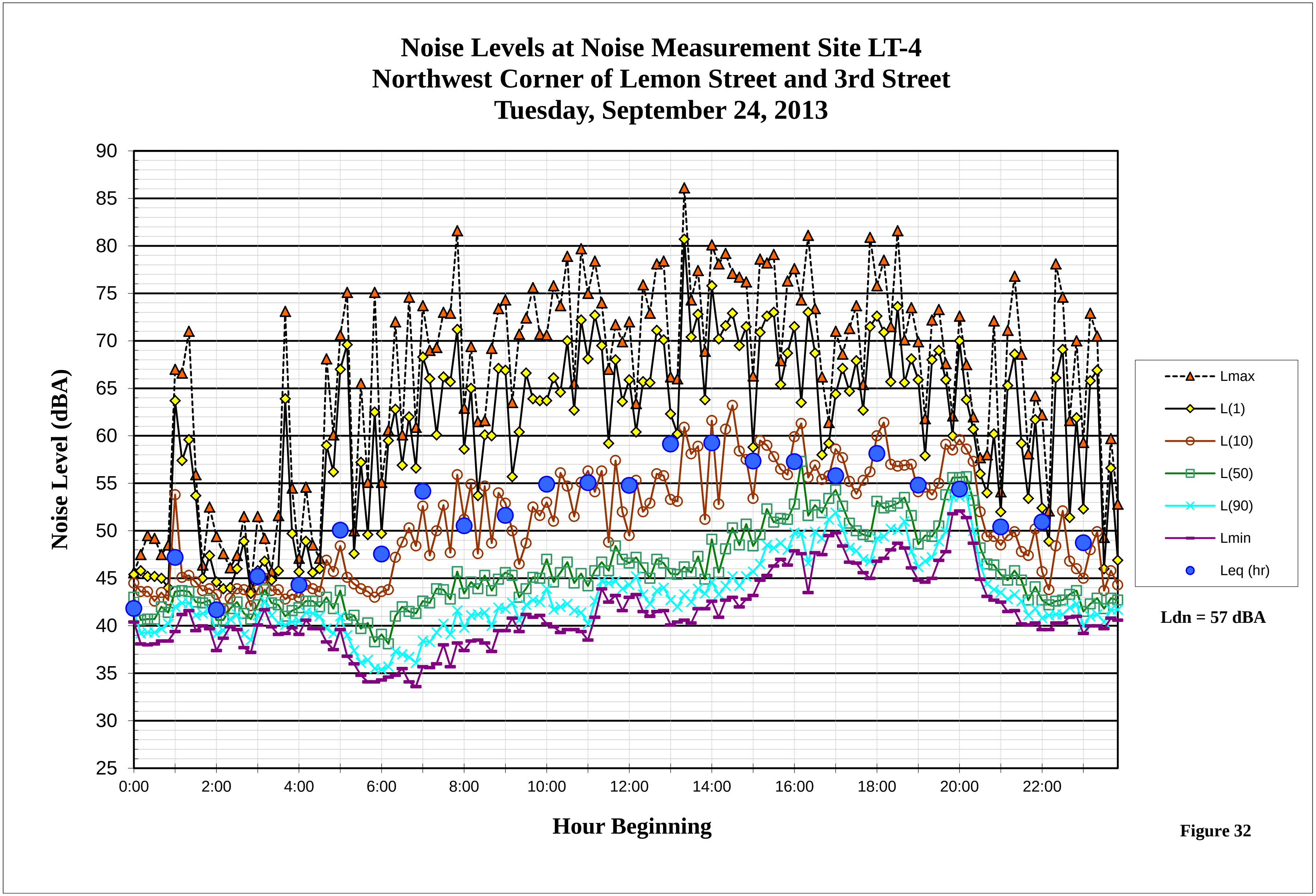

Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Tuesday, September 24, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 57 dBA

Figure 32

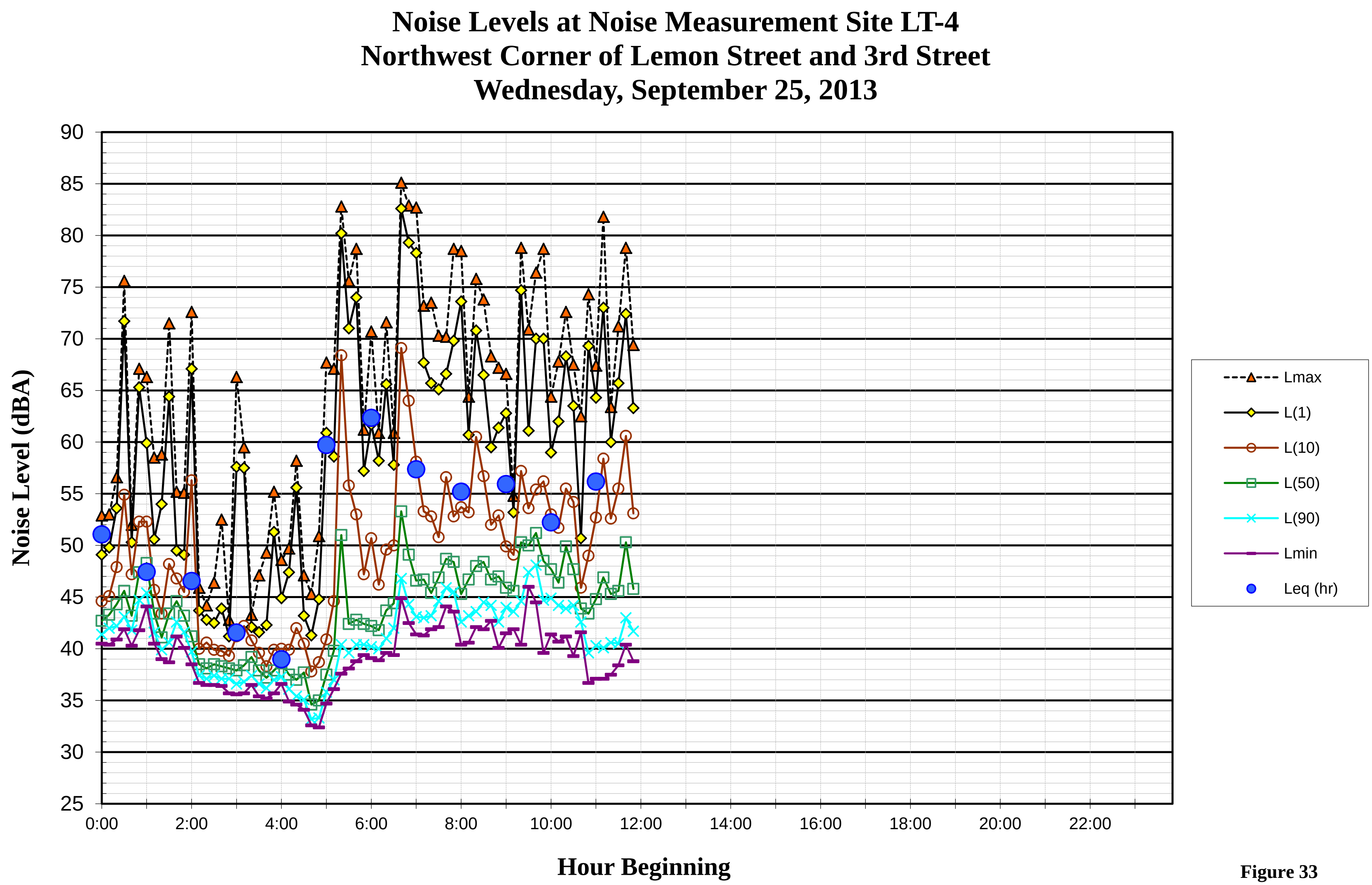
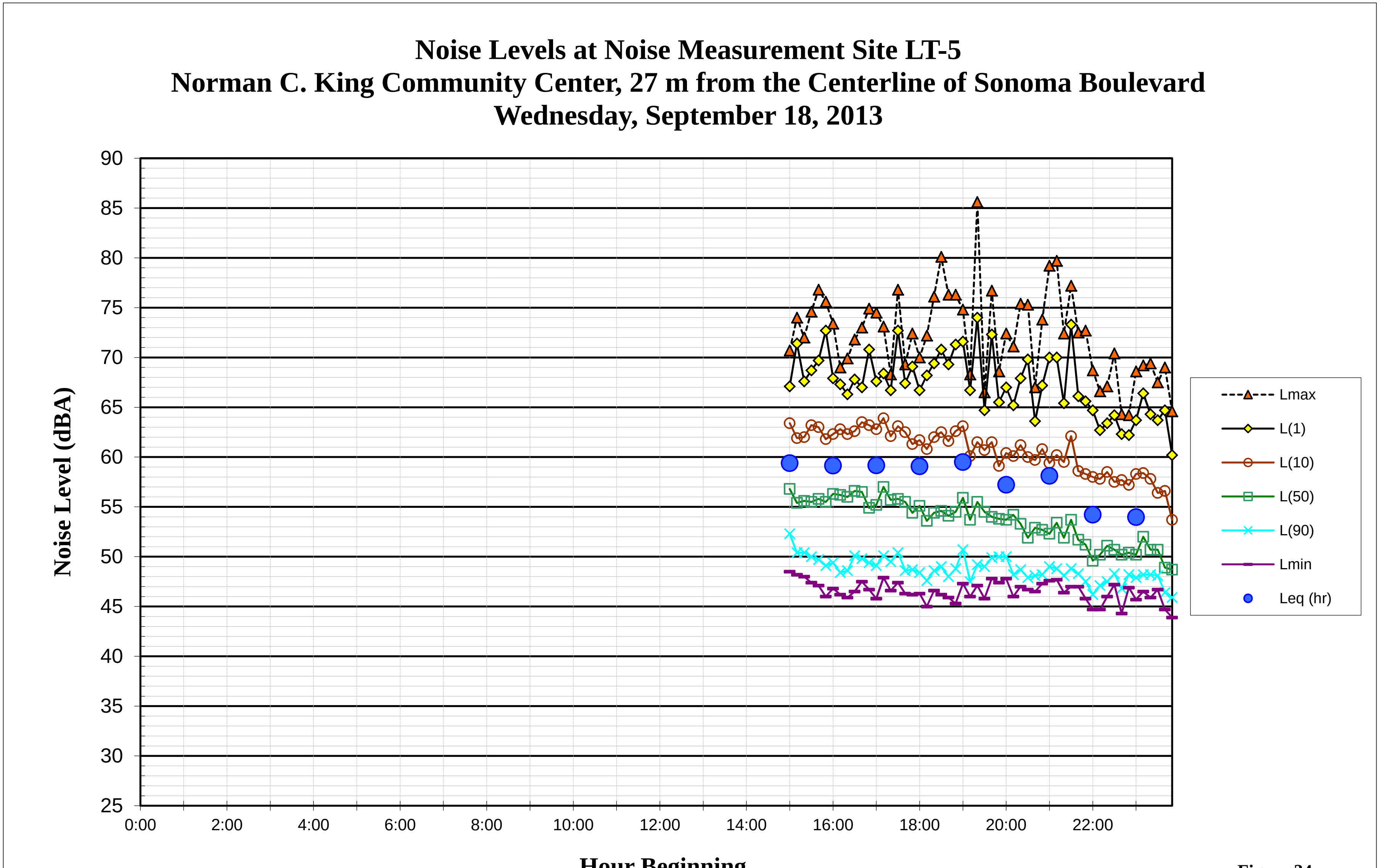

Noise Levels at Noise Measurement Site LT-4
Northwest Corner of Lemon Street and 3rd Street
Wednesday, September 25, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

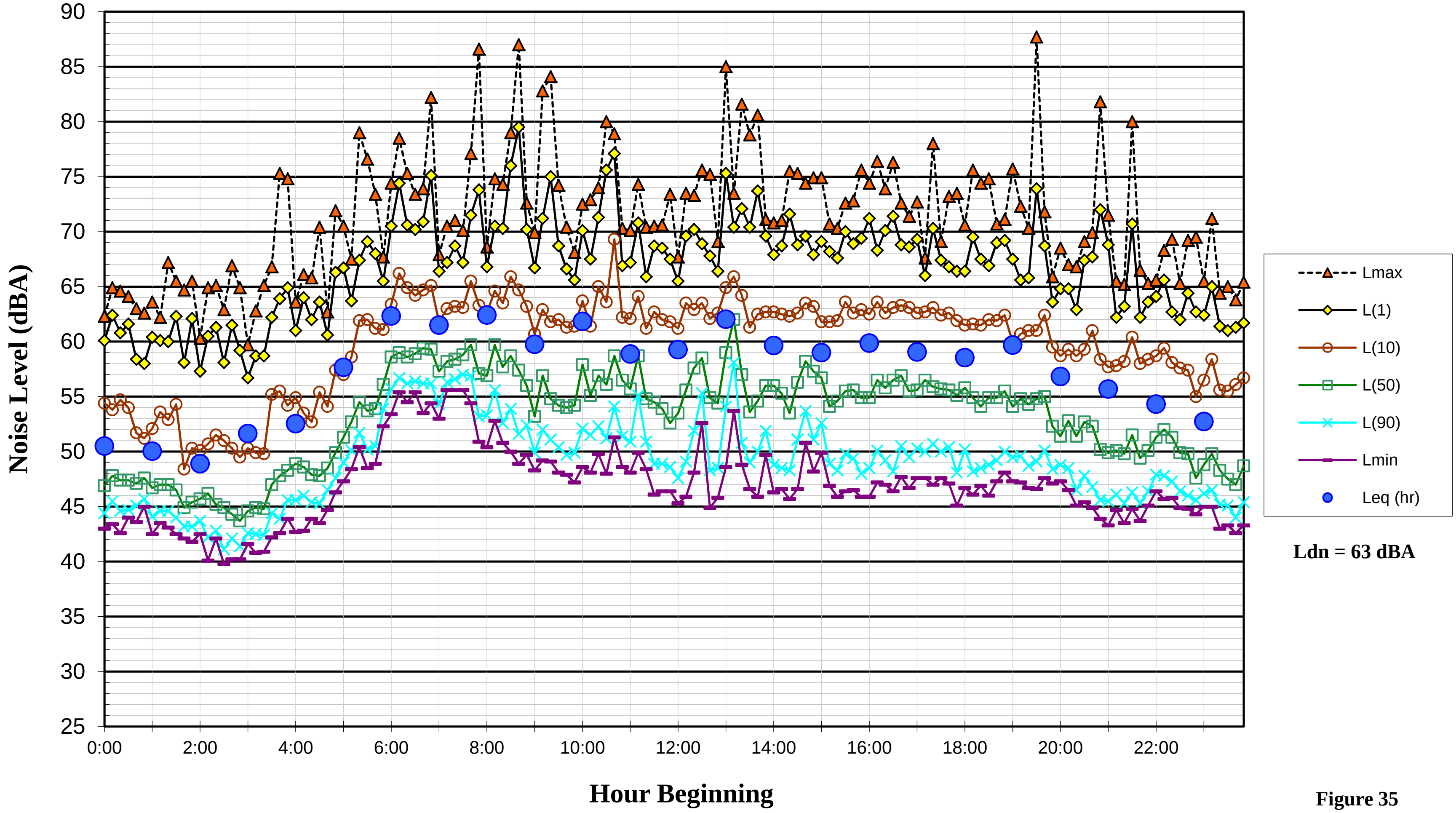
Figure 33



Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Wednesday, September 18, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 34

Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Thursday, September 19, 2013



Ldn = 63 dBA

Figure 35

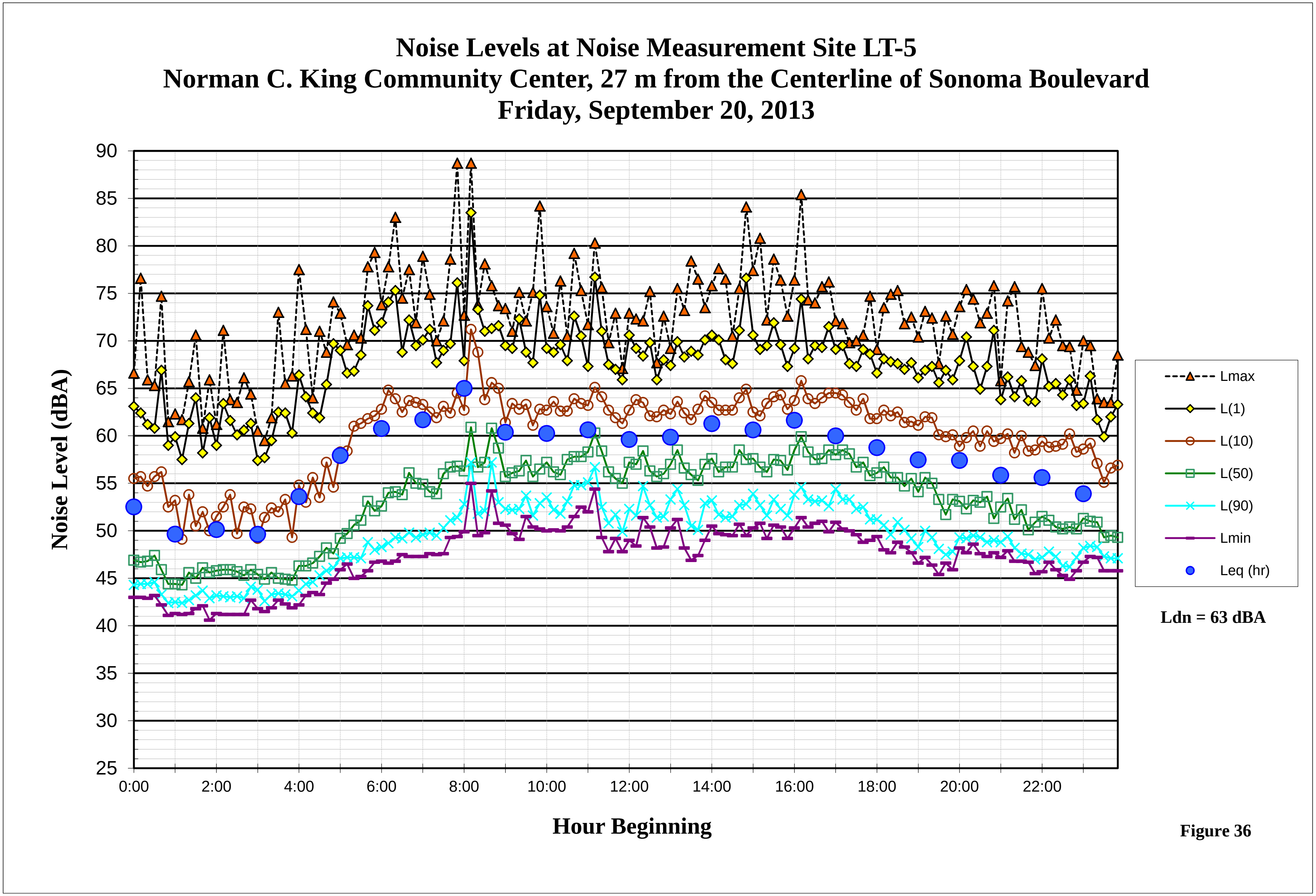
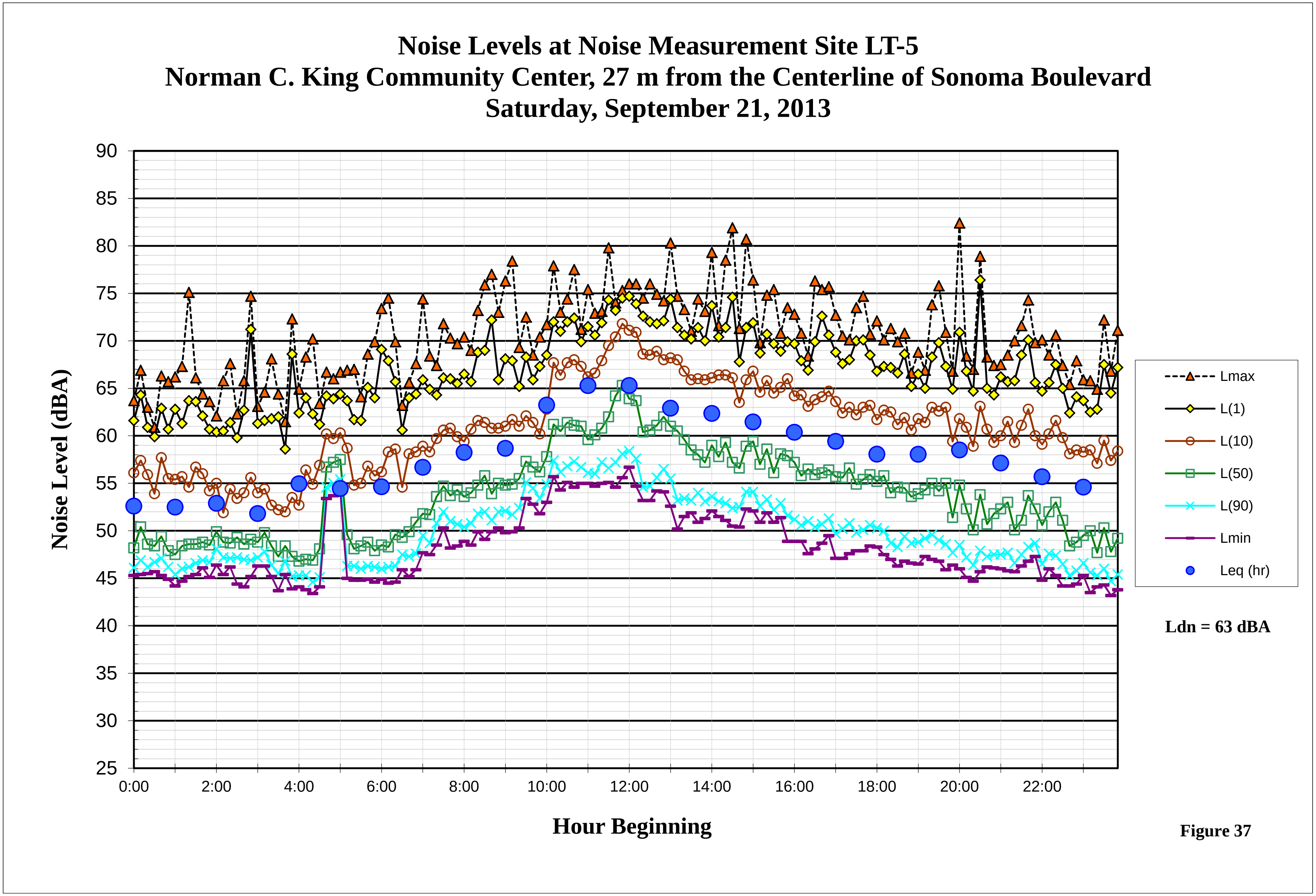
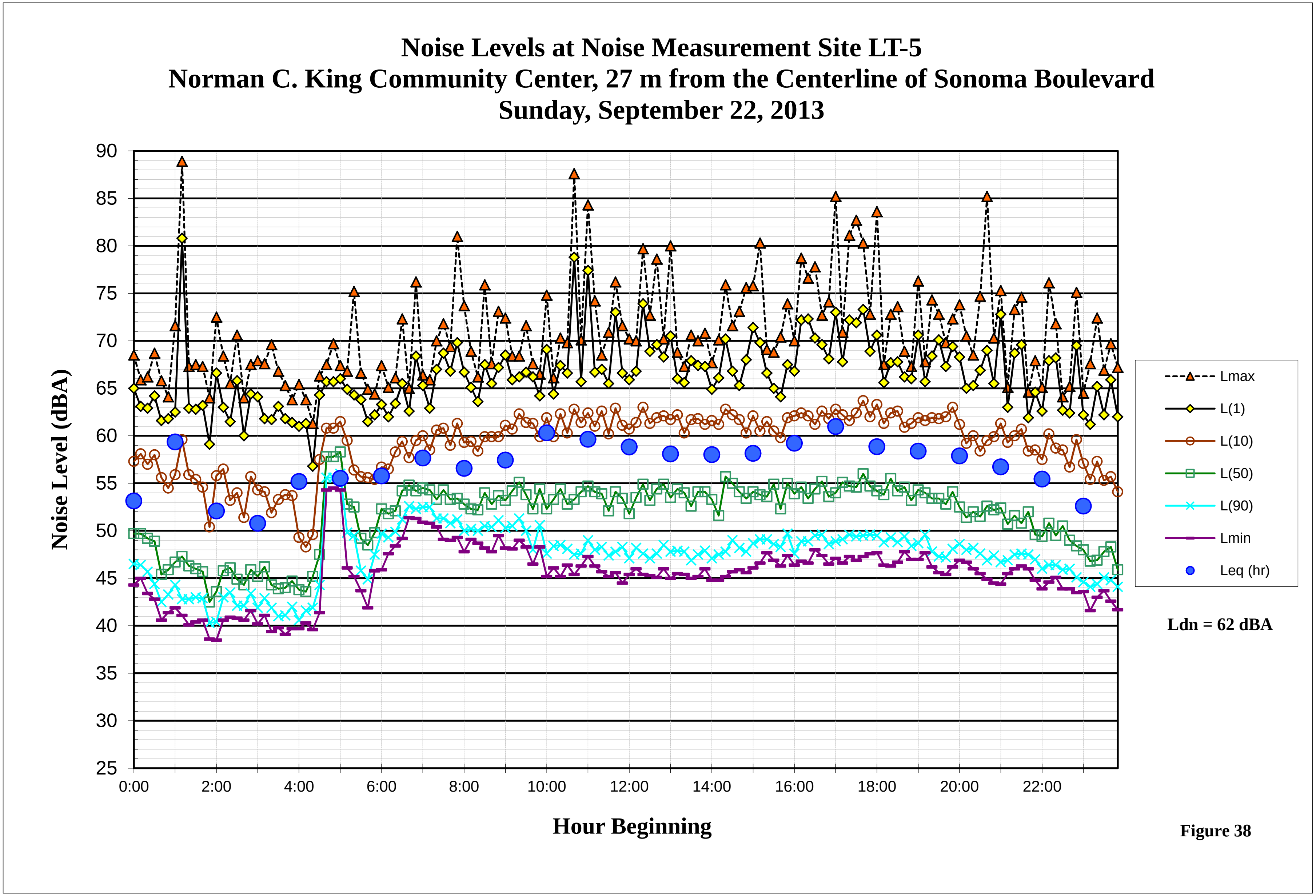

Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Friday, September 20, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 63 dBA

Figure 36



Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Saturday, September 21, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 63 dBA

Figure 37



Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Sunday, September 22, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 62 dBA

Figure 38

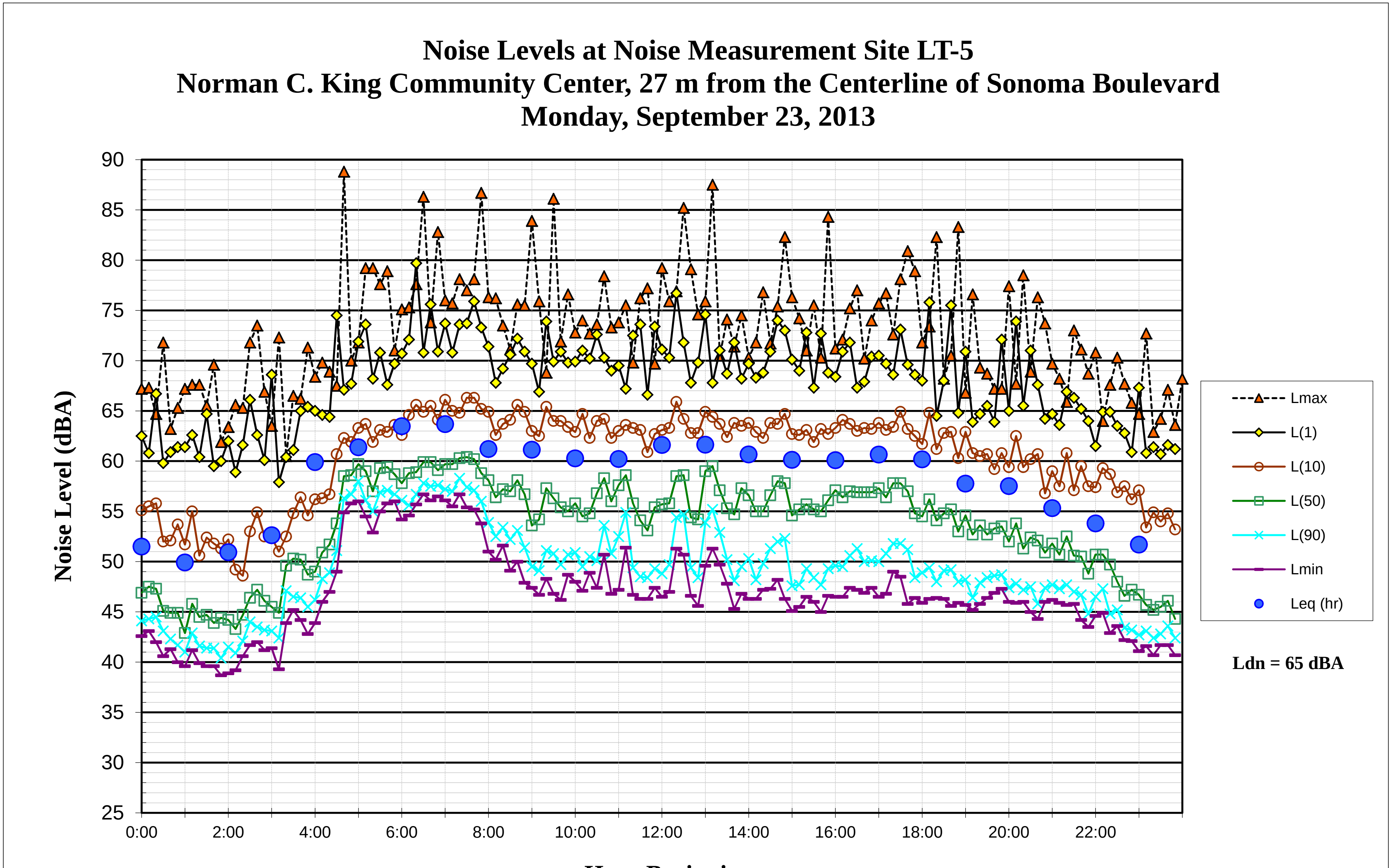
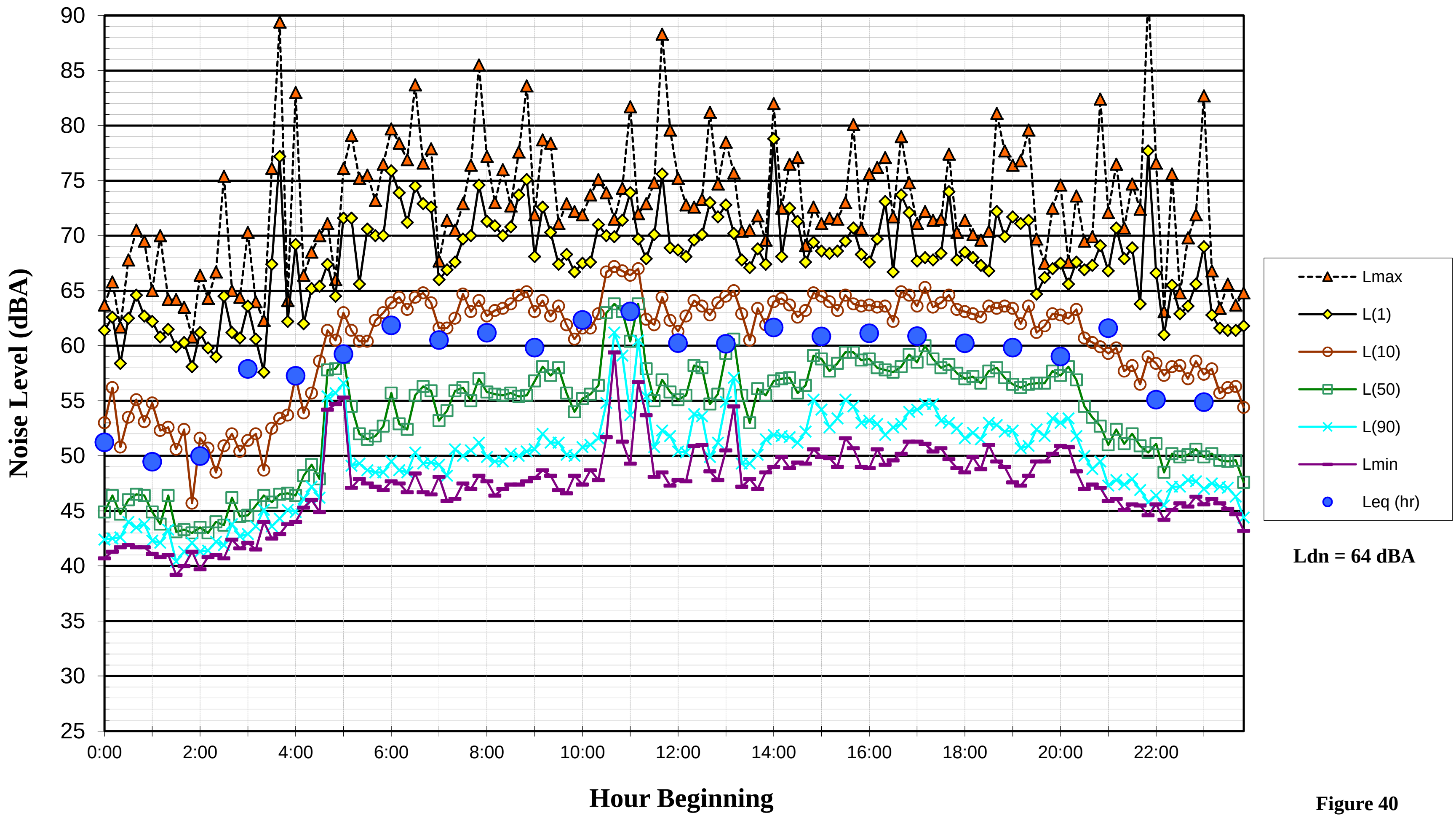

Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Monday, September 23, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)
Ldn = 65 dBA

Figure 39

Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Tuesday, September 24, 2013



Ldn = 64 dBA

Figure 40

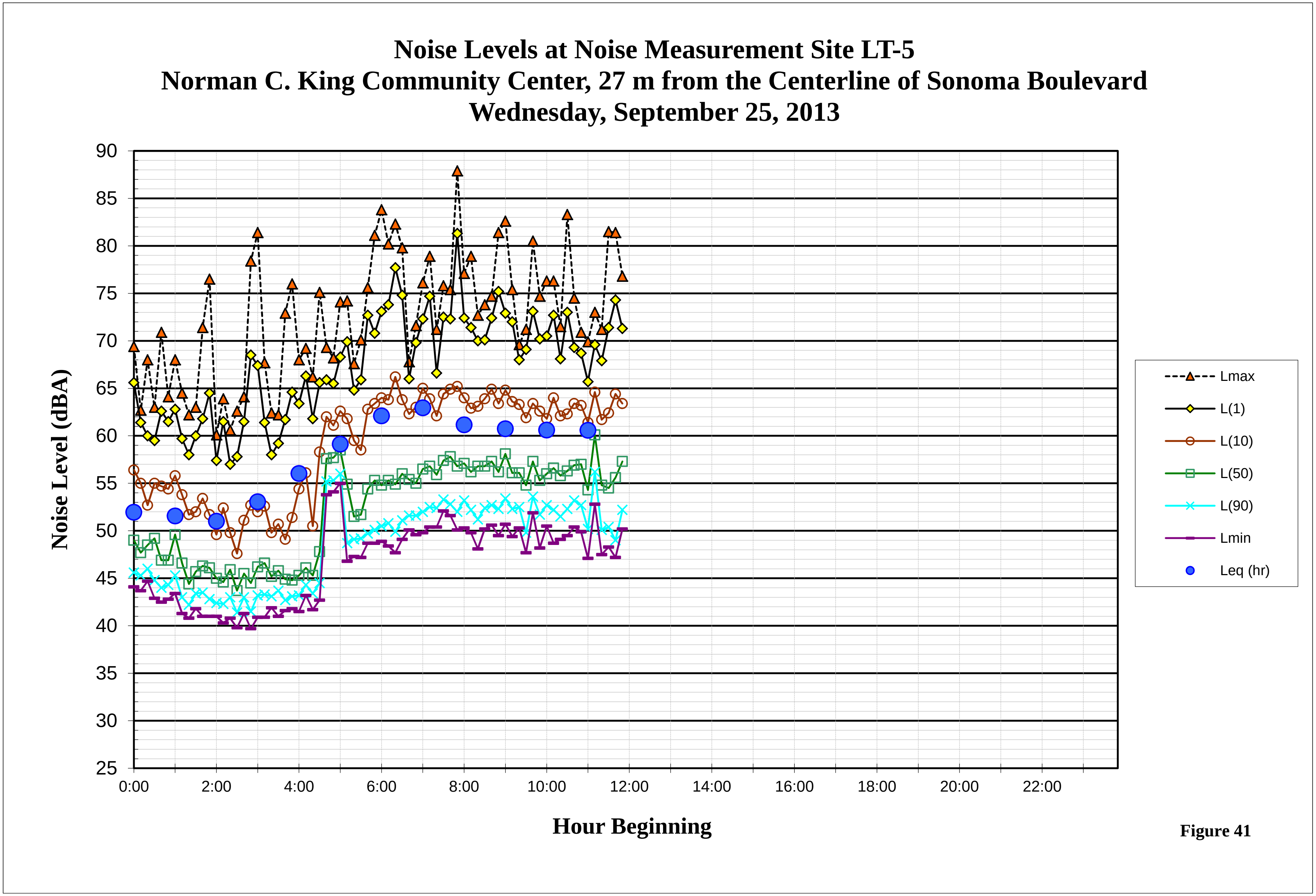

Noise Levels at Noise Measurement Site LT-5
Norman C. King Community Center, 27 m from the Centerline of Sonoma Boulevard
Wednesday, September 25, 2013
Noise Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
25
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Hour Beginning
Lmax
L(1)
L(10)
L(50)
L(90)
Lmin
Leq (hr)

Figure 41

APPENDIX C

Metrological Data During Noise Survey

Weather History for Napa County, CA

Wednesday, September 18, 2013

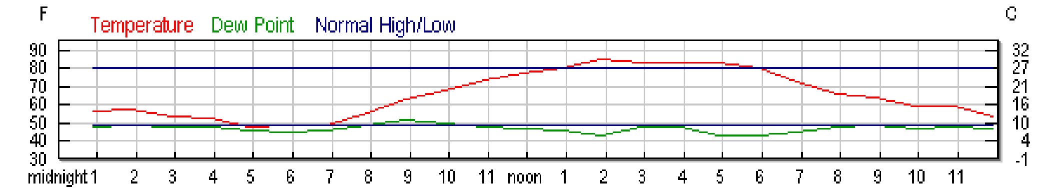
Wednesday, September 18, 2013

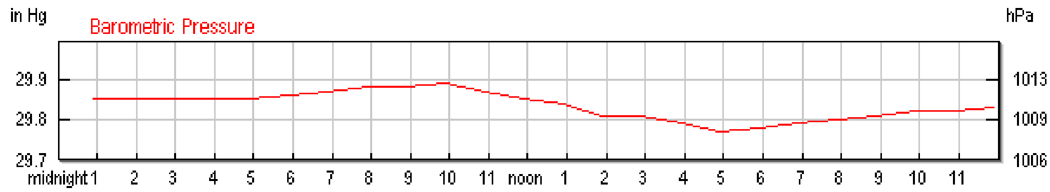
« Previous Day | September | 18 | 2013 | View | Next Day »

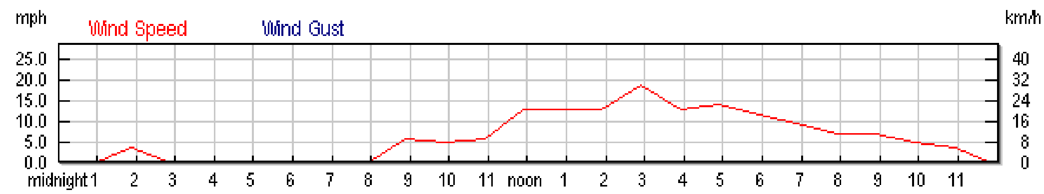
Daily | Weekly | Monthly | Custom

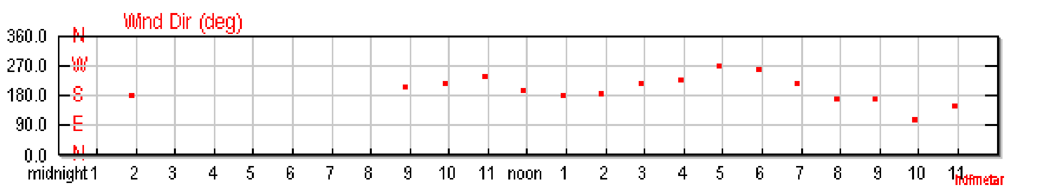
	Actual	Average	Record
Temperature			
Mean Temperature	**66** °F	**64** °F	
Max Temperature	**85** °F	**80** °F	**97** °F (2000)
Min Temperature	**47** °F	**49** °F	**38** °F (2008)
Degree Days			
Heating Degree Days	0		
Month to date heating degree days	1		
Since 1 July heating degree days	37		
Cooling Degree Days	1		
Month to date cooling degree days	58		
Year to date cooling degree days	295		
Growing Degree Days	16 (Base 50)		
Moisture			
Dew Point	**47** °F		
Average Humidity	58		
Maximum Humidity	93		
Minimum Humidity	23		
Precipitation			
Precipitation	**0.00** in	-	**1.87** in (1959)
Month to date precipitation	0.00		
Year to date precipitation	1.97		
Since 1 July precipitation	0.00		
Sea Level Pressure			
Sea Level Pressure	**29.83** in		
Wind			
Wind Speed	**6** mph (SSW)		
Max Wind Speed	**18** mph		
Max Gust Speed	**23** mph		
Visibility	**10** miles		
Events			

T = Trace of Precipitation, **MM** = Missing Value **Source:** NWS Daily Summary









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Hourly Weather History & Observations

Time (PDT)	Temp.	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**55.9** °F	**48.0** °F	75%	**29.85** in	**10.0** mi	Calm	Calm	-	N/A		Clear
1:54 AM	**57.0** °F	**48.9** °F	74%	**29.85** in	**10.0** mi	South	**3.5** mph	-	N/A		Clear
2:54 AM	**53.1** °F	**48.0** °F	83%	**29.85** in	**10.0** mi	Calm	Calm	-	N/A		Clear
3:54 AM	**52.0** °F	**48.0** °F	86%	**29.85** in	**10.0** mi	Calm	Calm	-	N/A		Clear
4:54 AM	**48.0** °F	**46.0** °F	93%	**29.85** in	**10.0** mi	Calm	Calm	-	N/A		Clear
5:54 AM	**48.9** °F	**45.0** °F	86%	**29.86** in	**10.0** mi	Calm	Calm	-	N/A		Clear
6:54 AM	**48.9** °F	**46.0** °F	90%	**29.87** in	**10.0** mi	Calm	Calm	-	N/A		Clear
7:54 AM	**55.0** °F	**48.9** °F	80%	**29.88** in	**10.0** mi	Calm	Calm	-	N/A		Clear
8:54 AM	**63.0** °F	**51.1** °F	65%	**29.88** in	**10.0** mi	SSW	**5.8** mph	-	N/A		Clear
9:54 AM	**68.0** °F	**50.0** °F	52%	**29.89** in	**10.0** mi	SW	**4.6** mph	-	N/A		Clear
10:54 AM	**73.0** °F	**48.0** °F	41%	**29.87** in	**10.0** mi	WSW	**5.8** mph	-	N/A		Clear
11:54 AM	**77.0** °F	**46.9** °F	34%	**29.85** in	**10.0** mi	SSW	**12.7** mph	-	N/A		Clear
12:54 PM	**80.1** °F	**46.0** °F	30%	**29.84** in	**10.0** mi	South	**12.7** mph	-	N/A		Clear
1:54 PM	**84.9** °F	**43.0** °F	23%	**29.81** in	**10.0** mi	South	**12.7** mph	-	N/A		Clear
2:54 PM	**82.9** °F	**48.0** °F	29%	**29.81** in	**10.0** mi	SW	**18.4** mph	-	N/A		Clear
3:54 PM	**82.9** °F	**48.0** °F	29%	**29.79** in	**10.0** mi	SW	**12.7** mph	-	N/A		Clear

4:54 PM	**82.9** °F	**43.0** °F	24%	**29.77** in	**10.0** mi	West	**13.8** mph	-	N/A		Clear
5:54 PM	**80.1** °F	**43.0** °F	27%	**29.78** in	**10.0** mi	West	**11.5** mph	-	N/A		Clear
6:54 PM	**72.0** °F	**45.0** °F	38%	**29.79** in	**10.0** mi	SW	**9.2** mph	-	N/A		Clear
7:54 PM	**66.0** °F	**48.0** °F	52%	**29.80** in	**10.0** mi	South	**6.9** mph	-	N/A		Clear
8:54 PM	**64.0** °F	**48.9** °F	58%	**29.81** in	**10.0** mi	South	**6.9** mph	-	N/A		Clear
9:54 PM	**59.0** °F	**46.9** °F	64%	**29.82** in	**10.0** mi	ESE	**4.6** mph	-	N/A		Clear
10:54 PM	**59.0** °F	**48.0** °F	67%	**29.82** in	**10.0** mi	SSE	**3.5** mph	-	N/A		Clear
11:54 PM	**53.1** °F	**46.9** °F	80%	**29.83** in	**10.0** mi	Calm	Calm	-	N/A		Clear

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Weather History for Napa County, CA

Thursday, September 19, 2013

Thursday, September 19, 2013

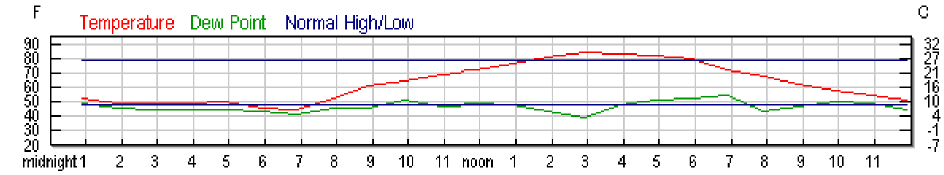
« Previous Day | September | 19 | 2013 | View | Next Day »

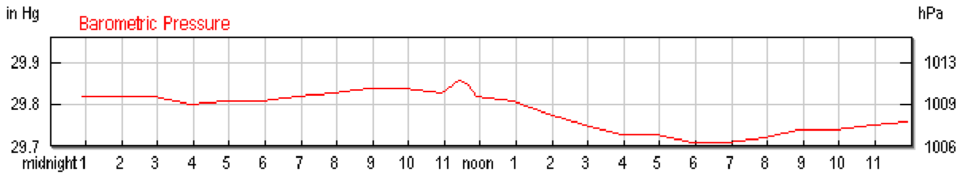
Daily | Weekly | Monthly | Custom

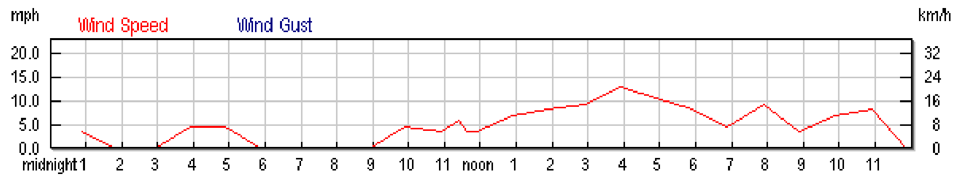
	Actual	Average	Record
Temperature			
Mean Temperature	**67** °F	**64** °F	
Max Temperature	**88** °F	**80** °F	**97** °F (2002)
Min Temperature	**45** °F	**49** °F	**41** °F (2008)
Degree Days			
Heating Degree Days	0		
Month to date heating degree days	1		
Since 1 July heating degree days	37		
Cooling Degree Days	2		
Month to date cooling degree days	60		
Year to date cooling degree days	297		
Growing Degree Days	16 (Base 50)		
Moisture			
Dew Point	**48** °F		
Average Humidity	56		
Maximum Humidity	93		
Minimum Humidity	19		
Precipitation			
Precipitation	**0.00** in	-	**0.51** in (1977)
Month to date precipitation	0.00		
Year to date precipitation	1.97		
Since 1 July precipitation	0.00		
Sea Level Pressure			
Sea Level Pressure	**29.79** in		
Wind			
Wind Speed	**5** mph (SSW)		
Max Wind Speed	**14** mph		
Max Gust Speed	**16** mph		
Visibility	**10** miles		
Events			

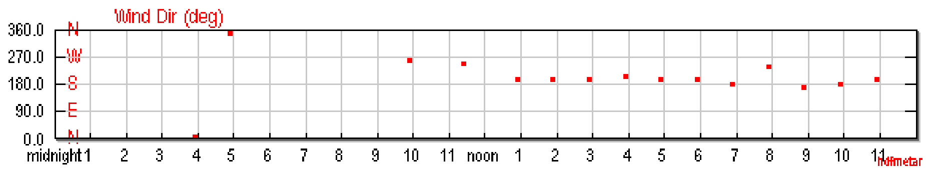
T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary









Certify This Report

Hourly Weather History & Observations

Time (PDT)	Temp.	Heat Index	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**54.0** °F	-	**50.0** °F	86%	**29.82** in	**10.0** mi	SSE	**3.5** mph	-	N/A		Clear
1:54 AM	**50.0** °F	-	**46.9** °F	89%	**29.82** in	**10.0** mi	Calm	Calm	-	N/A		Clear
2:54 AM	**50.0** °F	-	**46.0** °F	86%	**29.82** in	**10.0** mi	Calm	Calm	-	N/A		Clear
3:54 AM	**50.0** °F	-	**46.0** °F	86%	**29.80** in	**10.0** mi	North	**4.6** mph	-	N/A		Clear
4:54 AM	**51.1** °F	-	**46.0** °F	83%	**29.81** in	**10.0** mi	North	**4.6** mph	-	N/A		Clear
5:54 AM	**46.9** °F	-	**44.1** °F	90%	**29.81** in	**10.0** mi	Calm	Calm	-	N/A		Clear
6:54 AM	**46.0** °F	-	**42.1** °F	86%	**29.82** in	**10.0** mi	Calm	Calm	-	N/A		Clear
7:54 AM	**53.1** °F	-	**46.9** °F	80%	**29.83** in	**10.0** mi	Calm	Calm	-	N/A		Clear
8:54 AM	**62.1** °F	-	**46.9** °F	58%	**29.84** in	**10.0** mi	Calm	Calm	-	N/A		Clear
9:54 AM	**66.0** °F	-	**52.0** °F	60%	**29.84** in	**10.0** mi	West	**4.6** mph	-	N/A		Clear
10:54 AM	**70.0** °F	-	**48.0** °F	46%	**29.83** in	**10.0** mi	Variable	**3.5** mph	-	N/A		Clear
11:23 AM	**71.6** °F	-	**48.2** °F	43%	**29.86** in	**2.5** mi	WSW	**5.8** mph	-	N/A		Haze
11:38 AM	**73.4** °F	-	**50.0** °F	44%	**29.85** in	**10.0** mi	Variable	**3.5** mph	-	N/A		Clear
11:54 AM	**73.0** °F	-	**50.0** °F	44%	**29.82** in	**10.0** mi	Variable	**3.5** mph	-	N/A		Clear
12:54 PM	**78.1** °F	-	**48.9** °F	36%	**29.81** in	**10.0** mi	SSW	**6.9** mph	-	N/A		Clear
1:54 PM	**82.0** °F	-	**45.0** °F	27%	**29.78** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Clear
2:54 PM	**86.0** °F	-	**39.9** °F	20%	**29.75** in	**10.0** mi	SSW	**9.2** mph	-	N/A		Clear

3:54 PM	**84.9** °F	-	**48.9** °F	29%	**29.73** in	**10.0** mi	SSW	**12.7** mph	-	N/A		Clear
4:54 PM	**82.9** °F	-	**52.0** °F	34%	**29.73** in	**10.0** mi	SSW	**10.4** mph	-	N/A		Clear
5:54 PM	**81.0** °F	**80.4** °F	**53.1** °F	38%	**29.71** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Clear
6:54 PM	**73.9** °F	-	**55.9** °F	53%	**29.71** in	**10.0** mi	South	**4.6** mph	-	N/A		Clear
7:54 PM	**69.1** °F	-	**44.1** °F	40%	**29.72** in	**10.0** mi	WSW	**9.2** mph	-	N/A		Clear
8:54 PM	**63.0** °F	-	**48.0** °F	58%	**29.74** in	**10.0** mi	South	**3.5** mph	-	N/A		Clear
9:54 PM	**59.0** °F	-	**51.1** °F	75%	**29.74** in	**10.0** mi	South	**6.9** mph	-	N/A		Clear
10:54 PM	**55.9** °F	-	**50.0** °F	80%	**29.75** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Clear
11:54 PM	**52.0** °F	-	**46.0** °F	80%	**29.76** in	**10.0** mi	Calm	Calm	-	N/A		Clear

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Weather History for Napa County, CA

Friday, September 20, 2013

Friday, September 20, 2013

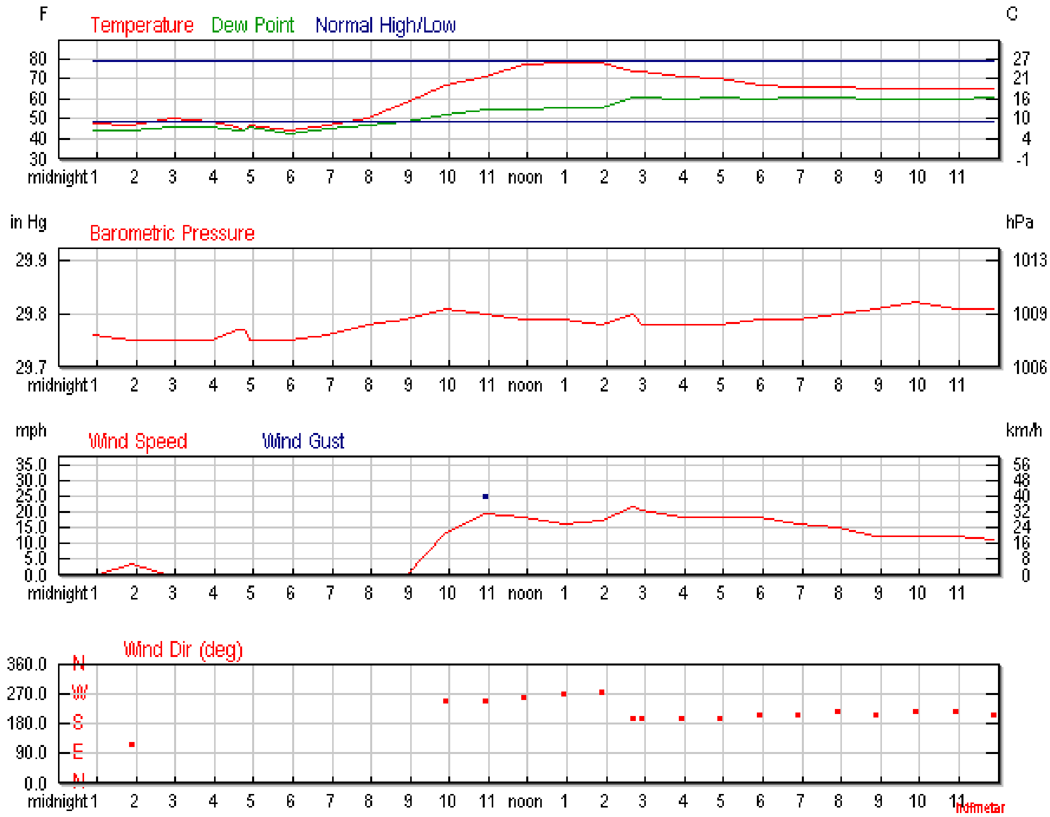
« Previous Day September 20 2013 View Next Day »

Daily Weekly Monthly Custom

	Actual	Average	Record
Temperature			
Mean Temperature	**61** °F	**64** °F	
Max Temperature	**80** °F	**79** °F	**97** °F (2011)
Min Temperature	**42** °F	**49** °F	**38** °F (2004)
Degree Days			
Heating Degree Days	4		
Month to date heating degree days	5		
Since 1 July heating degree days	41		
Cooling Degree Days	0		
Month to date cooling degree days	60		
Year to date cooling degree days	297		
Growing Degree Days	11 (Base 50)		
Moisture			
Dew Point	**53** °F		
Average Humidity	73		
Maximum Humidity	100		
Minimum Humidity	45		
Precipitation			
Precipitation	**0.00** in	-	**0.14** in (1973)
Month to date precipitation	0.00		
Year to date precipitation	1.97		
Since 1 July precipitation	0.00		
Sea Level Pressure			
Sea Level Pressure	**29.78** in		
Wind			
Wind Speed	**11** mph (SW)		
Max Wind Speed	**23** mph		
Max Gust Speed	**29** mph		
Visibility	**9** miles		
Events			

T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary



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Hourly Weather History & Observations

Time (PDT)	Temp.	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**48.0** °F	**44.1** °F	86%	**29.76** in	**10.0** mi	Calm	Calm	-	N/A		Clear
1:54 AM	**46.9** °F	**44.1** °F	90%	**29.75** in	**10.0** mi	ESE	**3.5** mph	-	N/A		Clear
2:54 AM	**50.0** °F	**46.0** °F	86%	**29.75** in	**10.0** mi	Calm	Calm	-	N/A		Clear
3:54 AM	**48.9** °F	**46.0** °F	90%	**29.75** in	**10.0** mi	Calm	Calm	-	N/A		Clear
4:36 AM	**46.4** °F	**44.6** °F	93%	**29.77** in	**1.8** mi	Calm	Calm	-	N/A		Clear
4:45 AM	**44.6** °F	**44.6** °F	100%	**29.77** in	**3.0** mi	Calm	Calm	-	N/A		Clear
4:54 AM	**46.9** °F	**46.0** °F	97%	**29.75** in	**10.0** mi	Calm	Calm	-	N/A		Clear
5:54 AM	**44.1** °F	**43.0** °F	96%	**29.75** in	**6.0** mi	Calm	Calm	-	N/A		Clear
6:54 AM	**46.9** °F	**45.0** °F	93%	**29.76** in	**10.0** mi	Calm	Calm	-	N/A		Clear
7:54 AM	**50.0** °F	**46.9** °F	89%	**29.78** in	**10.0** mi	Calm	Calm	-	N/A		Clear
8:54 AM	**57.9** °F	**48.9** °F	72%	**29.79** in	**10.0** mi	Calm	Calm	-	N/A		Clear
9:54 AM	**66.9** °F	**52.0** °F	59%	**29.81** in	**10.0** mi	WSW	**13.8** mph	**19.6** mph	N/A		Clear
10:54 AM	**71.1** °F	**55.0** °F	57%	**29.80** in	**8.0** mi	WSW	**19.6** mph	**25.3** mph	N/A		Partly Cloudy

11:54 AM	**77.0** °F	**55.0** °F	47%	**29.79** in	**10.0** mi	West	**18.4** mph	-	N/A		Clear
12:54 PM	**78.1** °F	**55.9** °F	46%	**29.79** in	**10.0** mi	West	**16.1** mph	**27.6** mph	N/A		Clear
1:54 PM	**78.1** °F	**55.9** °F	46%	**29.78** in	**10.0** mi	West	**17.3** mph	-	N/A		Scattered Clouds
2:42 PM	**73.4** °F	**60.8** °F	65%	**29.80** in	**10.0** mi	SSW	**21.9** mph	-	N/A		Mostly Cloudy
2:54 PM	**73.9** °F	**61.0** °F	64%	**29.78** in	**10.0** mi	SSW	**20.7** mph	-	N/A		Mostly Cloudy
3:54 PM	**71.1** °F	**60.1** °F	68%	**29.78** in	**10.0** mi	SSW	**18.4** mph	-	N/A		Mostly Cloudy
4:54 PM	**70.0** °F	**61.0** °F	73%	**29.78** in	**10.0** mi	SSW	**18.4** mph	-	N/A		Overcast
5:54 PM	**66.9** °F	**60.1** °F	79%	**29.79** in	**10.0** mi	SSW	**18.4** mph	-	N/A		Overcast
6:54 PM	**66.0** °F	**61.0** °F	84%	**29.79** in	**10.0** mi	SSW	**16.1** mph	-	N/A		Overcast
7:54 PM	**66.0** °F	**61.0** °F	84%	**29.80** in	**10.0** mi	SW	**15.0** mph	-	N/A		Overcast
8:54 PM	**64.9** °F	**60.1** °F	84%	**29.81** in	**10.0** mi	SSW	**12.7** mph	-	N/A		Mostly Cloudy
9:54 PM	**64.9** °F	**60.1** °F	84%	**29.82** in	**10.0** mi	SW	**12.7** mph	-	N/A		Overcast
10:54 PM	**64.9** °F	**60.1** °F	84%	**29.81** in	**10.0** mi	SW	**12.7** mph	-	N/A		Overcast
11:54 PM	**64.9** °F	**61.0** °F	87%	**29.81** in	**10.0** mi	SSW	**11.5** mph	-	N/A		Overcast

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Weather History for Napa County, CA

Saturday, September 21, 2013

Saturday, September 21, 2013

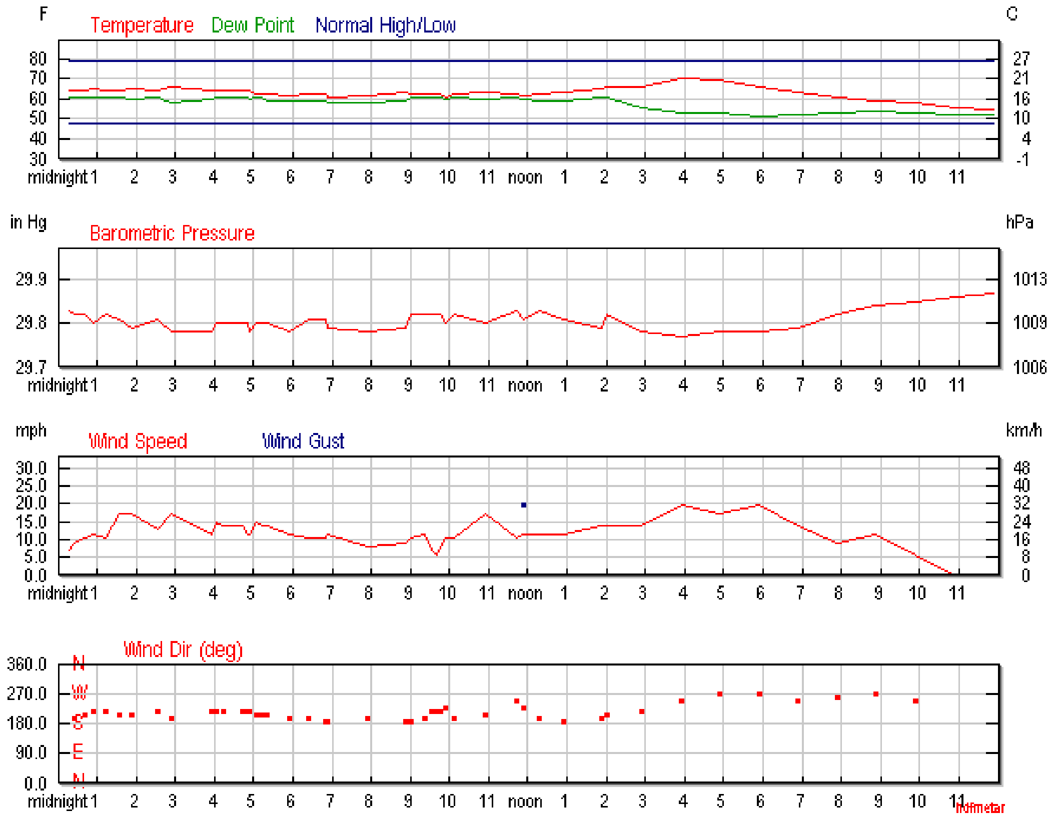
« Previous Day September 21 2013 View Next Day »

Daily | Weekly | Monthly | Custom

	Actual	Average	Record
Temperature			
Mean Temperature	**62** °F	**64** °F	
Max Temperature	**71** °F	**79** °F	**102** °F (2003)
Min Temperature	**53** °F	**48** °F	**41** °F (2012)
Degree Days			
Heating Degree Days	3		
Month to date heating degree days	8		
Since 1 July heating degree days	44		
Cooling Degree Days	0		
Month to date cooling degree days	60		
Year to date cooling degree days	297		
Growing Degree Days	12 (Base 50)		
Moisture			
Dew Point	**59** °F		
Average Humidity	79		
Maximum Humidity	100		
Minimum Humidity	57		
Precipitation			
Precipitation	**0.82** in	-	**0.82** in (2013)
Month to date precipitation	0.82		
Year to date precipitation	2.79		
Since 1 July precipitation	0.82		
Sea Level Pressure			
Sea Level Pressure	**29.81** in		
Wind			
Wind Speed	**11** mph (SW)		
Max Wind Speed	**22** mph		
Max Gust Speed	**25** mph		
Visibility	**8** miles		
Events	Fog , Rain		

T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary



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Hourly Weather History & Observations

Time (PDT)	Temp.	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:18 AM	**64.4** °F	**60.8** °F	88%	**29.83** in	**10.0** mi	SW	**6.9** mph	-	N/A		Overcast
12:25 AM	**64.4** °F	**60.8** °F	88%	**29.82** in	**10.0** mi	SSW	**9.2** mph	-	N/A		Overcast
12:40 AM	**64.4** °F	**60.8** °F	88%	**29.82** in	**10.0** mi	SSW	**10.4** mph	-	N/A		Overcast
12:54 AM	**64.9** °F	**61.0** °F	87%	**29.80** in	**10.0** mi	SW	**11.5** mph	-	N/A		Overcast
1:12 AM	**64.4** °F	**60.8** °F	88%	**29.82** in	**10.0** mi	SW	**10.4** mph	-	N/A		Overcast
1:33 AM	**64.4** °F	**60.8** °F	88%	**29.81** in	**10.0** mi	SSW	**17.3** mph	-	N/A		Scattered Clouds
1:54 AM	**64.9** °F	**60.1** °F	84%	**29.79** in	**10.0** mi	SSW	**17.3** mph	-	N/A		Mostly Cloudy
2:33 AM	**64.4** °F	**60.8** °F	88%	**29.81** in	**10.0** mi	SW	**12.7** mph	-	N/A		Overcast
2:54 AM	**66.0** °F	**57.9** °F	75%	**29.78** in	**10.0** mi	SSW	**17.3** mph	**23.0** mph	N/A		Overcast
3:54 AM	**64.0** °F	**60.1** °F	87%	**29.78** in	**10.0** mi	SW	**11.5** mph	-	**0.00** in		Overcast
4:02 AM	**64.4** °F	**60.8** °F	88%	**29.80** in	**10.0** mi	SW	**15.0** mph	-	**0.00** in	Rain	Light Rain
4:13 AM	**64.4** °F	**60.8** °F	88%	**29.80** in	**10.0** mi	SW	**13.8** mph	-	**0.00** in		Overcast

4:43 AM	**64.4** °F	**60.8** °F	88%	**29.80** in	**10.0** mi	SW	**13.8** mph	-	**0.00** in		Overcast
4:52 AM	**64.4** °F	**60.8** °F	88%	**29.80** in	**10.0** mi	SW	**11.5** mph	-	**0.00** in		Overcast
4:54 AM	**64.0** °F	**60.1** °F	87%	**29.78** in	**10.0** mi	SW	**11.5** mph	-	**0.00** in		Overcast
5:05 AM	**62.6** °F	**60.8** °F	94%	**29.80** in	**10.0** mi	SSW	**15.0** mph	-	N/A		Overcast
5:12 AM	**62.6** °F	**60.8** °F	94%	**29.80** in	**10.0** mi	SSW	**13.8** mph	-	N/A		Overcast
5:19 AM	**62.6** °F	**59.0** °F	88%	**29.80** in	**10.0** mi	SSW	**13.8** mph	-	N/A		Overcast
5:54 AM	**62.1** °F	**59.0** °F	90%	**29.78** in	**10.0** mi	SSW	**11.5** mph	-	N/A		Scattered Clouds
6:25 AM	**62.6** °F	**59.0** °F	88%	**29.81** in	**10.0** mi	SSW	**10.4** mph	-	N/A		Mostly Cloudy
6:50 AM	**62.6** °F	**59.0** °F	88%	**29.81** in	**10.0** mi	South	**10.4** mph	-	N/A		Overcast
6:54 AM	**61.0** °F	**57.9** °F	90%	**29.79** in	**10.0** mi	South	**11.5** mph	-	N/A		Mostly Cloudy
7:54 AM	**62.1** °F	**57.9** °F	86%	**29.78** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Mostly Cloudy
8:54 AM	**63.0** °F	**59.0** °F	87%	**29.79** in	**5.0** mi	South	**9.2** mph	-	**0.03** in	Rain	Light Rain
9:01 AM	**62.6** °F	**60.8** °F	94%	**29.82** in	**8.0** mi	South	**10.4** mph	-	**0.00** in	Rain	Light Rain
9:22 AM	**62.6** °F	**60.8** °F	94%	**29.82** in	**2.0** mi	SSW	**11.5** mph	-	**0.03** in	Rain	Rain
9:33 AM	**62.6** °F	**60.8** °F	94%	**29.82** in	**1.8** mi	SW	**6.9** mph	-	**0.10** in	Rain	Rain
9:40 AM	**62.6** °F	**60.8** °F	94%	**29.82** in	**1.2** mi	SW	**5.8** mph	-	**0.14** in	Rain	Heavy Rain
9:47 AM	**62.6** °F	**60.8** °F	94%	**29.82** in	**0.5** mi	SW	**8.1** mph	-	**0.34** in	Fog , Rain	Heavy Rain
9:54 AM	**61.0** °F	**60.1** °F	97%	**29.80** in	**0.2** mi	SW	**10.4** mph	**17.3** mph	**0.61** in	Fog , Rain	Heavy Rain
10:06 AM	**62.6** °F	**60.8** °F	94%	**29.82** in	**4.0** mi	SSW	**10.4** mph	-	**0.03** in	Rain	Rain
10:54 AM	**63.0** °F	**60.1** °F	90%	**29.80** in	**5.0** mi	SSW	**17.3** mph	-	**0.09** in	Rain	Rain
11:44 AM	**62.6** °F	**60.8** °F	94%	**29.83** in	**2.5** mi	WSW	**10.4** mph	**19.6** mph	**0.06** in	Rain	Heavy Rain
11:54 AM	**62.1** °F	**60.1** °F	93%	**29.81** in	**3.0** mi	SW	**11.5** mph	**19.6** mph	**0.08** in	Rain	Heavy Rain
12:17 PM	**62.6** °F	**59.0** °F	88%	**29.83** in	**10.0** mi	SSW	**11.5** mph	-	**0.00** in	Rain	Light Rain
12:54 PM	**63.0** °F	**59.0** °F	87%	**29.81** in	**10.0** mi	South	**11.5** mph	-	**0.00** in		Overcast
1:54 PM	**64.9** °F	**61.0** °F	87%	**29.79** in	**10.0** mi	SSW	**13.8** mph	-	**0.01** in		Overcast
2:01 PM	**66.2** °F	**60.8** °F	83%	**29.82** in	**10.0** mi	SSW	**13.8** mph	-	N/A		Overcast
2:54 PM	**66.0** °F	**55.9** °F	70%	**29.78** in	**10.0** mi	SW	**13.8** mph	-	N/A		Mostly Cloudy
3:54 PM	**70.0** °F	**53.1** °F	55%	**29.77** in	**10.0** mi	WSW	**19.6** mph	**23.0** mph	N/A		Partly Cloudy
4:54 PM	**69.1** °F	**53.1** °F	57%	**29.78** in	**10.0** mi	West	**17.3** mph	-	N/A		Scattered Clouds
5:54 PM	**66.0** °F	**51.1** °F	59%	**29.78** in	**10.0** mi	West	**19.6** mph	-	N/A		Scattered Clouds
6:54 PM	**63.0** °F	**52.0** °F	67%	**29.79** in	**10.0** mi	WSW	**13.8** mph	-	N/A		Partly Cloudy
7:54 PM	**61.0** °F	**53.1** °F	75%	**29.82** in	**10.0** mi	West	**9.2** mph	-	N/A		Partly Cloudy
8:54 PM	**59.0** °F	**54.0** °F	83%	**29.84** in	**10.0** mi	West	**11.5** mph	-	N/A		Clear
9:54 PM	**57.9** °F	**53.1** °F	84%	**29.85** in	**10.0** mi	WSW	**5.8** mph	-	N/A		Clear

10:54 PM	**55.9** °F	**52.0** °F	87%	**29.86** in	**10.0** mi	Calm	Calm	-	N/A		Clear
11:54 PM	**55.0** °F	**52.0** °F	89%	**29.87** in	**10.0** mi	Calm	Calm	-	N/A		Clear

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Weather History for Napa County, CA

Sunday, September 22, 2013

Sunday, September 22, 2013

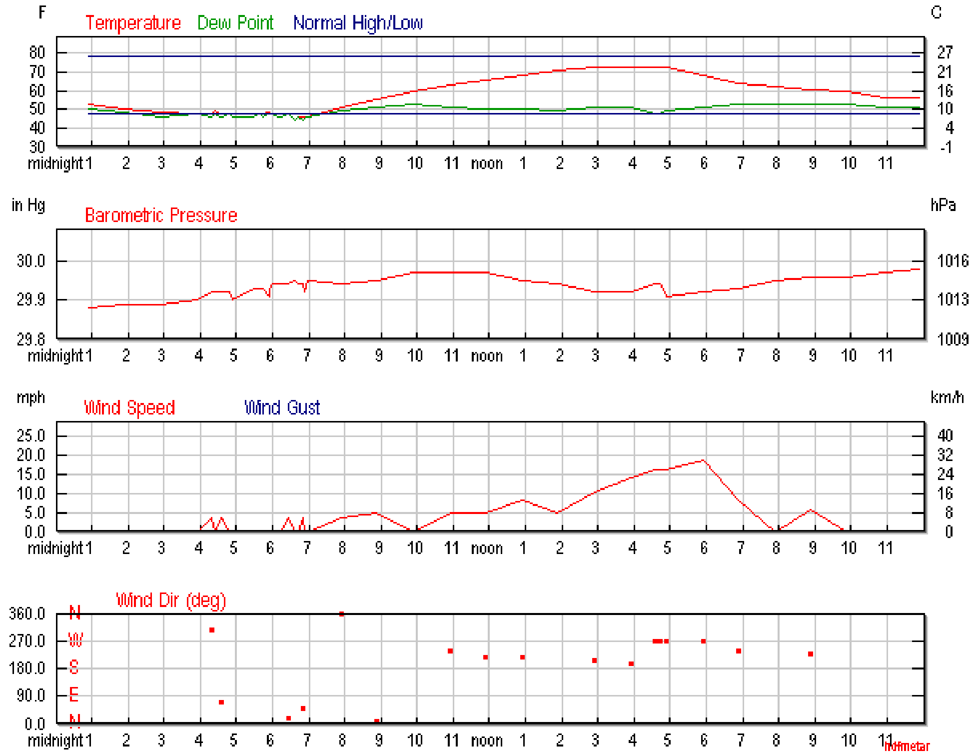
« Previous Day | September 22 2013 View | Next Day »

Daily | Weekly | Monthly | Custom

	Actual	Average	Record
Temperature			
Mean Temperature	**60** °F	**64** °F	
Max Temperature	**74** °F	**79** °F	**99** °F (2003)
Min Temperature	**45** °F	**48** °F	**40** °F (2005)
Degree Days			
Heating Degree Days	5		
Month to date heating degree days	13		
Since 1 July heating degree days	49		
Cooling Degree Days	0		
Month to date cooling degree days	60		
Year to date cooling degree days	297		
Growing Degree Days	8 (Base 50)		
Moisture			
Dew Point	**49** °F		
Average Humidity	72		
Maximum Humidity	100		
Minimum Humidity	44		
Precipitation			
Precipitation	**0.00** in	-	**0.40** in (1923)
Month to date precipitation	0.82		
Year to date precipitation	2.79		
Since 1 July precipitation	0.82		
Sea Level Pressure			
Sea Level Pressure	**29.93** in		
Wind			
Wind Speed	**4** mph (West)		
Max Wind Speed	**20** mph		
Max Gust Speed	**41** mph		
Visibility	**7** miles		
Events	Fog		

T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary



Certify This Report

Hourly Weather History & Observations

Time (PDT)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**53.1** °F	-	**51.1** °F	93%	**29.88** in	**10.0** mi	Calm	Calm	-	N/A		Clear
1:54 AM	**51.1** °F	-	**48.9** °F	92%	**29.89** in	**10.0** mi	Calm	Calm	-	N/A		Clear
2:54 AM	**48.9** °F	-	**46.9** °F	93%	**29.89** in	**10.0** mi	Calm	Calm	-	N/A		Clear
3:54 AM	**48.0** °F	-	**48.0** °F	100%	**29.90** in	**10.0** mi	Calm	Calm	-	N/A		Clear
4:18 AM	**48.2** °F	-	**46.4** °F	93%	**29.92** in	**1.8** mi	NW	**3.5** mph	-	N/A		Clear
4:25 AM	**50.0** °F	-	**48.2** °F	94%	**29.92** in	**3.0** mi	Calm	Calm	-	N/A		Clear
4:36 AM	**48.2** °F	-	**46.4** °F	93%	**29.92** in	**2.5** mi	ENE	**3.5** mph	-	N/A		Partly Cloudy
4:47 AM	**48.2** °F	-	**48.2** °F	100%	**29.92** in	**10.0** mi	Calm	Calm	-	N/A		Clear
4:54 AM	**48.0** °F	-	**46.9** °F	96%	**29.90** in	**9.0** mi	Calm	Calm	-	N/A		Clear
5:29 AM	**48.2** °F	-	**46.4** °F	93%	**29.93** in	**2.0** mi	Calm	Calm	-	N/A		Clear
5:39 AM	**48.2** °F	-	**48.2** °F	100%	**29.93** in	**9.0** mi	Calm	Calm	-	N/A		Clear
5:44 AM	**48.2** °F	-	**46.4** °F	93%	**29.93** in	**1.2** mi	Calm	Calm	-	N/A		Clear
5:54 AM	**48.9** °F	-	**48.0** °F	97%	**29.91** in	**1.8** mi	Calm	Calm	-	N/A		Clear
5:56 AM	**48.2** °F	-	**48.2** °F	100%	**29.93** in	**3.0** mi	Calm	Calm	-	N/A		Clear
5:59 AM	**48.2** °F	-	**48.2** °F	100%	**29.94** in	**1.8** mi	Calm	Calm	-	N/A		Clear
6:07 AM	**48.2** °F	-	**46.4** °F	93%	**29.94** in	**0.5** mi	Calm	Calm	-	N/A	Fog	Fog

6:14 AM	**48.2** °F	-	**46.4** °F	93%	**29.94** in	**1.0** mi	Calm	Calm	-	N/A		Clear
6:26 AM	**48.2** °F	-	**48.2** °F	100%	**29.94** in	**3.0** mi	NNE	**3.5** mph	-	N/A		Clear
6:36 AM	**44.6** °F	-	**44.6** °F	100%	**29.95** in	**1.8** mi	Calm	Calm	-	N/A		Clear
6:43 AM	**46.4** °F	-	**46.4** °F	100%	**29.94** in	**3.0** mi	Calm	Calm	-	N/A		Clear
6:51 AM	**46.4** °F	**45.2** °F	**44.6** °F	93%	**29.94** in	**1.8** mi	NE	**3.5** mph	-	N/A		Clear
6:54 AM	**46.9** °F	-	**46.0** °F	97%	**29.92** in	**1.2** mi	Calm	Calm	-	N/A		Clear
6:59 AM	**46.4** °F	-	**46.4** °F	100%	**29.95** in	**10.0** mi	Calm	Calm	-	N/A		Clear
7:54 AM	**52.0** °F	-	**50.0** °F	93%	**29.94** in	**10.0** mi	North	**3.5** mph	-	N/A		Clear
8:54 AM	**55.9** °F	-	**52.0** °F	87%	**29.95** in	**10.0** mi	North	**4.6** mph	-	N/A		Clear
9:54 AM	**60.1** °F	-	**53.1** °F	78%	**29.97** in	**10.0** mi	Calm	Calm	-	N/A		Clear
10:54 AM	**64.0** °F	-	**52.0** °F	65%	**29.97** in	**10.0** mi	WSW	**4.6** mph	-	N/A		Clear
11:54 AM	**66.0** °F	-	**51.1** °F	59%	**29.97** in	**10.0** mi	SW	**4.6** mph	-	N/A		Partly Cloudy
12:54 PM	**69.1** °F	-	**51.1** °F	53%	**29.95** in	**10.0** mi	SW	**8.1** mph	-	N/A		Scattered Clouds
1:54 PM	**71.1** °F	-	**50.0** °F	47%	**29.94** in	**10.0** mi	Variable	**4.6** mph	-	N/A		Scattered Clouds
2:54 PM	**73.0** °F	-	**52.0** °F	48%	**29.92** in	**10.0** mi	SSW	**10.4** mph	-	N/A		Scattered Clouds
3:54 PM	**73.0** °F	-	**52.0** °F	48%	**29.92** in	**10.0** mi	SSW	**13.8** mph	-	N/A		Clear
4:35 PM	**73.4** °F	-	**48.2** °F	41%	**29.94** in	**10.0** mi	West	**16.1** mph	-	N/A		Clear
4:44 PM	**73.4** °F	-	**48.2** °F	41%	**29.94** in	**10.0** mi	West	**16.1** mph	-	N/A		Clear
4:54 PM	**73.0** °F	-	**50.0** °F	44%	**29.91** in	**10.0** mi	West	**16.1** mph	-	N/A		Clear
5:54 PM	**69.1** °F	-	**52.0** °F	54%	**29.92** in	**10.0** mi	West	**18.4** mph	-	N/A		Clear
6:54 PM	**64.9** °F	-	**53.1** °F	65%	**29.93** in	**10.0** mi	WSW	**8.1** mph	-	N/A		Clear
7:54 PM	**63.0** °F	-	**53.1** °F	70%	**29.95** in	**10.0** mi	Calm	Calm	-	N/A		Clear
8:54 PM	**61.0** °F	-	**53.1** °F	75%	**29.96** in	**10.0** mi	SW	**5.8** mph	-	N/A		Clear
9:54 PM	**60.1** °F	-	**53.1** °F	78%	**29.96** in	**10.0** mi	Calm	Calm	-	N/A		Clear
10:54 PM	**57.0** °F	-	**52.0** °F	83%	**29.97** in	**10.0** mi	Calm	Calm	-	N/A		Clear
11:54 PM	**57.0** °F	-	**52.0** °F	83%	**29.98** in	**10.0** mi	Calm	Calm	-	N/A		Clear

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Weather History for Napa County, CA

Monday, September 23, 2013

Monday, September 23, 2013

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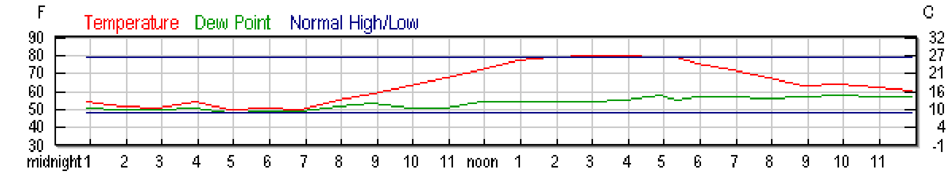
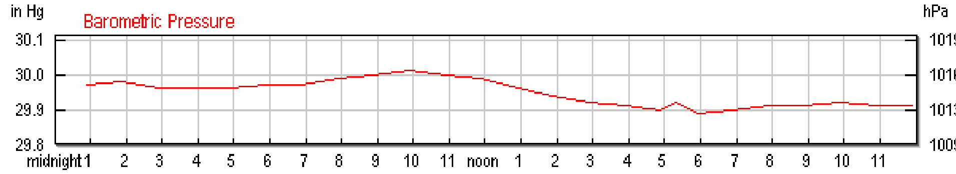
Daily Weekly Monthly Custom

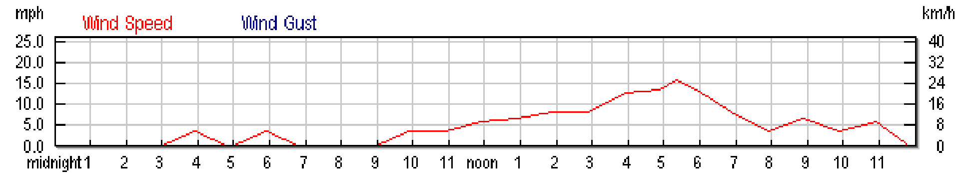
	Actual	Average	Record
Temperature			
Mean Temperature	**66** °F	**63** °F	
Max Temperature	**81** °F	**79** °F	**94** °F (2002)
Min Temperature	**50** °F	**48** °F	**39** °F (1932)
Degree Days			
Heating Degree Days	0		
Month to date heating degree days	13		
Since 1 July heating degree days	49		
Cooling Degree Days	1		
Month to date cooling degree days	61		
Year to date cooling degree days	298		
Growing Degree Days	15 (Base 50)		
Moisture			
Dew Point	**54** °F		
Average Humidity	68		
Maximum Humidity	96		
Minimum Humidity	39		
Precipitation			
Precipitation	**0.00** in	-	**0.36** in (1990)
Month to date precipitation	0.82		
Year to date precipitation	2.79		
Since 1 July precipitation	0.82		
Sea Level Pressure			
Sea Level Pressure	**29.95** in		
Wind			
Wind Speed	**5** mph (SW)		
Max Wind Speed	**18** mph		
Max Gust Speed	**21** mph		
Visibility	**10** miles		
Events			

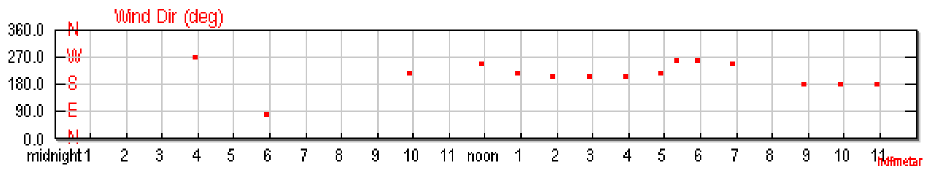
T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary









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Hourly Weather History & Observations

Time (PDT)	Temp.	Heat Index	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**54.0** °F	-	**51.1** °F	90%	**29.97** in	**10.0** mi	Calm	Calm	-	N/A		Clear
1:54 AM	**52.0** °F	-	**50.0** °F	93%	**29.98** in	**10.0** mi	Calm	Calm	-	N/A		Clear
2:54 AM	**51.1** °F	-	**50.0** °F	96%	**29.96** in	**10.0** mi	Calm	Calm	-	N/A		Clear
3:54 AM	**54.0** °F	-	**51.1** °F	90%	**29.96** in	**10.0** mi	West	**3.5** mph	-	N/A		Clear
4:54 AM	**50.0** °F	-	**48.0** °F	93%	**29.96** in	**10.0** mi	Calm	Calm	-	N/A		Clear
5:54 AM	**51.1** °F	-	**48.9** °F	92%	**29.97** in	**10.0** mi	East	**3.5** mph	-	N/A		Clear
6:54 AM	**50.0** °F	-	**48.9** °F	96%	**29.97** in	**10.0** mi	Calm	Calm	-	N/A		Clear
7:54 AM	**55.0** °F	-	**52.0** °F	89%	**29.99** in	**10.0** mi	Calm	Calm	-	N/A		Clear
8:54 AM	**59.0** °F	-	**53.1** °F	81%	**30.00** in	**10.0** mi	Calm	Calm	-	N/A		Clear
9:54 AM	**63.0** °F	-	**51.1** °F	65%	**30.01** in	**10.0** mi	SW	**3.5** mph	-	N/A		Clear
10:54 AM	**68.0** °F	-	**51.1** °F	55%	**30.00** in	**10.0** mi	Variable	**3.5** mph	-	N/A		Clear
11:54 AM	**72.0** °F	-	**54.0** °F	53%	**29.99** in	**10.0** mi	WSW	**5.8** mph	-	N/A		Clear
12:54 PM	**77.0** °F	-	**54.0** °F	45%	**29.96** in	**10.0** mi	SW	**6.9** mph	-	N/A		Clear
1:54 PM	**79.0** °F	-	**54.0** °F	42%	**29.94** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Clear
2:54 PM	**80.1** °F	**80.0** °F	**54.0** °F	40%	**29.92** in	**10.0** mi	SSW	**8.1** mph	-	N/A		Clear
3:54 PM	**80.1** °F	**80.1** °F	**55.0** °F	42%	**29.91** in	**10.0** mi	SSW	**12.7** mph	-	N/A		Clear
4:54 PM	**79.0** °F	-	**57.9** °F	48%	**29.90** in	**10.0** mi	SW	**13.8** mph	-	N/A		Clear

5:21 PM	**78.8** °F	-	**55.4** °F	44%	**29.92** in	**10.0** mi	West	**16.1** mph	-	N/A		Clear
5:54 PM	**75.9** °F	-	**57.0** °F	52%	**29.89** in	**10.0** mi	West	**13.8** mph	-	N/A		Clear
6:54 PM	**72.0** °F	-	**57.0** °F	59%	**29.90** in	**10.0** mi	WSW	**8.1** mph	-	N/A		Clear
7:54 PM	**68.0** °F	-	**55.9** °F	65%	**29.91** in	**10.0** mi	Variable	**3.5** mph	-	N/A		Clear
8:54 PM	**63.0** °F	-	**57.0** °F	81%	**29.91** in	**10.0** mi	South	**6.9** mph	-	N/A		Clear
9:54 PM	**64.0** °F	-	**57.9** °F	80%	**29.92** in	**10.0** mi	South	**3.5** mph	-	N/A		Clear
10:54 PM	**62.1** °F	-	**57.0** °F	84%	**29.91** in	**10.0** mi	South	**5.8** mph	-	N/A		Clear
11:54 PM	**60.1** °F	-	**57.0** °F	90%	**29.91** in	**10.0** mi	Calm	Calm	-	N/A		Clear

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Weather History for Napa County, CA

Tuesday, September 24, 2013

Tuesday, September 24, 2013

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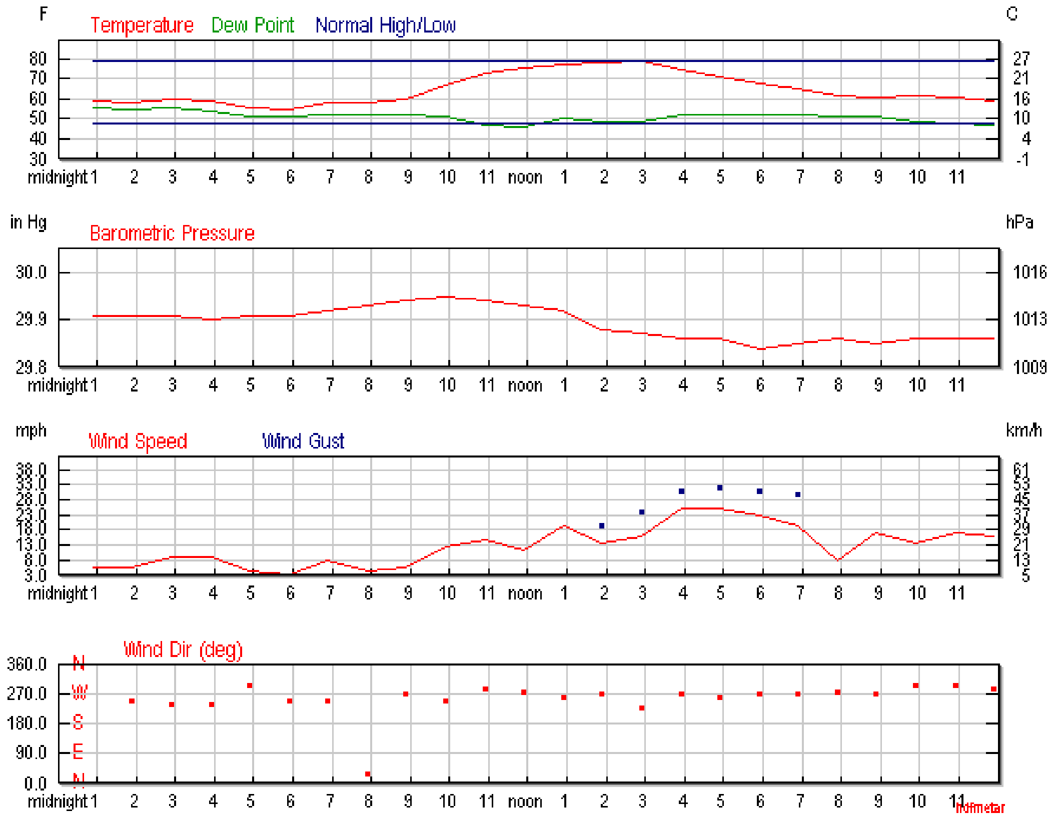
Daily | Weekly | Monthly | Custom

	Actual	Average	Record
Temperature			
Mean Temperature	**66** °F	**63** °F	
Max Temperature	**80** °F	**79** °F	**91** °F (2004)
Min Temperature	**52** °F	**48** °F	**40** °F (2005)
Degree Days			
Heating Degree Days	0		
Month to date heating degree days	13		
Since 1 July heating degree days	49		
Cooling Degree Days	1		
Month to date cooling degree days	62		
Year to date cooling degree days	299		
Growing Degree Days	17 (Base 50)		
Moisture			
Dew Point	**51** °F		
Average Humidity	64		
Maximum Humidity	93		
Minimum Humidity	35		
Precipitation			
Precipitation	**0.00** in	-	**0.62** in (1986)
Month to date precipitation	0.82		
Year to date precipitation	2.79		
Since 1 July precipitation	0.82		
Sea Level Pressure			
Sea Level Pressure	**29.89** in		
Wind			
Wind Speed	**14** mph (West)		
Max Wind Speed	**29** mph		
Max Gust Speed	**36** mph		
Visibility	**10** miles		
Events			

T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary



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Hourly Weather History & Observations

Time (PDT)	Temp.	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**59.0** °F	**55.9** °F	90%	**29.91** in	**10.0** mi	SSW	**5.8** mph	-	N/A		Clear
1:54 AM	**57.9** °F	**55.0** °F	90%	**29.91** in	**10.0** mi	WSW	**5.8** mph	-	N/A		Clear
2:54 AM	**60.1** °F	**55.9** °F	86%	**29.91** in	**10.0** mi	WSW	**9.2** mph	-	N/A		Clear
3:54 AM	**59.0** °F	**54.0** °F	83%	**29.90** in	**10.0** mi	WSW	**9.2** mph	-	N/A		Clear
4:54 AM	**55.9** °F	**51.1** °F	84%	**29.91** in	**10.0** mi	WNW	**4.6** mph	-	N/A		Clear
5:54 AM	**55.0** °F	**51.1** °F	86%	**29.91** in	**10.0** mi	WSW	**3.5** mph	-	N/A		Clear
6:54 AM	**57.9** °F	**52.0** °F	81%	**29.92** in	**10.0** mi	WSW	**8.1** mph	-	N/A		Clear
7:54 AM	**57.9** °F	**52.0** °F	81%	**29.93** in	**10.0** mi	NNE	**4.6** mph	-	N/A		Mostly Cloudy
8:54 AM	**60.1** °F	**52.0** °F	75%	**29.94** in	**10.0** mi	West	**5.8** mph	-	N/A		Clear
9:54 AM	**66.9** °F	**51.1** °F	57%	**29.95** in	**10.0** mi	WSW	**12.7** mph	-	N/A		Clear
10:54 AM	**73.0** °F	**46.9** °F	39%	**29.94** in	**10.0** mi	WNW	**15.0** mph	-	N/A		Clear
11:54 AM	**75.9** °F	**46.0** °F	35%	**29.93** in	**10.0** mi	West	**11.5** mph	-	N/A		Clear
12:54 PM	**77.0** °F	**50.0** °F	39%	**29.92** in	**10.0** mi	West	**19.6** mph	**26.5** mph	N/A		Clear

1:54 PM	**78.1** °F	**48.9** °F	36%	**29.88** in	**10.0** mi	West	**13.8** mph	**19.6** mph	N/A		Clear
2:54 PM	**79.0** °F	**48.9** °F	35%	**29.87** in	**10.0** mi	SW	**16.1** mph	**24.2** mph	N/A		Clear
3:54 PM	**75.0** °F	**52.0** °F	44%	**29.86** in	**10.0** mi	West	**25.3** mph	**31.1** mph	N/A		Clear
4:54 PM	**71.1** °F	**52.0** °F	51%	**29.86** in	**10.0** mi	West	**25.3** mph	**32.2** mph	N/A		Clear
5:54 PM	**68.0** °F	**52.0** °F	56%	**29.84** in	**10.0** mi	West	**23.0** mph	**31.1** mph	N/A		Clear
6:54 PM	**64.9** °F	**52.0** °F	63%	**29.85** in	**10.0** mi	West	**19.6** mph	**29.9** mph	N/A		Clear
7:54 PM	**62.1** °F	**51.1** °F	67%	**29.86** in	**10.0** mi	West	**8.1** mph	-	N/A		Clear
8:54 PM	**61.0** °F	**51.1** °F	70%	**29.85** in	**10.0** mi	West	**17.3** mph	**23.0** mph	N/A		Clear
9:54 PM	**62.1** °F	**48.9** °F	62%	**29.86** in	**10.0** mi	WNW	**13.8** mph	-	N/A		Clear
10:54 PM	**61.0** °F	**48.0** °F	62%	**29.86** in	**10.0** mi	WNW	**17.3** mph	-	N/A		Clear
11:54 PM	**59.0** °F	**46.9** °F	64%	**29.86** in	**10.0** mi	WNW	**16.1** mph	**20.7** mph	N/A		Clear

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Weather History for Napa County, CA

Wednesday, September 25, 2013

Wednesday, September 25, 2013

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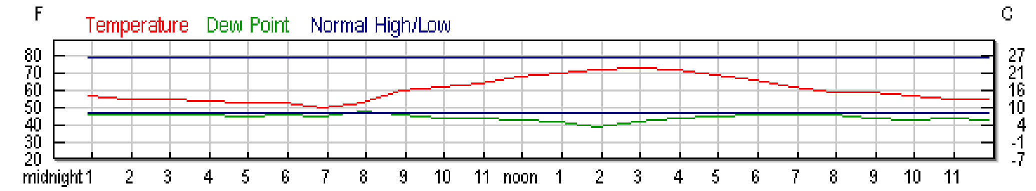
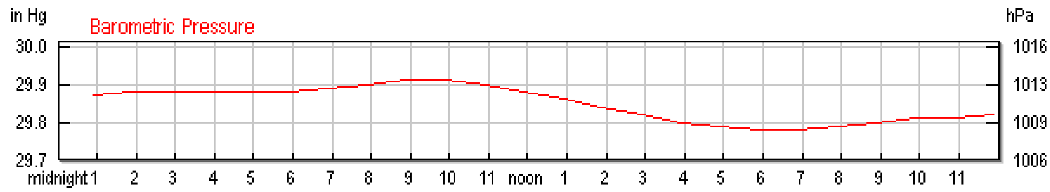
Daily | Weekly | Monthly | Custom

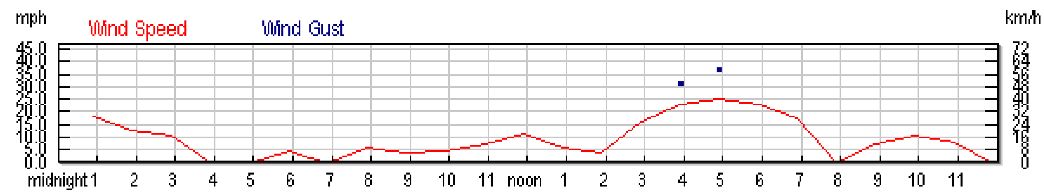
	Actual	Average	Record
Temperature			
Mean Temperature	**62** °F	**63** °F	
Max Temperature	**74** °F	**79** °F	**95** °F (2010)
Min Temperature	**49** °F	**47** °F	**37** °F (2005)
Degree Days			
Heating Degree Days	3		
Month to date heating degree days	16		
Since 1 July heating degree days	52		
Cooling Degree Days	0		
Month to date cooling degree days	62		
Year to date cooling degree days	299		
Growing Degree Days	12 (Base 50)		
Moisture			
Dew Point	**45** °F		
Average Humidity	57		
Maximum Humidity	83		
Minimum Humidity	31		
Precipitation			
Precipitation	**0.00** in	-	**0.26** in (1986)
Month to date precipitation	0.82		
Year to date precipitation	2.79		
Since 1 July precipitation	0.82		
Sea Level Pressure			
Sea Level Pressure	**29.85** in		
Wind			
Wind Speed	**8** mph (WNW)		
Max Wind Speed	**30** mph		
Max Gust Speed	**37** mph		
Visibility	**10** miles		
Events			

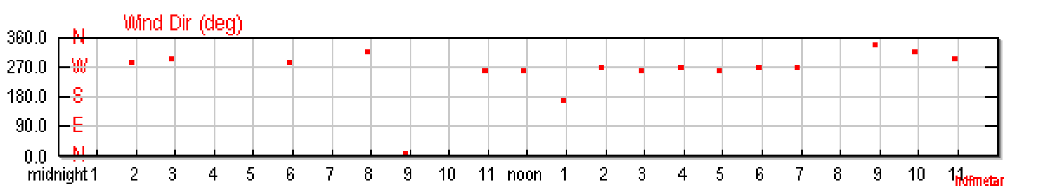
T = Trace of Precipitation, **MM** = Missing Value

Source: NWS Daily Summary









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Hourly Weather History & Observations

Time (PDT)	Temp.	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
12:54 AM	**57.0** °F	**46.9** °F	69%	**29.87** in	**10.0** mi	WNW	**18.4** mph	-	N/A		Clear
1:54 AM	**55.0** °F	**46.9** °F	74%	**29.88** in	**10.0** mi	WNW	**12.7** mph	-	N/A		Clear
2:54 AM	**55.9** °F	**46.9** °F	72%	**29.88** in	**10.0** mi	WNW	**10.4** mph	-	N/A		Clear
3:54 AM	**54.0** °F	**46.0** °F	75%	**29.88** in	**10.0** mi	Calm	Calm	-	N/A		Clear
4:54 AM	**53.1** °F	**45.0** °F	74%	**29.88** in	**10.0** mi	Calm	Calm	-	N/A		Clear
5:54 AM	**53.1** °F	**46.0** °F	77%	**29.88** in	**10.0** mi	WNW	**4.6** mph	-	N/A		Clear
6:54 AM	**50.0** °F	**45.0** °F	83%	**29.89** in	**10.0** mi	Calm	Calm	-	N/A		Clear
7:54 AM	**53.1** °F	**48.9** °F	86%	**29.90** in	**10.0** mi	NW	**5.8** mph	-	N/A		Clear
8:54 AM	**60.1** °F	**46.9** °F	62%	**29.91** in	**10.0** mi	North	**3.5** mph	-	N/A		Clear
9:54 AM	**62.1** °F	**44.1** °F	52%	**29.91** in	**10.0** mi	Variable	**4.6** mph	-	N/A		Clear
10:54 AM	**64.9** °F	**44.1** °F	47%	**29.90** in	**10.0** mi	West	**6.9** mph	-	N/A		Clear
11:54 AM	**68.0** °F	**43.0** °F	40%	**29.88** in	**10.0** mi	West	**11.5** mph	-	N/A		Clear
12:54 PM	**70.0** °F	**42.1** °F	36%	**29.86** in	**10.0** mi	South	**5.8** mph	-	N/A		Clear

1:54 PM	**72.0** °F	**39.9** °F	31%	**29.84** in	**10.0** mi	West	**3.5** mph	-	N/A		Clear
2:54 PM	**73.0** °F	**42.1** °F	33%	**29.82** in	**10.0** mi	West	**16.1** mph	**23.0** mph	N/A		Partly Cloudy
3:54 PM	**72.0** °F	**44.1** °F	37%	**29.80** in	**10.0** mi	West	**23.0** mph	**31.1** mph	N/A		Clear
4:54 PM	**69.1** °F	**45.0** °F	42%	**29.79** in	**10.0** mi	West	**25.3** mph	**36.8** mph	N/A		Clear
5:54 PM	**66.0** °F	**46.0** °F	48%	**29.78** in	**10.0** mi	West	**23.0** mph	-	N/A		Clear
6:54 PM	**62.1** °F	**46.9** °F	58%	**29.78** in	**10.0** mi	West	**17.3** mph	-	N/A		Clear
7:54 PM	**59.0** °F	**46.0** °F	62%	**29.79** in	**10.0** mi	Calm	Calm	-	N/A		Clear
8:54 PM	**59.0** °F	**44.1** °F	58%	**29.80** in	**10.0** mi	NNW	**6.9** mph	-	N/A		Clear
9:54 PM	**57.0** °F	**43.0** °F	59%	**29.81** in	**10.0** mi	NW	**10.4** mph	-	N/A		Clear
10:54 PM	**55.0** °F	**44.1** °F	67%	**29.81** in	**10.0** mi	WNW	**8.1** mph	-	N/A		Clear
11:54 PM	**55.0** °F	**43.0** °F	64%	**29.82** in	**10.0** mi	Calm	Calm	-	N/A		Clear

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APPENDIX D

Construction Noise Calculation Sheets

Demolition

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 03/10/2014

Case Description: Warehouse Demolition

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL1	Residential	54.0	50.0	48.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	1968.5	0.0
Excavator	No	40		80.7	1968.5	0.0
Excavator	No	40		80.7	1968.5	0.0
Crane	No	16		80.6	1968.5	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	1968.5	0.0
Grapple (on backhoe)	No	40		87.0	1968.5	0.0
Dump Truck	No	40		76.5	1968.5	0.0
All Other Equipment > 5 HP	No	50	85.0		1968.5	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Front End Loader	47.2	46.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	48.8	47.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	48.8	47.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	48.6	43.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mounted Impact Hammer (hoe ram)	58.4	54.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grapple (on backhoe)	55.1	54.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dump Truck	44.5	43.6	N/A	N/A	N/A									

Equipment	Calculated Lmax	Calculated L10	Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Demolition							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
							N/A							
All Other Equipment > 5 HP	53.1	53.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	58.4	59.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL2	Residential	52.0	48.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	1082.7	0.0
Excavator	No	40		80.7	1082.7	0.0
Excavator	No	40		80.7	1082.7	0.0
Crane	No	16		80.6	1082.7	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	1082.7	0.0
Grapple (on backhoe)	No	40		87.0	1082.7	0.0
Dump Truck	No	40		76.5	1082.7	0.0
All Other Equipment > 5 HP	No	50	85.0		1082.7	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Front End Loader	52.4	51.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	54.0	53.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	54.0	53.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	53.8	48.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mounted Impact Hammer (hoe ram)	63.6	59.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grapple (on backhoe)	60.3	59.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Demolition

Equipment	Calculated Lmax (dBA)	Calculated L10 (dBA)	Noise Limits Day Lmax	Noise Limits Day L10	Noise Limits Evening Lmax	Noise Limits Evening L10	Noise Limits Night Lmax	Noise Limits Night L10	Exceedance Day Lmax	Exceedance Day L10	Exceedance Evening Lmax	Exceedance Evening L10	Exceedance Night Lmax	Exceedance Night L10
Dump Truck	49.7	48.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP	58.3	58.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	63.6	64.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL3	Residential	49.0	45.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Front End Loader	No	40		79.1	721.8	0.0
Excavator	No	40		80.7	721.8	0.0
Excavator	No	40		80.7	721.8	0.0
Crane	No	16		80.6	721.8	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	721.8	0.0
Grapple (on backhoe)	No	40		87.0	721.8	0.0
Dump Truck	No	40		76.5	721.8	0.0
All Other Equipment > 5 HP	No	50	85.0		721.8	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Front End Loader	55.9	54.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	57.5	56.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	57.5	56.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	57.4	52.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mounted Impact Hammer (hoe ram)	67.1	63.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grapple (on backhoe)	63.8	62.8	N/A	N/A	N/A									

Demolition
N/A N/A N/A N/A N/A N/A N/A N/A N/A
Dump Truck 53.3 52.3 N/A N/A N/A
N/A N/A N/A N/A N/A N/A N/A N/A N/A
All Other Equipment > 5 HP 61.8 61.8 N/A N/A N/A
N/A N/A N/A N/A N/A N/A N/A N/A N/A
Total 67.1 68.5 N/A N/A N/A
N/A N/A N/A N/A N/A N/A N/A N/A N/A

Piling
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 03/10/2014
Case Description: General Mills Demolition

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL1	Residential	54.0	50.0	48.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Impact Pile Driver	Yes	20		101.3	1427.2	0.0

Results

Noise Limits (dBA)
Noise Limit Exceedance (dBA)

Equipment	Calculated (dBA) Lmax	L10	Day Lmax	L10	Evening Lmax	L10	Night Lmax	L10	Day Lmax	L10	Evening Lmax	L10	Night Lmax	L10
Impact Pile Driver	72.2	68.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	72.2	68.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL2	Residential	52.0	48.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Impact Pile Driver	Yes	20		101.3	984.3	0.0

Results

Noise Limits (dBA)
Noise Limit Exceedance (dBA)

Calculated (dBA) Day Evening
Night Day Evening Night

Piling

Equipment	Calculated Lmax	Calculated L10	Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Impact Pile Driver	75.4	71.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	75.4	71.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL3	Residential	49.0	45.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Impact Pile Driver	Yes	20		101.3	1148.3	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10
Impact Pile Driver	74.0	70.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	74.0	70.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Ground Works
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 03/10/2014
Case Description: Ground Works VMT

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL1	Residential	54.0	50.0	48.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	623.4	0.0
Excavator	No	40		80.7	623.4	0.0
Excavator	No	40		80.7	623.4	0.0
Front End Loader	No	40		79.1	623.4	0.0
Roller	No	20		80.0	623.4	0.0
Tractor	No	40	84.0		623.4	0.0
Vacuum Street Sweeper	No	10		81.6	623.4	0.0
All Other Equipment > 5 HP	No	50	85.0		623.4	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10
Backhoe	55.6	54.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	58.8	57.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	58.8	57.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	57.2	56.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	58.1	54.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	62.1	61.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vacuum Street Sweeper	59.7	52.7	N/A	N/A	N/A	N/A								

Ground Works

Equipment	Calculated Lmax (dBA)	Calculated L10 (dBA)	Noise Limits Day Lmax	Noise Limits Day L10	Noise Limits Evening Lmax	Noise Limits Evening L10	Noise Limits Night Lmax	Noise Limits Night L10	Exceedance Day Lmax	Exceedance Day L10	Exceedance Evening Lmax	Exceedance Evening L10	Exceedance Night Lmax	Exceedance Night L10
							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP	63.1	63.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	63.1	67.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL2	Residential	52.0	48.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	360.9	0.0
Excavator	No	40		80.7	360.9	0.0
Excavator	No	40		80.7	360.9	0.0
Front End Loader	No	40		79.1	360.9	0.0
Roller	No	20		80.0	360.9	0.0
Tractor	No	40	84.0		360.9	0.0
Vacuum Street Sweeper	No	10		81.6	360.9	0.0
All Other Equipment > 5 HP	No	50	85.0		360.9	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Backhoe	60.4	59.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	63.5	62.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	63.5	62.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	61.9	61.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	62.8	58.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	66.8	65.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Ground Works

Equipment	Calculated (dBA) Lmax	Calculated (dBA) L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Vacuum Street Sweeper	64.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP	67.8	67.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	67.8	72.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL3	Residential	49.0	45.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	705.4	0.0
Excavator	No	40		80.7	705.4	0.0
Excavator	No	40		80.7	705.4	0.0
Front End Loader	No	40		79.1	705.4	0.0
Roller	No	20		80.0	705.4	0.0
Tractor	No	40	84.0		705.4	0.0
Vacuum Street Sweeper	No	10		81.6	705.4	0.0
All Other Equipment > 5 HP	No	50	85.0		705.4	0.0

Results

Equipment	Calculated (dBA) Lmax	Calculated (dBA) L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Backhoe	54.6	53.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	57.7	56.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Excavator	57.7	56.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Front End Loader	56.1	55.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller	57.0	53.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	61.0	60.0	N/A	N/A	N/A	N/A								

Ground Works														
	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A						
Vacuum Street Sweeper	58.6	51.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP	62.0	62.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	62.0	66.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Concrete & Steel Noise Model
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 03/10/2014
Case Description: General Mills Demolition

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL1	Residential	54.0	50.0	48.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	590.6	0.0
Concrete Pump Truck	No	20		81.4	590.6	0.0
Concrete Saw	No	20		89.6	590.6	0.0
Crane	No	16		80.6	590.6	0.0
Drum Mixer	No	50		80.0	590.6	0.0
Flat Bed Truck	No	40		74.3	590.6	0.0
Pneumatic Tools	No	50		85.2	590.6	0.0
Welder / Torch	No	40		74.0	590.6	0.0

Results

Equipment	Calculated (dBA) Lmax	L10	Noise Limits (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10	Noise Limit Exceedance (dBA) Day Lmax	Day L10	Evening Lmax	Evening L10	Night Lmax	Night L10
Concrete Mixer Truck	57.4	56.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Pump Truck	60.0	56.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw	68.1	64.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	59.1	54.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Drum Mixer	58.6	58.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flat Bed Truck	52.8	51.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pneumatic Tools	63.7	63.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	52.6	51.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	68.1	68.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL 2	Residential	52.0	48.0	45.0

Concrete & Steel Noise Model

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	393.7	0.0
Concrete Pump Truck	No	20		81.4	393.7	0.0
Concrete Saw	No	20		89.6	393.7	0.0
Crane	No	16		80.6	393.7	0.0
Drum Mixer	No	50		80.0	393.7	0.0
Flat Bed Truck	No	40		74.3	393.7	0.0
Pneumatic Tools	No	50		85.2	393.7	0.0
Welder / Torch	No	40		74.0	393.7	0.0

Results

	Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10
Concrete Mixer Truck	60.9	59.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Pump Truck	63.5	59.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw	71.7	67.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	62.6	57.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Drum Mixer	62.1	62.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flat Bed Truck	56.3	55.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pneumatic Tools	67.3	67.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	56.1	55.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	71.7	72.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
NSL3	Residential	49.0	45.0	45.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	695.5	0.0
Concrete Pump Truck	No	20		81.4	695.5	0.0
Concrete Saw	No	20		89.6	695.5	0.0
Crane	No	16		80.6	695.5	0.0

Concrete & Steel Noise Model

Drum Mixer	No	50	80.0	695.5	0.0
Flat Bed Truck	No	40	74.3	695.5	0.0
Pneumatic Tools	No	50	85.2	695.5	0.0
Welder / Torch	No	40	74.0	695.5	0.0

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10
Concrete Mixer Truck	55.9	55.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Pump Truck	58.5	54.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw	66.7	62.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane	57.7	52.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Drum Mixer	57.1	57.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Flat Bed Truck	51.4	50.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pneumatic Tools	62.3	62.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	51.1	50.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	66.7	67.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

APPENDIX E

Noise Model Results

Report: Table of Control
Model: Port Model - Phase 1 (updated loading frequency)
Path: C:\Users\ssmyth.AWNCONSULTING\Documents\Temp Predictor Models\Ecocem\
Group: (main group)
Period: Ldn

Name	Description	NSL10_A	NSL1_A	NSL2_A	NSL3_A	NSL4_A	NSL5_A	NSL6_A	NSL7_A	NSL8_A	NSL9_A
S01	Ships 20.000 tot 60.000 ton	28	37	41	33	34	33	25	23	39	15
	Wheeled loaders (100 kW < > 200 kW) hopper 2	21	27	34	30	33	27	17	11	32	12
	Stockyard Activity	34	44	47	39	43	37	29	23	47	18
	Gravel Loading No. 3	24	36	43	31	30	28	20	19	37	7
	Gravel Loading No. 2	24	29	29	30	37	29	21	18	37	7
	Gravel Loading Rail Surge Bin	35	34	52	45	48	39	31	29	46	24
	Wheeled loaders (100 kW < > 200 kW) hopper 3	20	28	39	26	33	26	16	12	31	12
1	Transshipment gravel/ore/coal @ train	14	14	22	23	25	16	7	5	28	5
	Wheeled loaders (100 kW < > 200 kW) hopper 1	28	25	25	37	40	32	23	21	38	16
	Total	39	46	54	47	50	43	35	32	51	27
	(no category)	--	--	--	--	--	--	--	--	--	--
	Exceeding	--	--	--	--	--	--	--	--	--	--

All shown dB values are A-weighted

Report: Table of Control
Model: Port Model - Phase 1
Path: C:\Users\ssmyth.AWNCONSULTING\Documents\Temp Predictor Models\Ecocem\
Group: (main group)
Period: Ldn

Name	Description	NSL10_A	NSL1_A	NSL2_A	NSL3_A	NSL4_A	NSL5_A	NSL6_A	NSL7_A	NSL8_A	NSL9_A
S01	Ships 20.000 tot 60.000 ton	28	37	41	33	34	33	25	23	39	15
	Wheeled loaders (100 kW < > 200 kW) hopper 2	21	27	34	30	33	27	17	11	32	12
	Stockyard Activity	33	43	46	38	42	36	28	22	46	17
	Gravel Loading No. 3	24	36	43	31	30	28	20	19	37	7
	Gravel Loading No. 2	24	29	29	30	37	29	21	18	37	7
	Wheeled loaders (100 kW < > 200 kW) hopper 3	20	28	39	26	33	26	16	12	31	12
	Total	35	45	49	41	45	39	31	27	48	21
	(no category)	--	--	--	--	--	--	--	--	--	--
	Exceeding	--	--	--	--	--	--	--	--	--	--

All shown dB values are A-weighted

Report: Table of Control
Model: Port Model - Phase 2 - updated loading frequency
Path: C:\Users\ssmyth.AWNCONSULTING\Documents\Temp Predictor Models\Ecocem\
Group: (main group)
Period: Ldn

Name	Description	NSL10_A	NSL1_A	NSL2_A	NSL3_A	NSL4_A	NSL5_A	NSL6_A	NSL7_A	NSL8_A	NSL9_A
S01	Ships 20.000 tot 60.000 ton	28	37	41	33	34	33	25	23	39	15
	Wheeled loaders (100 kW < > 200 kW) hopper 2	21	27	34	30	33	27	17	11	32	12
	Stockyard Activity	33	43	46	38	42	36	28	22	46	17
	Transshipment gravel/ore/coal	36	39	42	42	45	40	31	26	46	18
	Gravel Loading No. 3	24	36	43	31	30	28	20	19	37	7
	Gravel Loading No. 2	24	29	29	30	37	29	21	18	37	7
	Gravel Loading Rail Surge Bin	35	34	52	45	48	39	31	29	46	24
	Wheeled loaders (100 kW < > 200 kW) hopper 3	20	28	39	26	33	26	16	12	31	12
	Gravel Barge Loading	36	38	31	44	45	41	34	31	49	28
	Transshipment gravel/ore/coal @ Barge	31	31	34	33	36	36	26	16	38	15
1	Transshipment gravel/ore/coal @ train	14	14	22	23	25	16	7	5	28	5
	Wheeled loaders (100 kW < > 200 kW) hopper 1	28	25	25	37	40	32	23	21	38	16
	Wheeled loaders (100 kW < > 200 kW) barge	30	36	25	38	40	36	28	25	44	20
	Total	42	47	54	50	52	47	39	35	54	31
	(no category)	--	--	--	--	--	--	--	--	--	--
	Exceeding	--	--	--	--	--	--	--	--	--	--

All shown dB values are A-weighted

Report: Table of Control
Model: Port Model - Phase 2
Path: C:\Users\ssmyth.AWNCONSULTING\Documents\Temp Predictor Models\Ecocem\
Group: (main group)
Period: Ldn

Name	Description	NSL10_A	NSL1_A	NSL2_A	NSL3_A	NSL4_A	NSL5_A	NSL6_A	NSL7_A	NSL8_A	NSL9_A
S01	Ships 20.000 tot 60.000 ton	28	37	41	33	34	33	25	23	39	15
	Wheeled loaders (100 kW < > 200 kW) hopper 2	21	27	34	30	33	27	17	11	32	12
	Stockyard Activity	33	43	46	38	42	36	28	22	46	17
	Transshipment gravel/ore/coal	36	39	42	42	45	40	31	26	46	18
	Gravel Loading No. 3	24	36	43	31	30	28	20	19	37	7
	Gravel Loading No. 2	24	29	29	30	37	29	21	18	37	7
	Wheeled loaders (100 kW < > 200 kW) hopper 3	20	28	39	26	33	26	16	12	31	12
	Wheeled loaders (100 kW < > 200 kW) spare	22	24	29	29	35	27	17	11	28	1
	Total	39	46	50	44	48	42	34	30	50	23
	(no category)	--	--	--	--	--	--	--	--	--	--
	Exceeding	--	--	--	--	--	--	--	--	--	--

All shown dB values are A-weighted

APPENDIX F

Noise Model Details

F.0 NOISE MODEL AND ASSESSMENT ASSUMPTIONS

The following sections discuss the noise modeling methodologies used to predict the calculated noise levels discussed throughout this report. In summary the following calculation methodologies have been used:

- ISO 9613-2:1996 Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation.
- Federal Highway Administration's Traffic Noise Model®(FHWA TNM), Version 2.5

F.1 ISO9613

F1.1 Noise Propagation Calculation

Brüel & Kjær Predictor Type 7810 is a proprietary noise calculation package for computing noise levels in the vicinity of industrial sites. Calculations are based on ISO 9613-2:1996 Acoustics – Attenuation of sound outdoors – Part 2: General method of calculation. This method has the scope to take into account a range of factors affecting the sound propagation, including:

- the magnitude of the noise source in terms of sound power;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- attenuation due to atmospheric absorption;
- meteorological effects such as wind gradient, temperature gradient, humidity (these have significant impact at distances greater than approximately 1,310').

Calculations have been performed in octave bands from 63Hz to 8kHz as well as in overall dB(A) terms.

F1.2 Brief Description of ISO 9613-2: 1996

ISO 9613-2:1996 calculates the noise level based on each of the factors discussed previously in Section E1.1. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, L_{AT}(DW), for the following conditions:

- wind direction at an angle of ±45° to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately 3fts^{-1} and 15fts^{-1}, measured at a height of 10ft to 36ft above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating $L_{AT(DW)}$ from any point source at any receiver location is given by:

$$L_{fT}(DW) = L_W + D_c - A \qquad \textbf{\textit{Eqn. F.1.1}}$$

Where:

$L_{fT}(DW)$	is an octave band centre frequency component of $L_{AT(DW)}$ in dB relative to $2x10^{-5}$Pa;
L_W	is the octave band sound power of the point source;
D_c	is the directivity correction for the point source;
A	is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table F1 below:

Height, h*	Distance, d†	
	0 < d < 330'	330' < d < 3,280'
0<h<16'	±3dB	±3dB
16'<h<100'	±1dB	±3dB

Table F1 Estimated accuracy for broadband noise of L_{AT}(DW)

* h is the mean height of the source and receiver in feet.
† d is the mean distance between the source and receiver in feet.

N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

F1.3 Initial Configuration of the Noise Model

The input to the noise model was an overall site plan, a set of buildings and noise sources. The buildings in the model were restricted to those on the development site, adjacent buildings and nearby noise sensitive locations. The ground model has been developed from the topographical survey of the site that has been provided. Figures F1 and F2 illustrate the noise model developed for the operation illustrating how the surrounding topography has been included.

Figure E1 Noise Model Topography

Figure F2 Noise Model Topography in Google Earth

Each noise source was input as sound power in octave bands. The Brüel & Kjær Predictor software accepts sound power levels in octave bands from 63Hz to 8kHz. Each source also has its own position, height and directivity. Figure

In terms of the calculation, a ground attenuation factor (general method) of 1.0 and no metrological correction were assumed for all calculations. The following atmospheric attenuation was assumed for all calculations.

Temp (°F)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
68	50	0.03	0.12	0.44	1.31	2.73	4.66	9.89	29.67

Table F2 Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

F1.4 Output of the Noise Model

Predicted noise levels are calculated for a set of receiver points, which can be chosen by the user. The results include an overall level in dB(A) and an A-weighted spectrum for each item in a list of the contributing sources. The items in the list can be ranked in order of their contribution, and thus the noisiest items can be identified.

F.2 TNM V2.5

F2.1 Noise Propagation Calculation

Brüel & Kjær Predictor Type 7810 is a proprietary noise calculation package for computing noise levels in the vicinity of road networks. Calculations are based on Federal Highway Administration's Traffic Noise Model®(FHWA TNM), Version 2.5 Calculation module. This method has the scope to take into account a range of factors affecting the sound propagation, including:

- the A-weighted 1/3rd octave band noise emission data for a range of vehicle and pavement types;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- attenuation due to atmospheric absorption;

Calculations are performed in octave bands from 63Hz to 8kHz and presented in overall dB(A) terms.

F2.2 Initial Configuration of the Noise Model

The input to the noise model was an overall site plan, a set of buildings and noise sources. The buildings in the model were restricted to those on the development site and those adjacent to the local road network. The ground model has been developed from the topographical survey of the site that has been provided.

In terms of the calculation the following default calculation settings were used:

- Relative humidity – 50%;
- Temperature - 68°F, and;
- Default ground type – Lawn.

F2.3 Output of the Noise Model

Predicted noise levels are calculated for a set of receiver points, which can be chosen by the user. The results include an overall level in dB(A) and an A-weighted spectrum for each item in a list of the contributing sources. The items in the list can be ranked in order of their contribution, and thus the noisiest items can be identified.

APPENDIX G

Low Emission Genset Switcher

Multi-Engine GenSet Ultra Low Emissions Road-Switcher Locomotive

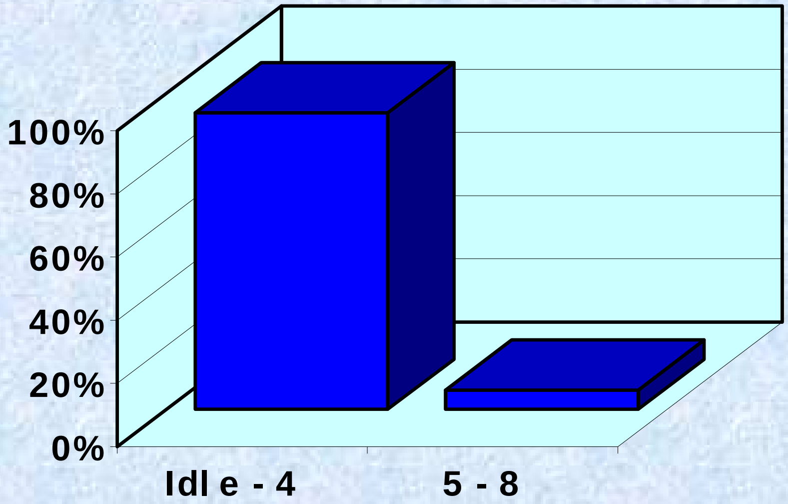
National Railway Equipment Co.

New Locomotive Concept

- Uses Multiple Diesel Engine GenSets that are EPA Tier III Off-Road certified.
- The locomotive is EPA Tier II Railway Industry certified and is recognized by the California Air Resources Board (CARB) as an Ultra Low Emissions Locomotive (ULEL).
- Control the horsepower and rpm levels for each engine in order to achieve even better emissions and fuel consumption rates.
- Manage “start/stop” functionality to minimize engine idling.
- Provide all electrical power to a common connection so that power can be managed to individual traction motors for better adhesion to the rail and provide all necessary power for the operator’s cab, air brake system and equipment cooling.
- Arrange all the major components on the locomotive frame to enhance ease of replacement.

Throttle Schedule

Notch Position	engines running	engine rpm	total horsepower	duty cycle	horsepower weighted
Idle	1	900	25	59.8%	14.95
1	1	1300	125	12.4%	15.50
2	1	1500	225	12.3%	27.68
3	1	1500	425	5.8%	24.65
4	1	1800	650	3.6%	23.40
5	2	1600	850	3.6%	30.60
6	2	1500	1000	1.5%	15.00
7	2	1500	1250	0.2%	2.50
8	2	1800	1400	0.8%	11.20

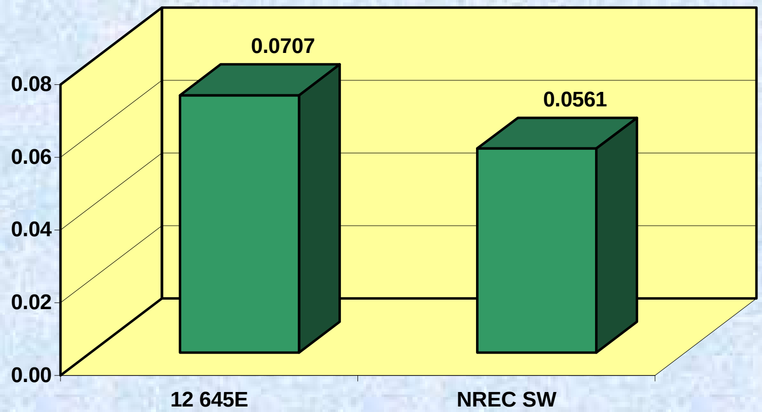


Idle - 4	94%
5 - 8	6%

20.7% Fuel Consumption Savings

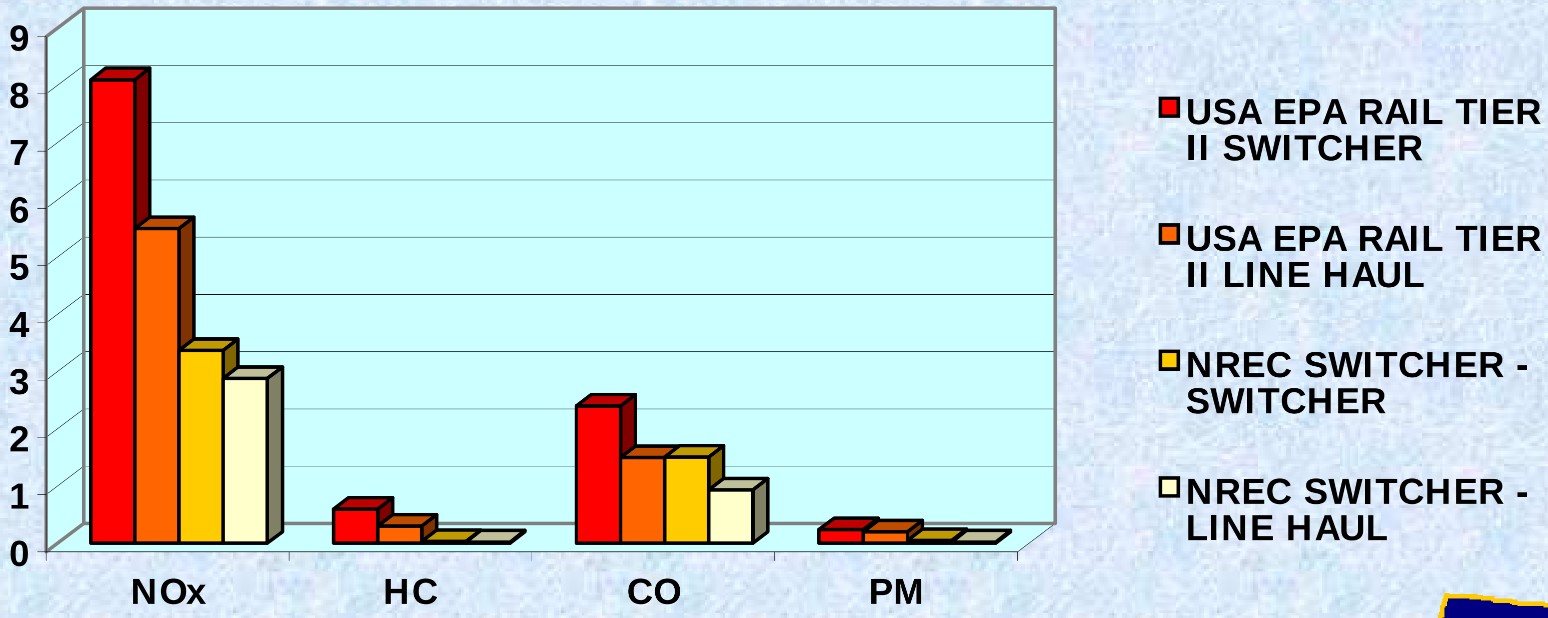
Throttle Notch	12 645E RPM	NREC SW RPM	NREC SW ENGs RUN	12 645E BHP	NREC SW BHP	12 645E Fuel Rate Gal/Hr	NREC SW Fuel Rate Gal/Hr	Duty Cycle %	12 645E Weighted BHP	NREC SW Weighted BHP	12 645E Weighted Gal/Hr	NREC SW Weighted Gal/Hr
8	900	1800	2	1517	1377	90.6	68.86	0.8%	12.14	11.02	0.72	0.55
7	820	1500	2	1334	1210	76.4	65.36	0.2%	2.67	2.42	0.15	0.13
6	729	1500	2	1016	1051	61.1	56.79	1.5%	15.24	15.76	0.92	0.85
5	651	1500	2	858	844	48.0	49.29	3.6%	30.89	30.40	1.73	1.77
4	568	1800	1	641	658	36.0	34.64	3.6%	23.08	23.68	1.30	1.25
3	490	1500	1	415	430	24.0	23.57	5.8%	24.07	24.93	1.39	1.37
2	370	1500	1	221	234	13.7	12.50	12.3%	27.18	28.76	1.69	1.54
1	300	1300	1	62	123	5.6	6.79	12.4%	7.69	15.28	0.70	0.84
Idle	300	900	1	10	44	3.2	2.86	59.8%	5.98	26.31	1.93	1.71
								Totals:	**148.93**	**178.55**	**10.53**	**10.01**

	12 645E	NREC SW	% Diff
Weighted BSFC:	**0.0707**	**0.0561**	**20.7%**

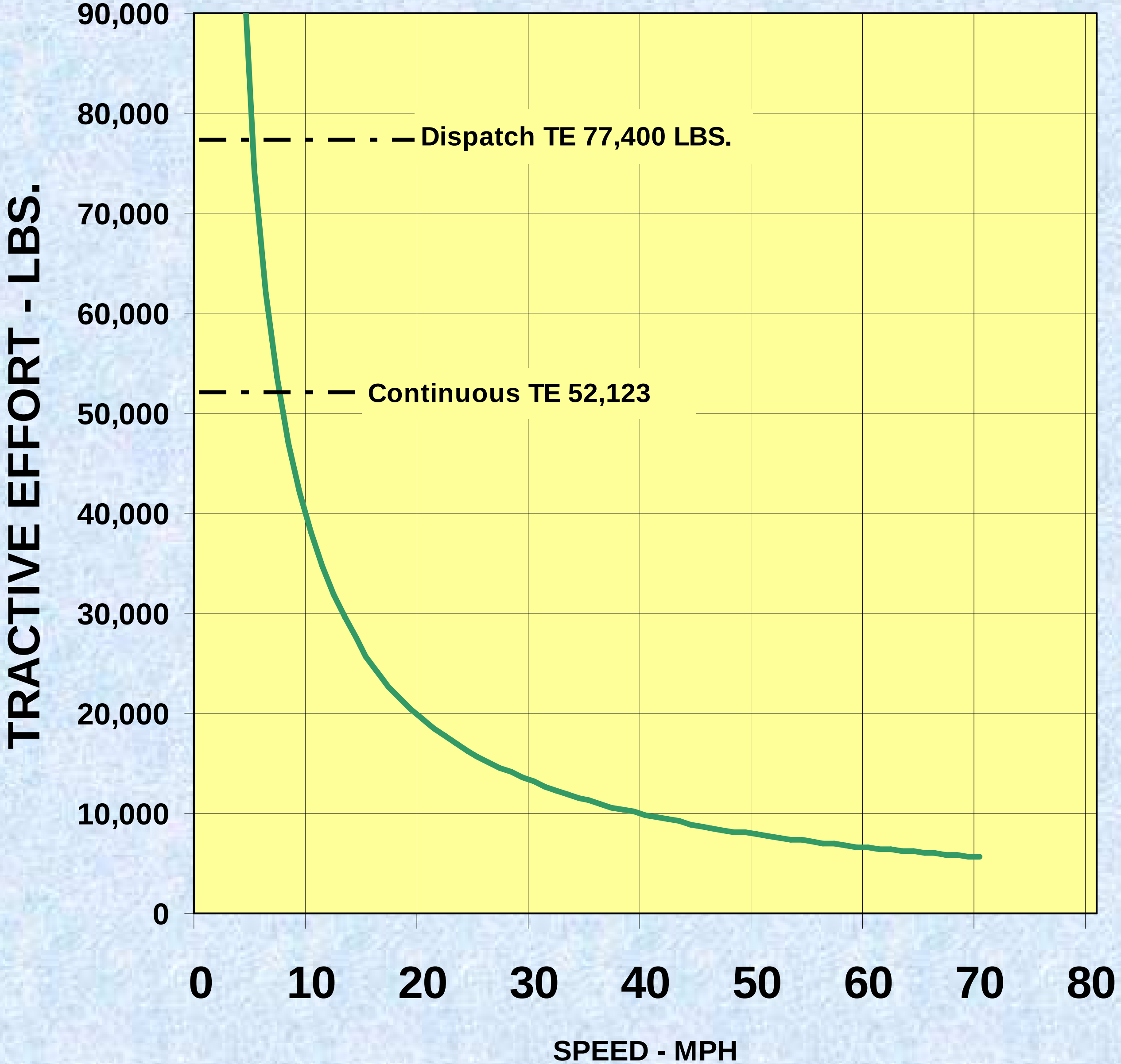


USA EPA EMISSIONS LIMITS FOR LOCOMOTIVES VS. NREC LOW EMISSIONS SWITCHER COMPARISON CHART

EMISSIONS	TIER II RAIL		NREC SWITCHER			
(G/BHP-H)	SWITCHER	LINE HAUL	SWITCHER	% LOWER	LINE HAUL	% LOWER
NOx	8.1	5.5	3.37	58%	2.88	48%
HC	0.6	0.3	0.04	94%	0.02	93%
CO	2.4	1.5	1.51	37%	0.93	38%
PM	0.24	0.2	0.05	80%	0.02	89%



TRACTIVE EFFORT VS SPEED

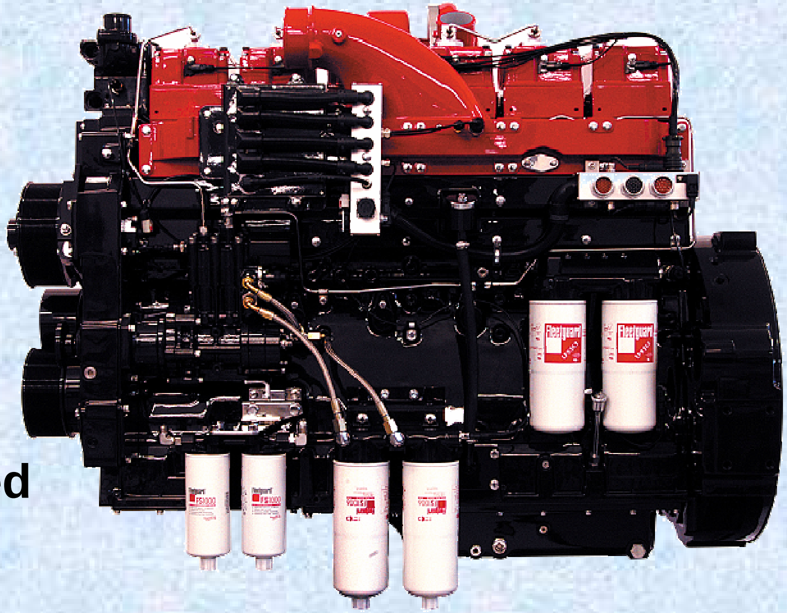


62:15 Gear Ratio
40 inch Wheels
1385 BHP - 129 Tons
D77 Traction Motors

Actual THP May Vary
Entire Curve May Not Be Available At All Times Due To Limitations of Wheel/Rail Adhesion

Dispatch TE is based on 30% adhesion

Cummins QSK19 Tier III



Engine Type = **In-Line, 4-Cycle, 6-Cyl**

Displacement = **1159 cu. In. 19 Liters**

Rated Power = **510-700 BHP 379-522 kW**

Aspiration = **Turbocharged**
Air-to-Air Charge Air Cooled

- The Engine is designed and certified as EPA Tier III Off-Road compliant
- Full Authority Electronic Controls
- Cummins Modular Common-Rail Fuel System
- Over 6500 QSK19 Engines in Industrial Applicatio

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

2006 Model Year Certificate of Conformity

Manufacturer:	**National Railway Equipment Company**
Certificate Number:	NRE-LOC-06-01
Effective Date:	DEC 16 2005
Date Issued:	DEC 16 2005

Merrylin Zaw-Mon, Director
Compliance and Innovative Strategies Division
Office of Transportation and Air Quality

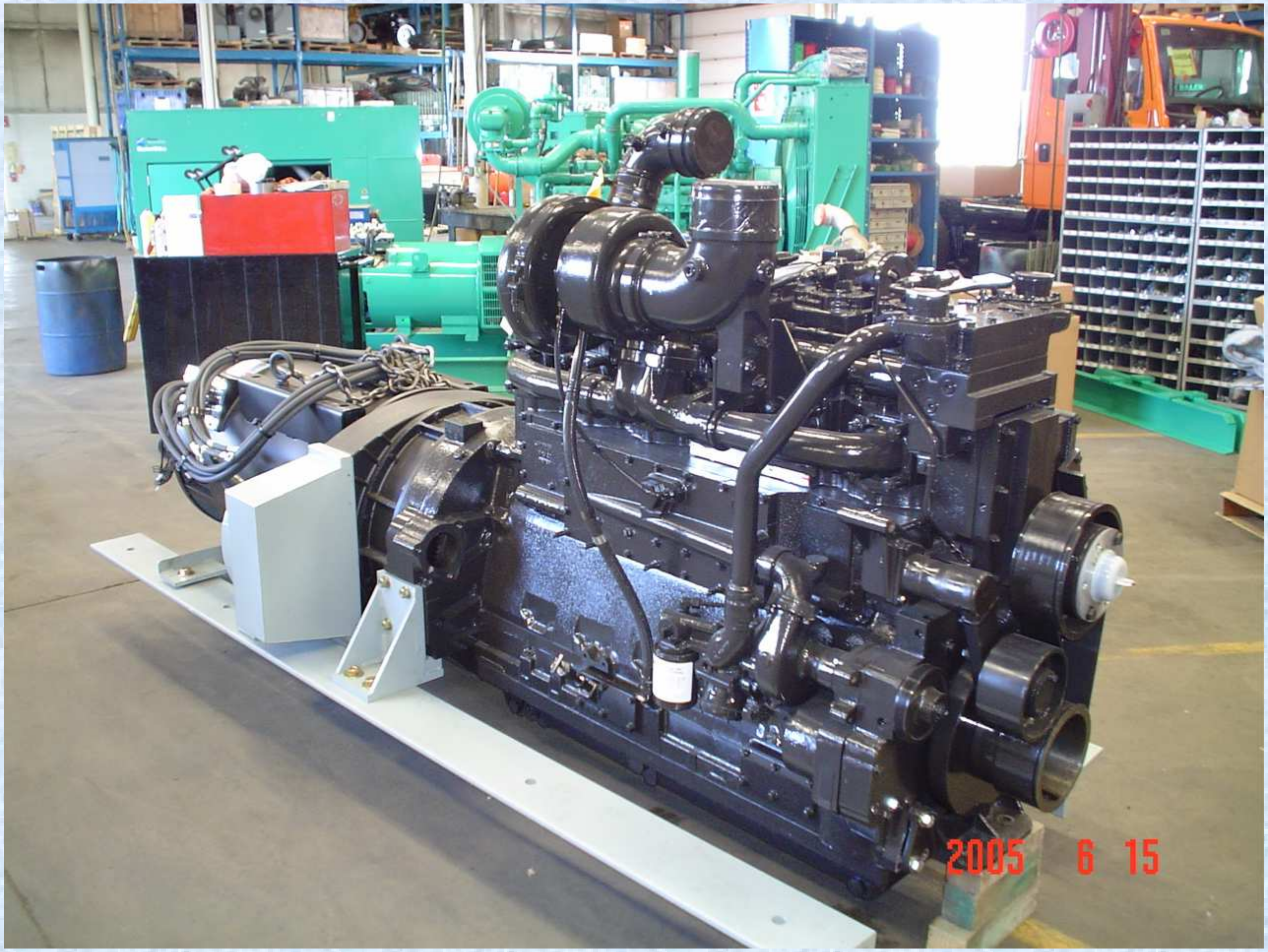
Pursuant to Section 213 of the Clean Air Act (42 U.S.C. section 7547) and 40 CFR 92, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engine which has been found to conform to applicable requirements and which represents the following locomotive engines, by engine family, more fully described in the documentation required by 40 CFR 92 and produced in the stated model year.

Locomotive Engine Family (New engine): 6NREGCM19LOC

This certificate of conformity covers only those new locomotive engines which conform in all material respects to the design specifications that applied to those engines described in the Application for Certification required by 40 CFR 92 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR 92.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 92.215(d)(1) and 92.504 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR 92. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR 92.

The GenSet in Process



Work in Process

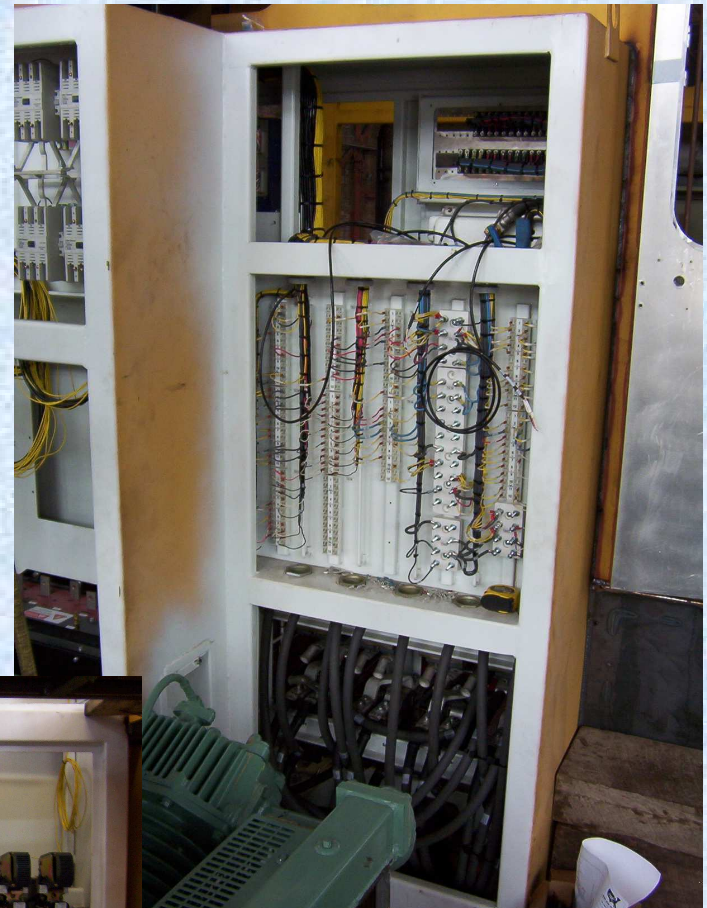
GENSET INSTALLED

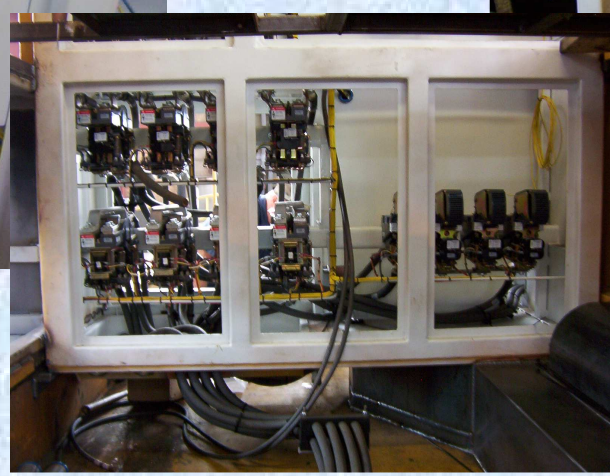
Electronic Propulsion control

- NRE Electronics provides the Electronic Control module called the N-FORCE. This equipment provides all propulsion, accessory equipment, and low voltage control. The N-FORCE is equipped with an Operator Interface Panel (Display) for monitoring of real time events, storing fault and run time data, and performing self tests.

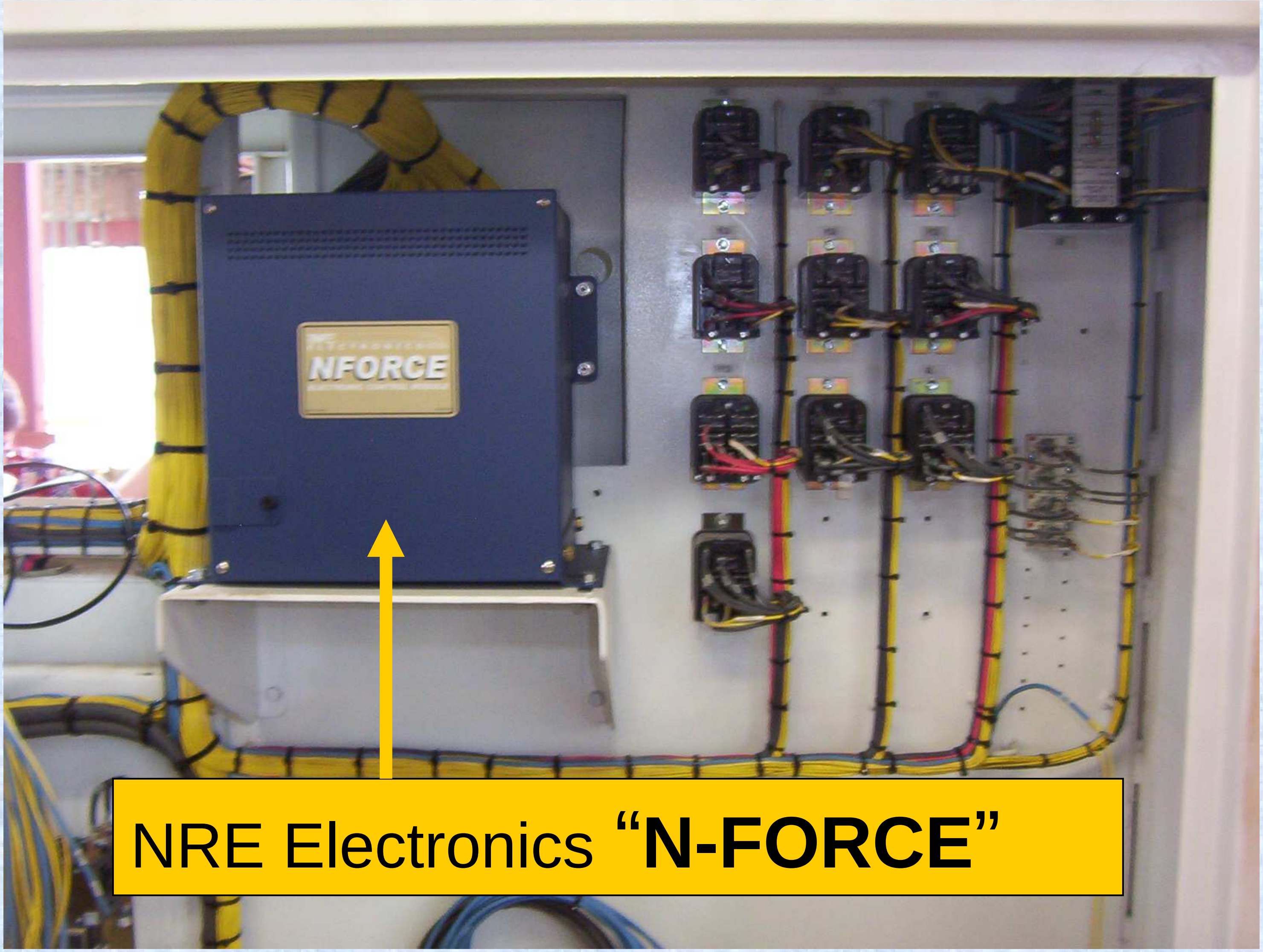
- A high voltage DC Chopper provides propulsion power to each traction motor separately for enhanced adhesion control

Electric Cabinet in Process





Microprocessor

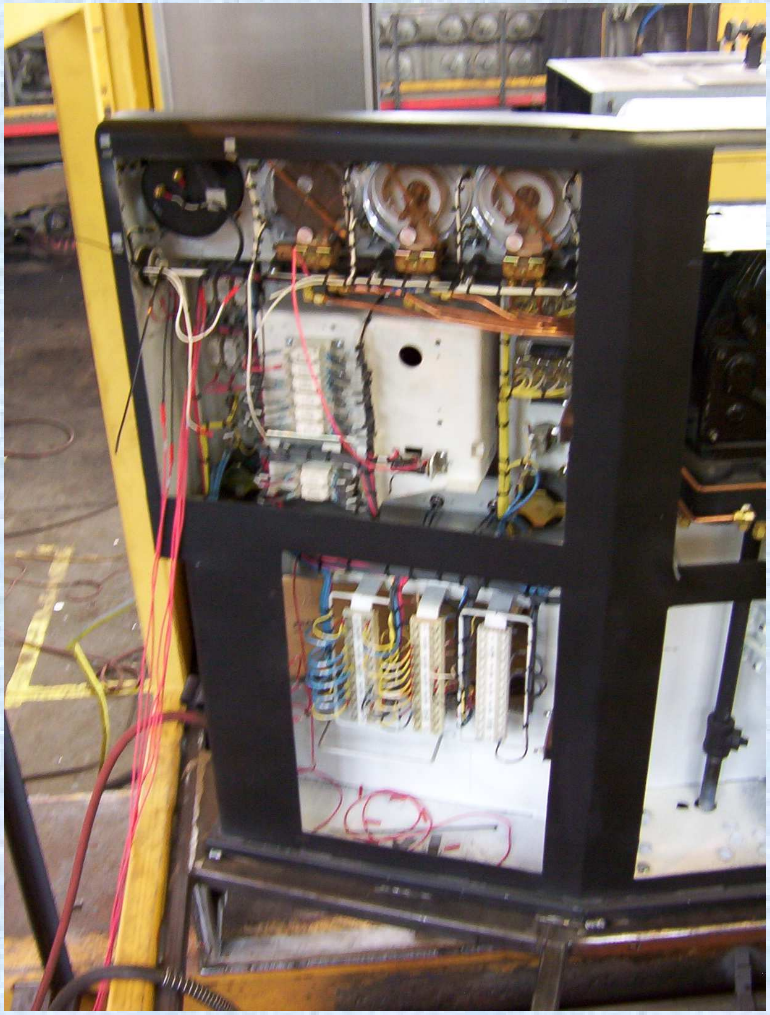


NRE Electronics “**N-FORCE**”

DC Chopper Compartment

Chopper Cooling Air Exhaust

Cab Console in Process



Cab Console Completed

Accessory Equipment

- Equipped with a variable speed 3 phase 240-480 VAC electric motor driven Atlas-Copco model rotary screw air compressor.
- The Equipment blower provides 15,000 cfm cooling air for the traction motors, DC Choppers, DC Rectifier, Low Voltage Power Supply and Electric Cabinet Pressurization.
- The Low Voltage Power Supply Converts 240-480 VAC to 64-74 VDC for battery charging and low voltage control.
- A DC to AC inverter is provided to convert 64-74 VDC to 115 VAC for RV type heating, ventilation and air conditioning (HVAC) power as well as 24 VDC for Low Voltage GenSet Control.
- Equipped with standard 26L air brake.
- NYAB electronic air brake is optional.

Air Compressor and Equipment Blower

RV Type HVAC

OUT WITH THE OLD AND IN WITH THE NEW


ENGINES OF CHANGE
UPY 2005
UPY 2005
Y 2005
UNION PACIFIC
BUILDING AMERICA
LOW EMISSIONS DIESEL
GENSET SWITCHER
ENGINES OF CHANGE

Canadian Pacific Genset Locomotive Trial

Grete Bridgewater

Director Environmental Programs

RAC AGM Conference 2011

October 18, 2011
Calgary Alberta

CANADIAN PACIFIC

Acknowledgements

Eco-Freight Program

Transport Canada Freight Technology Incentives Program

CP Project Team

Bob Goulet, Director, Locomotive and EOT Management
Randy Avery, Director, Crew and Locomotive Resources
Martin Quintal, Director, Rolling Stock and Operations Services
Kevin Lopresti, Locomotive Systems Specialist
Ken Roberge, Environmental Program Development Specialist
Ayan Sarkar, Specialist Sourcing – Locomotives
Jeff Smith, Manager, Special Projects
Renee Zmurchyk, Legal Counsel

Project Rationale

- No new switching locomotives have been manufactured in North America since the mid-1980s with the exception of 50 yard/switcher engines manufactured in early 1990.
  - CP's 276 Road Switchers and 226 Yard Switchers are > 20 years old

- **There is a clear need to modernize the yard/road switching locomotive fleet but with what?**
  - CP is committed to exploring new technologies having tested up to seven new yard and switching engine designs over the past several years.

- Purpose of this project was to evaluate new Genset technology considering:
  - Operational reliability and efficacy in both yard and road switching service
  - Potential fuel savings
  - Potential air emission reductions (CACs and GHG)

Technology

- Two new 3GS21B **N-ViroMotive Ultra Low Emitting Genset Locomotive (4 Axle)** provided by National Railway Equipment Company (NREC).
- Instead of one 2,100 horsepower diesel locomotive engine, they utilize **three independent industrial Cummins diesel engines Gensets** to achieve the same amount of total horsepower. The Gensets are operated individually and in concert to achieve the required amount of horsepower from 700 to 2100.
- The locomotives were also equipped with **glycol-based anti-freeze** system designed to reduce the need for engine idling.
- CP specified **dynamic braking capability**
- N-Viro Motive locomotives utilize United States Environmental Protection Agency (EPA) **Tier III off-road engine technology** and have been EPA certified to switching and line-haul duty cycles at 3.0 g/bhp-hr of NOx.
- The units met and exceeded all current EPA railroad emission standards for **Tier II locomotives**. In addition, the locomotives are recognized by the **California Air Resources Board (CARB) as Ultra Low Emitting Locomotives (ULEL).**

N-ViroMotive Ultra Low Emitting 2100 HP Locomotive

Cost to Purchase

- The cost of the 2 units was approximately $3,000,000.
- Transport Canada's incentive funding covered up to 50% of the cost up to a maximum of $500,000.
- One project objective was also to calculate the cost-effectiveness and payback period for the Gensets

Project Design

- The two Genset locomotives were tested in yard switching service in different yards in Southern Ontario (Oshawa, West Toronto, Gait, Hamilton and Woodstock) and in road service between these locations.
- Data from event recorders on the locomotives were downloaded every Monday and Friday during the test period.
- Locomotives were operated in the following configurations:
  - Gensets configured back-to-back comparing results to locomotive consists used in current assignment;
  - Operate one Genset with an EMD GP-9, GP-38 or SD40-2 in consist;
  - Operate with one Genset isolated and then the other;
  - Operate over the same track gradients with similar tonnage and length

Initial Challenges

- Initial CP Mechanical inspection identified items for correction
- CP Safety & Health Risk Assessment identified additional corrective actions including modifications to various handrails/stanchion and the installation of a handhold
- In the first year of testing (2009), the Genset locomotive availability and reliability was poor - failures due to:
  - Components
  - Engine shutdowns
  - General control firmware updates
  - Design deficiencies

Initial Challenges - Locomotive Availability

- Targets:
  - Availability 92.5%
  - Failures per Locomotive Year (FLY) 4.25

	Availability	FLY
CP2100 (2009)	70.4%	12.81
CP2101 (2009)	75.2%	14.64

Observations from the Crew

- Generally very well received by CP crews
- Cab was spacious and visibility was excellent
- Power from the three engine sets was responsive and seamless
- Noise decibel (dB) levels were within regulatory limits and acceptable to the switching crews
  - Horns were eventually moved to the rear and front of locomotive (removed from cab roof)

Results: Locomotive Availability

- Targets:
  - Availability 92.5%
  - Failures per Locomotive Year (FLY) 4.25

	Availability	FLY
CP2100 (2009)	70.4%	12.81
CP2101 (2009)	75.2%	14.64
CP2100 (2010)	95.0%	1
CP2101 (2010)	90.0%	2

Results: Fuel Consumption

- Fuel records (collected at each fuelling) were used to compare baseline GP9 yard locomotive fuel consumption data with the actual Genset locomotive fuel consumption in yard and switcher services and workload derived in kilowatt hours
- Fuel consumption in road service was calculated from the event recorder data downloaded and compared to baseline duty cycle (time spent in each throttle notch)

Locomotive Service	Fuel Reduction vs GP9 Yard (%)	Fuel Reduction vs GP9 Road (%)
NRE Actual Yard	35.0%	
NRE Actual Road		4.0%

Results: Criteria Air Contaminants (CACs)

- CACs were calculated using GP9 yard duty cycle based on historical event recorder data
- Emission factors were obtained from annual Locomotive Emission Monitoring Reports filed with Transport Canada and NRE

Criteria Air Contaminant	CAC Change vs GP9 Yard (+ or -)
Particulate Matter (PM)	- 235 kg/year
Nitrogen Oxides (NOx)	- 9,231 kg/year
Hydrocarbons (HC)	- 489 kg/year
Sulphur Oxides (SOx)*	- 83.9 g/year
Carbon monoxide (CO)	+ 269 kg/year

* Assuming ULSD

Results: Greenhouse Gases (GHG)

- GHGs were calculated using emission factors and Global Warming Potentials for carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Greenhouse Gas	GHG Change vs GP9 Yard (+ or -)
CO_2e	- 98,985 kg/year

Results: Noise Level

- Gensets had modern cab designs with insulation under the frame to reduce rail-truck road noise and vibration and surrounding ambient noise
- Noise levels at Throttle Notch 8 at No Load

Locomotive	Center of Cab (dB)			End of Walkway (dB)			Conductors (dB)		
Throttle	At idle	#4	#8	At idle	#4	#8	At idle	#4	#8
NRE	66		75	67		75	66		75
GP9 645	69	76	84	70	82	86	69	79	85

Results: Payback Period

- Qualifier:
  - Test period was insufficient to determine full benefits and costs of operating the new technology
- Very high level analysis indicated that over a 26 year period, operating a NRE Genset locomotive instead of a GP9 yard locomotive yields an Internal Rate of Return (IRR) of approximately 8-10%
  - Factors considered:
    - Maintenance
    - Fuel
    - Overhaul costs

* Does not include the acquisition of the locomotive or the grant

Final Conclusions

- Demonstrated **reductions in fuel consumption, criteria air contaminants and greenhouse gases and noise** are significant reasons to continue to investigate new technologies.
- Genset locomotives are **best employed in yard and local switching operations** and not for routine use in road service.
- Genset configuration may effectively **reduce engine in-service failures** by allowing remaining engines to operate at reduced power.
- The modular design may provide opportunities for time-saving and **cost-effective maintenance in the field** but needs further development and exploration.
- This **technology is emerging**: CP found issues e.g. Genset controls, cooling system piping, low voltage power supply configuration. Excellent cooperation from NRE to resolve.
- There is a clear role for **government funding** to continue to develop promising technologies.

Recommendations

- **Design for mobile maintenance**: drain piping easily accessible, complete engine module designed for quick replacement, all external to shop environment.
- **Integrated control system**: individual engine control and central system should be integrated and data formatted to be easily understood by operating crew and Mechanical staff.
- Year round **engine idle reduction**: automated engine stop-start should be added for additional fuel and emissions reductions.
- **Radio communications**: remote monitoring and data download to facilitate failure investigation and expedite repairs.
- **Training**: OEM should prepare comprehensive training modules on components and systems.
- **Technical resources**: on-site OEM technical assistance during warranty period.
- **Contract maintenance**: maintenance service agreement with OEM for parts inventory and service assistance.

APPENDIX H

Rubber Wear Liner

Wear Products

www.metsominerals.com

General Trellex Wear Products

metso
minerals

Control costs with Trellex products

Industrial activities unavoidably result in wear, and wear costs money. That's why it pays to tackle wear with with Trellex wear resistant products from Metso Minerals. Experience prove that Trellex wear resistant products cuts cost in nearly every application. From discharge and storage chutes, to hoppers , skips, launders and truck boxes.

Wide range of use

Metso Minerals concept of providing the right products for the right application has resulted in the most complete and flexible range of products and wear resistant materials available on the market today.

Fewer and shorter stoppages

E quipment fitted with Trellex wear resistant polymers enjoys a longer life which equates to reduced costs for maintenance and worn part replacements. Stoppages are few and production losses smaller, and with the simple and secure fastening systems, fitting work can be carried out faster.

Improved working environment

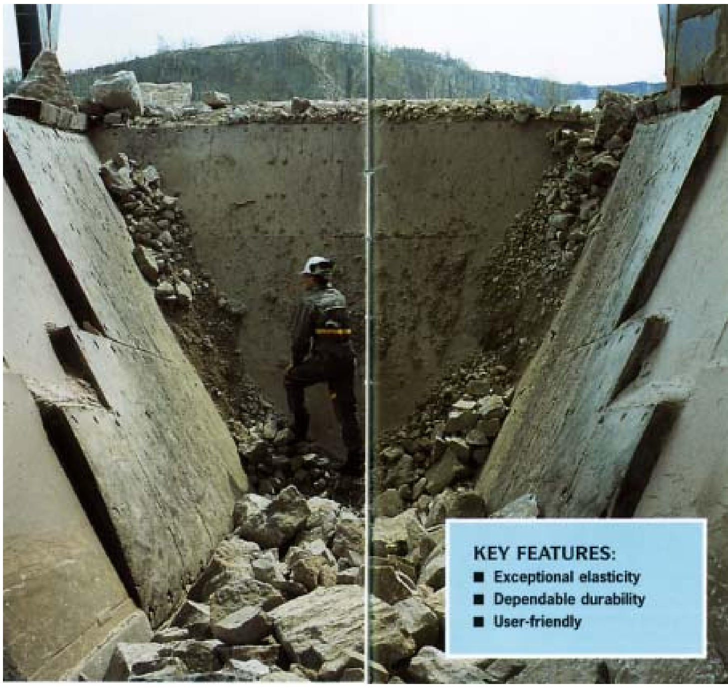
Choosing a Trellex product has more than ecomical advantages. The polymer wear products helps to create a more comfortable working environment by substantially reducing noise and vibrations generated in industrial environments. In most application it is possible to reduce the audiable noise by 50% just by switching from steel to a Trellex polymer product.

User-friendly

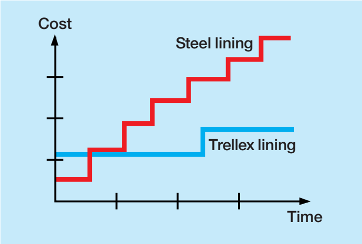
The polymer products within the Trellex product range such as rubber and polyurethane, are light weight materials. This equates into ease of handling and and installation, therefor maintanance staff are less likely to suffer injuries caused by lifteing heavy objects. The low weight of Trellex polymer products in conjunction with excellent impact absorbing properties also allows for simpler and lighter support structures.

Wear strength mean better overall economy

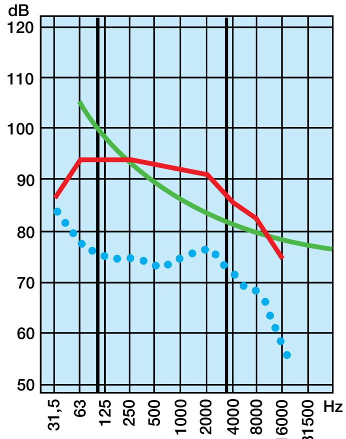
More than three decades of experience shows that Trellex polymer products out-perform other materials in the majority of applications where loading and discharging materials generates wear. Trellex products delivers outstanding benefits - including long service life, more uptime and reduced maintenance - that combined to give lower total costs.



Trellex Rubber Elements in Primary Feedhopper.



Investment cost is somewhat higher for the Trellex lining than steel. But the Trellex linings pays off quickly in form of reduced maintenance and longer service life.



Above the curves for noise levels for rubber-lined and steel-lined truck boxes. A rubber lining reduces the decibel level by 10 dB (A), which personnel perceive as a 50% reduction.

Control wear with Trellex products

Polymers has proven to be exceptional wear materials, more durable than even the hardest steels. The secret lies in our polymers unique chacteristic- elasticity - which gives it a shock absorbing function.

To achieve the most from a Metso Minerals solution it is imperative to follow the golden rule: Always take into considerationof the operating conditions at your plant.

Type of material

It is equally crucial to select a wear resistant produduct on the specific weight, shape and hardness of the material to handle.

Particle size

Establishing the maximum particle size of the material will help to avoid crushing of the lining, which reduces life span of the lining. This can be avoided by choosing the correct polymer thickness.

Drop height

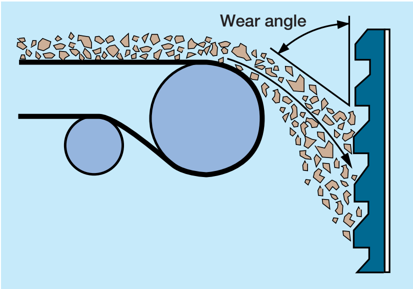
Along with particle size, drop height is the most important design criterion. In chutes and hoppers drop height should not exceed 3-4 meters. Oversized thickness can be used to counter excessive drop heights.

Material flow speed

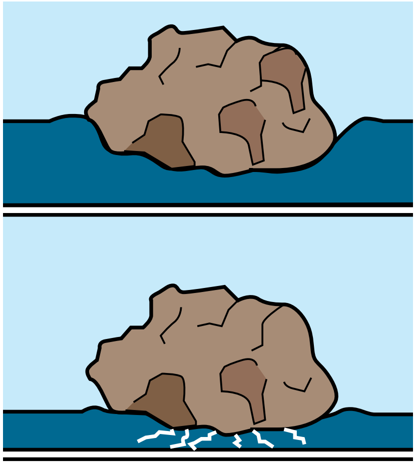
Practical and labratory testing have revealed that special attention should be given to flow rates exceeding 7 m/s. By restricting high flow rates the polymer has time to flex and absorb the energy leading to wear readuction.

Impact angle

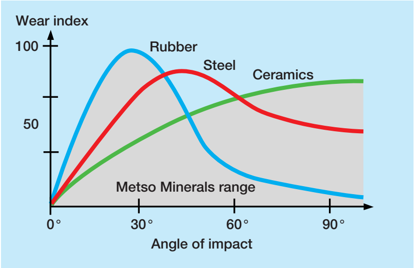
For optimal wear protection, material should strike the polymer surface at a minimal angle (0-5º) or as close to perpendicular as possible (90º). Polymer can best resist impact forces and wear when the material strikes it at right angles.



Trellex profiled Rubber Elements in chute.



Appropriate thickness is essential for each application, in order to avoid risk of damage due to crushing.



Metso Minerals wide range

Trellex Wear elements for heavy duty applikations

Transporting rocks and other heavy material can load down the lifetime of trucks and feed hoppers. At Trellex, our wear elements have been providing heavy duty wear protection in the mineral processing industry for more than three decades.

When introduced, Trellex wear elements set a new industry standard. These wear elements not only protect against wear but also serve as impact-dampers and prevent damage to trucks and hoppers.

Maximizing the benefits of wear rubber

Truck boxes and feed hoppers are exposed to heavy stress daily – the constant crushing, cutting, abrasion and impact of rocks and other particles. The wear strength and elasticity of rubber generate valuable benefits during the entire working cycle.

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Rubber absorbs the load

Elasticity is one of the most outstanding properties of rubber. As the load is absorbed, the rubber gives way and then regains its original form when the load disappears. A non-elastic surface becomes deformed or cracked.

Steel back extends life

Steel backed rubber elements, such as PP and VM elements, have a metal backing that holds the elements together if the rubber is cut by extremely jagged and sharpedged particles. The metal backing can also prevent fine material from working its way into the joints and cavities causing the lining to loosen.

Truck type Cat lined with Trellex wear resistant elements type PP.

Fast and simple installation

Trellex wear elements are always easy to install. First of all they are tailoredmade and come complete with drawings and mounting hardware. Modules are easy to handle and work with. A specialdesigned rubberplugg protects the fastening (see page 5).

Primary feed hopper lined with Trellex Wear resistant elements type PP.

Trellex Wear Plates and Bars

Industrial activities unavoidably result in wear. And wear costs money. Often, lots of money. That's why it pays to tackle wear with wear resistant rubber cuts costs in nearly every application. From discharge and storage chutes, to hoppers, skips, launders and truck boxes.

Trellex PP Wear Plates

PP, plain steel backed wear rubber plate.

PP Wear Plates are excellent wear lining for; Truck boxes, feeders, chutes, hoppers, bins, and other applications subjected to wear and noise.

Can easily be installed with a wide range of secure and reliable fastening methods.

Trellex PR Wear Plates

PR, plain wear rubber plate with invulcanised steel washers.

PR Wear Plates are excellent wear lining to; Feeders, chutes, hoppers, transfer points, bins, and other applications subjected to wear and noise.

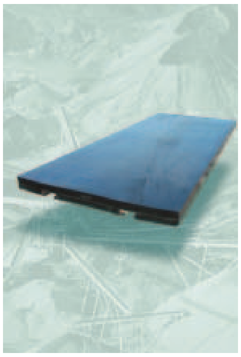
Simple installation by using a wide range of secure and reliable fastening methods.

Trellex PT Wear Plates

PT, plain wear rubber plate with invulcanised aluminium tracks.

Trellex PT Wear Plates are excellent wear lining to; Feeders, chutes, hoppers, bins, and other applications subjected to wear and noise.

Secure and quick T-bolt fastening system.



Trellex Wear Bars

Wear bar with invulcanised aluminium track.

Trellex Wear Bars are excellent wear lining to; Washing drums, rock boxes, feed cones-crushers and other applications subjected to wear and noise.

Wear Bars can be installed in applications by using the secure and quick T-bolt fastening system.

Trellex SP Wear Plates

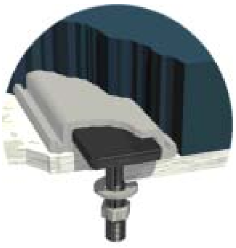
SP, serrated steel backed wear rubber plate.

Excellent wear lining for transfer points, chutes, hoppers, bins, and other applications subjected to wear and noise. Also possible to use for creating material pockets.

SP Wear Plates can easily be installed in applications by using a wide range of secure and reliable fastening methods.

Through bolt

Stud welded bolt



T-bolt

Trellex SQ Modular System

SQ is the highest performing and most versatile wear protection system on the market, due to its modular design. It delivers the best possible protection for chutes, hoppers, bins, loading, discharge, transfer points and other places subjected to wear.

The wear protection chameleon

SQ modules can be selected and installed in rubber, polyurethane and ceramic, or mixed in order to create the necessary conditions for optimising service life and minimising total operation costs.

SQ wear plates protect against wear from the fine and medium grades of abrasive materials. The modular system can handle particle sizes up to 200 mm (8″) or particle weights up to 35 kg (77 lbs) depending on application.

SQ Modular System range.

Feed chute at a sugar plant lined with Trellex SQ Modules and PP-XL wear plates.

Environment friendly

SQ rubber and polyurethane modules are easy to recycle due to the pure material content, i.e. without fabric or steel reinforcements.

Noise is considerably reduced with SQ wear plates. Human ear registers a noise reduction of 10 dB(A) as cutting the noise in half. The use of SQ modules results in a 40 – 75 % noise reduction compared to a traditional steel lining.

Easy to install

The SQ wear plates have been designed for simplicity of installation and minimum downtime by using a patented fastening system.

All modules are 300 x 300 mm (1´x 1´)

Rubber and polyurethane modules are easily cut with knife or Alu-Cut machine. The modules low weight makes for ease of handling and reduces the risk of injury.

Trellex Flexback

Trellex Flexback is designed to meet the problems of industrial wear; with a combination of Metso polymers and light steel reinforcement the Flexback is highly resistant to wear and has excellent shock absorption properties thus reducing the risk of damage due to crushing.

Flexback helps to reduce noise, absorbs vibration and provides a better working environment.

Better overall economy

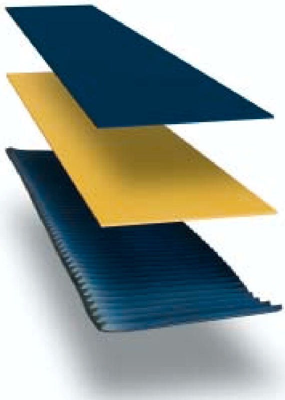
Trellex Flexback has a considerably longer service life than other corresponding steel linings. The combination of polymer and light steel reinforcement provides unmatched wear strength.

Self-bearing designs

The Flexback design enables self bearing chute and slide constructions to be configured from a very simple lattice of flat bar steel and angle irons.

Features

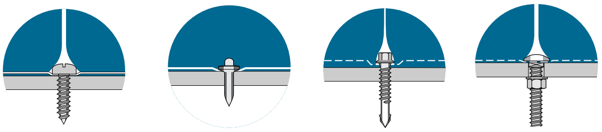
- Boosts service life of existing equipment
- Minimises maintenance and reduces down time
- Provides a safe working environment.



All Flexback elements are 1270 x 3000 mm.

Flexback attachment system

Installation is kept simple – there is no need for time-consuming adhesives. To fasten the Flexback range, use a Hilti-nail, self threading/drilling screws or wagon bolts, it is that simple.



Self threading screw *Hilti-nail* *Self threading/ drilling screw* *Wagon bolt*

Flexback

Flexback is built-up and consists of T60 wear rubber and light steel reinforcement, which translates to a strong and flexible wear element. Recommended for medium and light conditions of impact and sliding wear. Available in thickness 10, 15, 20, 25 and 30mm.

Flexback PU

Flexback PU is built-up and consists of Polyurethane and light steel reinforcement, which generates excellent properties to meet wear and sticky conditions. Recommended for fine or wet materials in medium and light conditions. Available in thickness 10, 12, 15, 20, 25 and 30,mm.

Flexback Serrated

T60 wear rubber with profiled top is built up in the same way as Flexback. Recommended for medium and light conditions with impact angles between 15-45 degrees. Flexback serrated is available in one thickness 35mm.

Noise reduction

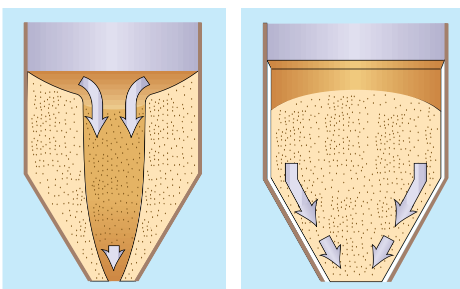
Noise exposure and environmental noise pollution are problems that continue to receive attention throughout the mining and quarrying industry and in government legislation.

Trellex Flexback can assist in providing a quieter and better working atmosphere for both operator and environment.

Trellex LF-plate eliminates flow problems in bulk handling

Improved flow patterns

Moisture and adhesive properties in fine granulates and powders can lead to laterial adhering to the surfaces of hoppers, chutes and containers. The answer to this type of problem is Trellex LF-plate, an ultra-high molecular polyethylene that combines wear strength with low friction.

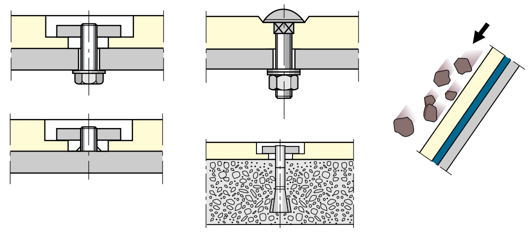


Flow pattern in silos. The silo on the right side has a LF-lining.

Trellex LF-plate range

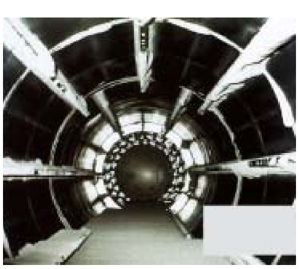
- White, pure PE-UHMW
- Black, anti-static
- Reclaim, pure powder mixed with fine ground regenerated material
- Rubber-backed LF. Rubber warm-vulcanized together with LF for damping and noisy applications

Hopper lined with Trellex LF-plate White.



Fastening methods.

Trellex Granuflex® Effectively prevents clogging problems



Complete lining with Trellex Granuflex.

Trellex Granuflex rubber sheeting granulated drum liner eliminates the problem of clogging in granulators. Trellex Granuflex is a heat resistant hard wearing rubber that withstands temperatures up to to 120 ℃ and is resistant to chemicals and acids used in fertilizer production.

Quality Improver

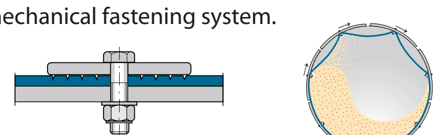
Granuflex increases capacity and efficiency. Your finished product will carry a more even quality while you avoid costly stoppages in production. Granuflex helps to create a movement that causes any clogged material to drop off the sheeting and return flush against the mantel as the drum continues rolling.

Fabric Reinforcement

Trellex Granuflex has a special fabric reinforcement which makes the sheeting equally strong both length and crosswise. The fabric reinforcement means that it cannot be stretched making it a highly efficient self-supporting material.

Fitting

Trellex Granuflex rubber sheeting is fitted lengthwise in the drum and is held in position at the edges by a simple secure mechanical fastening system.



Fastening method.

Trellex wear rubber linings for concrete mixers

Wear linings for drum and pan concrete mixers from Trellex are the logical cost effective choice. Our linings are designed to meet the tough criteria set by your pan and drum mixers and deliver heavy-duty savings.

Pan Mixers

Trellex wear-resistant rubber linings for pan mixers consist of plates which are manufactured for the majority of concrete mixers in the same sizes and with the same mounting system as original steel linings.

Trellex designs and manufactures paddles that are compatible with most types of pan mixers in Europe.

The patented Trellex arm protection of snap-on design is available in a number of different versions and gives several advantages.

Drum Mixers

Trellex designed the first rubber lining for a drum mixer in the 1960s. Today our rubber linings for drum mixers continue to set the standard in the industry.

Drum mixer with our replaceable rubber or PU linings.

Complete linings and paddles for pan mixer.

Our standard wear linings are delivered for specific compatibility with big name mixers in the industry.

Our line of paddle protectors for drum mixers have an unbeatable track record when it comes to increasing the life of your paddles and reducing tension in the inside of the drum. Our replaceable rubber linings fit the major brands in the industry and will allow your drum mixer to mix concrete four times longer than if your paddles went unprotected.

Trellex wear rubber linings for debarking drums

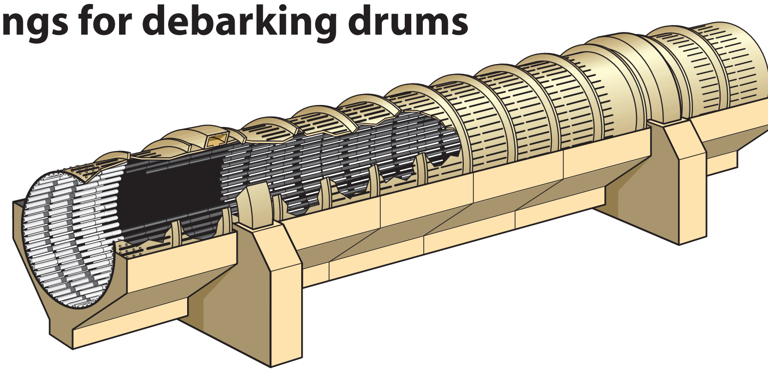
A complete system

Trellex rubber lining system for debarking drums is a combination of the old brands, Svedala, Trellex and Skega, today merged into Metso Minerals. Our rubber linings for debarking drums have been supplied to many satisfied customers in both the paper mill and drum manufacturing industries.

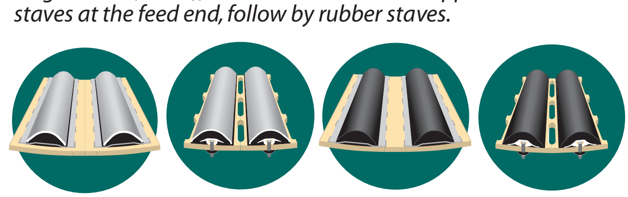
Trellex rubber linings are components of a complete system especially designed to fit all debarking drums.

Features and benefits

- Increased wood yield
- Increased drum availability
- Quieter operation
- Unsurpassed



Sketch of the largest rubber lined debarking drum Ø 5,6 m (18 ft) length 39 m (128 ft), lined with Trellex steel capped rubber staves at the feed end, follow by rubber staves.



Examples of the range of debarking staves. For detailed information about the full range, please contact your nearest Metso representative.

Trellex wear resistant rubber sheeting

Trellex rubber sheeting reduces the risk of operational breakdowns and gives your company an increased profitability. Trellex wear resistant rubber sheeting comes in two grades: Trellex 60 for stringent wear resistant applications such as impacting coarse to medium material and Trellex 40 for medium to fine, sliding material. In addition, the grades are available for quick delivery in different versions: smooth or profiled for mechanical fastening or traditional bonding, as well as preglued or with tear-off fabric to facilitate bonding.

Trellex Polyurethane sheeting in 3 different hardnesses, 70° Shore A (Blue), 80° Shore A (Yellow) and 90° Shore A (Green).

A pleasure to work with

Trellex wear resistant rubber is of relatively low weight which makes it easy to work with in most structural and lining applications. Thin sheeting can be cut with heavy-duty shears while thick sizes can be cut with a knife.

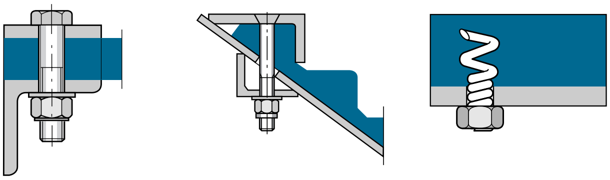
Two-component bonding system

For extreme high strength when bonding Trellex wear resistant rubber, the Trell-bond two-component system will prove advantageous. The system makes use of a specially developed adhesive and primer that results in exceptional strong bonding of the rubber to subsurfaces such as metal and concrete.

Trellex rubber sheeting, available in 3 different preparations, Smooth, Tear-Off (TO) and Contact Layer (CL).

Mechanical fastening

Mechanical fastening of the Trellex wear-resistant rubber sheeting to varied structures and subsurfaces can take place in many different ways. Wear resistant sheeting can be bolted, screwed, riveted, nailed or clamped in position.



Example of fastening methods.

Trellex hose system

The Trellex Hose System is the natural choice for handling materials in heavy-duty hydraulic or pneumatic conveying systems.

The system is designed on the basis of first-hand experienced off transporting highly abrasive iron, copper and other metallic or non-metallic ores in mineral processing plants.

Rubber offers superior wear resistance when handling abrasive rocks and sands, as well as slag and other materials.

The Trellex Hose System is used in sand, lime and glass plants, in quarries, in coal preparation and power plants, as well as in steel and cement works.

Supplied in two types

Trellex Slurry Hose for hydraulic pressure and suction service of abrasive slurries containing particles up to 20 mm in size, and Trellex Bulk Hose for pneumatic service of abrasive powders and chips of up to 30 mm in size.

The benefits

- Safety factor 3.2 times the working pressure
- Smooth outer cover ensures good resistance to wear and weather

- Thick, smooth-walls wear tubes providing low resistance to flow and long service life
- Simple installation, no special tools needed
- Easily configured to meet changes in production environments
- Less vibrations
- Lower noise levels

Other wear products

Trellex classifier wearing shoes

Trellex wear resistant rubber and Polyurethane shoes are used in screw feeders, classifiers and dewatering screws.
When considering the benefits of longer shoe life and tube bottom, combined with the ease of installation and noise reducing qualities, Trellex wear resistant rubber shoes will prove to be the most economical choice.

Trellex cable crossings

The problem of damage to electrical power cables by crossing wheeled equipment is now easily solved by the Trellex cable crossing. These high durability rubber cable crossings are equipped with mounting holes for warning flags and integral steel chains which allow the crossing to be moved easily. The standard crossing length is 11 meters and three types are available. Special lengths can be produced to meet customer requirements.

Trellex cable crossings.

Classifier equipped with Trellex wear segment/shoes.

Trellex Wear Products

Our ranges:

Wear plates
Rubber
Polyurethane
Ceramic/Rubber
Low friction material

Modular system
Rubber
Polyurethane
Ceramic/Polyurethane

Hose

Sheeting
Rubber
Polyurethane

Tailor-made linings for: Debarking drums, Concrete mixers, Silos, Feeders, Chutes, Hoppers, Truck boxes, Washing drums and other applications subjected to wear and noise.

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Brochure No: 1413-06-02-WPC/Trelleborg-English

Printed in Sweden