Environmental Noise & Vibration Analysis

SGI Ione Quarry Expansion

Amador County, California

BAC Job # 2018-137

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Introduction & Project Description

Specialty Granules (Ione) LLC (SGI) proposes to expand the existing footprint and depth of Ione Quarry to access additional rock reserves. This expansion requires an amended Conditional Use Permit (CUP) and Reclamation Plan that allows for the proposed expanded mining area and additional stockpiling area(s) for the additional cap rock (the proposed project). The project site is approximately 3 miles west of the City of Ione in unincorporated Amador County. Figure 1 shows the SGI property boundary, project boundary, location of existing quarry, and the proposed quarry and stockpile expansion areas.

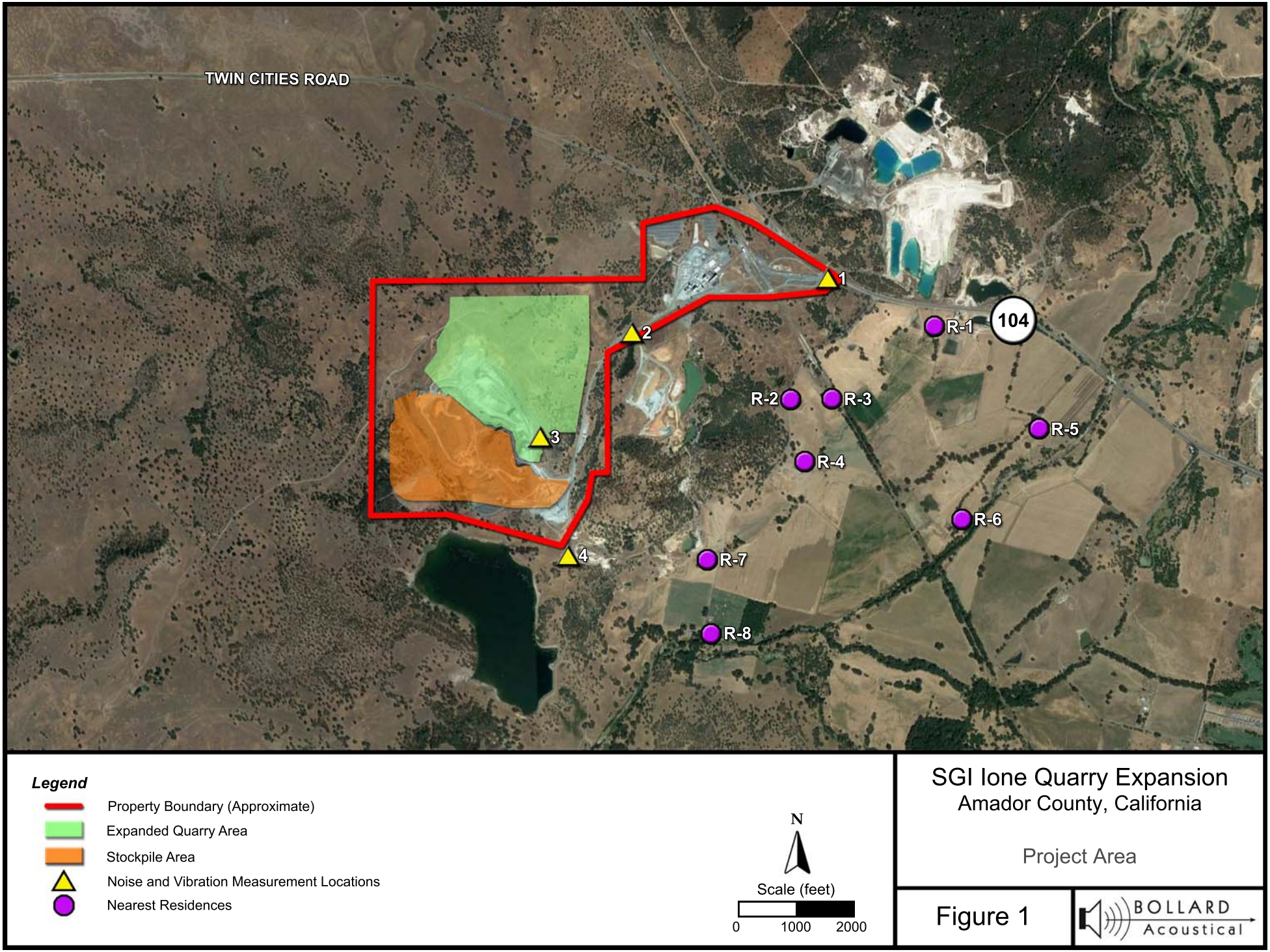
The quarry will be expanded by approximately 130 acres and the depth will increase by 605 feet. The stockpile area will expand by approximately 87 acres and increase in height by approximately 44 feet (at its largest increase). No changes in the current rates of production or other operations are proposed. The expanded reserves could provide for 100 years of operation at current annual production rates. The expanded quarry footprint will be entirely within SGI property boundaries.

The Project is an expansion of the quarry and stockpile areas only, and no changes to any fundamental elements of the existing operation (e.g., mining methods, processing operations, production levels, truck traffic, or hours of operation) are proposed. As a result, this analysis focuses on the change in noise and vibration environments which would result from the quarry and stockpile expansion.

Objectives of This Analysis

The objectives of this analysis are as follows:

- To provide background information pertaining to the effects of noise & vibration.
- To identify existing sensitive land uses in the immediate project vicinity.
- To quantify existing ambient noise and vibration levels in the immediate project vicinity.
- To identify the applicable Amador County noise & vibration standards which would be most applicable to this project.
- To predict project-related noise & vibration levels at the nearest sensitive areas, and to compare those levels against the applicable noise & vibration standards.
- To recommend mitigation, as necessary, to ensure compliance with the applicable project noise & vibration standards.
- To summarize the results of this analysis into a report to support the use permit and reclamation plan amendment application and for eventual use in the development of the project environmental documents.



SGI Ione Quarry Expansion

Amador County, California

Project Area

Figure 1

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Noise Fundamentals and Terminology

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard and hence are called sound. The number of pressure variations per second is called the frequency of sound, and is expressed as cycles per second, called Hertz (Hz).

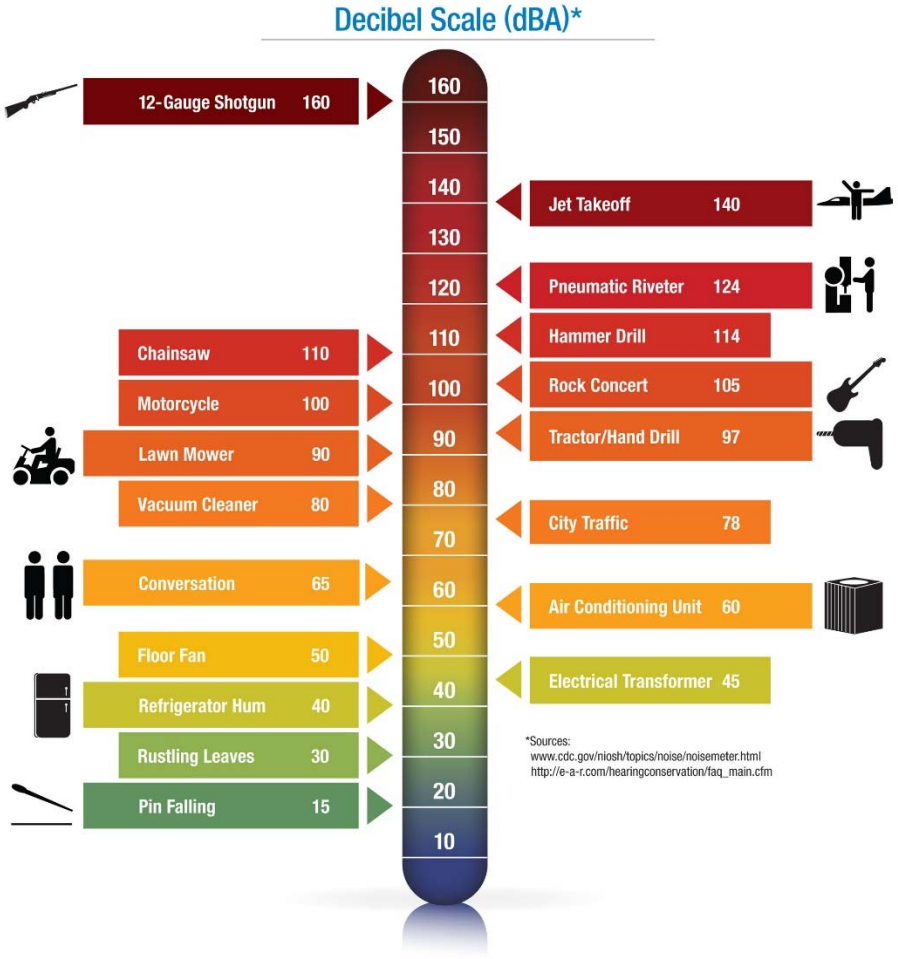
Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale uses the hearing threshold (20 micropascals), as a point of reference, defined as 0 dB. Other sound pressures are then compared to the reference pressure, and the logarithm is taken to keep the numbers in a practical range. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness. Figure 2 illustrates common noise sources associated with a range of decibel levels.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighing the frequency response of a sound level meter by means of the standardized A-weighing network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels in decibels.

Community noise is commonly described in terms of the ambient noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}) over a given time period (usually one hour). The L_{eq} is the foundation of the Day-Night Average Level noise descriptor, L_{dn}, and shows very good correlation with community response to noise.

The Day-night Average Level (L_{dn}) is based upon the average noise level over a 24-hour day, with a +10 decibel weighing applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because L_{dn} represents a 24-hour average, it tends to disguise short-term variations in the noise environment. L_{dn}-based noise standards are commonly used to assess noise impacts associated with traffic, railroad and aircraft noise sources.

Figure 2
Noise Levels Associated with Common Noise Sources



The Amador County noise standards which would be applicable to this project are expressed in terms of hourly average (L_{eq}) and maximum (L_{max}) noise levels for both daytime and nighttime periods.

In addition to applying the applicable Amador County standards to this Project, the California Environmental Quality Act (CEQA) requires that noise impacts be assessed relative to ambient noise and vibration levels that are present without the project. As a result, ambient noise surveys were conducted, and comparisons of Project to No-Project noise levels were used to assess noise impacts (in addition to comparison to Amador County noise standards). Specifically, single-event maximum (L_{max}) noise levels and hourly average (L_{eq}) noise levels, both with and without the project, were compared so that the assessment of noise impacts was based on an assessment of project-generated noise in short-term fluctuations in the ambient noise environment.

This analysis also provides measured ambient noise levels in terms of L50 and L90. These descriptors represent the levels of noise exceeded 50% and 90% of each hour, and are commonly referred to as median and background noise levels.

It should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project which added any audible amount of noise to the environment would be considered significant according to CEQA. Because every physical process creates noise, whether by the addition of a single vehicle on a roadway, or by a tractor in an agricultural field, the use of audibility alone as significance criteria would be unworkable. CEQA requires a substantial increase in noise levels before noise impacts are identified as significant, not simply an audible change. The discussion of what constitutes a substantial change in noise environments, both existing and cumulative, is provided in the Regulatory Setting section of this report.

Noise Attenuation with Distance

Stationary "point" sources of noise, attenuate (lessen) at a rate of approximately 6 dBA per doubling of distance from the source, not accounting for environmental conditions (i.e., atmospheric conditions, noise barriers, ground type, vegetation, topography, etc.). Surface traffic (a "moving point" source), would typically attenuate at a lower rate, approximately 4.5 dBA per doubling distance from the source (also dependent upon environmental conditions).

Noise from aggregate excavation sites with heavy mobile equipment exhibits characteristics of a point source at substantial distances from sensitive receptors. Atmospheric absorption of sound varies depending on temperature and relative humidity, as well as the frequency content of the noise source. In general, "average day" atmospheric conditions result in attenuation at a rate of approximately 1.5 dBA per thousand feet of distance in the 1,000 hertz frequency band (SAE ARP 866A, 1975).

Noise Attenuation by Topography, Quarry Highwalls, Stockpiles and Ground Cover

A noise barrier is any impediment which intercepts the path of sound as it travels from source to receiver. Such impediments can be natural, such as a hill or other naturally occurring topographic feature which blocks the receiver's view of the source, vegetative, such as heavy tree cover which similarly blocks the source from view of the receiver, or man-made, such as a solid wall, earthen berm, aggregate stockpile, or quarry highwall. Regardless of the type of impediment, the physical properties of sound are such that, at the point where the line-of-sight between the source and receiver is interrupted by a barrier, a 5 dB reduction in sound occurs.

The effectiveness of a barrier is a function of the difference in distance sound travels on a straight-line path from source to receiver versus the distance it must travel from source to barrier, then barrier to receiver. This difference is referred to as the "path length difference", and is used to calculate the Fresnel Number. A barrier's effectiveness is a function of the Fresnel number and frequency content of the source. In general, the more acute the angle of the sound path created by the introduction of a barrier, the greater the noise reduction provided by the barrier.

For this project, most of the nearest receptors will be completely shielded from view of the expanded quarry and stockpiling operations. Where such shielding would occur, the level of noise reaching the receiver would be lower than at unshielded receivers located the same distances from the source. Because shielding of the various components of the project varies both by

source and receiver location, this analysis computed shielding for quarry and stockpiling operations individually at each of the nearest residences to the project area.

Effects of Noise on People

The effects of noise on people can be divided into three categories:

- Subjective effects of annoyance, nuisance, dissatisfaction;
- Interference with activities such as speech, sleep, and learning; and
- Physiological effects such as hearing loss or sudden startling.

Environmental noise typically produces effects in the first two categories. Workers in industrial plants can experience noise in the third category. There is no completely satisfactory way to measure the subjective effects of noise or the corresponding reactions of annoyance and dissatisfaction. A wide variation in individual thresholds of annoyance exists, and different tolerances to noise tend to develop based on an individual's past experiences with noise.

An important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment (or ambient noise) to which one has adapted. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be judged by those hearing it. With regard to increases in A-weighted noise level, the following relationships occur (Caltrans, 2013):

- It is widely accepted that the average healthy ear can barely perceive noise level changes of 3 dBA;
- A change in level of 5 dBA is a readily perceptible increase in noise level; and
- A 10-dBA change is recognized as twice as loud as the original source.

These relationships occur in part because of the logarithmic nature of sound and the decibel system. Noise levels are measured on a logarithmic scale, instead of a linear scale. On a logarithmic scale, the sum of two noise sources of equal loudness is 3 dBA greater than the noise generated by only one of the noise sources (e.g., a noise source of 60 dBA plus another noise source of 60 dBA generate a composite noise level of 63 dBA). To apply this formula to a specific noise source, in areas where existing levels are dominated by traffic, a doubling in traffic volume will increase ambient noise levels by 3 dBA. Similarly, a doubling in heavy equipment use, such as the use of two pieces of equipment where one formerly was used, would also increase ambient noise levels by 3 dBA.

Vibration Fundamentals and Terminology

Vibration is like noise in that it involves a source, a transmission path, and a receiver. While vibration is related to noise, it differs in that noise is generally considered to be pressure waves transmitted through air, while vibration is usually associated with transmission through the ground or structures. As with noise, vibration consists of an amplitude and frequency. A person's response to vibration will depend on their individual sensitivity as well as the amplitude and frequency of the source.

Vibration can be described in terms of acceleration, velocity, or displacement. A common practice is to monitor vibration in terms of velocity in inches per second peak particle velocity (IPS, PPV) or root-mean-square (VdB, RMS). Standards pertaining to perception as well as damage to structures have been developed for vibration in terms of peak particle velocity as well as RMS velocities.

As vibrations travel outward from the source, they excite the particles of rock and soil through which they pass and cause them to oscillate. Differences in subsurface geologic conditions and distance from the source of vibration will result in different vibration levels characterized by different frequencies and intensities. In all cases, vibration amplitudes will decrease with increasing distance. The maximum rate, or velocity of particle movement, is the commonly accepted descriptor of the vibration "strength".

According to the Transportation and Construction-Induced Vibration Guidance Manual (Caltrans, June 2004), operation of heavy earthmoving equipment construction equipment and construction techniques generate ground vibration. Traffic traveling on roadways can also be a source of such vibration. At high enough amplitudes, ground vibration has the potential to damage structures and/or cause cosmetic damage. Ground vibration can also be a source of annoyance to individuals who live or work close to vibration-generating activities.

Blasting creates seismic waves that radiate along the surface of the earth and downward into the earth. If close enough to the blasting location, these surface waves can be felt as ground vibration. Airblast and ground vibration can result in effects ranging from annoyance of people to damage of structures.

Environmental Setting

Sensitive Receptors in Project Vicinity

The nearest sensitive receptors to the project site are residences to the east and southeast. Figure 1 shows the locations of the six nearest residences. The City of Ione is the closest population center, with numerous residential and commercial land uses, but is considerably farther (approximately 3 miles) away from the project site and the identified receptors shown on Figure 1. Because sound decreases with distance, project-generated noise levels would be substantially lower within the City of Ione than at the closer residences, likely being undetectable. As a result, this impact analysis focuses on the nearest receptors shown on Figure 1.

Baseline Noise Environment in Project Vicinity

The existing baseline noise environment in the project vicinity is defined primarily by local and distant traffic. Existing operations at the SGI site and natural sounds (birds, insects, wind, etc.) also contribute to the ambient noise environment.

To quantify the existing ambient noise environment in the immediate project vicinity, continuous noise level measurements were conducted at the four (4) locations identified on Figure 1 during the period of October 3 to October 7, 2019. Three of the ambient noise survey sites were selected

to be representative of conditions at the property boundary of the site with the fourth site selected to be representative of conditions within the existing quarry area. During the survey period, operations within the SGI quarry occurred during the weekday noise monitoring periods (Thursday, Friday and Monday), but no quarrying operations occurred during the weekend period of the ambient noise survey (Saturday and Sunday).

Weather conditions present during the ambient noise monitoring program were typical for the season, with no anomalous conditions present which would adversely affect the validity of the survey results in describing typical ambient conditions.

Larson Davis Laboratories (LDL) Model 820 & LxT precision integrating sound level meters were used for the noise level measurement survey. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4). Photographs of the noise survey locations are provided Appendix B.

The baseline noise survey results are summarized in Table 1. The complete survey results at each measurement site are provided in tabular and graphical formats in Appendices C & D, respectively.

Table 1
Statistical Summary of Ambient Noise Measurement Results
SGI Ione Site Vicinity

		Daytime (7 a.m. - 10 p.m.)		Nighttime (10 p.m. to 7 a.m.)		
		Average	Maximum	Average	Maximum	
Site	Date	(L_{eq})	(L_{max})	(L_{eq})	(L_{max})	L_{dn}
1	Oct 3	61	78	57	75	64
	Oct 4	59	77	57	73	64
	Oct 5	56	74	53	71	60
	Oct 6	53	71	52	69	58
	Oct 7	57	74	56	74	62
	Averages	**57**	**75**	**55**	**72**	**62**
2	Oct 3	64	75	59	77	66
	Oct 4	67	74	54	68	66
	Oct 5	53	67	37	49	52
	Oct 6	45	60	50	53	56
	Oct 7	53	70	60	76	66
	Averages	**56**	**69**	**52**	**65**	**61**
3	Oct 3	48	60	41	50	50
	Oct 4	48	57	47	53	53
	Oct 5	36	53	27	45	36
	Oct 6	35	52	27	43	36
	Oct 7	50	61	42	50	51
	Averages	**43**	**57**	**37**	**48**	**45**
4	Oct 3	37	53	39	55	45
	Oct 4	40	52	40	46	46
	Oct 5	36	52	25	41	36
	Oct 6	36	52	29	42	37
	Oct 7	36	52	29	42	37
	Averages	**37**	**52**	**32**	**45**	**40**

Source: Bollard Acoustical Consultants, Inc.
The noise measurement locations are identified on Figure 1.
Noise level data shown in this table represent averages for the periods. For a complete depiction of hourly measurement results, please refer to Appendices C & D.

The Table 1 data indicate that measured ambient noise levels were highest at Sites 1 & 2, as these locations were in close proximity to Highway 104 and the SGI on-site truck route, respectively. The lowest levels were measured at Site 4, which is considered to be representative of local ambient conditions at positions removed from, or considerably shielded from, noise generated at the SGI site. As a result, the Site 4 weekend data was conservatively used to establish baseline ambient conditions for the nearest residences to the site. Measurement Site 3 was located approximately 1,500 feet from the active quarry area with a direct view of the excavation activities, and approximately 200 feet from the haul truck passby area. The data from Site 3 is used later in this assessment to establish reference noise generation levels for the quarry operations.

Baseline Vibration Environment in Project Vicinity

The existing ambient vibration environment at the borders of the property were subjectively evaluated by BAC staff as being imperceptible during field surveys despite operations occurring normally at the SGI site. Nonetheless, to quantify baseline ambient vibration levels at the site, short-term vibration measurements were conducted at the four locations where the ambient noise survey locations were conducted (See Figure 1). Vibration measurement equipment consisted of a Larson Davis Laboratories (LDL) Model LxT meter equipped with PCB Electronics velocity transducers. The vibration monitoring system was calibrated in the field prior to use with an IMI Model 699A02 vibration calibrator to ensure the accuracy of the measurements.

Measured vibration levels around the perimeter of the site were well below the threshold of human perception. Specifically, vibration levels in the absence of heavy truck passbys near the monitoring sites were typically in the range or 30-35 VdB. During truck passbys within approximately 50 feet of the vibration measurement sites, maximum vibration levels of approximately 60 VdB were measured.

Criteria for Acceptable Noise Exposure

California Environmental Quality Act

The State of California has established regulatory criteria that are applicable to this assessment. Specifically, Appendix G of the State of California Environmental Quality Act (CEQA) Guidelines are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. According to Appendix G of the CEQA guidelines, the project would result in a significant noise or vibration impact if the following occur:

A. Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or other applicable standards of other agencies?

B. Generation of excessive groundborne vibration or groundborne noise levels?

C. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Amador County Criteria

The project is located within Amador County. The Amador County noise standards are contained in the County's General Plan Noise Element. For stationary, or non-transportation, noise sources, the Amador County General Plan Table N-4 provides noise level performance standards in terms of average (L_{eq}) and maximum (L_{max}) for both daytime (7 am – 10 pm) and Nighttime (10 pm – 7 am) hours. Those standards, which are applicable at the receiving noise-sensitive land use, are reproduced below in Table 2.

Table 2
Noise Level Performance Standards for Non-Transportation Noise Sources
Amador County General Plan Noise Element

Noise Level Descriptor	Daytime (7 am – 10 pm)	Nighttime (10 pm – 7 am)
Hourly average level (L_{eq})	60	45
Maximum level (L_{max})	75	65

Each of the noise levels specified shall be lowered by 5 decibels for simple tone noises, noises consisting primarily of speech, or music, or for recurring impulsive noises. These noise level standards do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwellings). The noise standard is to be applied at the property planes of the affected land use.

In addition, the Amador County General Plan provided the following goals and policies that would be applicable to this project. Analysis of the projects consistency with the applicable goals and policies is provided in the *SGI Ione Quarry Expansion Land Use Technical Study*.

Goal N-1: Manage noise levels throughout the County through land use planning and development review and promote a pattern of land uses compatible with current and future noise levels.

Policy N-1.1: Enforce noise standards to maintain acceptable noise limits, especially near noise-sensitive uses. Noise measurement methods are subject to County approval.

Policy N-1.3: Evaluate potential noise conflicts for individual sites and projects, and require mitigation of all significant noise impacts (including construction and short-term noise impacts) as a condition of project approval.

Policy N-1.4: Protect existing areas with acceptable noise environments, and also those locations deemed "noise sensitive" from new noise sources.

Goal N-2: Minimize noise conflicts from transportation sources.

Policy N-2.1: Minimize noise conflicts between current and proposed land uses and the circulation network by encouraging compatible land uses around critical roadway segments with higher noise potential.

Policy N-2.2: Minimize noise conflicts between current and proposed land uses and railroad corridors by protecting railroad corridors from encroachment of incompatible land uses and by adhering to the noise standards presented in Tables N-2 and N-3.

Policy N-2.3: Encourage coordinated site planning and traffic control measures that minimize traffic noise in noise-sensitive land use areas.

Goal N-3: Minimize noise conflicts between airports and surrounding land uses.

Goal N-4: Minimize noise conflicts with stationary noise generators.

Policy N-4.1: Protect the continued viability of economically valuable noise sources such as farm operations, mining activities, commercial and industrial facilities, and airports.

The Amador County Code does not contain any noise standards which would be applicable to this project. Rather, the County Code defers to the noise standards of the County General Plan Noise Element.

Criteria for Determining a Substantial Increase in Noise

As noted in the CEQA Criteria "A" cited above, a project would result in a significant noise impact if it would result in the generation of a *substantial* temporary or permanent increase in ambient noise levels in the vicinity of the project. The question then becomes, what constitutes a substantial increase in ambient noise levels?

It is generally recognized that an increase of at least 3 dBA for similar noise sources is usually required before most people will perceive a change in noise levels, and an increase of 6 dBA is required before the change will be clearly noticeable (*Egan, Architectural Acoustics, McGraw Hill*).

The Federal Interagency Commission on Noise (FICON) has developed a graduated scale for use in the assessment of project-related noise level increases. Table 3 was developed by FICON as a means of developing thresholds for impact identification for project-related noise level increases. The rationale for the graduated scale is that test subject's reactions to increases in noise levels varied depending on the starting level of the noise. Specifically, with lower ambient noise environments, such as those below 60 dBA L_{dn}, a larger increase in noise levels was required to achieve a negative reaction than was necessary in more elevated noise environments.

Table 3
Significance of Changes in Cumulative Noise Exposure

Ambient Noise Level (No Project), dBA L_{dn}	Increase Required for Finding of Significance, dB
<60	+5 or more
60-65	+3 or more
>65	+1.5 or more

Source: Federal Interagency Committee on Noise (FICON)

Based on the FICON research, a 5 dBA increase in noise levels due to a project is required for a finding of significant noise impact where ambient noise levels without the project are less than 60 dBA L_{dn}. Where pre-project ambient conditions are between 60 and 65 dBA L_{dn}, a 3 dBA increase is applied as the standard of significance. Finally, in areas already exposed to higher noise levels – specifically pre-project noise levels in excess of 65 dBA L_{dn} – a 1.5 dBA increase is considered by FICON as the threshold of significance.

According to the FICON study, if screening analysis shows that noise-sensitive areas will be at or above DNL 65 dBA and will have an increase of DNL 1.5 or more, further analysis should be conducted. The FICON study also reported the following: every change in the noise environment does not necessarily impact public health and welfare.

While CEQA requires that noise impacts be assessed relative to ambient noise levels that are present without the project, it should be noted that audibility is not a test of significance according to CEQA. If this were the case, any project that added any audible amount of noise to the environment would be considered an adverse impact according to CEQA. Because every physical process creates noise, whether by the addition of a single vehicle on a roadway, or a tractor in an agricultural field, the use of audibility alone as a significance criterion would be unworkable. CEQA therefore requires a *substantial* increase in noise levels before noise impacts are identified, not simply an *audible* change.

Criteria for Acceptable Vibration Exposure

The California Environmental Quality Act (CEQA) requires assessment of a projects vibration impact. The Amador County Noise Element and Noise Ordinance do not contain criteria for acceptable vibration exposure which would be applicable to this project. However, the California Department of Transportation (Caltrans) provide such criteria. Those criteria are discussed in the sections that follow.

California Department of Transportation Criteria for Acceptable Vibration Levels

In the California Department of Transportation (Caltrans) publication, *Transportation and Construction Vibration Guidance Manual* (September 2013), information is presented with respect to the potential damage to structures associated with transient sources of vibration (i.e. blasting activities). Table 4 contains the Caltrans threshold criteria for transient vibration events such as blasting.

Table 4
Vibration Damage Potential Criteria for Transient Sources

Structure and Condition	Peak Particle Velocity, Inches/Second
Extremely fragile historic buildings, ruins, ancient monuments	0.12
Fragile buildings	0.2
Historic and some old buildings	0.5
Older residential structures	0.5
New residential structures	1.0
Modern industrial/commercial buildings	2.0

Source: Caltrans Transportation and Construction Vibration Guidance Manual – Table 19

As indicated in Table 4, vibration thresholds for older and newer residential structures exposed to transient sources of vibration, such as that generated by project blasting operations, are 0.5 and 1.0 inches per second, respectively.

In addition to providing guidance with respect to vibration levels which would cause damage to structures, the Caltrans guidelines also provide criteria for assessing the potential for annoyance related to transient sources of vibration. Table 6 of the Caltrans publication provides vibration criteria for human response to transient vibration. These criteria are reproduced below in Table 5.

Table 5
Human Response to Transient Vibration

Human Response	Peak Particle Velocity, Inches/Second
Severe	2.0
Strongly Perceptible	0.9
Distinctly Perceptible	0.25
Barely Perceptible	0.04

Source: Caltrans Transportation and Construction Vibration Guidance Manual – Table 20

Noise Impacts of the Project

The project proposes the expansion of the existing quarry and stockpiling areas into undeveloped areas of the site as indicated on Figure 1. Mining and stockpiling activities will utilize the same equipment, techniques, and operating schedules as currently occurring within the site. Because the project only involves an expansion of the quarry and stockpiling areas, no changes in noise related to aggregate processing, equipment operation, or the off-site shipment of aggregate products would result from this project. Therefore, the noise impact assessment focuses on the noise generation of the mining and stockpiling activities within the proposed expansion areas.

Reference Noise Levels for Excavation and Stockpiling Activities

As noted previously, baseline noise monitoring Site 3 was selected due to its proximity to the existing quarry operations. That site was approximately 1,500 feet from the excavation activities and approximately 200 feet from the haul truck passby area. Appendices D-11, D-12 and D-15 indicate that measured average noise levels at Site 3 were approximately 50 dBA L_{eq} during the hours that quarrying activities were occurring. A level of 50 dBA L_{eq} at 1,500 feet equates to an average noise level of approximately 75 dBA L_{eq} at 100 feet, which is consistent with BAC file data for similar quarry sites. As a result, a reference noise level of 75 dBA L_{eq} was used at a distance of 100 feet for the projection of average noise levels from the proposed quarry expansion area to the nearest residences.

Measured maximum noise levels at Site 3 were caused by the passage of haul trucks approximately 200 feet from the measurement site. Based on the measured maximum noise levels, distance from the haul road and degree of shielding of the haul road by intervening topography, BAC computed an unshielded maximum noise level resulting from quarry operations of 90 dBA at a distance of 100 feet from the haul truck passby route.

Excavation Noise Levels at Nearest Residences

The reference noise levels of 75 dBA L_{eq} and 90 dBA L_{max} were projected from the proposed quarry expansion area to the nearest residences identified on Figure 1. A sound level decay rate of 6 dBA per each doubling of distance between the source and receiver was used, representing standard spherical spreading of sound over distance. In addition, atmospheric absorption of sound in air was assumed to be 1.5 dBA per each thousand feet. Because the mining activities in the quarry expansion area will not be visible from the nearest residences, offsets for shielding by intervening topography were also applied. Table 6 shows the attenuation offsets for distance, atmospheric absorption, and topography, and the resulting average and maximum noise levels at the four nearest residences. Appendix E shows the calculation sheets used to predict shielding by intervening topography for excavation activities at each of the nearest residences.

Table 6
Attenuation Offsets and Predicted Excavation Noise Levels at Nearest Residences

Receiver	Distance (feet)	Attenuation Offsets, dBA			Predicted Levels, dBA	
		Distance	Atmospheric Absorption	Topography	Lmax	Leq
1	5,900	35	9	5	41	26
2	3,600	31	5	7	47	32
3	4,100	32	6	5	47	32
4	4,000	32	6	17	35	20
5	7,700	38	12	5	36	21
6	6,800	37	10	8	35	20
7	3,000	30	5	19	37	22
8	4,600	33	7	19	31	16
Amador County Noise Standards				**Daytime**	**75**	**60**
				Nighttime	**65**	**45**

Source: Bollard Acoustical Consultants, Inc. (BAC)

Table 6 indicates that the predicted average and maximum noise levels at the nearest residences would be well below the Amador County noise standards applicable to non-transportation noise sources. In addition, the project noise levels predicted in Table 6 are below measured ambient conditions reported in Table 1 for the weekend daytime periods when the quarry was not operating. As a result, the proposed excavation activities within the expanded quarry area are predicted to be less than significant relative to both Amador County General Plan performance standards and relative to CEQA guidelines pertaining to increases in ambient noise levels.

It should be noted that the Table 6 predictions are considered worst-case because they assume excavation operations at the closest point from the proposed quarry and stockpile expansion areas to the existing residences. In addition, the noise generation of the excavation equipment was assumed to be at the current elevation of the eastern edge of the quarry expansion area, which would provide the least shielding at the nearest residences by intervening topography. As the excavation equipment progresses deeper into the quarry and further from the eastern quarry boundary the noise levels at the nearest residences would be further attenuated.

Because worst-case predictions of excavation-related noise levels in the expanded quarry area would be below the Amador County noise standards at the nearest residences and would not result in a substantial increase in ambient noise levels at those residences, noise impacts of the excavation activity of the project are considered ***less than significant***.

Stockpiling Operations Noise Levels at Nearest Residences

The reference noise levels of 75 dBA L_{eq} and 90 dBA L_{max} were projected from the proposed stockpile expansion area to the nearest residences identified on Figure 1. As with the excavation analysis, a sound level decay rate of 6 dBA per each doubling of distance between the source and receiver was used, representing standard spherical spreading of sound over distance. In

addition, atmospheric absorption of sound in air was assumed to be 1.5 dBA per each thousand feet.

The stockpiling activities would occur at higher elevations than the excavation activities. A cross-sectional analysis was performed between the proposed stockpile locations and nearest residences to determine the stockpile locations where the minimum degree of intervening topographic shielding would occur. Those worst-case locations were used to predict stockpiling noise levels at the nearest residences. Table 7 shows the attenuation offsets for distance, atmospheric absorption, and topography, and the resulting average and maximum noise levels at the four nearest residences. Appendix F shows the calculation sheets used to predict shielding by intervening topography for stockpiling activities at each of the nearest residences.

Table 7
Attenuation Offsets and Predicted Stockpiling Noise Levels at Nearest Residences

		Attenuation Offsets, dBA			Predicted Levels, dBA	
Receiver	Distance (feet)	Distance	Atmospheric Absorption	Topography	Lmax	Leq
1	7,867	38	12	0	40	25
2	5,174	34	8	12	36	21
3	5,914	35	9	7	38	23
4	5,438	35	8	17	30	15
5	9,346	39	14	11	26	11
6	8,078	38	12	15	25	10
7	3,960	32	6	18	34	19
8	4,791	34	7	0	49	34
Amador County Noise Standards				**Daytime**	**75**	**60**
				Nighttime	**65**	**45**

Source: Bollard Acoustical Consultants, Inc. (BAC)

Table 7 indicates that the predicted average and maximum stockpiling noise levels at the nearest residences would be well below the Amador County noise standards applicable to non-transportation noise sources. In addition, the project noise levels predicted in Table 7 are below measured ambient conditions reported in Table 1 for the weekend daytime periods when the quarry was not operating. As a result, the proposed excavation activities within the expanded quarry area are predicted to be less than significant relative to both Amador County General Plan performance standards and relative to CEQA guidelines pertaining to increases in ambient noise levels.

It should be noted that the Table 7 predictions are considered worst-case because they are based on stockpiling operations at the locations with the least impeded view from the nearest residences. Stockpiling operations occurring at lower elevations would result in lower noise levels than those indicated in Table 7 at the nearest residences.

Because worst-case predictions of stockpiling-related noise levels in the expanded quarry area would be below the Amador County noise standards at the nearest residences and would not result in a substantial increase in ambient noise levels at those residences, noise impacts of the stockpiling operations of the project are considered ***less than significant***.

Combined Excavation and Stockpiling Activities

The excavation and stockpiling activity noise levels reported in Tables 6 and 7 are in excess of 10 dB below the applicable Amador County noise standards and existing ambient noise levels at the nearest residences. The maximum noise level increase which would result from the combination of the two noise sources (excavation and stockpiling), would be 3 dB. The resulting combined noise levels would remain more than 10 dB below the applicable noise criteria. As a result, noise impacts resulting from combined excavation and stockpiling operations would be ***less than significant.***

Excavation & Stockpile Equipment Vibration

The typical vibration levels generated by heavy earthmoving equipment is presented in Table 8 at a reference distance of 25 feet from the operating equipment.

Table 8
Vibration Source Levels for Heavy Equipment

Equipment	PPV at 25 feet (in/sec)	Approximate RMS L_V[1] at 25 feet
Hoe ram	0.089	87
Bulldozer	0.089	87
Drilling	0.089	87
Loaded trucks	0.076	86

[1] RMS velocity in decibels (VdB) re 1 micro-inch/second

Source: Federal Transit Administration, Transit Noise and Vibration Impact Assessment Manual (2018)

The vibration data shown in Table 8 indicate that heavy equipment vibration levels at a distance of 25 feet from the operating equipment range from 0.09 to 0.08 inches/second. The closest residence is located approximately 3,000 feet from the quarry expansion area. At that nearest residence, the vibration levels due to project excavation equipment are predicted to be approximately 0.0001 inches/second peak particle velocity. According to Tables 4 & 5, vibration levels of this magnitude would be well below the thresholds of perception and damage to structures. As a result, this impact is considered ***less than significant.***

Blasting Noise & Vibration

Blasting within the expanded quarry area will utilize the same equipment and processes as currently employed in the existing quarry area.

Noise sources associated with blasting consist of rock drills and the shot itself. The noise levels generated by the rock drills depend on drill type, but are predicted to be generally similar to the noise levels generated by excavation equipment, and are included in the levels described in the previous section pertaining to mining noise sources. In the event that the rock drills used for blasting are considered to be a "recurring impulsive" noise source, the County standards would be adjusted downward by 5 dB for that noise source.

Noise generated by aggregate shots are variable, depending on the amount of charge-material used, the number of holes and the depth of those holes, timing delays, and other factors. There tends to be misconceptions regarding aggregate blasting as aggregate shots are designed to transfer the energy of the shot into the ground, rather than have it vent into the atmosphere.

To quantify vibration generated by blasting which will occur in the quarry expansion area, BAC reviewed vibration measurement logs of 34 separate blasting events which occurred within the existing SGI quarry area between January of 2018 and June of 2020. The blasting events during this period occurred with a frequency of just over one shot per month. For each shot, noise and vibration levels were monitored at between 1 and 3 locations, resulting in a total of 72 separate measurements during this time period. The measurement locations ranged from 1,095 to 3221 feet from the blast area.

As noted previously in Table 6 of this report, the distance from the proposed quarry expansion area to the nearest sensitive receptor (Residence 7), is approximately 3,000 feet. The SGI data was normalized to a distance of 3,000 feet using algorithms contained within the Federal Transit Administration Transit Noise and Vibration Impact Assessment Manual (September 2018). The resulting average vibration level at the normalized distance of 3,000 feet from the blast site was 0.09 inches per second (peak particle velocity). According to Table 4, a vibration level of this magnitude would be below the thresholds for damage to structures. According to Table 5, a vibration level of this magnitude would be between barely perceptible and distinctly perceptible, but well below strongly perceptible. Given the relative infrequency of the blasting events and the fact that they are limited to daytime hours, blasting vibration impacts are considered ***less than significant.***

To quantify noise generated by blasting which will occur in the quarry expansion area, BAC reviewed the same measurement logs described above. The average linear peak noise levels for 72 separate blast events normalized to a reference distance of 3,000 feet was 119 dB at very low frequencies (approximately 5 hertz). The corresponding maximum A-weighted sound pressure level for these blasts would be below 50 dBA L_{max}. The applicable daytime noise standard would be 75 dBA L_{max}. As a result, this level would be below both Amador County noise standards and below existing ambient noise levels at the nearest residences to the proposed quarry expansion area. As a result, blasting noise impacts are considered ***less than significant.***

Excessive Noise Exposure Within the Vicinity of a Private Airstrip or Public Airport

The closest airport, Westover Field (Amador County Airport), is approximately 11 miles east of the Project site. Given the distance between the two sites no noise impacts to either the airport or SGI employees would occur.

Conclusions

This analysis concludes that, due to the substantial distance between the proposed SGI Ione quarry & stockpile expansion areas and the nearest residences, no adverse noise or vibration impacts would result from the project.

This concludes BAC's analysis of the SGI Ione Quarry Expansion Project. Please contact BAC at (916) 663-0500 or Info@bacnoise.com with any questions or comments on this analysis.

Appendix A
Acoustical Terminology

Acoustics The science of sound.

Ambient Noise The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.

Attenuation The reduction of an acoustic signal.

A-Weighting A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.

Decibel or dB Fundamental unit of sound. A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.

CNEL Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.

Frequency The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.

IIC Impact Insulation Class (IIC): A single-number representation of a floor/ceiling partition's impact generated noise insulation performance. The field-measured version of this number is the FIIC.

L_{dn} Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.

L_{eq} Equivalent or energy-averaged sound level.

L_{max} The highest root-mean-square (RMS) sound level measured over a given period of time.

Loudness A subjective term for the sensation of the magnitude of sound.

Masking The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.

Noise Unwanted sound.

Peak Noise The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.

RT_{60} The time it takes reverberant sound to decay by 60 dB once the source has been removed.

STC Sound Transmission Class (STC): A single-number representation of a partition's noise insulation performance. This number is based on laboratory-measured, 16-band (1/3-octave) transmission loss (TL) data of the subject partition. The field-measured version of this number is the FSTC.

Legend

- A Site 1: 38°22'37.03"N, 120°58'58.88"W
- B Site 2: 38°22'27.51"N, 120°59'40.26"W
- C Site 3: 38°22'19.35"N, 121° 0'3.67"W
- D Site 4: 38°21'50.14"N, 120°59'53.57"W

Note: Long-term monitoring completed on October 2-8, 2019.

SGI Ione Quarry Expansion

Amador County, California

Photographs of Long-Term
Noise Survey Locations

Appendix B

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Appendix C-1
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Thursday, October 03, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	58	83	46	38
1:00 AM	52	74	38	36
2:00 AM	44	68	38	34
3:00 AM	49	71	38	35
4:00 AM	52	71	38	33
5:00 AM	60	84	53	40
6:00 AM	61	77	57	48
7:00 AM	61	78	57	47
8:00 AM	61	84	53	44
9:00 AM	66	93	54	40
10:00 AM	61	87	49	40
11:00 AM	62	80	48	39
12:00 PM	58	77	48	41
1:00 PM	61	77	49	41
2:00 PM	67	81	59	44
3:00 PM	61	77	55	40
4:00 PM	55	73	45	38
5:00 PM	54	71	47	39
6:00 PM	55	71	45	39
7:00 PM	53	69	45	40
8:00 PM	51	68	44	40
9:00 PM	56	79	47	42
10:00 PM	56	75	51	45
11:00 PM	53	73	44	40

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	67	51	61	61	44	57
Lmax (Maximum)	93	68	78	84	68	75
L50 (Median)	59	44	50	57	38	45
L90 (Background)	47	38	41	48	33	39

Computed Ldn, dB	64
% Daytime Energy	82%
% Nighttime Energy	18%

GPS Coordinates	38°22'37.03"N
	120°58'58.88"W

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Appendix C-2
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Friday, October 04, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	54	72	50	47
1:00 AM	51	73	43	39
2:00 AM	46	67	42	39
3:00 AM	47	67	43	41
4:00 AM	54	73	41	37
5:00 AM	59	74	53	43
6:00 AM	64	91	57	48
7:00 AM	60	74	55	44
8:00 AM	58	76	48	41
9:00 AM	58	75	46	41
10:00 AM	59	80	48	42
11:00 AM	61	88	52	44
12:00 PM	61	84	53	46
1:00 PM	61	76	56	47
2:00 PM	59	78	54	45
3:00 PM	59	75	55	45
4:00 PM	58	77	51	43
5:00 PM	58	82	49	43
6:00 PM	55	71	48	43
7:00 PM	55	69	50	44
8:00 PM	52	68	45	36
9:00 PM	54	75	44	35
10:00 PM	54	68	44	35
11:00 PM	50	72	29	22

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	61	52	59	64	46	57
Lmax (Maximum)	88	68	77	91	67	73
L50 (Median)	56	44	50	57	29	45
L90 (Background)	47	35	43	48	22	39

Computed Ldn, dB	64
% Daytime Energy	71%
% Nighttime Energy	29%

GPS Coordinates	38°22'37.03"N
	120°58'58.88"W

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Appendix C-3
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Saturday, October 05, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	47	67	27	23
1:00 AM	44	64	24	21
2:00 AM	49	73	27	23
3:00 AM	48	69	24	22
4:00 AM	48	68	27	23
5:00 AM	56	73	45	25
6:00 AM	57	75	47	33
7:00 AM	57	77	48	36
8:00 AM	60	91	44	36
9:00 AM	53	72	40	29
10:00 AM	52	67	38	28
11:00 AM	55	74	41	29
12:00 PM	53	70	43	32
1:00 PM	55	73	47	34
2:00 PM	54	67	46	34
3:00 PM	56	75	50	32
4:00 PM	54	71	43	30
5:00 PM	55	72	46	31
6:00 PM	54	69	43	29
7:00 PM	58	88	45	29
8:00 PM	55	69	49	32
9:00 PM	55	71	49	37
10:00 PM	56	77	46	29
11:00 PM	51	72	34	25

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	60	52	56	57	44	53
Lmax (Maximum)	91	67	74	77	64	71
L50 (Median)	50	38	45	47	24	33
L90 (Background)	37	28	32	33	21	25

Computed Ldn, dB	60
% Daytime Energy	76%
% Nighttime Energy	24%

GPS Coordinates	38°22'37.03"N
	120°58'58.88"W

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Appendix C-4
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Sunday, October 06, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	50	68	28	22
1:00 AM	47	68	27	23
2:00 AM	42	64	24	22
3:00 AM	46	68	23	21
4:00 AM	47	70	24	22
5:00 AM	57	73	48	28
6:00 AM	54	70	45	31
7:00 AM	53	71	39	29
8:00 AM	53	69	41	32
9:00 AM	53	69	41	31
10:00 AM	52	70	38	27
11:00 AM	53	70	42	29
12:00 PM	54	73	41	29
1:00 PM	54	72	45	31
2:00 PM	54	75	42	29
3:00 PM	54	70	43	30
4:00 PM	53	68	39	29
5:00 PM	53	69	42	31
6:00 PM	52	71	40	28
7:00 PM	54	72	42	29
8:00 PM	53	69	41	29
9:00 PM	54	71	45	31
10:00 PM	55	72	45	28
11:00 PM	47	67	35	26

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	54	52	53	57	42	52
Lmax (Maximum)	75	68	71	73	64	69
L50 (Median)	45	38	41	48	23	33
L90 (Background)	32	27	30	31	21	25

Computed Ldn, dB	58
% Daytime Energy	70%
% Nighttime Energy	30%

GPS Coordinates	38°22'37.03"N
	120°58'58.88"W

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Appendix C-5
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Monday, October 07, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	53	74	41	37
1:00 AM	53	75	40	38
2:00 AM	49	72	40	37
3:00 AM	54	75	42	37
4:00 AM	55	80	43	38
5:00 AM	59	74	53	44
6:00 AM	60	72	57	46
7:00 AM	61	78	55	46
8:00 AM	58	77	48	41
9:00 AM	59	78	51	39
10:00 AM	56	73	41	34
11:00 AM	58	74	46	36
12:00 PM	56	73	45	37
1:00 PM	59	75	51	38
2:00 PM	58	74	52	38
3:00 PM	59	74	53	41
4:00 PM	57	75	49	40
5:00 PM	56	74	47	41
6:00 PM	55	74	49	45
7:00 PM	55	71	51	46
8:00 PM	52	67	46	35
9:00 PM	56	75	45	35
10:00 PM	55	73	45	37
11:00 PM	52	73	40	33

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	61	52	57	60	49	56
Lmax (Maximum)	78	67	74	80	72	74
L50 (Median)	55	41	49	57	40	44
L90 (Background)	46	34	39	46	33	39

Computed Ldn, dB	62
% Daytime Energy	71%
% Nighttime Energy	29%

GPS Coordinates	38°22'37.03"N
	120°58'58.88"W

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Appendix C-6
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Thursday, October 03, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	61	78	52	50
1:00 AM	59	78	50	48
2:00 AM	61	79	51	47
3:00 AM	56	76	50	49
4:00 AM	61	78	50	48
5:00 AM	57	76	49	47
6:00 AM	57	78	51	49
7:00 AM	57	76	51	49
8:00 AM	73	94	46	43
9:00 AM	61	82	42	40
10:00 AM	55	78	41	39
11:00 AM	58	79	40	38
12:00 PM	72	89	40	38
1:00 PM	54	73	40	37
2:00 PM	55	77	40	37
3:00 PM	47	66	38	35
4:00 PM	43	65	37	35
5:00 PM	47	70	39	37
6:00 PM	51	75	40	38
7:00 PM	42	67	38	36
8:00 PM	46	62	44	38
9:00 PM	47	66	44	41
10:00 PM	49	69	47	43
11:00 PM	55	76	50	46

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	73	42	64	61	49	59
Lmax (Maximum)	94	62	75	79	69	77
L50 (Median)	51	37	41	52	47	50
L90 (Background)	49	35	39	50	43	47

Computed Ldn, dB	66
% Daytime Energy	86%
% Nighttime Energy	14%

GPS Coordinates	38°22'27.51"N
	120°59'40.26"W

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Appendix C-7
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Friday, October 04, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	49	68	47	44
1:00 AM	46	53	46	44
2:00 AM	48	68	47	44
3:00 AM	56	77	47	44
4:00 AM	58	84	46	43
5:00 AM	57	78	51	44
6:00 AM	56	77	53	48
7:00 AM	74	93	50	48
8:00 AM	61	77	47	44
9:00 AM	56	76	43	42
10:00 AM	72	91	43	41
11:00 AM	54	76	44	41
12:00 PM	71	89	45	41
1:00 PM	70	92	45	43
2:00 PM	55	78	44	41
3:00 PM	48	67	43	41
4:00 PM	47	64	43	41
5:00 PM	47	67	44	42
6:00 PM	46	58	46	44
7:00 PM	49	63	48	46
8:00 PM	51	61	51	49
9:00 PM	52	59	51	48
10:00 PM	52	60	49	42
11:00 PM	34	52	27	22

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	74	46	67	58	34	54
Lmax (Maximum)	93	58	74	84	52	68
L50 (Median)	51	43	46	53	27	46
L90 (Background)	49	41	43	48	22	42

Computed Ldn, dB	66
% Daytime Energy	97%
% Nighttime Energy	3%

GPS Coordinates	38°22'27.51"N
	120°59'40.26"W

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Appendix C-8
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Saturday, October 05, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	29	42	25	22
1:00 AM	27	44	23	21
2:00 AM	31	47	24	22
3:00 AM	33	50	23	21
4:00 AM	31	47	24	21
5:00 AM	39	50	36	23
6:00 AM	43	60	40	31
7:00 AM	62	81	45	38
8:00 AM	59	80	40	33
9:00 AM	52	73	32	28
10:00 AM	56	73	36	30
11:00 AM	48	73	29	26
12:00 PM	45	68	32	28
1:00 PM	47	71	32	30
2:00 PM	46	71	33	31
3:00 PM	34	51	33	30
4:00 PM	38	64	32	30
5:00 PM	49	84	34	31
6:00 PM	39	56	35	32
7:00 PM	38	48	36	33
8:00 PM	41	58	38	35
9:00 PM	40	52	38	34
10:00 PM	39	52	35	27
11:00 PM	34	51	30	25

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	62	34	53	43	27	37
Lmax (Maximum)	84	48	67	60	42	49
L50 (Median)	45	29	35	40	23	29
L90 (Background)	38	26	31	31	21	24

Computed Ldn, dB	52
% Daytime Energy	99%
% Nighttime Energy	1%

GPS Coordinates	38°22'27.51"N
	120°59'40.26"W

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Appendix C-9
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Sunday, October 06, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	31	46	26	23
1:00 AM	32	55	25	23
2:00 AM	26	43	23	22
3:00 AM	29	47	24	22
4:00 AM	30	51	24	22
5:00 AM	38	51	35	26
6:00 AM	38	57	35	28
7:00 AM	42	59	39	34
8:00 AM	54	76	38	32
9:00 AM	37	52	32	29
10:00 AM	44	69	31	29
11:00 AM	40	61	30	27
12:00 PM	49	72	30	27
1:00 PM	32	55	30	28
2:00 PM	37	62	31	29
3:00 PM	47	73	31	29
4:00 PM	37	61	31	29
5:00 PM	35	48	32	28
6:00 PM	39	63	34	30
7:00 PM	36	48	33	29
8:00 PM	35	48	31	27
9:00 PM	39	50	36	29
10:00 PM	40	53	36	26
11:00 PM	60	75	46	27

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	54	32	45	60	26	50
Lmax (Maximum)	76	48	60	75	43	53
L50 (Median)	39	30	33	46	23	30
L90 (Background)	34	27	29	28	22	24

Computed Ldn, dB	56
% Daytime Energy	33%
% Nighttime Energy	67%

GPS Coordinates	38°22'27.51"N
	120°59'40.26"W

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Appendix C-10
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Monday, October 07, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	63	78	55	53
1:00 AM	59	78	53	51
2:00 AM	61	78	55	50
3:00 AM	59	77	56	53
4:00 AM	62	78	55	50
5:00 AM	61	78	53	51
6:00 AM	60	76	51	49
7:00 AM	58	77	49	46
8:00 AM	54	73	42	40
9:00 AM	54	74	39	37
10:00 AM	56	77	37	34
11:00 AM	52	74	37	34
12:00 PM	49	72	37	33
1:00 PM	53	72	37	32
2:00 PM	55	76	36	30
3:00 PM	45	65	40	36
4:00 PM	46	67	40	39
5:00 PM	52	73	42	40
6:00 PM	47	58	47	45
7:00 PM	48	59	47	45
8:00 PM	51	63	51	49
9:00 PM	51	67	50	49
10:00 PM	53	61	53	49
11:00 PM	61	78	53	49

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	58	45	53	63	53	60
Lmax (Maximum)	77	58	70	78	61	76
L50 (Median)	51	36	42	56	51	54
L90 (Background)	49	30	39	53	49	51

Computed Ldn, dB	66
% Daytime Energy	22%
% Nighttime Energy	78%

GPS Coordinates	38°22'27.51"N
	120°59'40.26"W

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Appendix C-11
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Thursday, October 03, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	26	43	22	20
1:00 AM	27	46	20	18
2:00 AM	27	44	24	22
3:00 AM	27	47	22	20
4:00 AM	26	45	23	20
5:00 AM	29	43	26	22
6:00 AM	48	67	34	29
7:00 AM	43	62	33	30
8:00 AM	47	67	31	28
9:00 AM	48	66	43	25
10:00 AM	51	67	46	32
11:00 AM	44	63	26	21
12:00 PM	53	67	49	43
1:00 PM	54	68	49	41
2:00 PM	53	68	48	26
3:00 PM	32	53	25	21
4:00 PM	34	51	22	20
5:00 PM	40	61	23	19
6:00 PM	31	50	22	19
7:00 PM	33	53	27	22
8:00 PM	29	47	22	19
9:00 PM	31	53	23	20
10:00 PM	30	50	20	18
11:00 PM	48	64	27	18

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	54	29	48	48	26	41
Lmax (Maximum)	68	47	60	67	43	50
L50 (Median)	49	22	32	34	20	24
L90 (Background)	43	19	26	29	18	21

Computed Ldn, dB	50
% Daytime Energy	89%
% Nighttime Energy	11%

GPS Coordinates	38°22'9.68"N
	121° 0'0.07"W

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Appendix C-12
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Friday, October 04, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	52	65	48	38
1:00 AM	50	62	44	35
2:00 AM	50	62	46	36
3:00 AM	40	57	37	33
4:00 AM	42	56	40	35
5:00 AM	40	45	39	35
6:00 AM	38	49	36	25
7:00 AM	40	59	31	27
8:00 AM	42	56	39	25
9:00 AM	48	63	27	23
10:00 AM	53	66	48	32
11:00 AM	38	64	29	24
12:00 PM	55	67	51	37
1:00 PM	53	66	47	36
2:00 PM	53	66	49	31
3:00 PM	37	58	33	28
4:00 PM	36	55	33	29
5:00 PM	36	55	32	27
6:00 PM	31	52	25	22
7:00 PM	29	46	25	22
8:00 PM	28	44	24	22
9:00 PM	29	39	27	24
10:00 PM	28	40	26	21
11:00 PM	24	39	21	18

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	55	28	48	52	24	47
Lmax (Maximum)	67	39	57	65	39	53
L50 (Median)	51	24	35	48	21	37
L90 (Background)	37	22	27	38	18	31

Computed Ldn, dB	53
% Daytime Energy	70%
% Nighttime Energy	30%

GPS Coordinates	38°22'9.68"N
	121° 0'0.07"W

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Appendix C-13
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Saturday, October 05, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	23	39	21	18
1:00 AM	26	57	18	17
2:00 AM	26	49	18	17
3:00 AM	22	47	18	17
4:00 AM	21	33	18	18
5:00 AM	26	38	25	19
6:00 AM	30	54	25	22
7:00 AM	31	44	27	23
8:00 AM	38	61	27	22
9:00 AM	38	58	24	22
10:00 AM	36	61	25	21
11:00 AM	45	73	23	20
12:00 PM	28	49	23	20
1:00 PM	36	59	24	21
2:00 PM	34	53	24	20
3:00 PM	27	48	22	20
4:00 PM	30	51	24	20
5:00 PM	35	53	26	22
6:00 PM	33	52	22	20
7:00 PM	25	42	21	19
8:00 PM	27	46	24	20
9:00 PM	28	39	26	22
10:00 PM	28	40	26	21
11:00 PM	28	47	22	19

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	45	25	36	30	21	27
Lmax (Maximum)	73	39	53	57	33	45
L50 (Median)	27	21	24	26	18	21
L90 (Background)	23	19	21	22	17	19

Computed Ldn, dB	36
% Daytime Energy	94%
% Nighttime Energy	6%

GPS Coordinates	38°22'9.68"N
	121° 0'0.07"W

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Appendix C-14
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Sunday, October 06, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	26	45	20	18
1:00 AM	21	33	19	18
2:00 AM	19	36	18	18
3:00 AM	20	41	18	18
4:00 AM	20	39	18	18
5:00 AM	25	38	24	18
6:00 AM	31	61	25	20
7:00 AM	40	68	24	20
8:00 AM	39	64	23	20
9:00 AM	37	57	24	19
10:00 AM	35	51	26	20
11:00 AM	34	54	22	19
12:00 PM	33	52	22	19
1:00 PM	26	45	22	20
2:00 PM	25	48	22	20
3:00 PM	31	54	22	20
4:00 PM	27	44	22	20
5:00 PM	34	54	23	20
6:00 PM	41	66	21	19
7:00 PM	30	43	21	19
8:00 PM	30	44	22	19
9:00 PM	28	44	24	21
10:00 PM	30	45	25	19
11:00 PM	29	45	21	18

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	41	25	35	31	19	27
Lmax (Maximum)	68	43	52	61	33	43
L50 (Median)	26	21	23	25	18	21
L90 (Background)	21	19	19	20	18	18

Computed Ldn, dB	36
% Daytime Energy	92%
% Nighttime Energy	8%

GPS Coordinates	38°22'9.68"N
	121° 0'0.07"W

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Appendix C-15
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Monday, October 07, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	30	47	27	22
1:00 AM	26	40	24	21
2:00 AM	27	45	24	21
3:00 AM	24	42	23	20
4:00 AM	36	53	34	26
5:00 AM	48	59	46	38
6:00 AM	49	65	45	40
7:00 AM	49	61	46	39
8:00 AM	53	64	49	43
9:00 AM	51	69	44	39
10:00 AM	55	72	47	40
11:00 AM	45	69	38	32
12:00 PM	55	72	50	44
1:00 PM	53	73	48	42
2:00 PM	51	64	43	24
3:00 PM	41	67	23	20
4:00 PM	30	47	21	19
5:00 PM	37	62	23	20
6:00 PM	40	64	22	19
7:00 PM	29	44	20	19
8:00 PM	29	40	22	19
9:00 PM	32	52	26	23
10:00 PM	29	47	25	22
11:00 PM	31	50	25	21

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	55	29	50	49	24	42
Lmax (Maximum)	73	40	61	65	40	50
L50 (Median)	50	20	35	46	23	30
L90 (Background)	44	19	29	40	20	26

Computed Ldn, dB	51
% Daytime Energy	91%
% Nighttime Energy	9%

GPS Coordinates	38°22'9.68"N
	121° 0'0.07"W

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Appendix C-16
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Thursday, October 03, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	39	54	33	25
1:00 AM	37	61	23	20
2:00 AM	42	65	37	30
3:00 AM	33	53	21	20
4:00 AM	45	66	36	28
5:00 AM	31	45	28	24
6:00 AM	36	50	33	29
7:00 AM	37	53	32	29
8:00 AM	33	49	30	27
9:00 AM	36	53	30	26
10:00 AM	35	51	30	24
11:00 AM	36	57	30	26
12:00 PM	40	64	29	25
1:00 PM	37	58	32	26
2:00 PM	41	59	36	28
3:00 PM	35	53	28	24
4:00 PM	32	47	26	23
5:00 PM	41	62	29	25
6:00 PM	33	50	28	25
7:00 PM	36	50	35	33
8:00 PM	32	44	30	27
9:00 PM	32	51	27	25
10:00 PM	32	55	24	22
11:00 PM	36	49	23	21

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	41	32	37	45	31	39
Lmax (Maximum)	64	44	53	66	45	55
L50 (Median)	36	26	30	37	21	29
L90 (Background)	33	23	26	30	20	24

Computed Ldn, dB	45
% Daytime Energy	49%
% Nighttime Energy	51%

GPS Coordinates	38°21'50.14"N
	120°59'53.57"W

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Appendix C-17
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Friday, October 04, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	40	45	39	37
1:00 AM	40	45	40	36
2:00 AM	39	46	39	35
3:00 AM	40	46	40	37
4:00 AM	41	50	41	39
5:00 AM	42	49	42	40
6:00 AM	43	53	42	28
7:00 AM	32	45	30	27
8:00 AM	36	56	32	30
9:00 AM	39	55	32	27
10:00 AM	39	51	36	32
11:00 AM	41	55	37	30
12:00 PM	43	56	41	36
1:00 PM	45	68	43	39
2:00 PM	44	54	42	38
3:00 PM	42	56	40	36
4:00 PM	41	51	40	35
5:00 PM	40	52	38	35
6:00 PM	36	57	32	28
7:00 PM	34	42	34	32
8:00 PM	32	44	31	26
9:00 PM	27	37	26	25
10:00 PM	27	39	25	22
11:00 PM	24	42	20	19

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	45	27	40	43	24	40
Lmax (Maximum)	68	37	52	53	39	46
L50 (Median)	43	26	36	42	20	36
L90 (Background)	39	25	32	40	19	33

Computed Ldn, dB	46
% Daytime Energy	64%
% Nighttime Energy	36%

GPS Coordinates	38°21'50.14"N
	120°59'53.57"W

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Appendix C-18
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Saturday, October 05, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	21	38	20	19
1:00 AM	23	40	20	19
2:00 AM	23	39	20	18
3:00 AM	22	37	20	19
4:00 AM	21	40	20	19
5:00 AM	24	39	22	19
6:00 AM	29	46	25	22
7:00 AM	34	50	31	27
8:00 AM	40	58	30	26
9:00 AM	37	55	28	25
10:00 AM	35	52	27	23
11:00 AM	44	71	25	21
12:00 PM	34	50	27	22
1:00 PM	31	52	25	22
2:00 PM	34	51	28	22
3:00 PM	30	48	26	22
4:00 PM	33	49	29	22
5:00 PM	36	56	30	26
6:00 PM	35	53	32	28
7:00 PM	34	44	34	32
8:00 PM	30	42	30	27
9:00 PM	28	43	26	24
10:00 PM	27	39	25	23
11:00 PM	29	49	25	23

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	44	28	36	29	21	25
Lmax (Maximum)	71	42	52	49	37	41
L50 (Median)	34	25	28	25	20	22
L90 (Background)	32	21	25	23	18	20

Computed Ldn, dB	36
% Daytime Energy	95%
% Nighttime Energy	5%

GPS Coordinates	38°21'50.14"N
	120°59'53.57"W

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Appendix C-19
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Sunday, October 06, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	27	44	23	21
1:00 AM	26	44	22	20
2:00 AM	21	37	20	19
3:00 AM	21	37	20	18
4:00 AM	20	34	19	18
5:00 AM	24	39	23	19
6:00 AM	30	46	26	21
7:00 AM	38	59	30	26
8:00 AM	41	61	30	25
9:00 AM	37	55	28	25
10:00 AM	35	51	27	23
11:00 AM	33	50	24	21
12:00 PM	34	56	26	22
1:00 PM	29	46	25	21
2:00 PM	29	52	26	22
3:00 PM	32	51	25	22
4:00 PM	31	47	27	23
5:00 PM	33	47	28	23
6:00 PM	41	67	31	25
7:00 PM	35	44	34	32
8:00 PM	33	43	31	28
9:00 PM	29	43	27	25
10:00 PM	31	44	26	24
11:00 PM	35	49	27	24

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	41	29	36	35	20	29
Lmax (Maximum)	67	43	52	49	34	42
L50 (Median)	34	24	28	27	19	23
L90 (Background)	32	21	24	24	18	20

Computed Ldn, dB	37
% Daytime Energy	90%
% Nighttime Energy	10%

GPS Coordinates	38°21'50.14"N
	120°59'53.57"W

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Appendix C-20
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Monday, October 07, 2019

Hour	Leq	Lmax	L50	L90
12:00 AM	43	68	38	29
1:00 AM	40	62	34	28
2:00 AM	37	59	32	27
3:00 AM	31	52	24	22
4:00 AM	40	53	37	33
5:00 AM	43	61	40	35
6:00 AM	43	63	37	30
7:00 AM	33	53	30	27
8:00 AM	35	52	29	26
9:00 AM	37	60	30	26
10:00 AM	32	44	29	27
11:00 AM	34	48	29	23
12:00 PM	36	47	31	24
1:00 PM	40	58	34	29
2:00 PM	41	58	34	26
3:00 PM	41	63	29	24
4:00 PM	32	48	26	22
5:00 PM	40	64	28	23
6:00 PM	36	54	29	25
7:00 PM	34	42	33	31
8:00 PM	33	42	32	28
9:00 PM	33	51	29	26
10:00 PM	29	45	26	25
11:00 PM	39	60	33	25

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	41	32	37	43	29	40
Lmax (Maximum)	64	42	52	68	45	58
L50 (Median)	34	26	30	40	24	33
L90 (Background)	31	22	26	35	22	28

Computed Ldn, dB	46
% Daytime Energy	42%
% Nighttime Energy	58%

GPS Coordinates	38°21'50.14"N
	120°59'53.57"W

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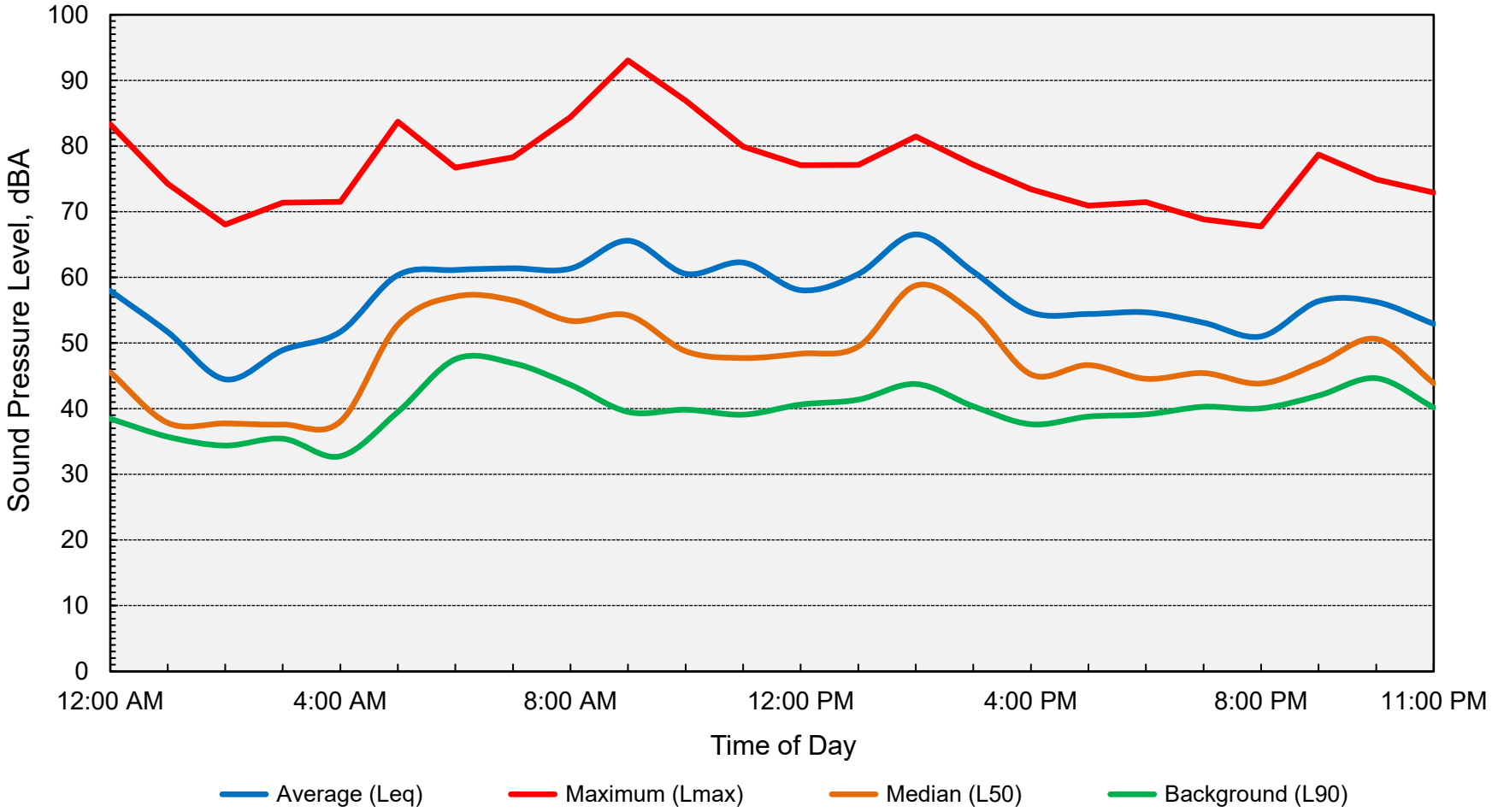
Appendix D-1
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Thursday, October 03, 2019



Computed Ldn = 64 dB

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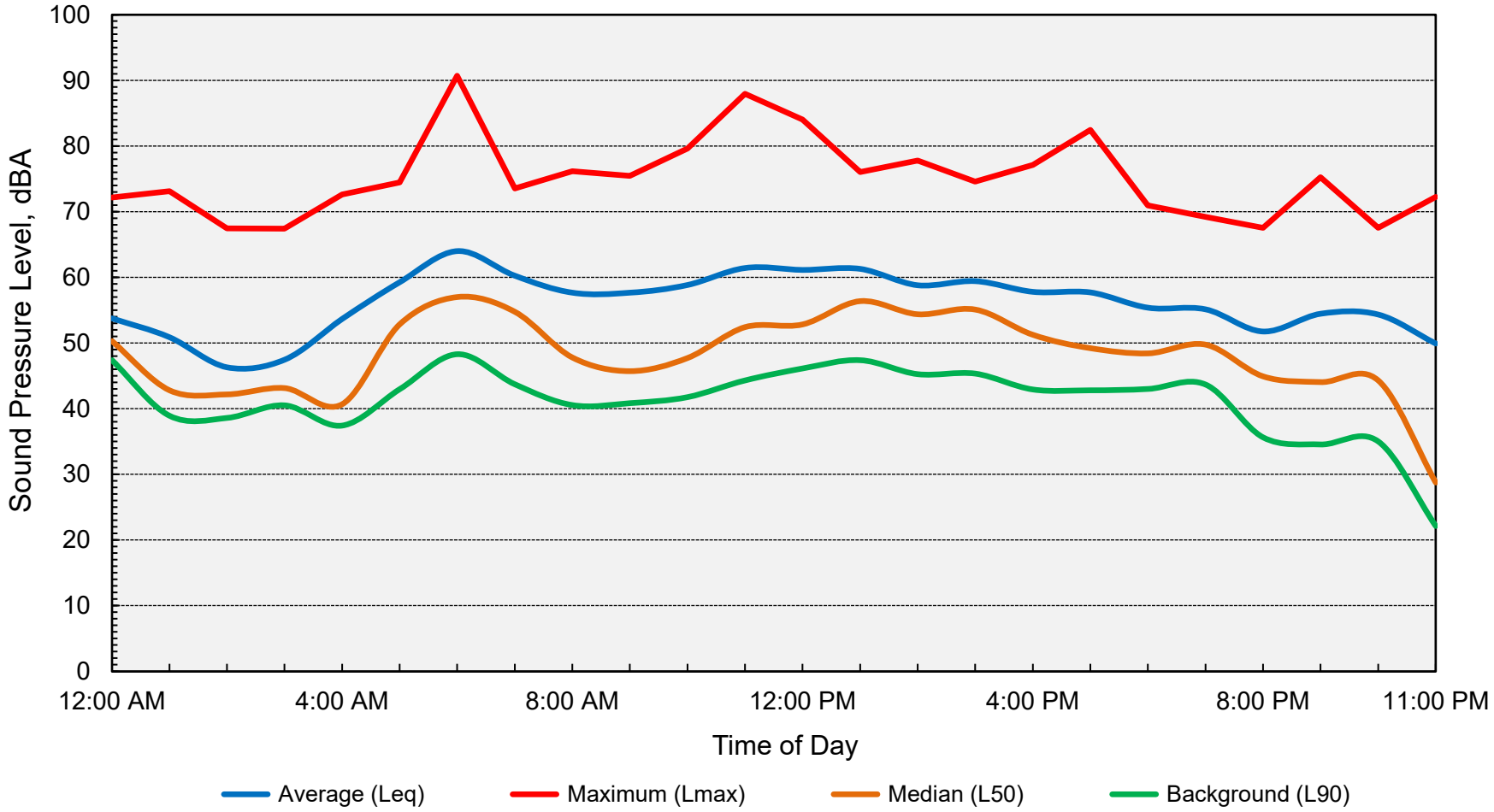
Appendix D-2
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Friday, October 04, 2019



Computed Ldn = 64 dB

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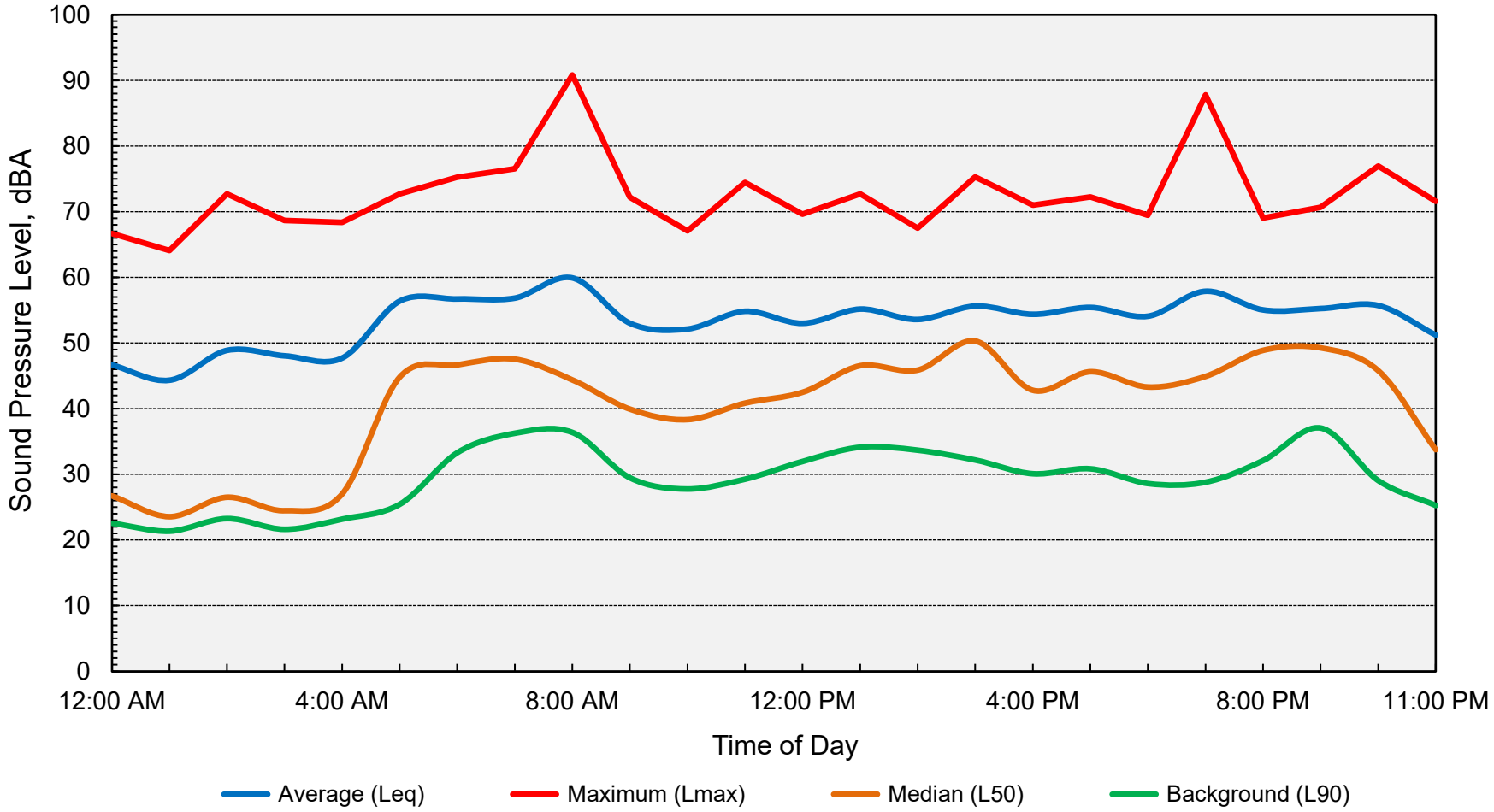
Appendix D-3
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Saturday, October 05, 2019



Computed Ldn = 60 dB

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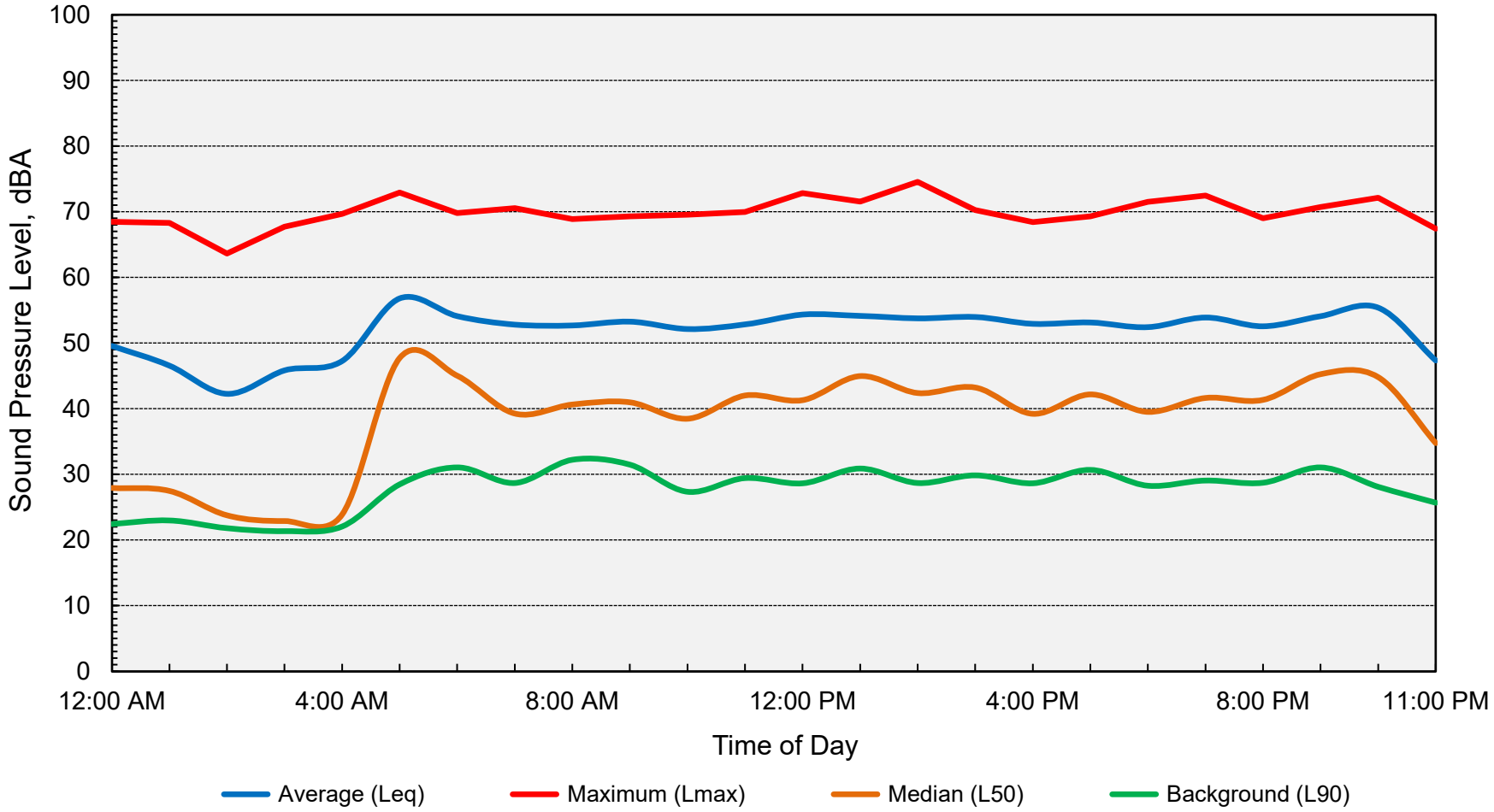
Appendix D-4
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Sunday, October 06, 2019



Computed Ldn = 58 dB

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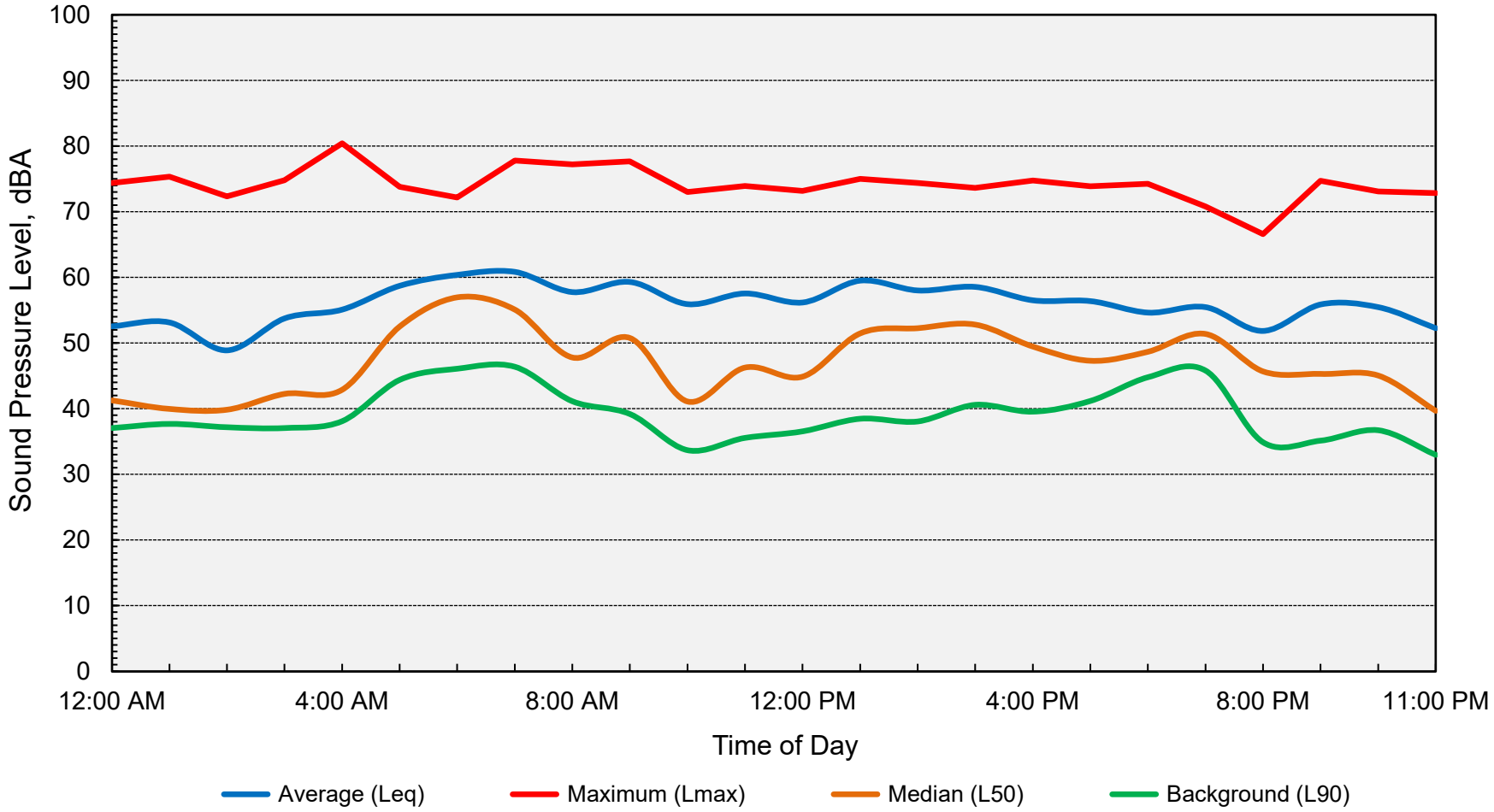
Appendix D-5
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 1
Monday, October 07, 2019



Computed Ldn = 62 dB

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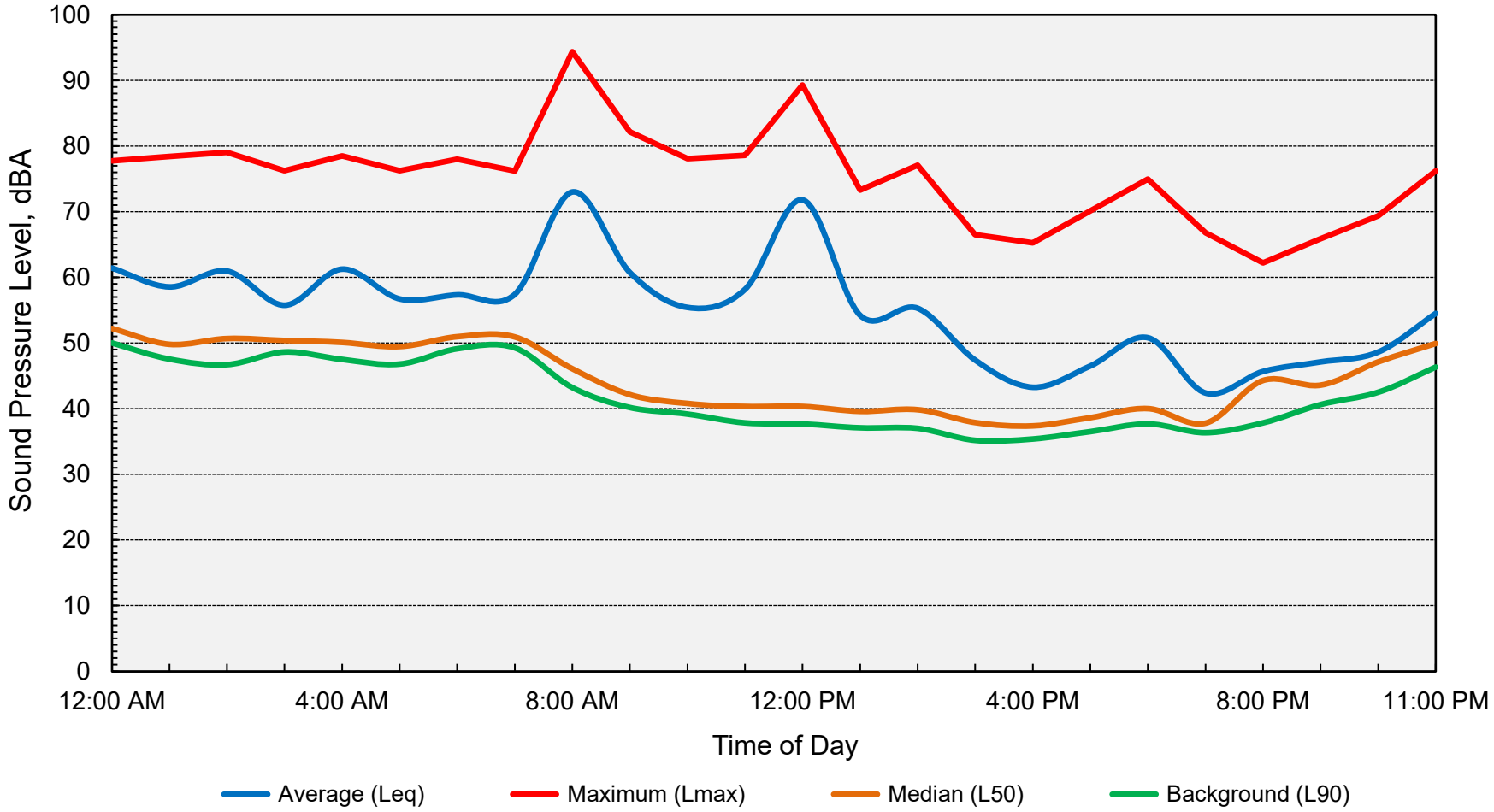
Appendix D-6
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Thursday, October 03, 2019



Computed Ldn = 66 dB

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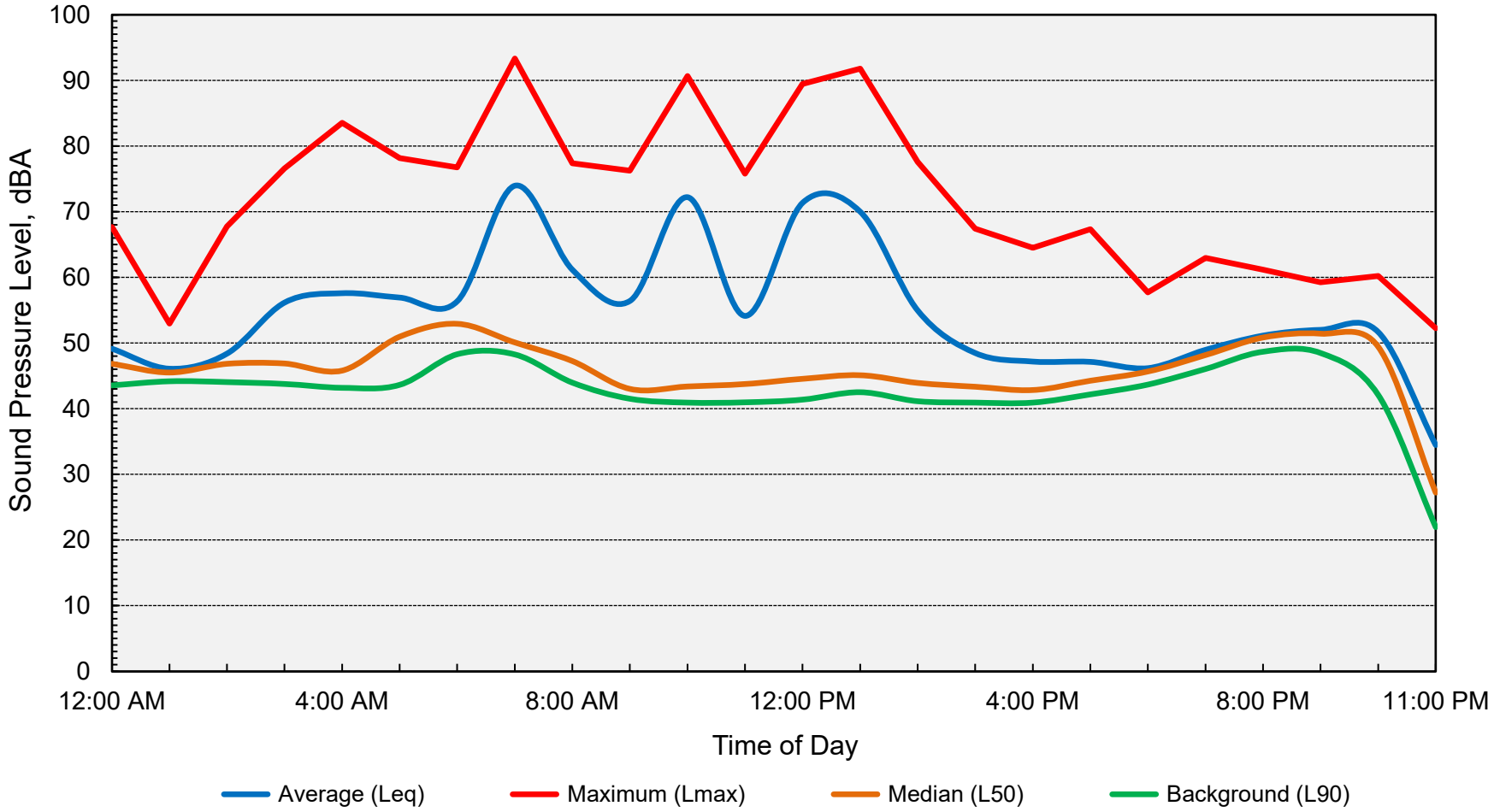
Appendix D-7
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Friday, October 04, 2019



Computed Ldn = 66 dB

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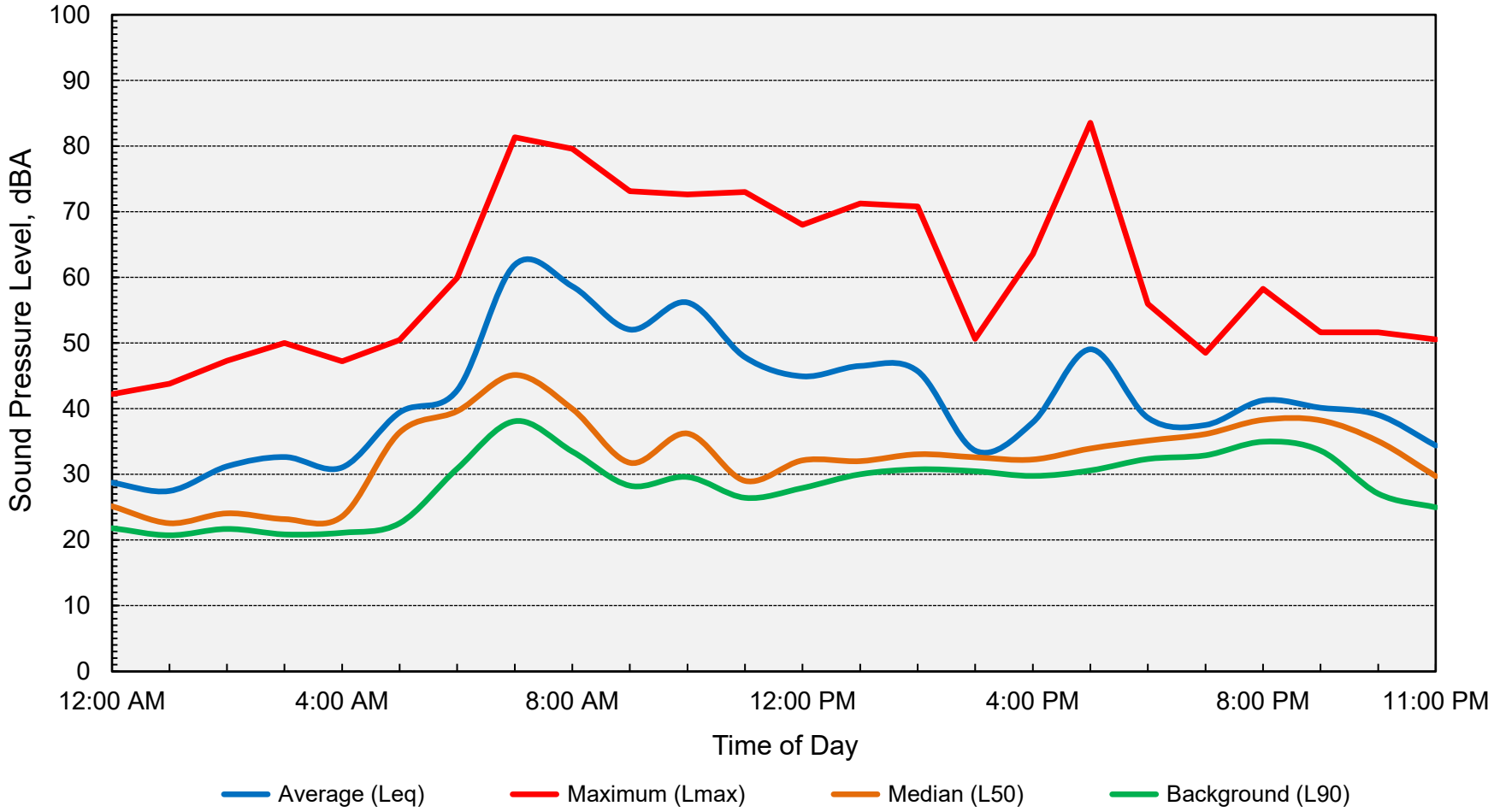
Appendix D-8
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Saturday, October 05, 2019



Computed Ldn = 52 dB

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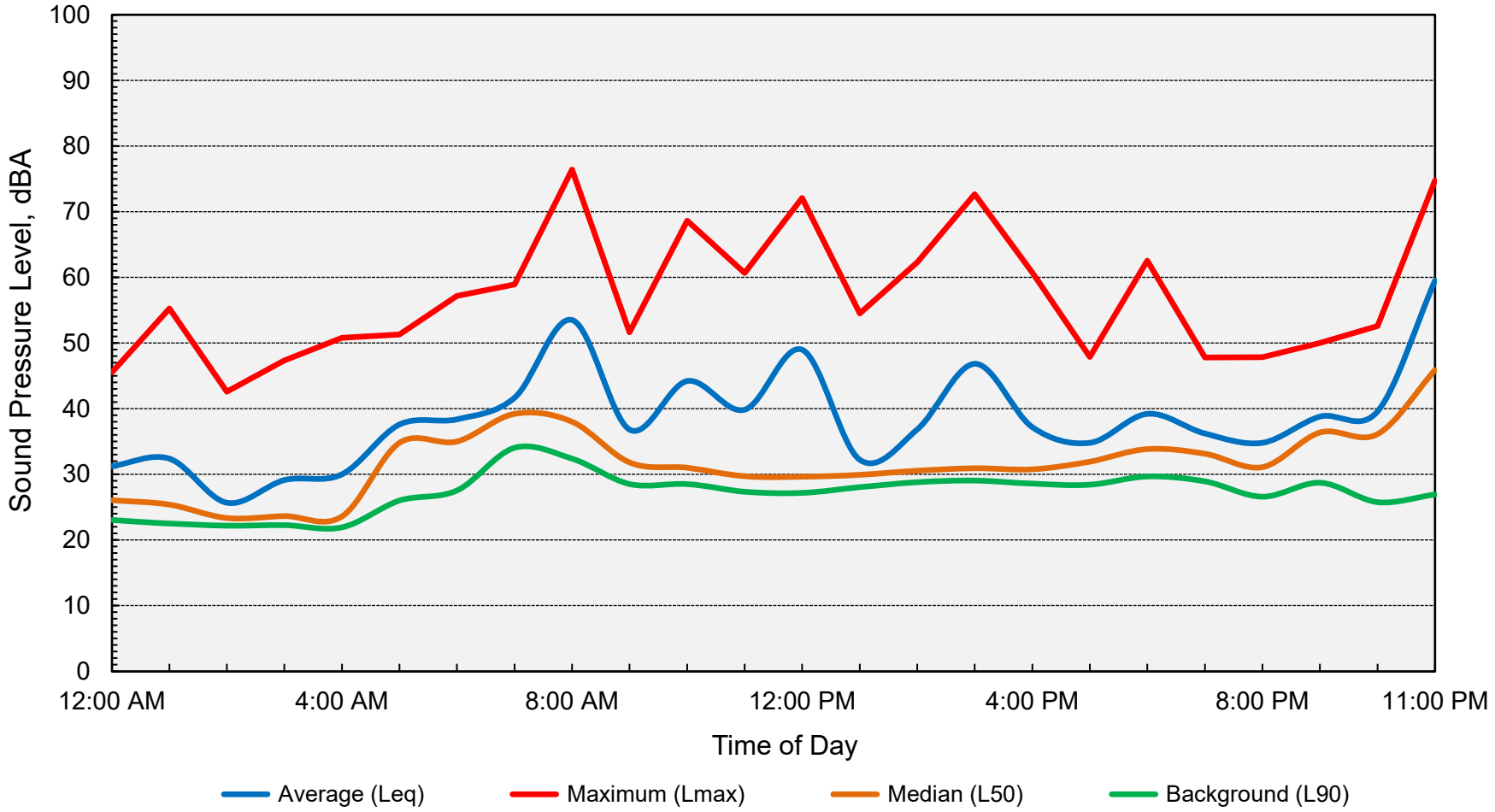
Appendix D-9
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Sunday, October 06, 2019



Computed Ldn = 56 dB

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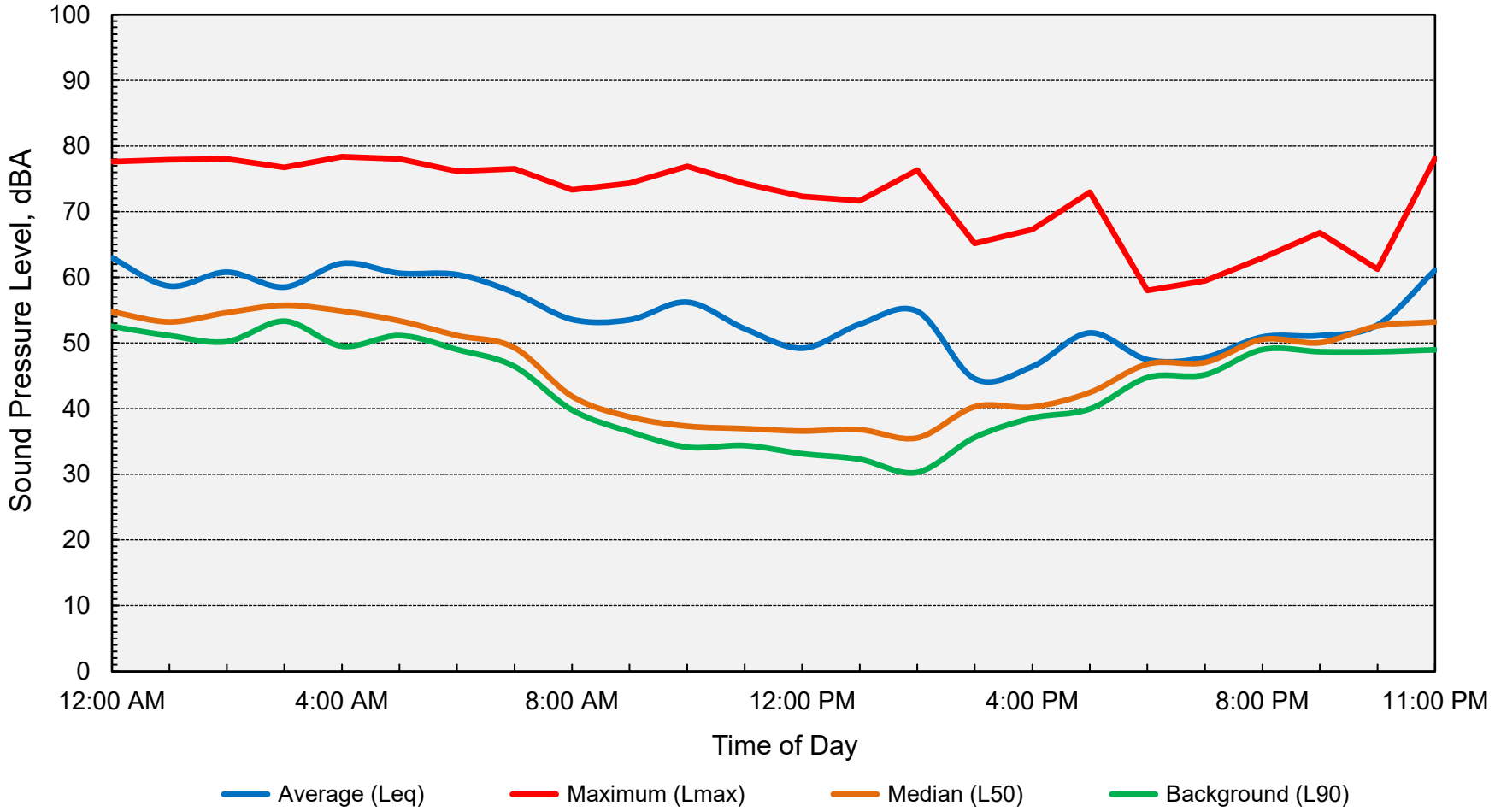
Appendix D-10
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 2
Monday, October 07, 2019



Computed Ldn = 66 dB

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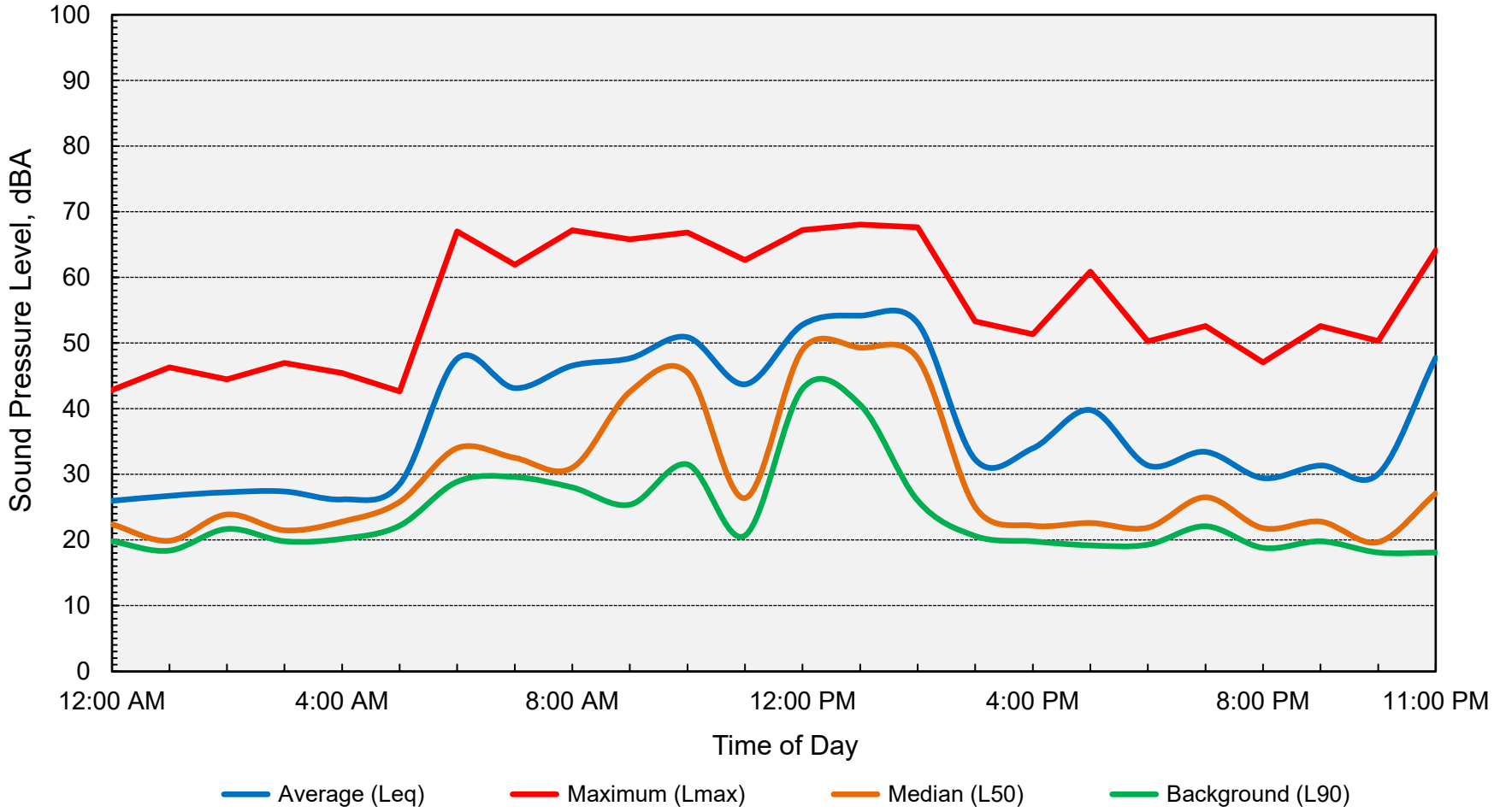
Appendix D-11
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Thursday, October 03, 2019



Computed Ldn = 50 dB

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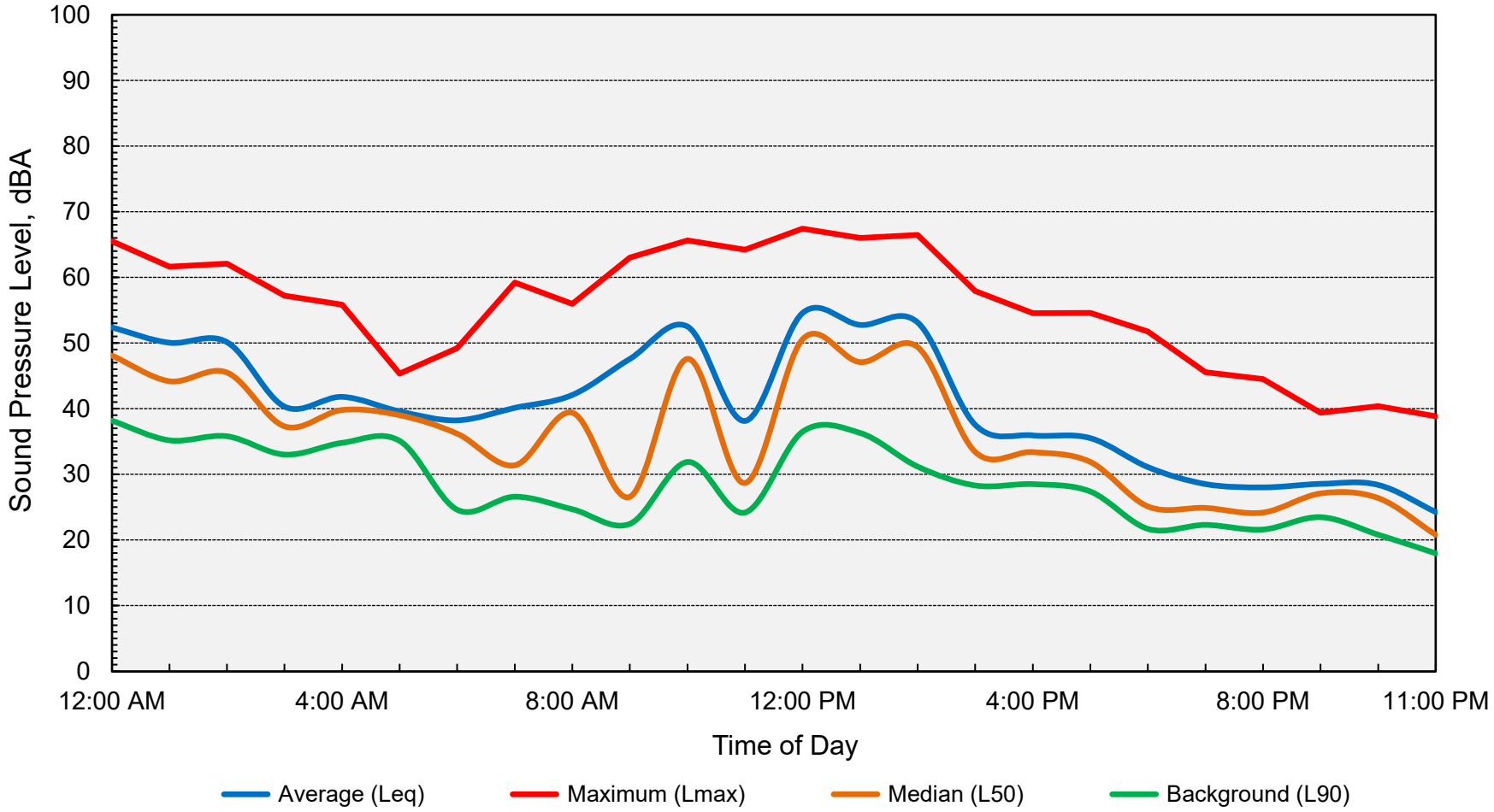
Appendix D-12
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Friday, October 04, 2019



Computed Ldn = 53 dB

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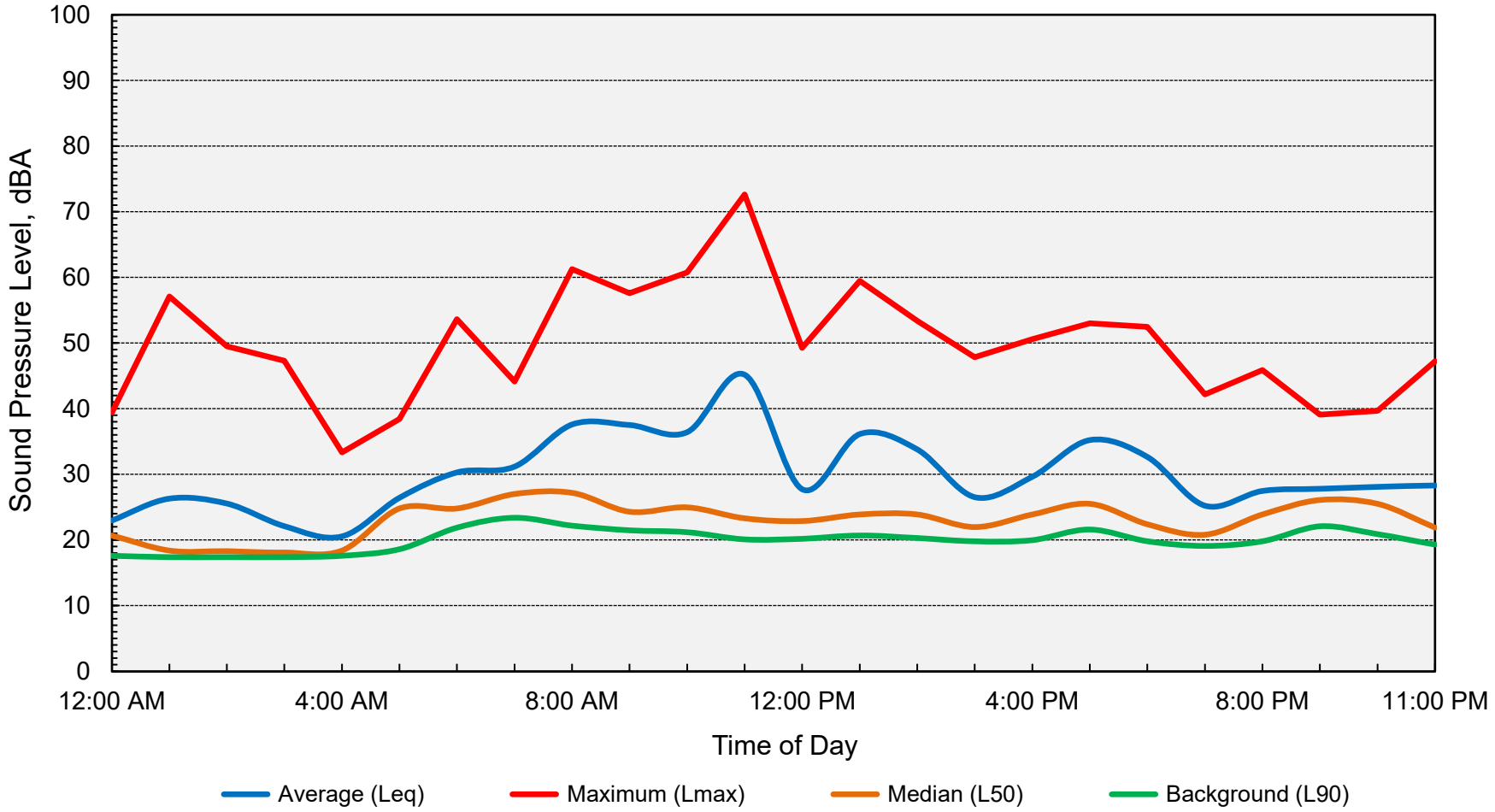
Appendix D-13
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Saturday, October 05, 2019



Computed Ldn = 36 dB

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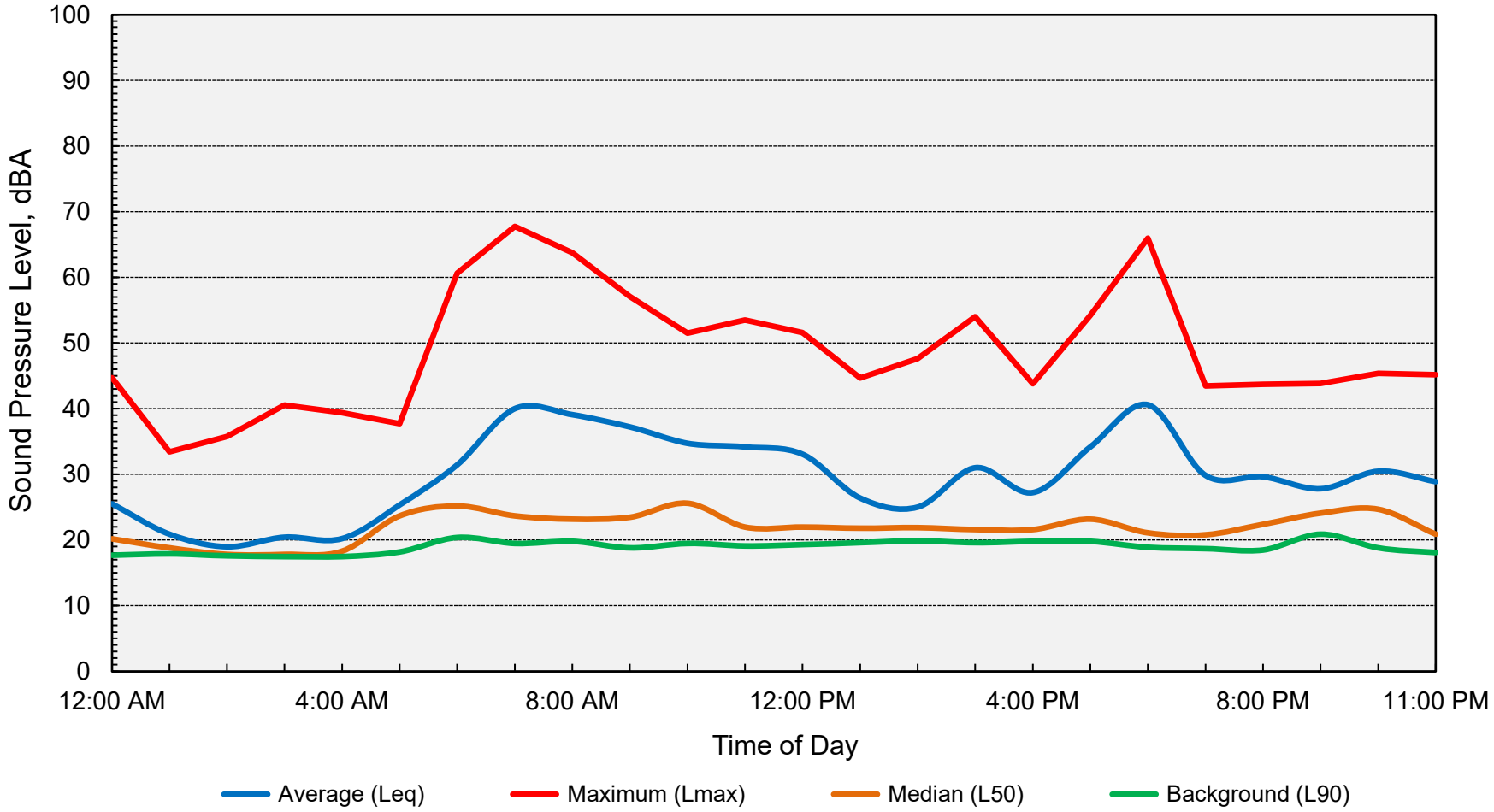
Appendix D-14
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Sunday, October 06, 2019



Computed Ldn = 36 dB

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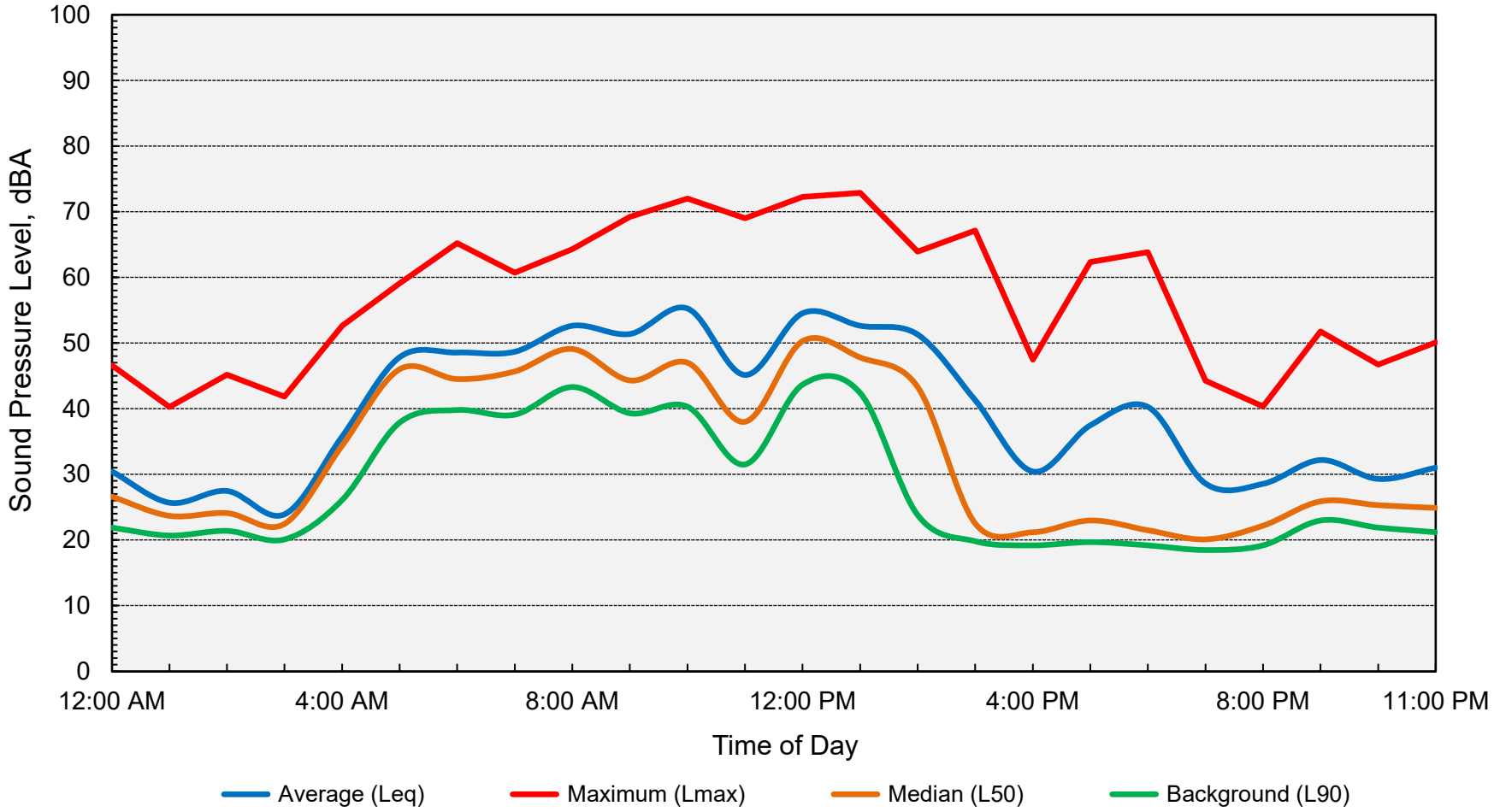
Appendix D-15
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 3
Monday, October 07, 2019



Computed Ldn = 51 dB

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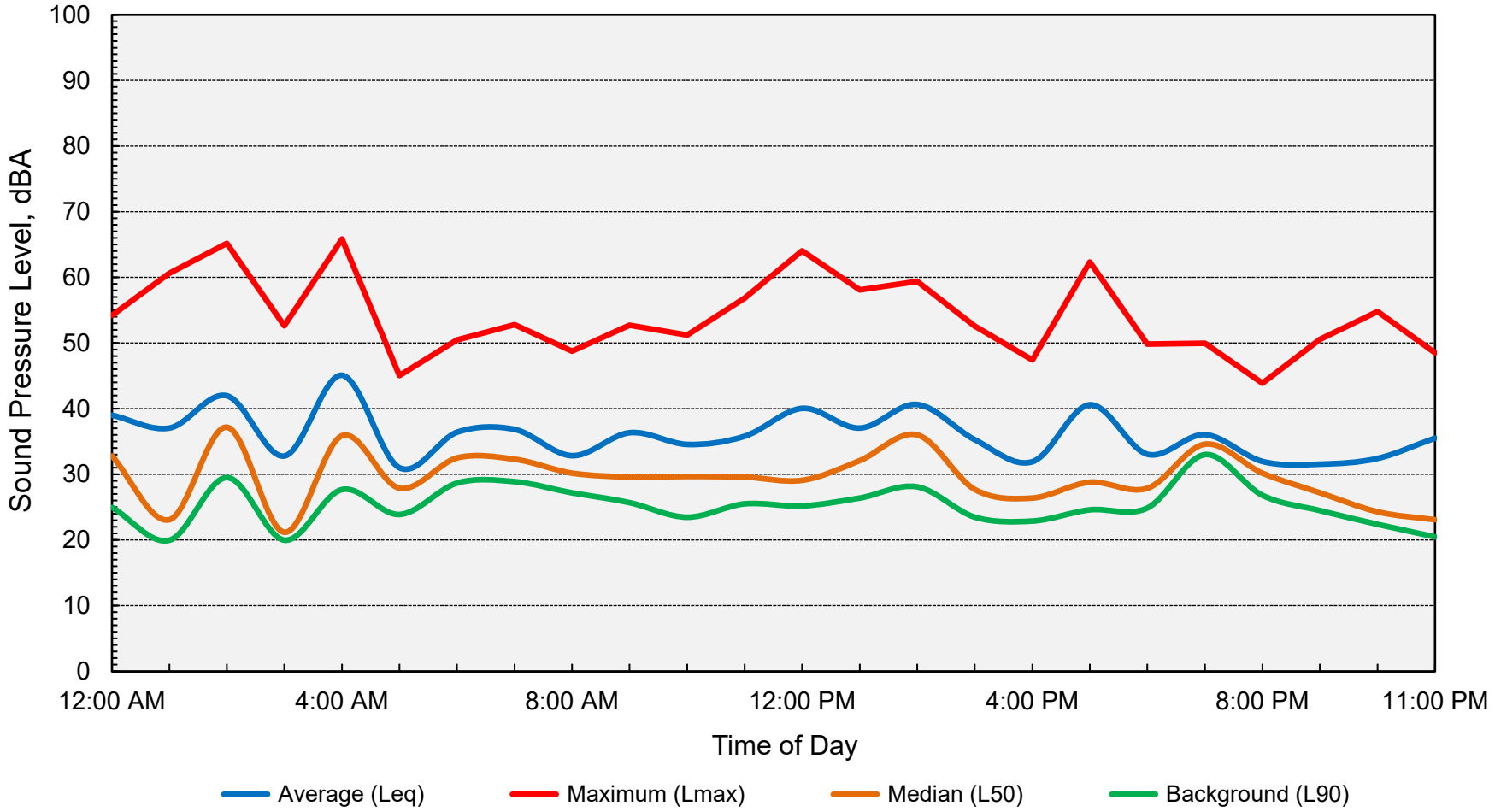
Appendix D-16
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Thursday, October 03, 2019



Computed Ldn = 45 dB

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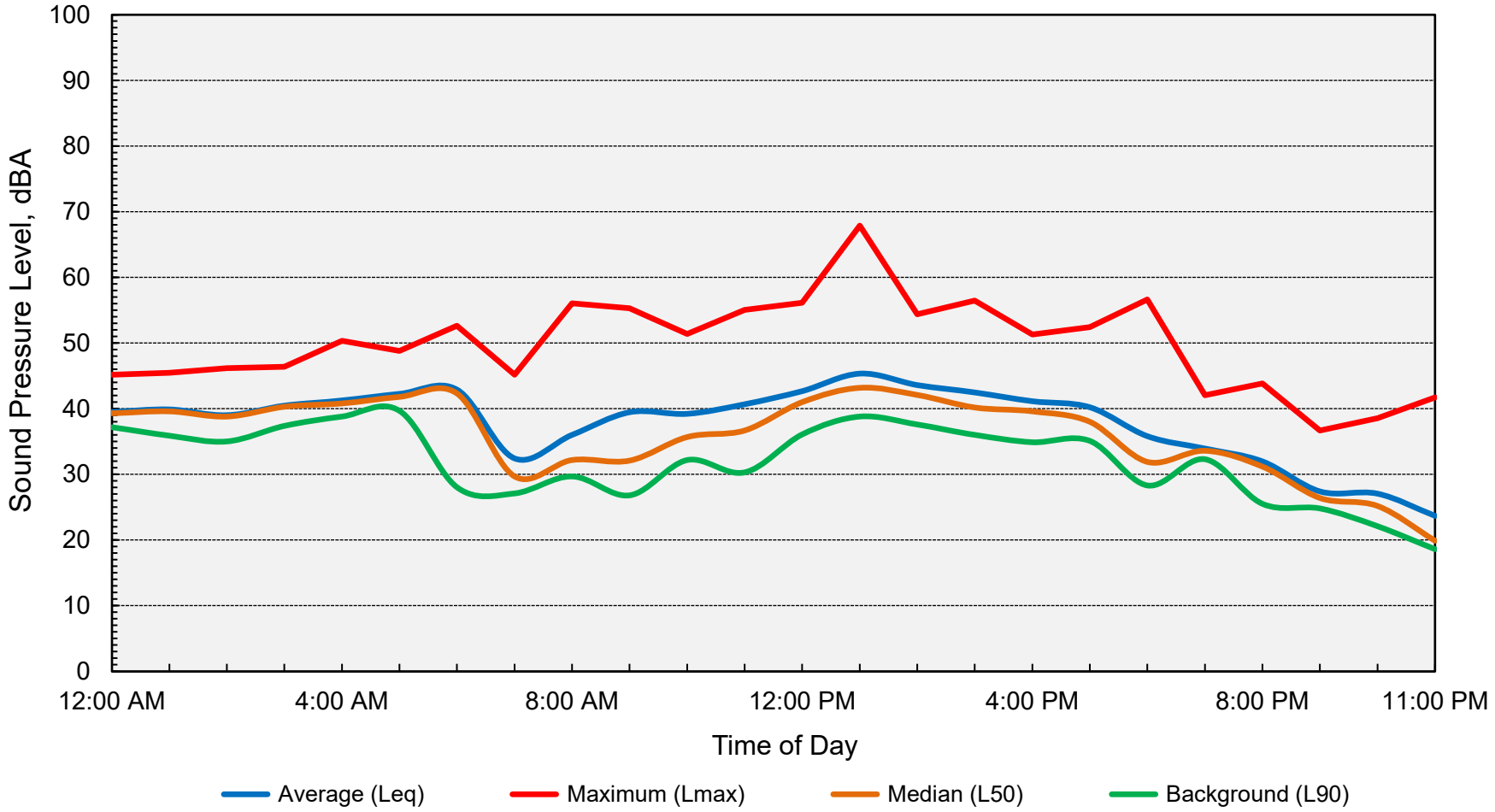
Appendix D-17
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Friday, October 04, 2019



Computed Ldn = 46 dB

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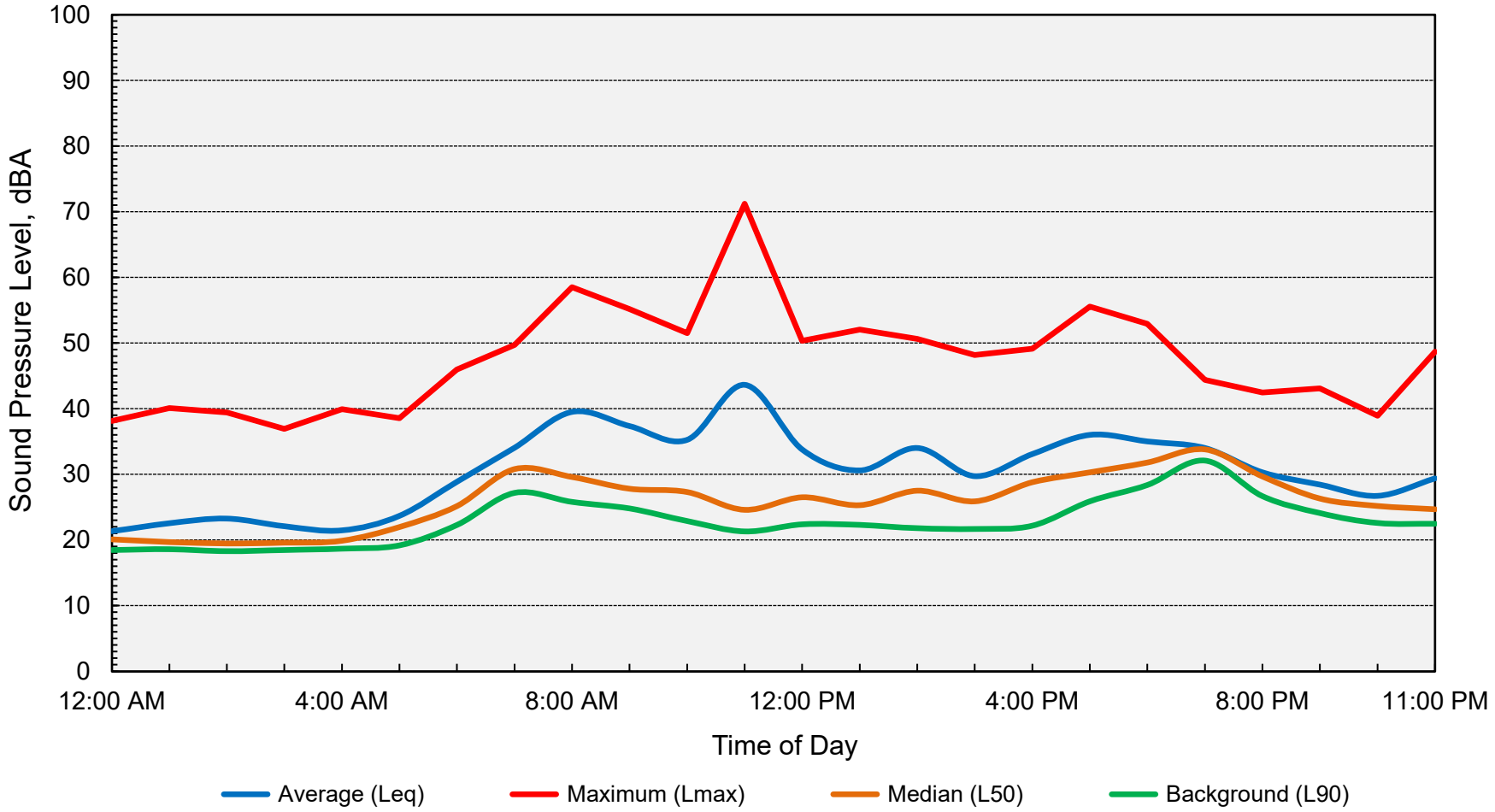
Acoustical Consultants

Appendix D-18
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Saturday, October 05, 2019



Computed Ldn = 36 dB

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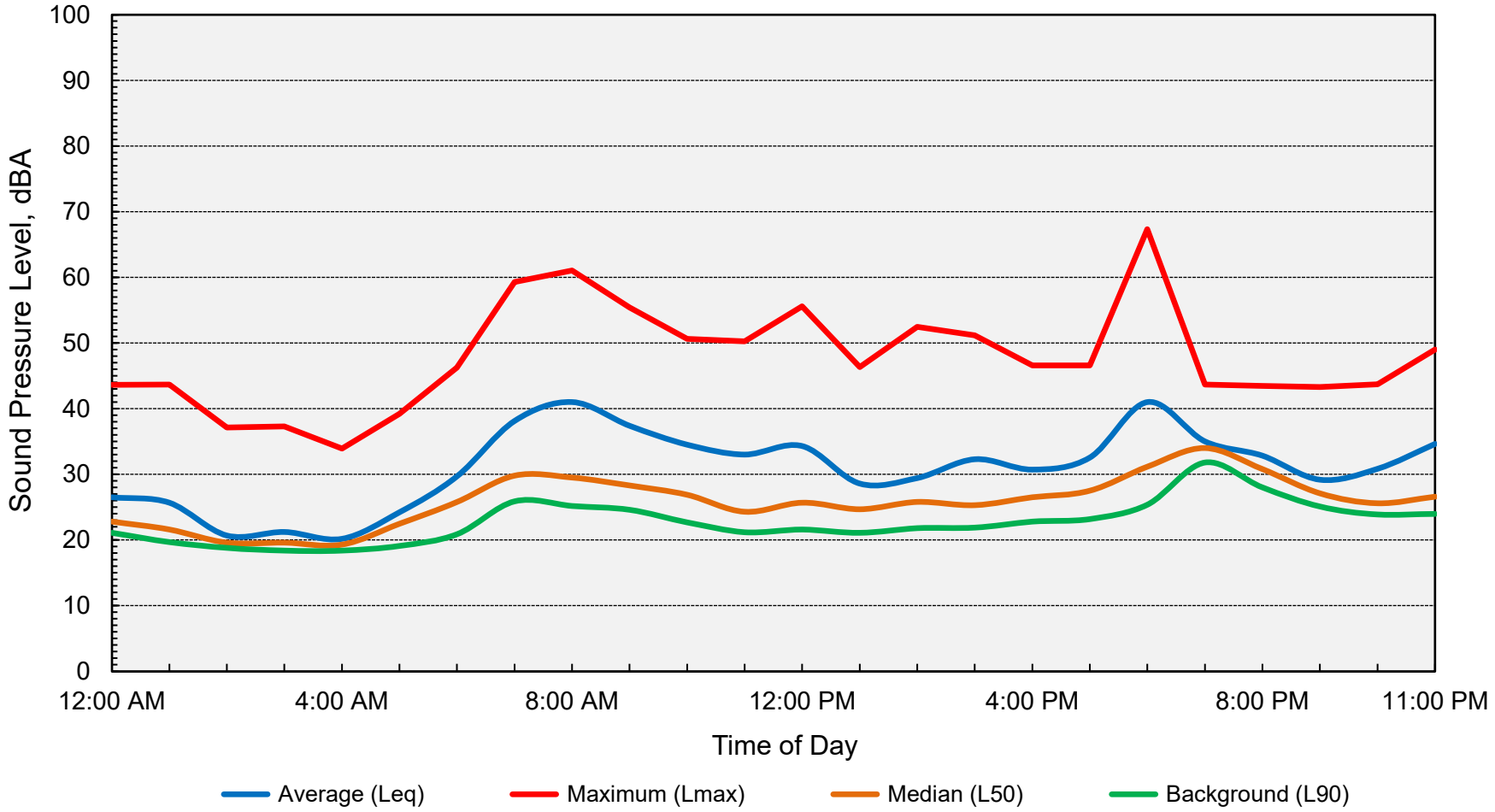
Appendix D-19
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Sunday, October 06, 2019



Computed Ldn = 37 dB

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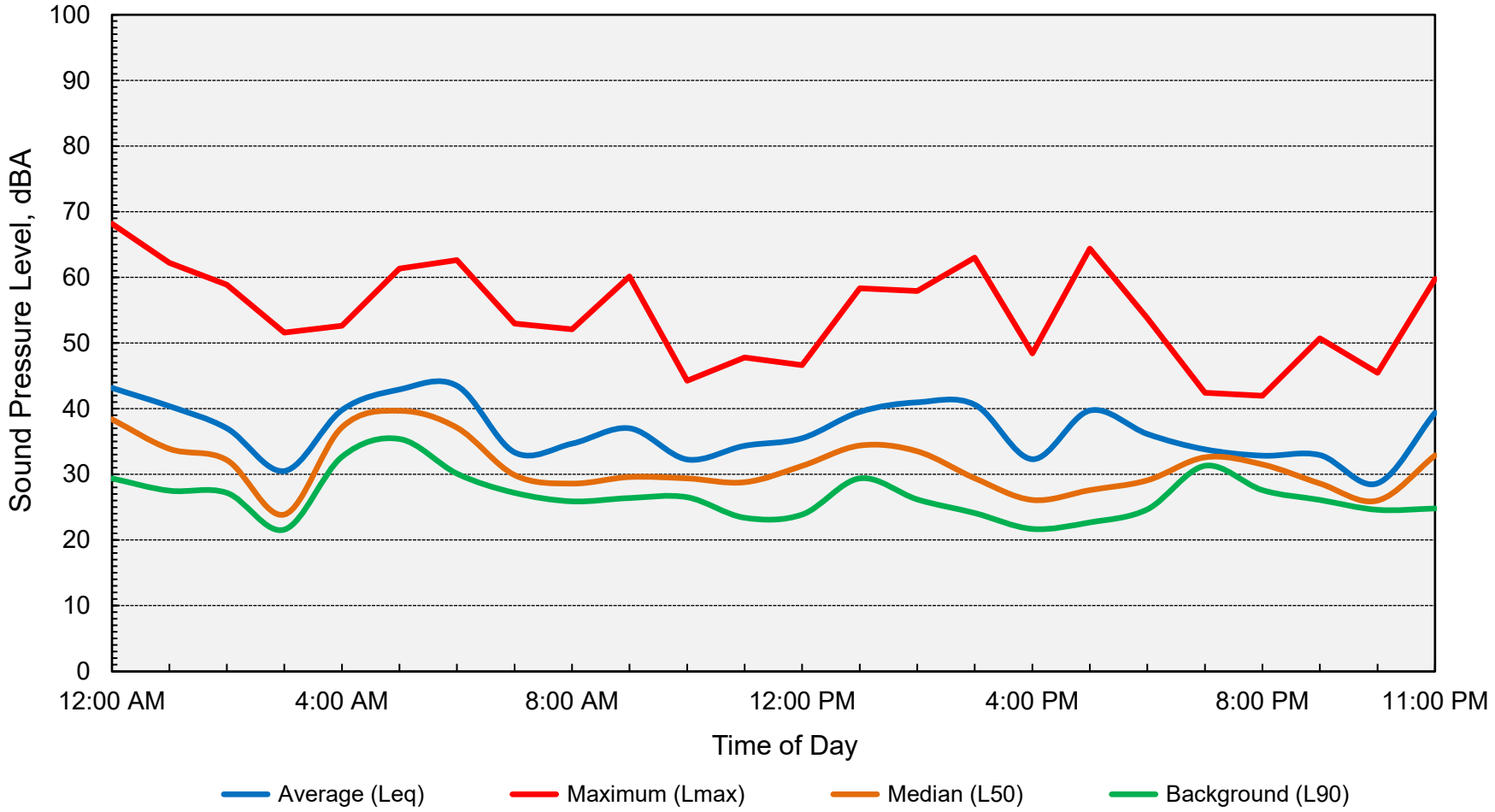
Appendix D-20
Ambient Noise Monitoring Results
SGI Ione Quarry Expansion - Site 4
Monday, October 07, 2019



Computed Ldn = 46 dB

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Acoustical Consultants

Appendix E-1

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 46
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R1
Source to Barrier Distance (C_1): 1400
Barrier to Receiver Distance (C_2): 4500

Pad/Ground Elevation at Receiver: 265
Receiver Elevation[1]: 270
Base of Barrier Elevation: 336
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
336	0	-5.1	40.9	Yes
337	1	-5.1	40.9	Yes
338	2	-5.2	40.8	Yes
339	3	-5.2	40.8	Yes
340	4	-5.3	40.7	Yes
341	5	-5.4	40.6	Yes
342	6	-5.5	40.5	Yes
343	7	-5.5	40.5	Yes
344	8	-5.7	40.3	Yes
345	9	-5.8	40.2	Yes
346	10	-5.9	40.1	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-2

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 53
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R2
Source to Barrier Distance (C_1): 2564
Barrier to Receiver Distance (C_2): 1036

Pad/Ground Elevation at Receiver: 260
Receiver Elevation[1]: 265
Base of Barrier Elevation: 309
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
309	0	-6.9	46.1	Yes
310	1	-7.1	45.9	Yes
311	2	-7.3	45.7	Yes
312	3	-7.5	45.5	Yes
313	4	-7.6	45.4	Yes
314	5	-7.8	45.2	Yes
315	6	-7.9	45.1	Yes
316	7	-8.1	44.9	Yes
317	8	-8.2	44.8	Yes
318	9	-8.4	44.6	Yes
319	10	-8.6	44.4	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-3

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 53
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R3
Source to Barrier Distance (C_1): 2798.4
Barrier to Receiver Distance (C_2): 1301.6

Pad/Ground Elevation at Receiver: 257
Receiver Elevation[1]: 262
Base of Barrier Elevation: 293
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
293	0	-5.0	48.0	Yes
294	1	-5.0	48.0	Yes
295	2	-5.1	47.9	Yes
296	3	-5.1	47.9	Yes
297	4	-5.2	47.8	Yes
298	5	-5.3	47.7	Yes
299	6	-5.4	47.6	Yes
300	7	-5.5	47.5	Yes
301	8	-5.6	47.4	Yes
302	9	-5.7	47.3	Yes
303	10	-5.8	47.2	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-4

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 52
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R4
Source to Barrier Distance (C_1): 2745.6
Barrier to Receiver Distance (C_2): 1254.4

Pad/Ground Elevation at Receiver: 258
Receiver Elevation[1]: 263
Base of Barrier Elevation: 430
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
430	0	-17.1	34.9	Yes
431	1	-17.1	34.9	Yes
432	2	-17.1	34.9	Yes
433	3	-17.1	34.9	Yes
434	4	-17.1	34.9	Yes
435	5	-17.1	34.9	Yes
436	6	-17.1	34.9	Yes
437	7	-17.1	34.9	Yes
438	8	-17.1	34.9	Yes
439	9	-17.1	34.9	Yes
440	10	-17.1	34.9	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-5

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 41
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R5
Source to Barrier Distance (C_1): 900
Barrier to Receiver Distance (C_2): 6800

Pad/Ground Elevation at Receiver: 265
Receiver Elevation[1]: 270
Base of Barrier Elevation: 345
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
345	0	-5.1	35.9	Yes
346	1	-5.1	35.9	Yes
347	2	-5.2	35.8	Yes
348	3	-5.3	35.7	Yes
349	4	-5.3	35.7	Yes
350	5	-5.4	35.6	Yes
351	6	-5.5	35.5	Yes
352	7	-5.7	35.3	Yes
353	8	-5.8	35.2	Yes
354	9	-5.9	35.1	Yes
355	10	-6.0	35.0	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-6

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 43
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R6
Source to Barrier Distance (C_1): 2700
Barrier to Receiver Distance (C_2): 4100

Pad/Ground Elevation at Receiver: 265
Receiver Elevation[1]: 270
Base of Barrier Elevation: 355
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
355	0	-7.8	35.2	Yes
356	1	-7.9	35.1	Yes
357	2	-8.0	35.0	Yes
358	3	-8.1	34.9	Yes
359	4	-8.2	34.8	Yes
360	5	-8.3	34.7	Yes
361	6	-8.4	34.6	Yes
362	7	-8.6	34.4	Yes
363	8	-8.7	34.3	Yes
364	9	-8.8	34.2	Yes
365	10	-8.9	34.1	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-7

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 56
Source Frequency (Hz): 500
Source Height (ft): 350

Site Geometry:

Receiver Description: R7
Source to Barrier Distance (C_1): 2164
Barrier to Receiver Distance (C_2): 836

Pad/Ground Elevation at Receiver: 240
Receiver Elevation[1]: 245
Base of Barrier Elevation: 574
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
574	0	-19.2	36.8	Yes
575	1	-19.2	36.8	Yes
576	2	-19.2	36.8	Yes
577	3	-19.2	36.8	Yes
578	4	-19.2	36.8	Yes
579	5	-19.2	36.8	Yes
580	6	-19.2	36.8	Yes
581	7	-19.2	36.8	Yes
582	8	-19.2	36.8	Yes
583	9	-19.2	36.8	Yes
584	10	-19.2	36.8	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix E-8

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Expanded Quarry to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 50
Source Frequency (Hz): 500
Source Height (ft): 370

Site Geometry:

Receiver Description: R8
Source to Barrier Distance (C_1): 2000
Barrier to Receiver Distance (C_2): 2600

Pad/Ground Elevation at Receiver: 240
Receiver Elevation[1]: 245
Base of Barrier Elevation: 650
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
650	0	-19.0	31.0	Yes
651	1	-19.0	31.0	Yes
652	2	-19.0	31.0	Yes
653	3	-19.0	31.0	Yes
654	4	-19.0	31.0	Yes
655	5	-19.0	31.0	Yes
656	6	-19.0	31.0	Yes
657	7	-19.0	31.0	Yes
658	8	-19.0	31.0	Yes
659	9	-19.0	31.0	Yes
660	10	-19.0	31.0	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-1

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 40
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R1
Source to Barrier Distance (C_1): 1086
Barrier to Receiver Distance (C_2): 6781

Pad/Ground Elevation at Receiver: 265
Receiver Elevation[1]: 270
Base of Barrier Elevation: 495
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
495	0	-0.9	39.1	No
496	1	-0.9	39.1	No
497	2	-0.9	39.1	No
498	3	-0.9	39.1	No
499	4	-0.9	39.1	No
500	5	-1.4	38.6	No
501	6	-2.1	37.9	No
502	7	-2.5	37.5	No
503	8	-2.9	37.1	No
504	9	-2.9	37.1	No
505	10	-3.3	36.7	No

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-2

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 48
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R2
Source to Barrier Distance (C_1): 4066
Barrier to Receiver Distance (C_2): 1109

Pad/Ground Elevation at Receiver: 260
Receiver Elevation[1]: 265
Base of Barrier Elevation: 385
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
385	0	-11.5	36.5	Yes
386	1	-11.5	36.5	Yes
387	2	-11.7	36.3	Yes
388	3	-11.9	36.1	Yes
389	4	-11.9	36.1	Yes
390	5	-12.1	35.9	Yes
391	6	-12.1	35.9	Yes
392	7	-12.3	35.7	Yes
393	8	-12.5	35.5	Yes
394	9	-12.5	35.5	Yes
395	10	-12.6	35.4	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-3

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 46
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R3
Source to Barrier Distance (C_1): 4171
Barrier to Receiver Distance (C_2): 1742

Pad/Ground Elevation at Receiver: 257
Receiver Elevation[1]: 262
Base of Barrier Elevation: 377
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
377	0	-7.3	38.7	Yes
378	1	-7.4	38.6	Yes
379	2	-7.5	38.5	Yes
380	3	-7.6	38.4	Yes
381	4	-7.7	38.3	Yes
382	5	-7.8	38.2	Yes
383	6	-7.9	38.1	Yes
384	7	-8.1	37.9	Yes
385	8	-8.2	37.8	Yes
386	9	-8.3	37.7	Yes
387	10	-8.4	37.6	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-4

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 47
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R4
Source to Barrier Distance (C_1): 4013
Barrier to Receiver Distance (C_2): 1426

Pad/Ground Elevation at Receiver: 258
Receiver Elevation[1]: 263
Base of Barrier Elevation: 524
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
524	0	-17.1	29.9	Yes
525	1	-17.1	29.9	Yes
526	2	-17.1	29.9	Yes
527	3	-17.1	29.9	Yes
528	4	-17.1	29.9	Yes
529	5	-17.1	29.9	Yes
530	6	-17.1	29.9	Yes
531	7	-17.1	29.9	Yes
532	8	-17.1	29.9	Yes
533	9	-17.1	29.9	Yes
534	10	-17.1	29.9	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-5

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 37
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R5
Source to Barrier Distance (C_1): 2291
Barrier to Receiver Distance (C_2): 7055

Pad/Ground Elevation at Receiver: 265
Receiver Elevation[1]: 270
Base of Barrier Elevation: 557
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
557	0	-10.5	26.5	Yes
558	1	-10.7	26.3	Yes
559	2	-10.7	26.3	Yes
560	3	-10.7	26.3	Yes
561	4	-10.9	26.1	Yes
562	5	-10.9	26.1	Yes
563	6	-11.1	25.9	Yes
564	7	-11.1	25.9	Yes
565	8	-11.1	25.9	Yes
566	9	-11.3	25.7	Yes
567	10	-11.3	25.7	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-6

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 40
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R6
Source to Barrier Distance (C_1): 2560
Barrier to Receiver Distance (C_2): 5518

Pad/Ground Elevation at Receiver: 265
Receiver Elevation[1]: 270
Base of Barrier Elevation: 605
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
605	0	-14.6	25.4	Yes
606	1	-14.6	25.4	Yes
607	2	-14.6	25.4	Yes
608	3	-14.6	25.4	Yes
609	4	-15.3	24.7	Yes
610	5	-15.3	24.7	Yes
611	6	-15.3	24.7	Yes
612	7	-15.3	24.7	Yes
613	8	-15.3	24.7	Yes
614	9	-15.3	24.7	Yes
615	10	-15.3	24.7	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-7

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 52
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R7
Source to Barrier Distance (C_1): 2400
Barrier to Receiver Distance (C_2): 1560

Pad/Ground Elevation at Receiver: 240
Receiver Elevation[1]: 245
Base of Barrier Elevation: 599
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
599	0	-18.3	33.7	Yes
600	1	-18.3	33.7	Yes
601	2	-18.3	33.7	Yes
602	3	-18.3	33.7	Yes
603	4	-18.3	33.7	Yes
604	5	-18.3	33.7	Yes
605	6	-18.3	33.7	Yes
606	7	-18.3	33.7	Yes
607	8	-18.3	33.7	Yes
608	9	-18.3	33.7	Yes
609	10	-18.3	33.7	Yes

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).

Appendix F-8

Barrier Insertion Loss Calculation

Project Information:

Job Number: 2018-137
Project Name: SGI Ione Quarry Expansion
Location(s): Highest Stockpile to Nearest Residences

Noise Level Data:

Source Description: Quarry Excavation Operations
Source Noise Level, dBA: 49
Source Frequency (Hz): 500
Source Height (ft): 560

Site Geometry:

Receiver Description: R8
Source to Barrier Distance (C_1): 2042
Barrier to Receiver Distance (C_2): 2749

Pad/Ground Elevation at Receiver: 240
Receiver Elevation[1]: 245
Base of Barrier Elevation: 411
Starting Barrier Height 0

Barrier Effectiveness:

Top of Barrier Elevation (ft)	Barrier Height (ft)	Insertion Loss, dB	Noise Level, dB	Barrier Breaks Line of Site to Source?
411	0	-3.8	45.2	No
412	1	-3.9	45.1	No
413	2	-4.1	44.9	No
414	3	-4.2	44.8	No
415	4	-4.4	44.6	No
416	5	-4.5	44.5	No
417	6	-4.6	44.4	No
418	7	-4.6	44.4	No
419	8	-4.8	44.2	No
420	9	-4.8	44.2	No
421	10	-4.9	44.1	No

Notes: 1. Standard receiver elevation is five feet above grade/pad elevations at the receiver location(s).