OPERATING PERMIT APPLICATION

MONTANA LIMESTONE RESOURCES

APPENDIX A-11

BASELINE NOISE REPORT

Revised September 2017

BASELINE NOISE LEVEL INVENTORY
MONTANA LIMESTONE RESOURCES PROJECT
GRANITE COUNTY, MONTANA

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ATTACHMENT

1.0 INTRODUCTION

On April 1 and 2, 2014, Big Sky Acoustics, LLC (BSA) conducted baseline noise level measurements for the Montana Limestone Resources Project. The ambient daytime and nighttime noise level measurements were completed at six locations indicated on Figure A (all figures are presented in Section 5.0), in order to document existing background noise levels prior to mining operations. A 24-hour noise level measurement was completed at Location 1. One 20-minute daytime (7 a.m. to 10 p.m.) and one 20-minute nighttime (10 p.m. to 7 a.m.) noise level measurement was completed at each of Locations 2 through 6. Results of the baseline noise level inventory are discussed following.

2.0 NOISE TERMINOLOGY

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq}, during a certain time period. The L_{eq} metric uses a single number, similar to an average, to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time, and accounts for all noises and quiet periods that occur during that time period.

The 90^{th} percentile-exceeded noise level, L_{90}, is a metric that indicates the single noise level that is exceeded during 90 percent of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level helps quantify the acoustical character of an environment, such as "rural area", "urban area", or "noisy neighborhood" because it represents the residual (*i.e.*, ambient) noise between individual noise events.

The L_{90} noise level is often near the low end of the instantaneous noise levels during a measurement period. Brief, intermittent and loud sources, such as an aircraft fly-over, car doors closing, bird chirps, dog barks, car horns, vehicle pass-by, etc., will influence the L_{eq} of the measurement period but typically not the L_{90}, even though these other noise sources may be briefly audible and louder than a noise source of interest during the same measurement period. If a person were only listening to one continuously operating noise source, such as a large fan, the L_{eq} and L_{90} noise levels at that location would be approximately equal.

The L_{max} metric denotes the maximum instantaneous noise level recorded during a measurement period. The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} can be determined using 24 consecutive one-hour L_{eq} noise levels, Leq(h), or estimated using measured Leq noise levels during shorter time periods (FTA 2006). The L_{dn} includes a 10-decibel penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people's higher sensitivity to noise at night when the background noise level is typically low.

3.0 NOISE LEVEL MEASUREMENTS

Noise level measurements were conducted by BSA in general accordance with the American National Standards Institute (ANSI) S12.18-1994, *Procedures for Outdoor Measurement of Sound Pressure Level* (ANSI 1994). BSA conducted the noise level measurements using Larson Davis Model 831 and CEL 593 Type I Sound Level Meters with preamplifiers, and 0.5-inch-diameter microphone. The meters were calibrated prior to and after each measurement period using a CEL Instruments Model 284/2 Acoustical Calibrator. The sound level meters were set to "fast" response. Windscreens were used over the microphones, and the microphones were approximately five feet above the ground surface at each measurement location.

Weather data during the noise level measurements were recorded at Montana Department of Transportation's Bearmouth I-90 weather station (Mile Post 145.8) and downloaded from the www.wrh.noaa.gov website. Weather conditions were favorable during the measurements: no precipitation, clear to partly cloudy with temperatures ranging from 30 to 60°F and winds from 1 to 9 mph (with gusts to 14 mph). The weather data are included as Attachment A.

3.1 LOCATION 1 – DRUMMOND COMMUNITY CHURCH

The 24-hour Measurement Location 1 was located along the west fence at the Drummond Community Church along Route 1, less than a mile southwest of downtown Drummond (Figure A). This location was sited at the eastern property line of the Project Area, but due to topography, the project site (including the quarry area) located approximately two miles to the northwest was not visible. Measurement Location 1 is shown in the following photograph.

Measurement Location 1 – Looking east at Drummond Community Church and Route 1.

The long-term noise level measurement at Location 1 was completed from 1100 hours on Tuesday, April 1 to 1100 hours on Wednesday, April 2, to document the ambient noise level conditions at the Project's eastern property line. Noise levels were measured in 1-minute and 1-hour increments during the measurement period, and the sound level meter recorded audio clips during high noise events. BSA analyzed the audio files and the dominant L_{max} noise sources, which included vehicles on Route 1, train horns, helicopters and birds.

The results of the ambient noise level measurements at Location 1 are summarized in Graph 1. The L_{eq} ranged from 35 to 50 dBA and L_{90} ranged from 26 to 39 dBA, which are typical noise levels for sparsely-populated rural areas (Harris 1998). The average measured L_{eq} and L_{90} frequency spectra for the 24-hour period are shown on Figure 1. Based on the measured noise levels, the L_{dn} at Location 1 is L_{dn} 52 dBA.

3.2 LOCATION 2 – MULLAN ROAD

Measurement Location 2 was approximately 1.8 miles south of the project site adjacent to the Project's southern property line along Mullan Road, a possible site access and haul road (Figure A). Measurement Location 2 is shown in the following photograph.

Measurement Location 2 – Looking north at the project site from Mullan Road.

The results of the ambient noise level measurements at Location 2 are summarized in Table 1, and the measured L_{eq} and L_{90} frequency spectra for each measurement period are shown on Figure 2. The measured L_{eq} and L_{90} noise levels are typical for rural areas (Harris 1998). Based on the measured noise levels, the L_{dn} was calculated (FTA 2006) and estimated to be L_{dn} 34 dBA at Location 2.

Graph 1: Location 1 Ambient Noise Levels
April 1-2, 2014

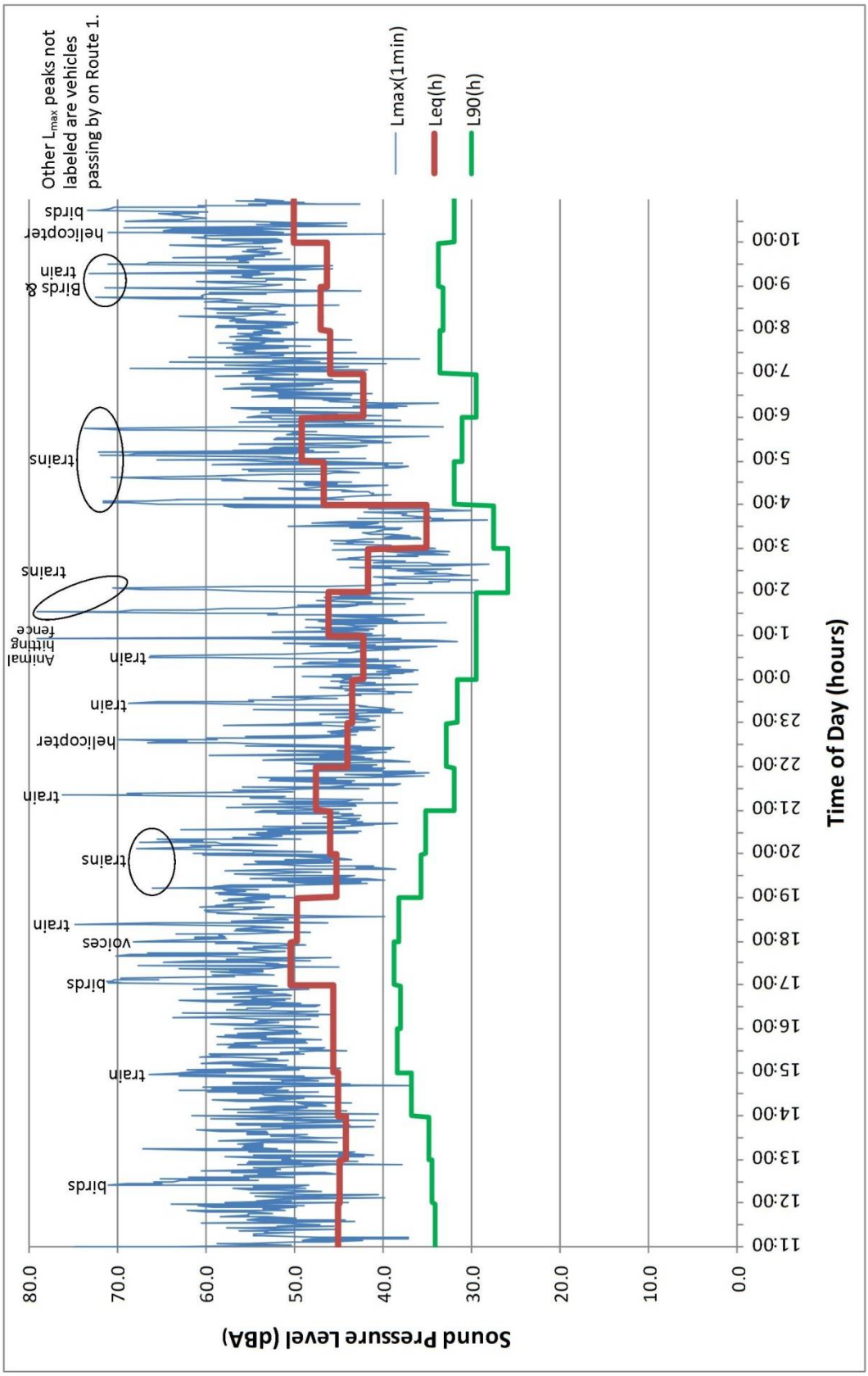


Table 1
Average Ambient Noise Levels (dBA) at Location 2 – Mullan Road

Date	Time (hours)	L_{eq}	L_{90}	Notes
4/1/14	Daytime 1153 – 1213	27	23	Noise sources included traffic on I-90 (faint) and cows mooing.
4/1/14	Nighttime 2251 – 2311	30	22	Noise sources included traffic on I-90 (faint), airplane in distance and electrical noise from overhead wires.

3.3 LOCATION 3 – DRUMMOND CITY PARK

Measurement Location 3 is approximately 0.5 miles southwest of downtown Drummond along Old Route 1 (Figure A), as shown in the following photograph.

Measurement Location 3 – Looking west at Old Route 1 from Drummond City Park.

The results of the ambient noise level measurements at Location 3 are summarized in Table 2, and the average measured L_{eq} and L_{90} frequency spectra for each measurement period are shown on Figure 3. The measured L_{eq} and L_{90} noise levels are typical for sparsely-populated rural areas (Harris 1998). Based on the measured noise levels, the L_{dn} was calculated (FTA 2006) and estimated to be L_{dn} 46 dBA at Location 3.

Table 2
Average Ambient Noise Levels (dBA) at Location 3 – Drummond City Park

Date	Time (hours)	L_{eq}	L_{90}	Notes
4/1/14	Daytime 1329 – 1349	43	37	The dominant noise source was traffic on Old Route 1. Other noise sources included birds, I-90 traffic (faint), a back-up alarm and a distant tractor.
4/1/14	Nighttime 2244 – 2310	41	37	The dominant noise source was I-90 traffic. Other noise sources included breeze in the tree tops, distant dog barking and a faint buzz from the substation located north of the river.

3.4 LOCATION 4 – EAST END OF DRUMMOND – FRONT STREET

Measurement Location 4 is at the east end of Drummond, adjacent to Front Street at the mobile home lot prior to the I-90 on-ramp (Figure A), as shown in the following photograph. Front Street is a potential haul route for the project trucks.

Measurement Location 4 – Looking north at the mobile home lot and I-90 from Front Street.

The results of the ambient noise level measurements at Location 4 are summarized in Table 3, and the average measured L_{eq} and L_{90} frequency spectra for each measurement period are shown on Figure 4. The measured L_{eq} and L_{90} noise levels are typical for suburban, not rural, areas (Harris 1998). Based on the measured noise levels, the L_{dn} was calculated (FTA 2006) and estimated to be L_{dn} 58 dBA at Location 4.

Table 3
Average Ambient Noise Levels (dBA) at Location 4 – East end of Drummond, Front Street

Date	Time (hours)	L_{eq}	L_{90}	Notes
4/1/14	Daytime 1410 – 1428	59	49	The dominant noise sources were I-90 and Front Street traffic and a heavy truck idling to the east.
4/2/14	Nighttime 0034 – 0054	52	27	The dominant noise source was I-90 traffic.

3.5 LOCATION 5 – CAMPGROUND/I-90 FRONTAGE ROAD

Measurement Location 5 is approximately 2.5 miles northwest of Drummond, north of I-90 along the Frontage Road (Figure A) at the Project's northern property line, as shown in the following photograph. Scattered rural residences and a campground are located adjacent to the Frontage Road.

Measurement Location 5 – Looking south at the campground and I-90.

The results of the ambient noise level measurements at Location 5 are summarized in Table 4, and the average measured L_{eq} and L_{90} frequency spectra for each measurement period are shown on Figure 5. The measured L_{eq} and L_{90} noise levels are typical for suburban, not rural, areas (Harris 1998). Based on the measured noise levels, the L_{dn} was calculated (FTA 2006) and estimated to be L_{dn} 56 dBA at Location 5.

Table 4
Average Ambient Noise Levels (dBA) at Location 5 – Campground/I-90 Frontage Road

Date	Time (hours)	L_{eq}	L_{90}	Notes
4/1/14	Daytime 1520 – 1540	52	42	The dominant noise sources were I-90 and Frontage Road traffic and birds.
4/1/14	Nighttime 2215 – 2235	51	32	The dominant noise sources were I-90 traffic and a helicopter.

3.6 LOCATION 6 – NORTH OF POLE YARD

Measurement Location 6 is approximately 0.5 miles southeast of Drummond, and north of I-90 and the Frontage Road (Figure A) as shown in the following photograph. Scattered rural residences are located

adjacent to the Frontage Road, and Location 6 is north of the east end of the pole facility south of I-90, which is a potential location for project rail load out facilities.

Measurement Location 6 – Looking south at the Frontage Road, I-90 and the pole yard.

The results of the ambient noise level measurements at Location 6 are summarized in Table 5, and the average measured L_{eq} and L_{90} frequency spectra for each measurement period are shown on Figure 6. The measured L_{eq} and L_{90} noise levels are typical for suburban, not rural, areas (Harris 1998). Based on the measured noise levels, the L_{dn} was calculated (FTA 2006) and estimated to be L_{dn} 62 dBA at Location 6.

Table 5
Average Ambient Noise Levels (dBA) at Location 6 – North of Pole Yard

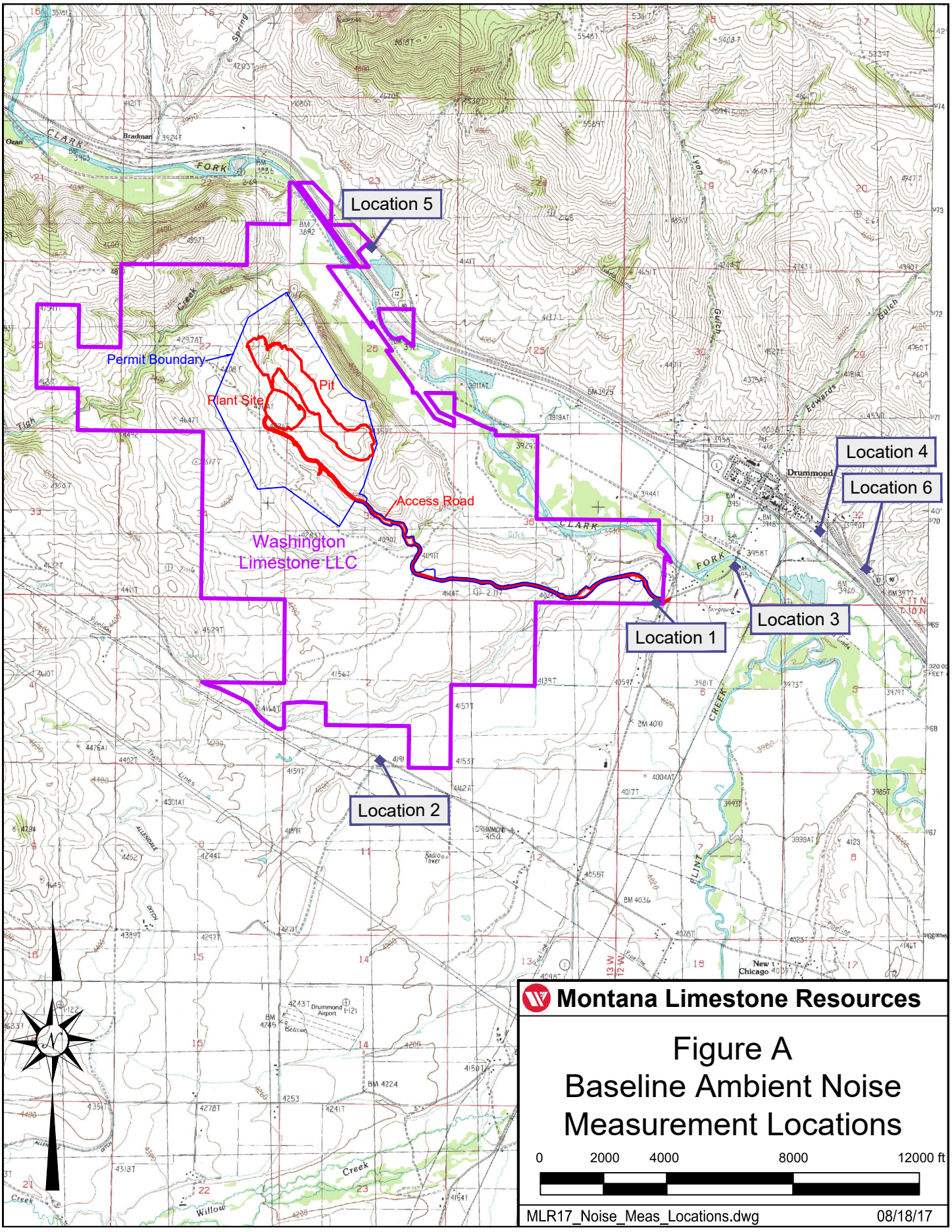
Date	Time (hours)	L_{eq}	L_{90}	Notes
4/1/14	Daytime 1608 – 1628	62	49	The dominant noise source was I-90 traffic. Another noise source was a loader working at the pole yard. The loader engine and backup alarm were audible.
4/2/14	Nighttime 0005 – 0025	56	29	The dominant noise source was I-90 traffic. Other noise sources included an idling car in driveway and a train horn in the distance.

4.0 REFERENCES CITED

American National Standards Institute (ANSI). 1994.
S12.18-1994, *Procedures for Outdoor Measurement of Sound Pressure Level.*

Harris, C., ed. 1998.
Handbook of Acoustical Measurements and Noise Control, 3rd edition. Acoustical Society of America, Woodbury, New York.

5.0 FIGURES


Location 5
Permit Boundary
Pit
Plant Site
Access Road
Washington
Limestone LLC
Location 4
Location 6
Location 3
Location 1
Location 2
Montana Limestone Resources
Figure A
Baseline Ambient Noise
Measurement Locations
0
2000
4000
8000
12000 ft
MLR17_Noise_Meas_Locations.dwg
08/18/17

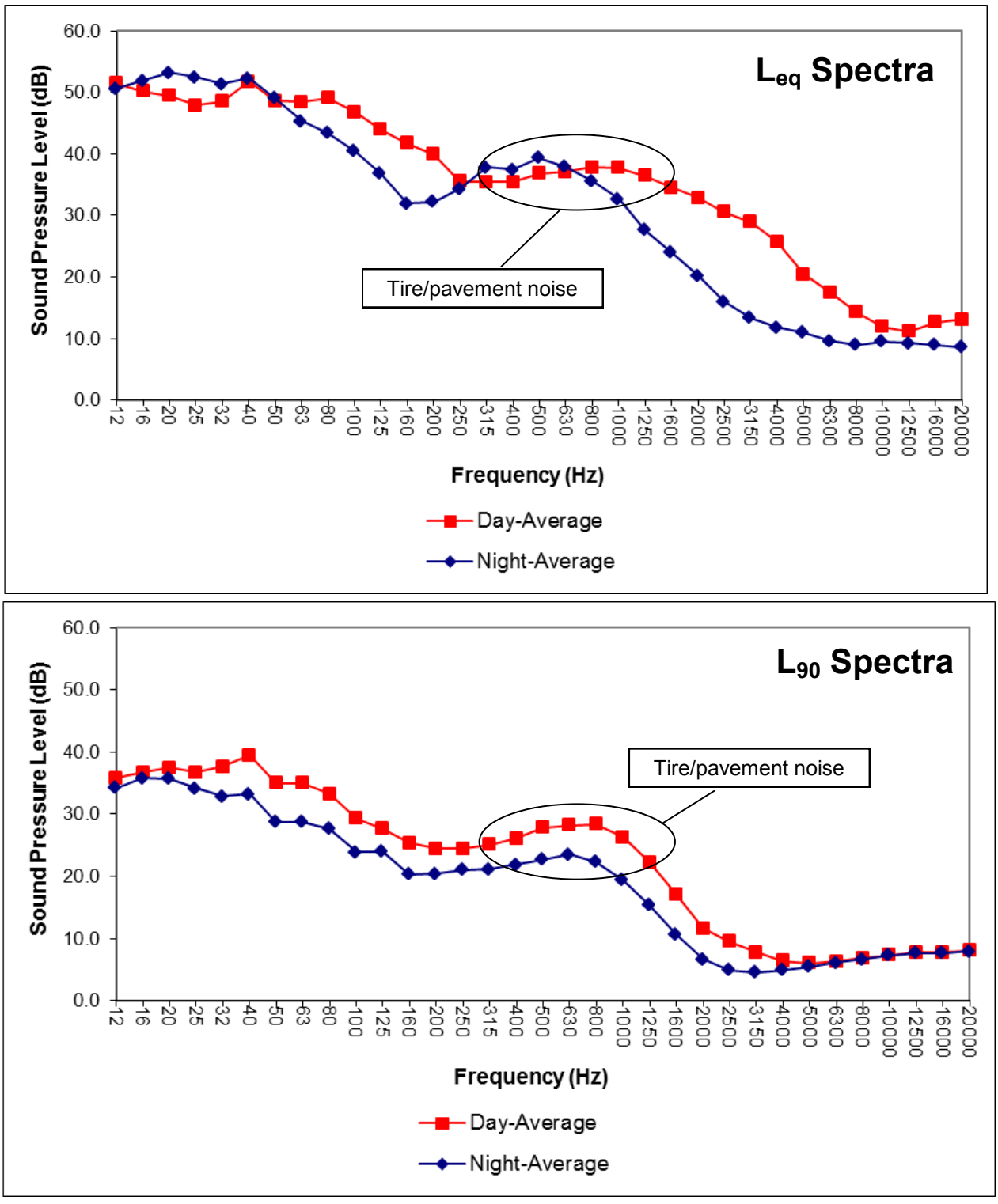


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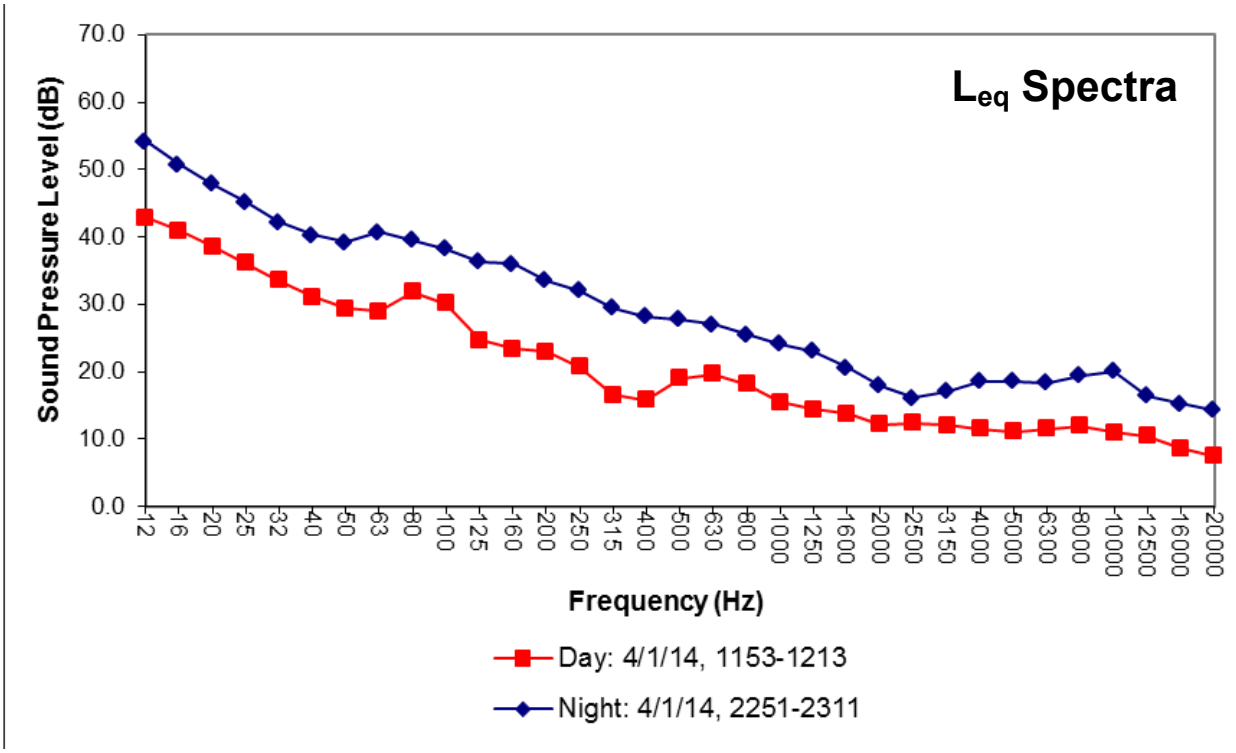
FIGURE 1

Baseline Ambient Noise Measurements:
Location 1 Frequency Spectra
Montana Limestone Resources



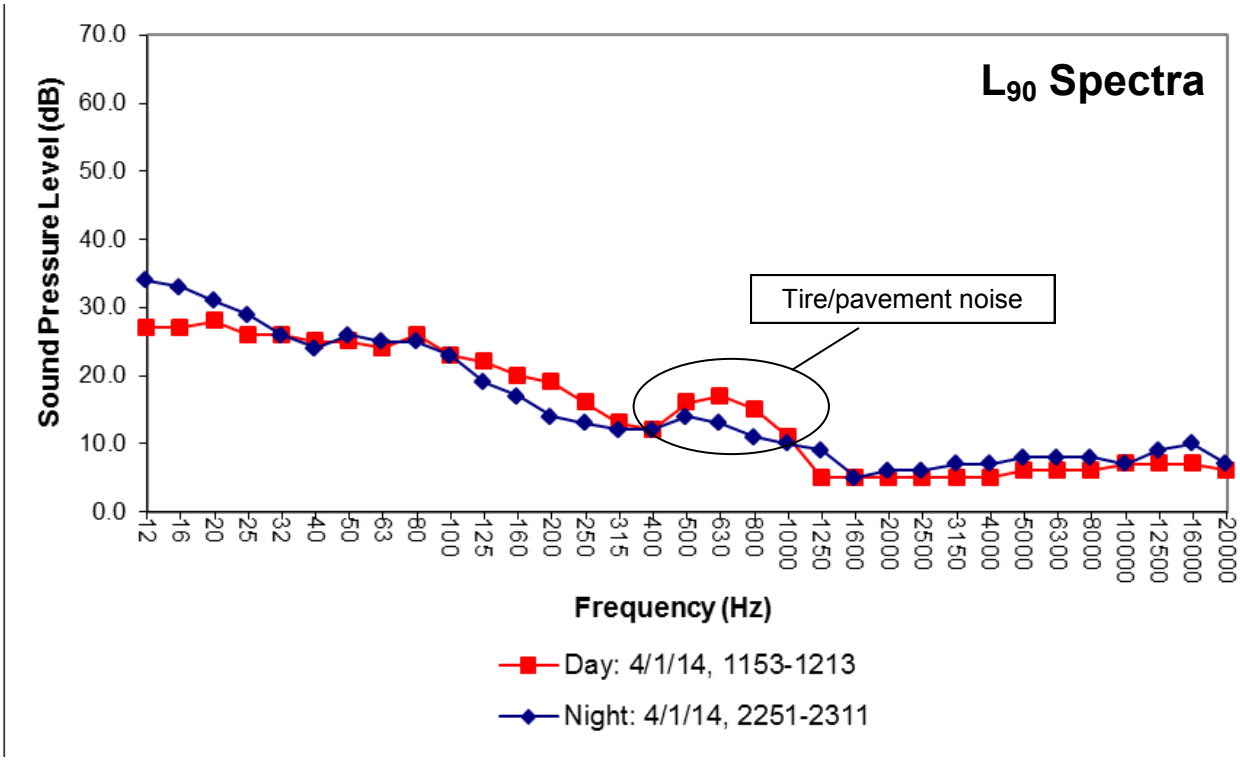


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FIGURE 2

Baseline Ambient Noise Measurements:
Location 2 Frequency Spectra
Montana Limestone Resources

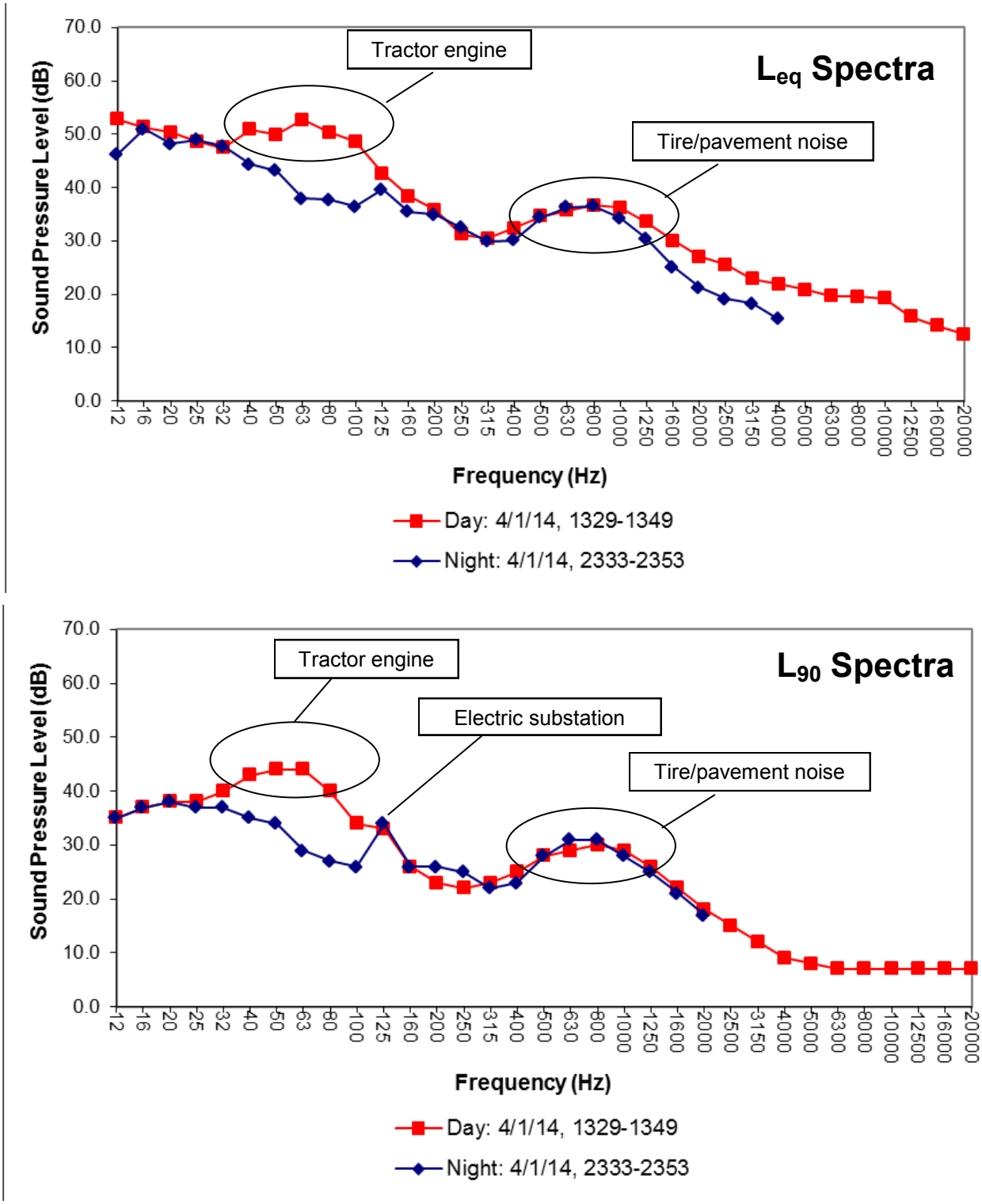

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FIGURE 3

Baseline Ambient Noise Measurements:
Location 3 Frequency Spectra
Montana Limestone Resources

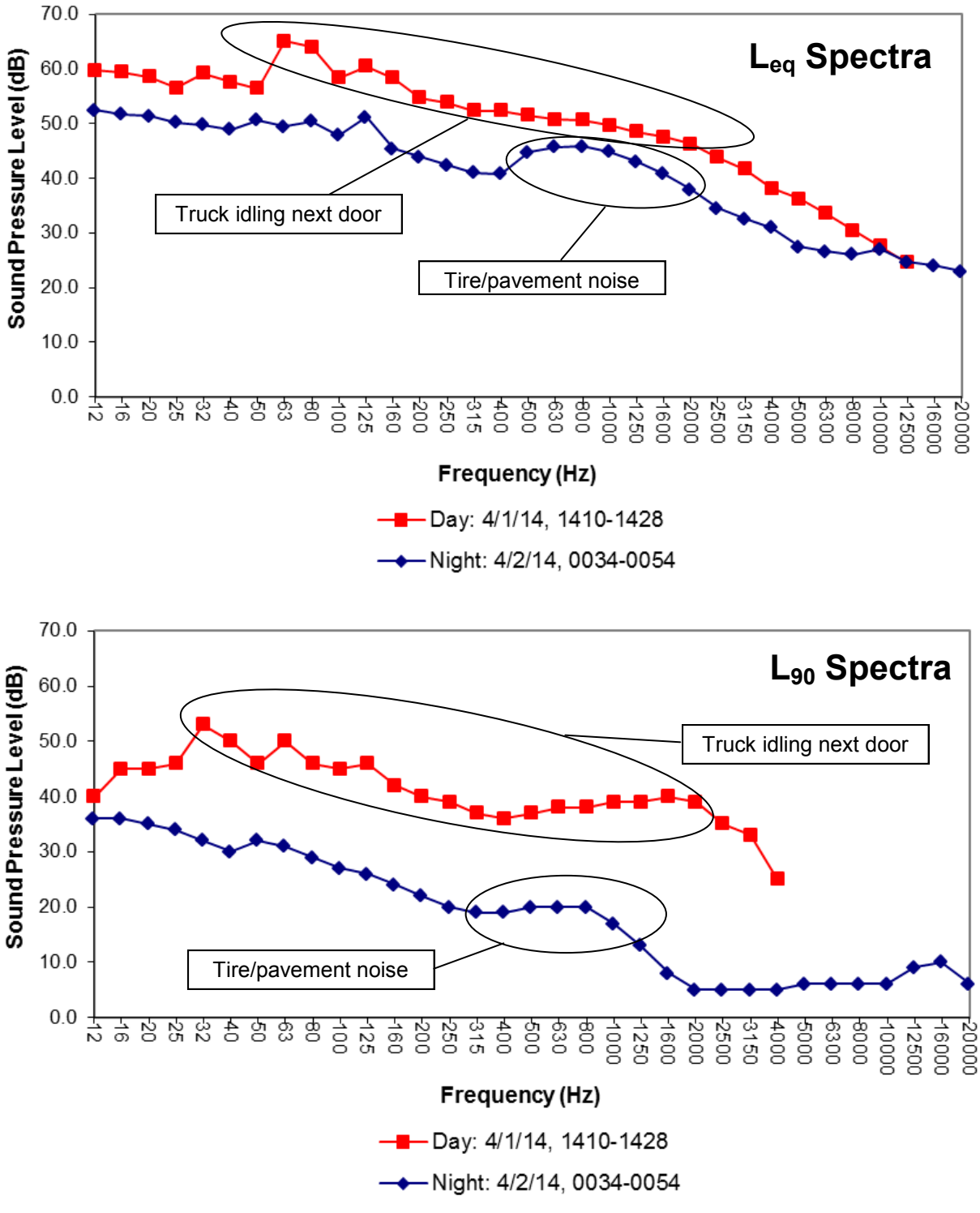

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FIGURE 4

Baseline Ambient Noise Measurements:
Location 4 Frequency Spectra
Montana Limestone Resources

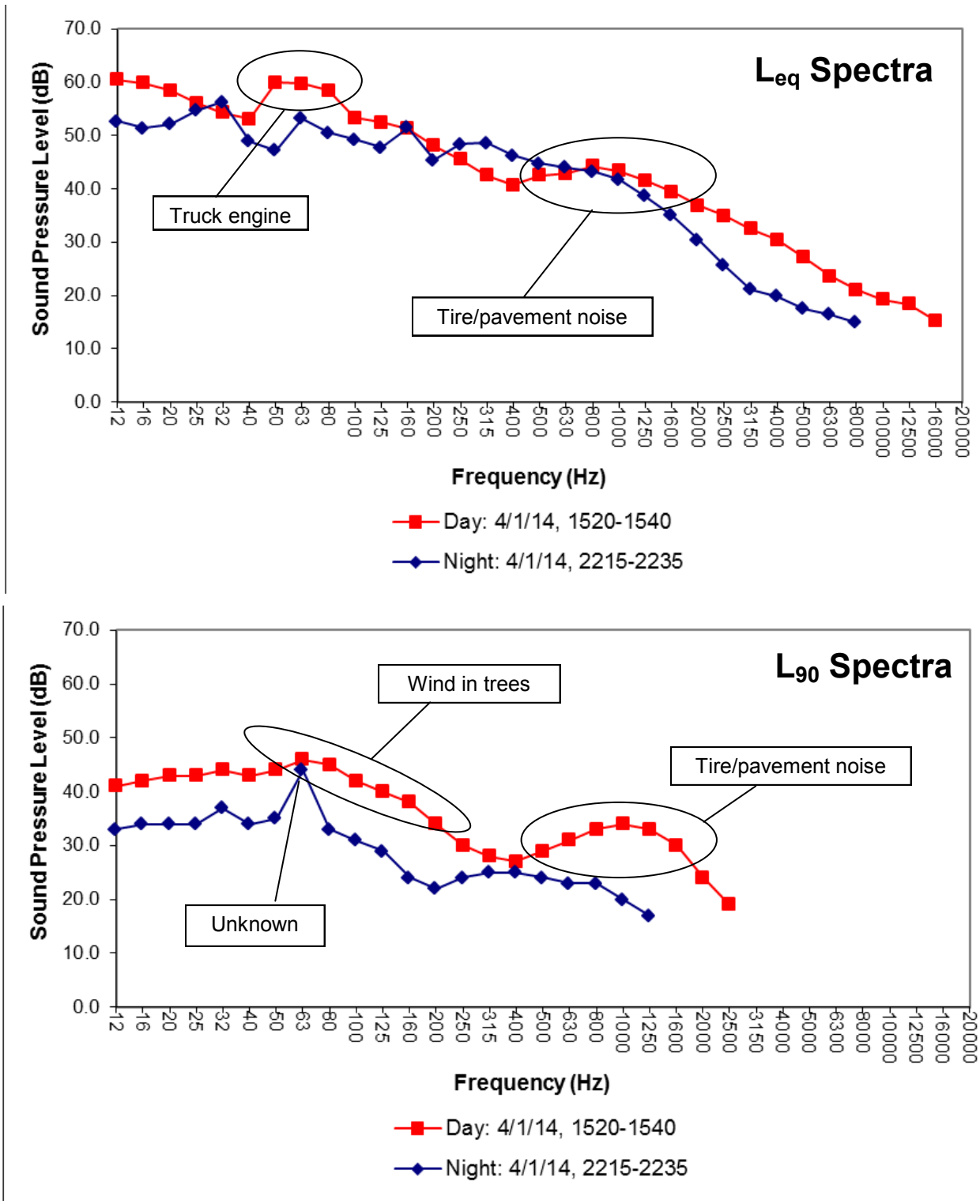

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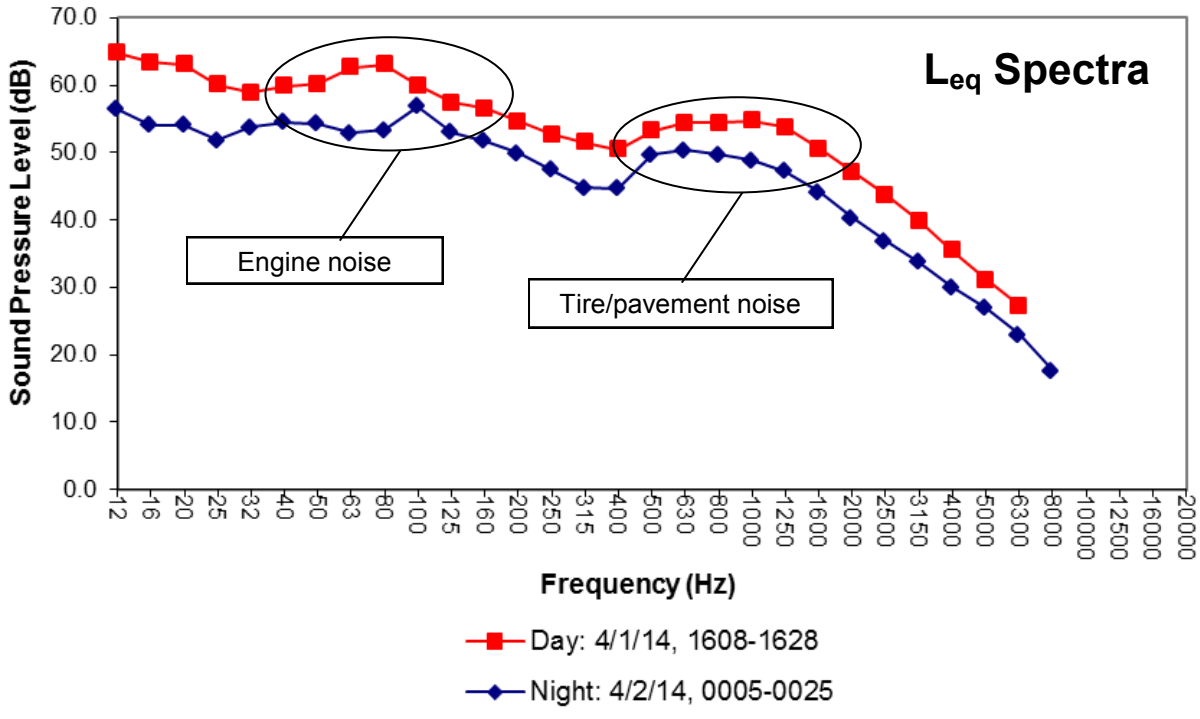
FIGURE 5

Baseline Ambient Noise Measurements:
Location 5 Frequency Spectra
Montana Limestone Resources



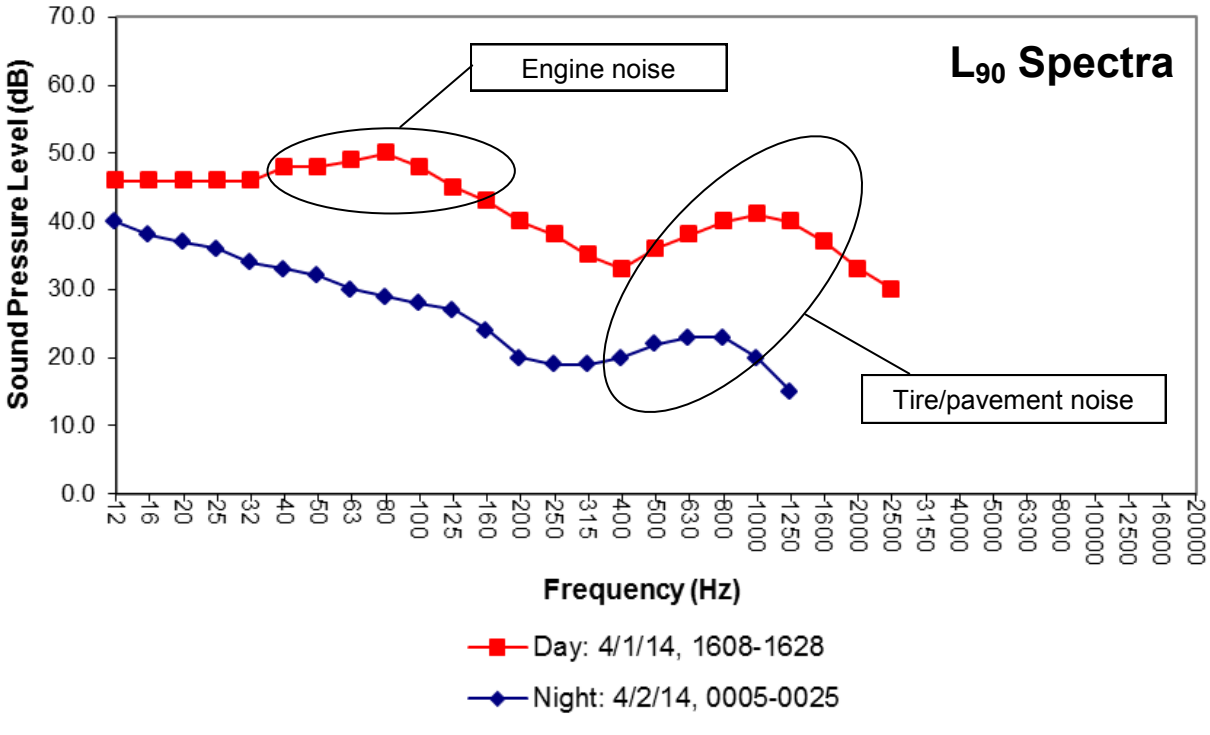


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FIGURE 6

Baseline Ambient Noise Measurements:
Location 6 Frequency Spectra
Montana Limestone Resources