Duntroon Quarry Operations Fact Sheet: Operations Noise

July 2008

Noise is unwanted sound. Noise from industry can be particularly disruptive when we hear it in our homes and gardens. At Walker we continually look for ways to reduce noise from our operations. It is our goal that our neighbours do not hear our operations at all. Noise reduction not only benefits our neighbours but also improves our health and safety standards. This fact sheet explains the science of sound, and the ways new technologies are helping us mitigate the noise of quarry operations.

Please continue to ask questions, raise concerns and share ideas. We are constantly seeking new and innovative ways to improve our operations in ways that benefit the environment, our neighbours, and our business.

Characteristics of Sound

Whether or not the noise from an operation is a nuisance depends on what type of noise it is, how far it might travel and the background noise level.

An operation in the countryside will be noticed by neighbours more than the same operation located by a highway or in an industrial area. A noise in the quiet of the night will be more noticeable than the same noise during the day.

Noise is a wave that travels in a straight line from its source. Placing something between the source and the receptor will help to reduce or eliminate what can be heard by the receptor.

A receptor is a place on a property where sound or vibration originating elsewhere is received by a person. There are a number of receptors that are considered by the Ministry of the Environment to be sensitive. They include homes, schools, hospitals, nursing homes, retirement homes and daycares.

An operation that is close to a sensitive receptor must be quieter than one that is not.

Typical Sound Levels in Decibels

Instant perforation of eardrum	160	
	140	Threshold of pain
Jet take off (60 m)	130	
	120	Rock concert, Pop group disco dancefloor
INDY Race car (30 m)	110	
Railroad locomotive at 100 km/h	100	Arena during playoff hockey (Max.Levels)
Lawn mower (15 m)	90	Kitchen blender
Inside sports car (80 km/h)	80	Pneumatic drill (15 m); Ringing alarm clock (1 m)
Subway train (15 m), Freight train (30 m) Well-projected speech (1 m)	70	Highway 401, 50 m from closest lane
Large store, Shopping mall	60	Microwave oven (0.5 m); Large office
	50	Residential area, Downtown at night
1.8 MW Wind turbine at 500m, Bedroom No TV or HiFi	40	Suburban residential areas at night
Soft whisper (1.5 m)	30	Broadcast studio
Recording studio	20	Concert hall
Threshold of hearing	0	Pin drop

Typical A-Weighted Sound Levels of Common Sounds (page 2 has A-weighted definition)

We're working on it...

What Walker does to minimize noise from our operations:

- ✓ replaced Walker back-up beepers with broad band back-up alarms that warn the immediate area without causing off-site nuisance noise.
- ✓ lined trucks and other equipment with thick sound-dampening rubber
- ✓ lowered the crushing plant to the quarry floor
- ✓ organized on-site traffic flow to minimize backing up of highway trucks
- ✓ enclosed crushers and transfer points on the plant
- ✓ lined transfer points with rubber to deaden noise of falling stone
- ✓ employ a preventive maintenance program on all equipment
- ✓ do not load vehicles that don't have a Ministry approved exhaust system (no straight pipes)
- ✓ design blast to minimize noise impacts

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Measuring noise levels

Sound is measured in decibels (dB). Decibels are a scale of sound intensity and are based on a logarithmic scale. A logarithmic scale is based on multiplication rather than addition of the linear scale. A sound level of 0dB has an intensity of 1, that of 10dB has an intensity of 10, 20dB an intensity of 100 and 30dB an intensity of 1000.

Because decibels are logarithmic they can't be added normally. If one machine emits a sound level of 100 dB, and a second identical machine is placed beside the first, the combined sound level is 103 dB, not 200 dB (see example).

When the difference between two noise levels is 10 dB or more, the amount added to the higher noise level is zero. No adjustment factor is needed because adding in the contribution of the lower to the total noise level makes no perceptible difference in what people can hear.

For example, if a machine noise level is 95 dB and you add another machine at 80 dB, the combined noise level is still 95dB (95-80=15; difference is greater than 10).

What is Leq?

Because sound levels are constantly changing, the equivalent sound level (Leq) is the descriptor used in noise impact assessments. Leq is the level of a steady sound carrying the same total sound energy over a given time interval as the fluctuating sound. For stationary noise source assessments, such as for quarries, a one hour time period is used (i.e. T = 1 hr).

Adding Decibels

Numerical difference between two noise levels (dB)	Amount added to the higher of the two noise levels (dB)
0	3.0
0.1 - 0.9	2.5
1.0 - 2.4	2.0
2.4 - 4.0	1.5
4.1 - 6.0	1.0
6.1 - 10	0.5
10	0.0

For example:

two machines are each emitting a noise level of 100 dB:

The numerical difference between the two levels is 0 dB
100-100=0

The corresponding number to the difference of 0, taken from the right hand column, is 3.

Add 3 to the highest level. The resulting noise level is 103 dB.
100+3=103

What levels of sound can humans hear?

The threshold of hearing is assigned a level of 0 decibels . The ability of the human ear to perceive sound level changes is summarized below:

Change (dBA)	Average Ability to Perceive Changes in Noise Levels
0-2	Not noticeable to most people
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of loudness of sound
20	A dramatic change

Human hearing and A-weighted decibels(dBA)

If a person hears two sounds of the same sound pressure but different frequencies, one sound may seem louder than the other. This happens because people hear high frequency noise much better than low frequency noise. Noise measurement readings are adjusted to correspond to this peculiarity of human hearing. A-weighted decibels are an internationally standardized frequency weighting applied to sound levels to approximate the sensitivity of human hearing as a function of frequency.

MOE Noise Limits for Stationary Sources*

Time of Day	One Hour Leq (dBA)	
	Class 2 Area	Class 3 Area
07:00 to 19:00	50	45
19:00 to 07:00	45	40

dBA= A-weighted decibels

**or the existing ambient sound exposure, if higher*

MOE Indoor Sound Level Criteria For New Residential Development

Type of Space	Leq (Time Period) dBA	
	Road	Rail
Living/dinding areas of residences, hospitals, schools, nursing/retirement homes, day-care centres (Time period: 16 hr, 07:00 – 23:00)	45	40
Sleeping quarters (Time period: 8 hr, 23:00 – 07:00)	40	35

dBA = A-weighted decibels

Provincial noise area classes

The Ministry of the Environment has defined three classes of acoustical environments:

Class One:	Urban; background sound level is dominated by "urban hum."
Class Two:	Characteristics of Classes One and Three
Class Three:	Rural; little or no road traffic; a rural recreational area such as a cottage or a resort area; a wilderness area

Please refer to "Georgian Aggregates and Construction Inc. Duntroon Quarry Expansion Planning Report and Aggregate Resource Act Summary Statement", MHBC Planning, September 2005 for more details.

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