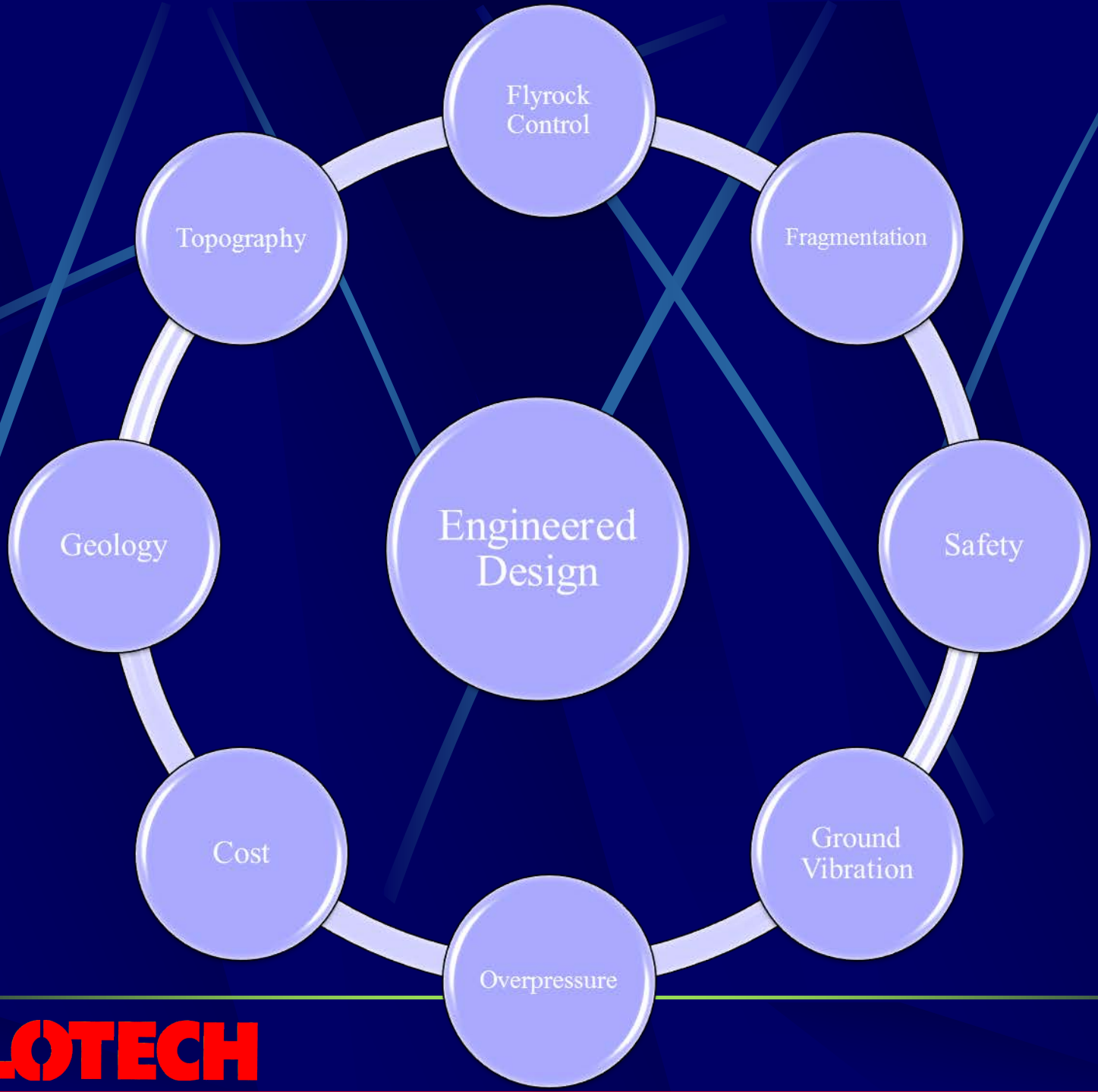

Flyrock Control
Fragmentation
Safety
Ground Vibration
Overpressure
Cost
Geology
Topography
Engineered Design

EXPLOTECH

Why Blasting?

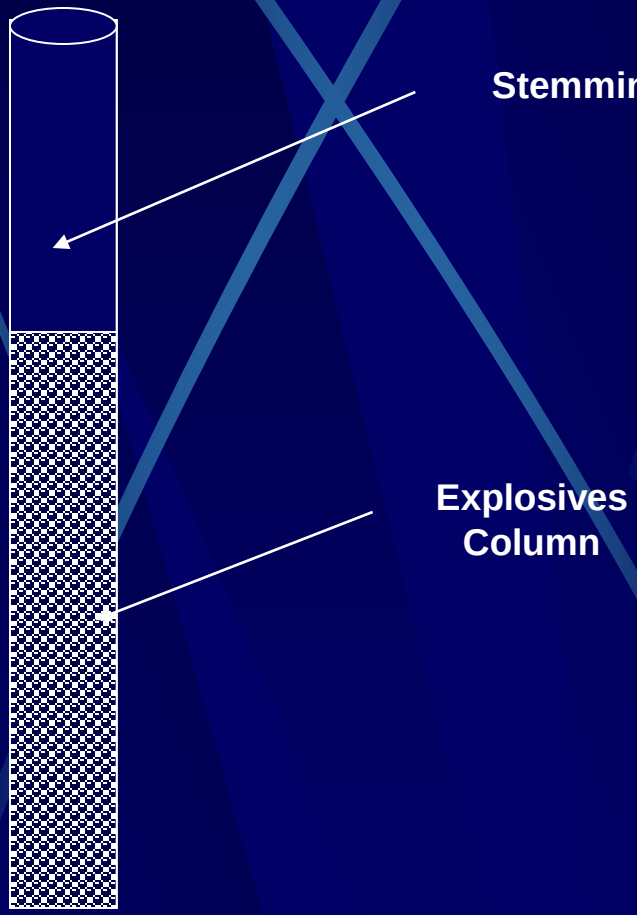
- Efficient
- Effective
- Economical

Unfortunately…..

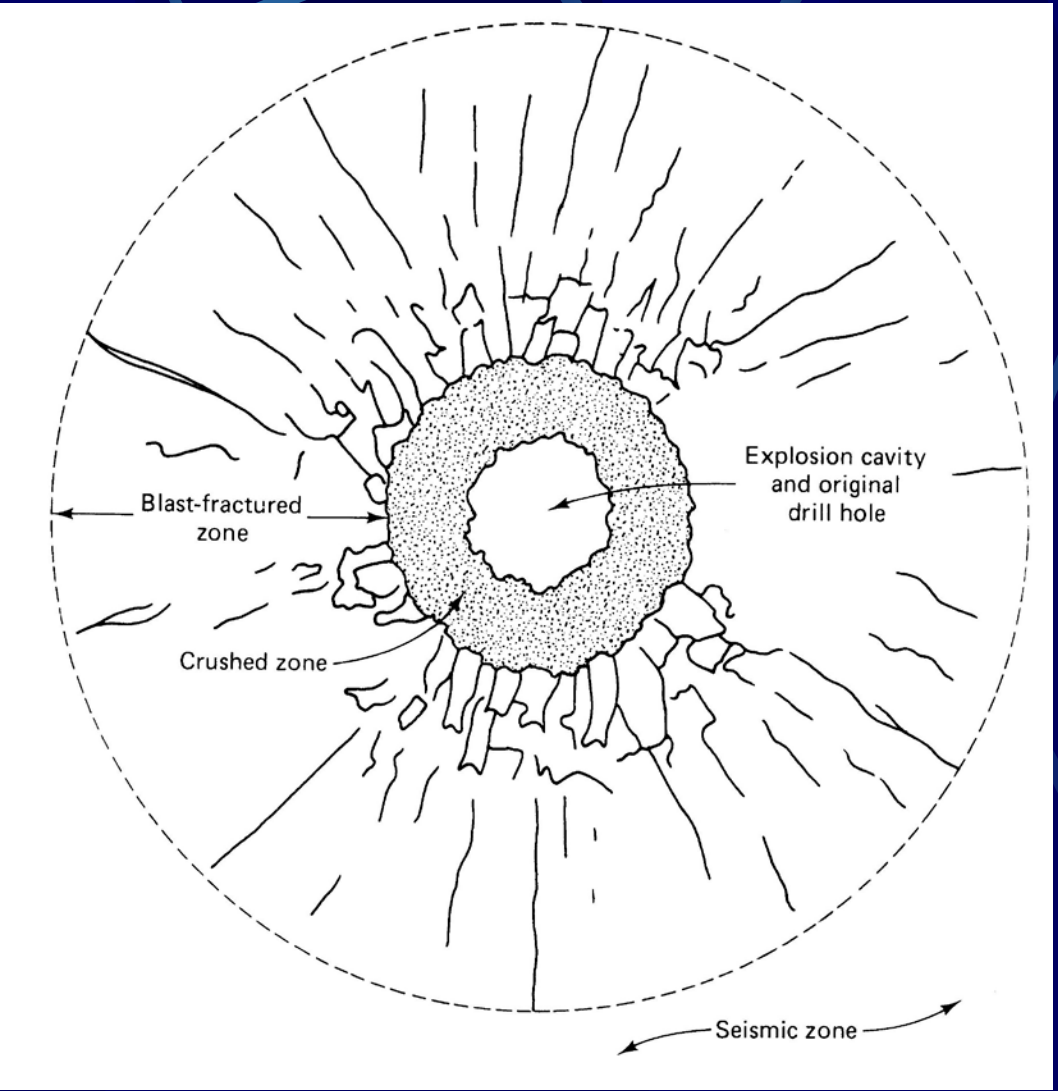
- Blasting represents an inconvenience to day-to-day activities of neighbors.
- Blasting attracts a great deal of attention from nearby occupants and homeowners.
- Blasting tends to create concern in neighbors, producing an increased number of damage complaints.
- Blasting requires special safeguards to be in place.

Despite the intuitive belief that sounds and vibrations from blasting operations are an indication of increased damage potential or safety concern, such is not the case.

Typical Column Loading

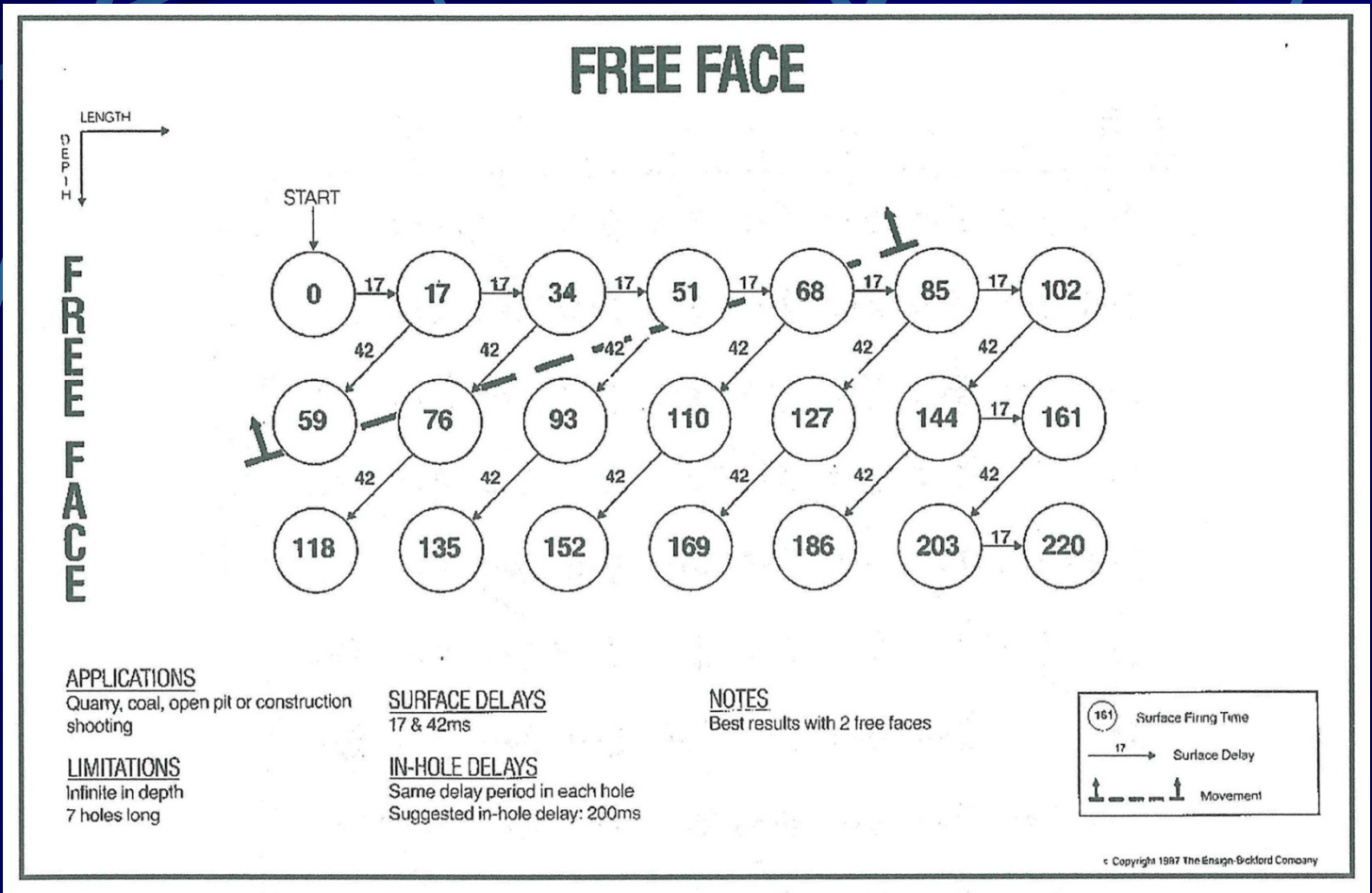


Blast Schematic



EXPLOTECH

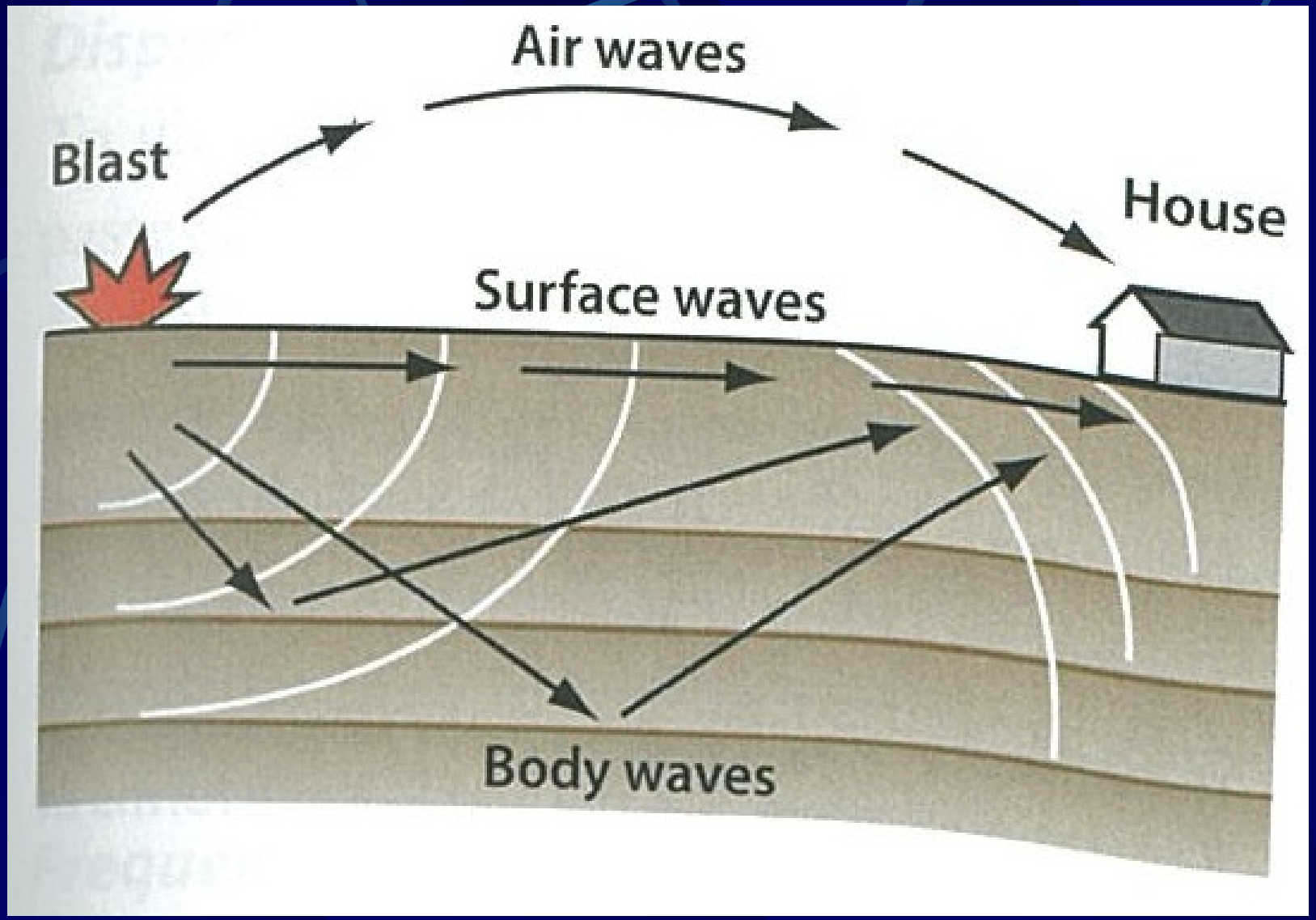
Blast Layout
Timing Example

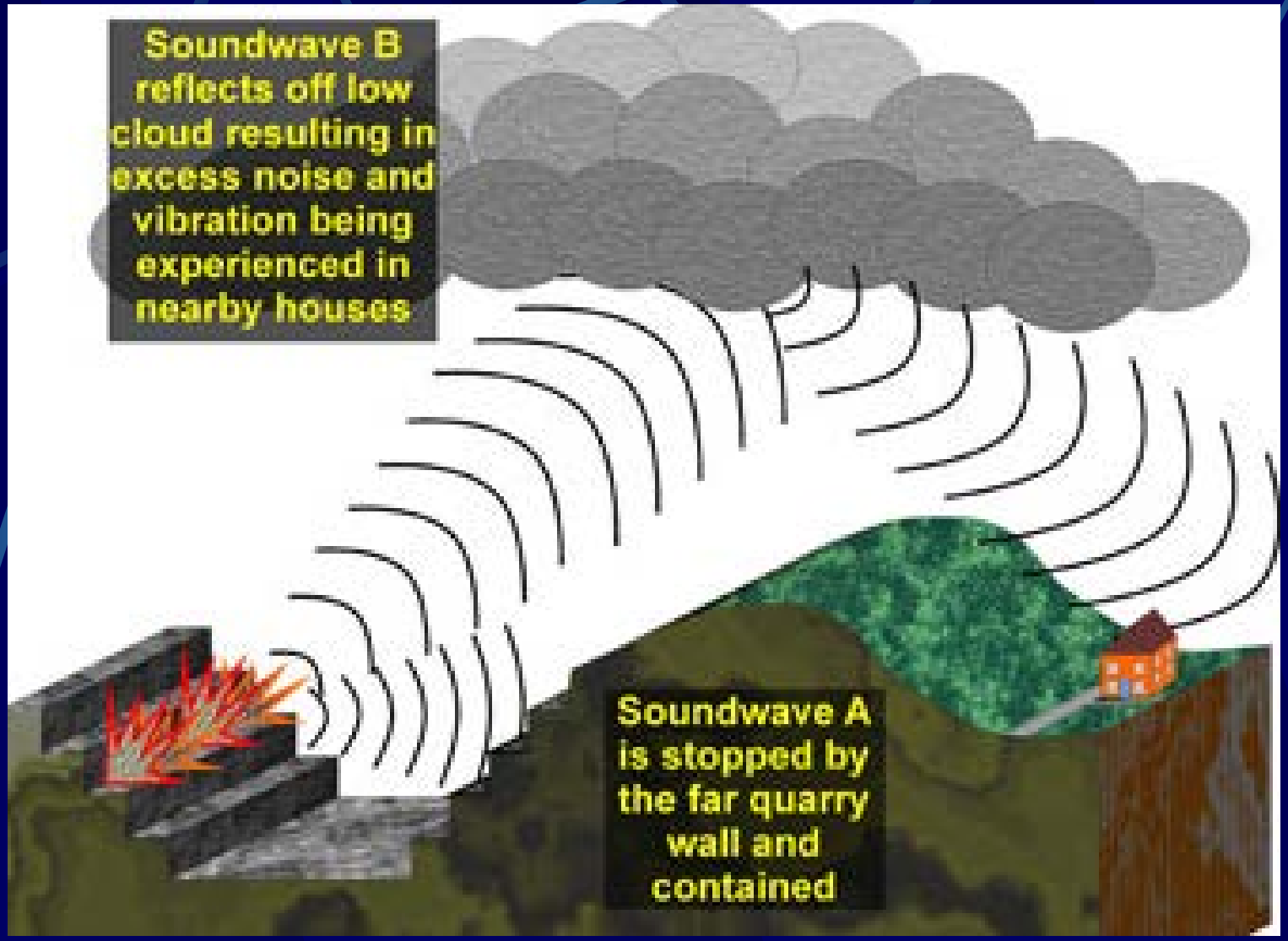


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Air waves
Blast
House
Surface waves
Body waves


Soundwave B reflects off low cloud resulting in excess noise and vibration being experienced in nearby houses
Soundwave A is stopped by the far quarry wall and contained

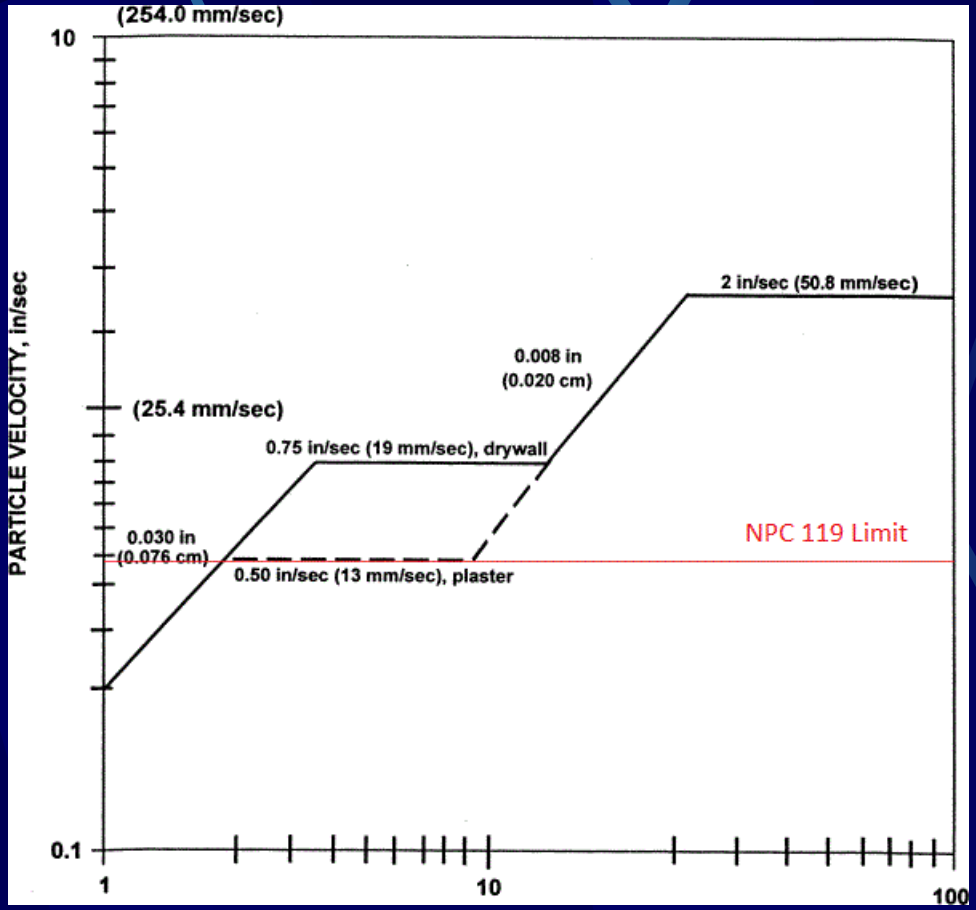
BLAST VIBRATIONS AND OVERPRESSURE LIMITS

- *NPC 119 of the Ministry of Environment Model Municipal Noise Control By-law establishes guideline limits of 12.5mm/s and 128dBL for ground vibration and overpressure respectively*
- *Studies by various research organizations have shown that normal temperature and humidity changes cause more damage to residences than blast vibrations and overpressure in the range listed in NPC 119.*

Blast Vibrations

- The magnitude of ground vibrations is expressed in terms of Peak Particle Velocity in mm/s. Peak Particle Velocity is generally accepted world wide as the best way to express the potential for damage from blast vibrations.
- Peak Particle Velocity is defined as the rate of exchange of the amplitude. This is the speed of excitation of the particles in the ground resulting from vibratory motion caused by blasting.

BLAST VIBRATIONS AND OVERPRESSURE LIMITS



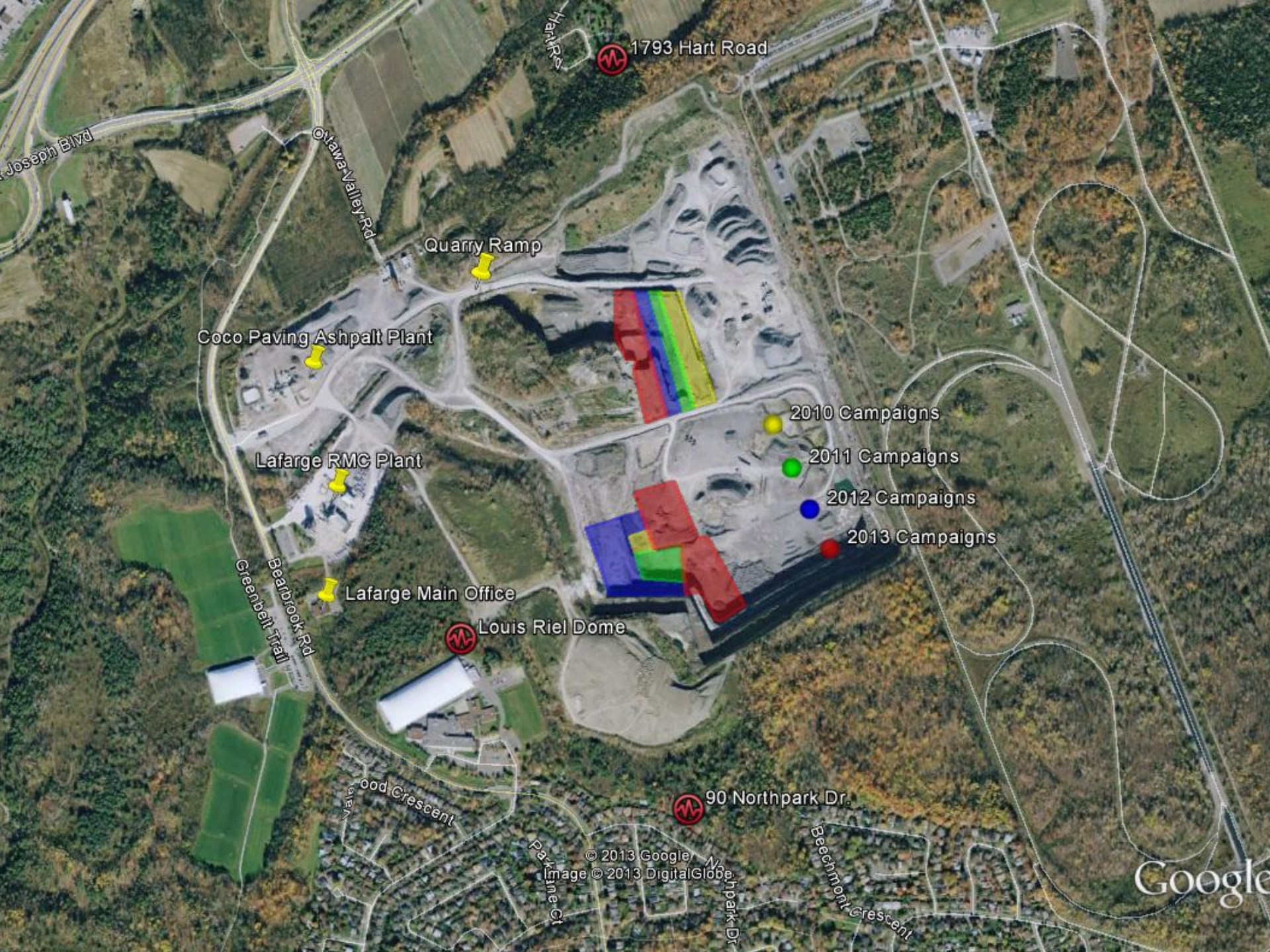
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Wind Speed vs. Overpressure

WIND EQUIVALENT (Kph)	OVERPRESSURE		STANDARDS
	(dB)	(Kpa)	
650	180	20.68	Structural Damage
525	176	13.79	Plaster Cracks
250	164	3.45	Most Windows Break
115	150	0.62	Some Windows Break
65	140	0.21	OSHA Maximum For Impulsive Sound. This level could cause loose windows to vibrate. THRESHOLD OF PAIN
32	128	0.05	M.O.E.E. Guideline for Monitored Blasts
15	115	0.01	Complaints Likely
6.5	100	2.07×10^{-3}	Pneumatic Hammer
0.65	60	2.07×10^{-5}	Conversational Speech
0.02	0	2.07×10^{-8}	Threshold of hearing

Measurement of Blast vibrations

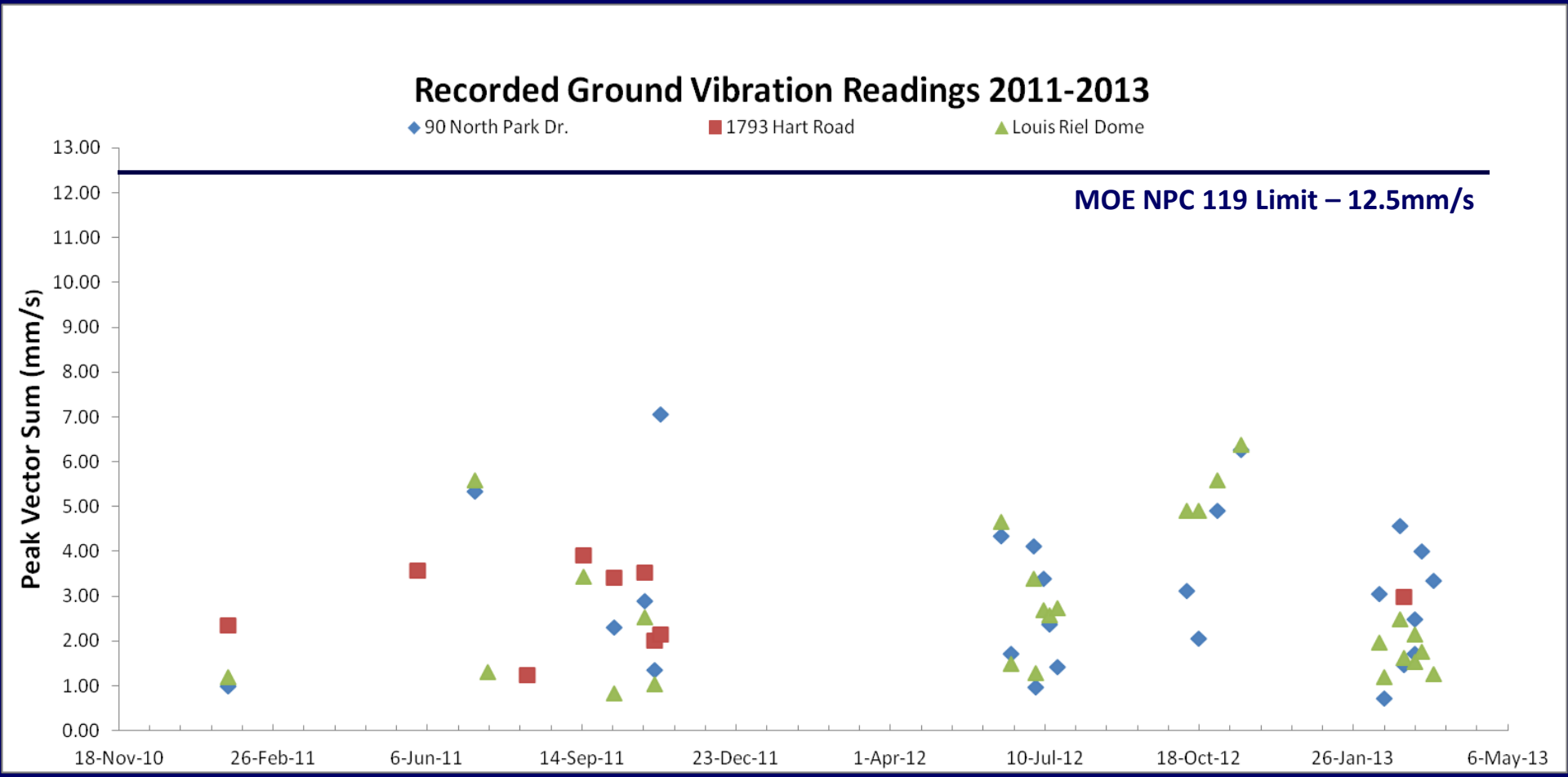
- Seismographs monitor blasting at Lafarge Bearbrook Quarry on a continual basis and record both ground vibration and overpressure intensities.
- These records allow reliable, accurate, legal documentation of blast effects and analytical tools for advanced analysis if required.


1793 Hart Road
Hart Rd
Joseph Blvd
Ottawa Valley Rd
Quarry Ramp
Coco Paving Ashpalt Plant
Lafarge RMC Plant
2010 Campaigns
2011 Campaigns
2012 Campaigns
2013 Campaigns
Lafarge Main Office
Louis Riel Dome
Greenbelt Trail
Bearbrook Rd
90 Northpark Dr.
Beechmont Crescent
Northpark Dr
Parkane Ct
© 2013 Google
Image © 2013 DigitalGlobe
Google

Highest Ground Vibration Readings 2011-2013

(MOE NPC 119 Limit – 12.5mm/s)

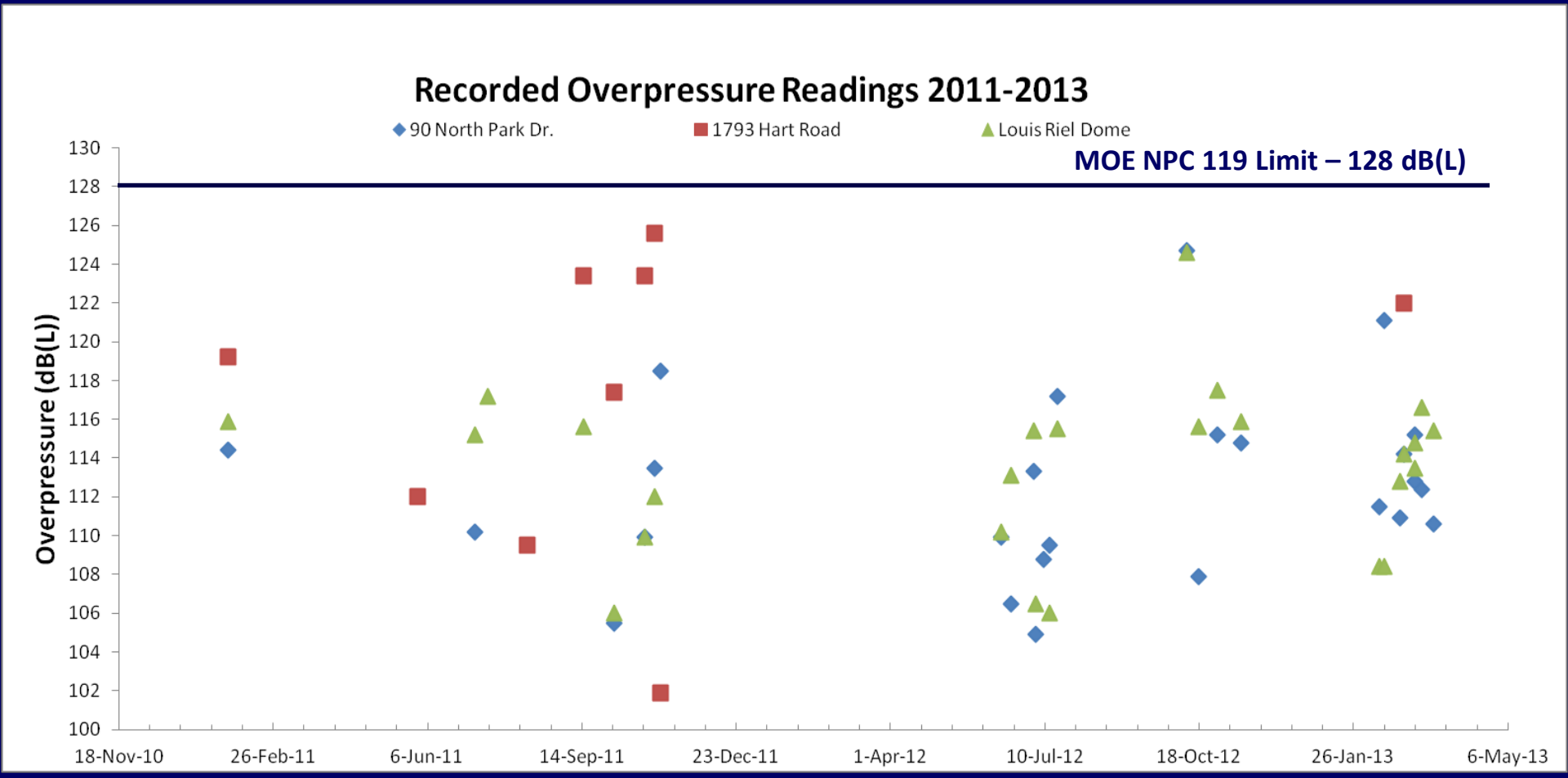
Location	Date	Ground Vibration (mm/s)
1793 Hart Rd.	Sept 15, 2011	3.91
Louis Riel Dome	Nov 14, 2012	6.38
90 Northpark Dr.	Nov 4, 2011	7.06


Recorded Ground Vibration Readings 2011-2013
90 North Park Dr.
1793 Hart Road
Louis Riel Dome
MOE NPC 119 Limit – 12.5mm/s
Peak Vector Sum (mm/s)
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
18-Nov-10
26-Feb-11
6-Jun-11
14-Sep-11
23-Dec-11
1-Apr-12
10-Jul-12
18-Oct-12
26-Jan-13
6-May-13

Highest Air Overpressure Readings 2011-2013

(MOE NPC 119 Limit – 128 dBL)

Location	Date	Air Overpressure (dBL)
1793 Hart Rd.	Oct 31, 2011	125.6
Louis Riel Dome	Oct 10, 2012	124.6
90 Northpark Dr.	Oct 10, 2012	124.7

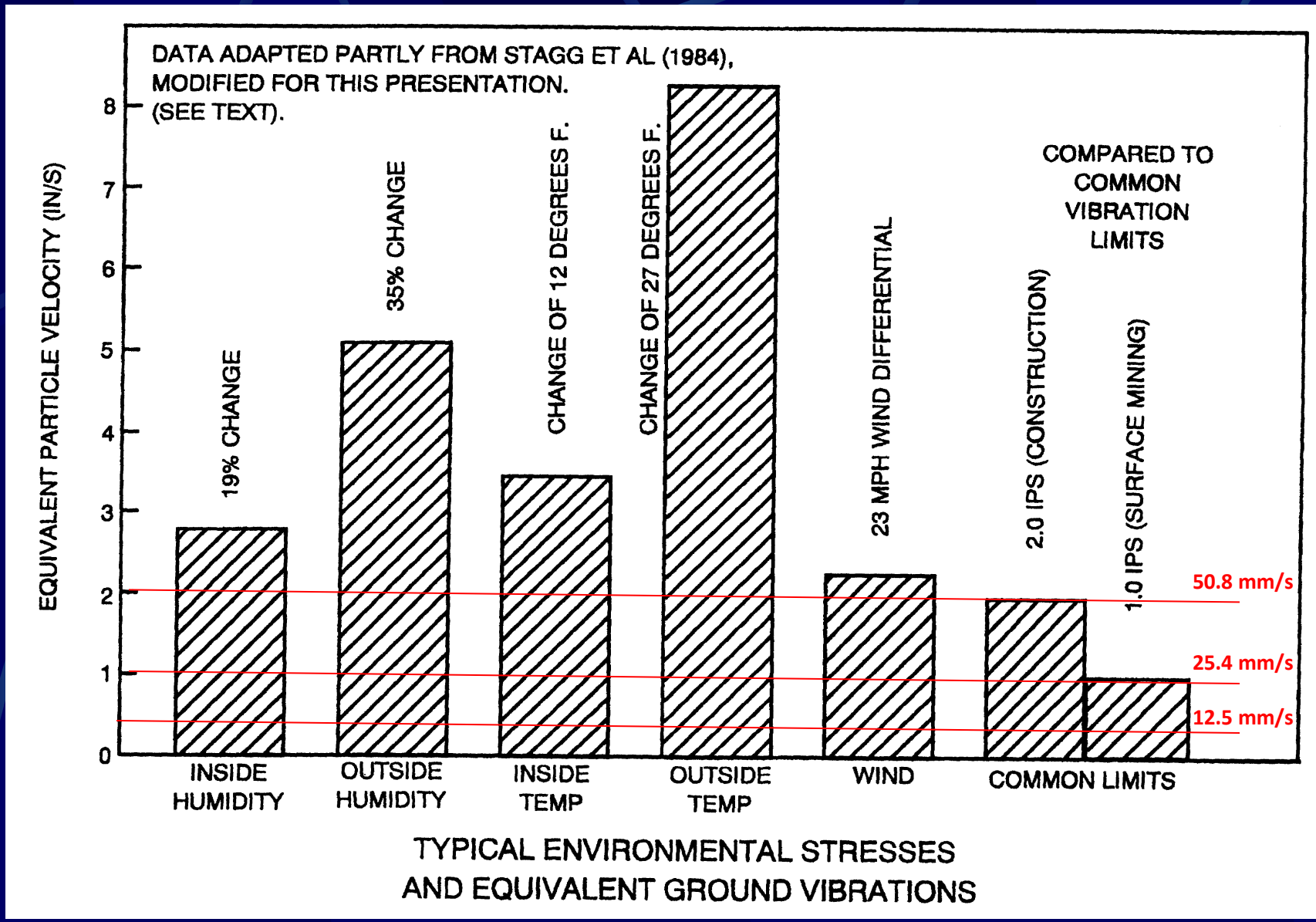

Recorded Overpressure Readings 2011-2013
90 North Park Dr.
1793 Hart Road
Louis Riel Dome
MOE NPC 119 Limit – 128 dB(L)
Overpressure (dB(L))
130
128
126
124
122
120
118
116
114
112
110
108
106
104
102
100
18-Nov-10
26-Feb-11
6-Jun-11
14-Sep-11
23-Dec-11
1-Apr-12
10-Jul-12
18-Oct-12
26-Jan-13
6-May-13

Human Response to Blast Vibrations and Overpressure

- Human beings are very sensitive to blast vibrations and fears expressed concerning vibrations cracking are often a result of this sensitivity
- Vibrations as low as 0.5 mm/s are perceptible and annoying to some people.
- Blast overpressure rarely causes damage but at levels of 115 dBL or more complaints increase.

Other Influences on Residential Construction

- All significant impacts on the residence should be considered
- Differential thermal expansion, structural overloading, chemical changes in building materials, shrinkage and swelling of wood, fatigue and aging of building materials, foundation settlement and the impacts of human habitation all induce transient deformation similar to those induced by construction operations.



TYPICAL ENVIRONMENTAL STRESSES
AND EQUIVALENT GROUND VIBRATIONS

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