

## **Appendix G6**

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### **2015 Blast Monitoring Report for the Protection of Nearby Fish Habitat**

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# ANNUAL REPORT MEMORANDUM

Agnico Eagle Mines Ltd Meadowbank Division  
Environment Department

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**SUBJECT: 2015 Blast Monitoring Report for the Protection of Nearby Fish Habitat**

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## 1- Introduction and Objectives

In accordance with NIRB Project Certificate No.004, Condition 85, AEM Meadowbank Division developed a blasting program which complies with *The Guidelines for the Use of Explosives In or Near Canadian Fisheries Water* (Wright and Hopky, 1998) as modified by the DFO for use in the North. As a result, AEM conducts monitoring to evaluate blast related peak particle velocity and overpressure to protect nearby fish bearing waters.

The detonation of explosives in or near water produces compressive shock waves that can cause significant impacts to the swim bladders of fish, rupture other internal organs and/or damage or kill fish eggs and larvae. In addition, the effects of the shock waves can be intensified in the presence of ice. Consequently, *the Guidelines for the Use of Explosives In or Near Canadian Fisheries Water* guidelines have been developed by DFO to protect fish and fish habitat from works or undertakings that involve explosives in or near fisheries waters. It includes the following requirements:

1. No explosive is to be detonated in or near fish habitat that produces an instantaneous pressure change (IPC) greater than 100 kPa in the swim bladder of a fish; representatives from DFO requested that AEM use a value of 50 kPa instead of 100 kPa; and
2. No explosive is to be detonated that produces a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation (for lakes near the Meadowbank mine, it takes place between August 15 and June 30).

Peak particle velocity (PPV) and overpressure monitoring data was recorded throughout 2015 during blasting activities at the North Portage Pit, South Portage Pit, Bay Goose Pit and Vault Pit. The locations of the blast monitoring stations in 2015 are called Portage Pit North (14W 7214597N 639457E), Portage Pit South (14W 7213663N 639349E), Goose Pit (14W 7212116N 638881E), Vault Pit station #1 (14W 7219726N 640741E) and Vault Pit station #2 (15W 7220873N 359907E). These monitoring stations are illustrated in Figure 1 and Figure 2 for Vault Pit. The Portage stations are located near the shoreline of Second Portage Lake and the station located on the Bay Goose Dike is near Third Portage Lake East Basin. The Vault Pit station #1 is located between the Vault Attenuation Pond (dewatered Vault Lake) and the Vault Pit, and Vault Pit station #2 is located near Wally Lake.

Blast monitoring was conducted at Goose Pit from January to April 2015 when mining ceased. Blast monitoring was also conducted from January thru December 2015 at Portage Pit South, Portage Pit North, Vault station #1 and, Vault station #2 according to blast patterns.

Figure 1 - Portage and Goose Pit Blast Monitoring Stations

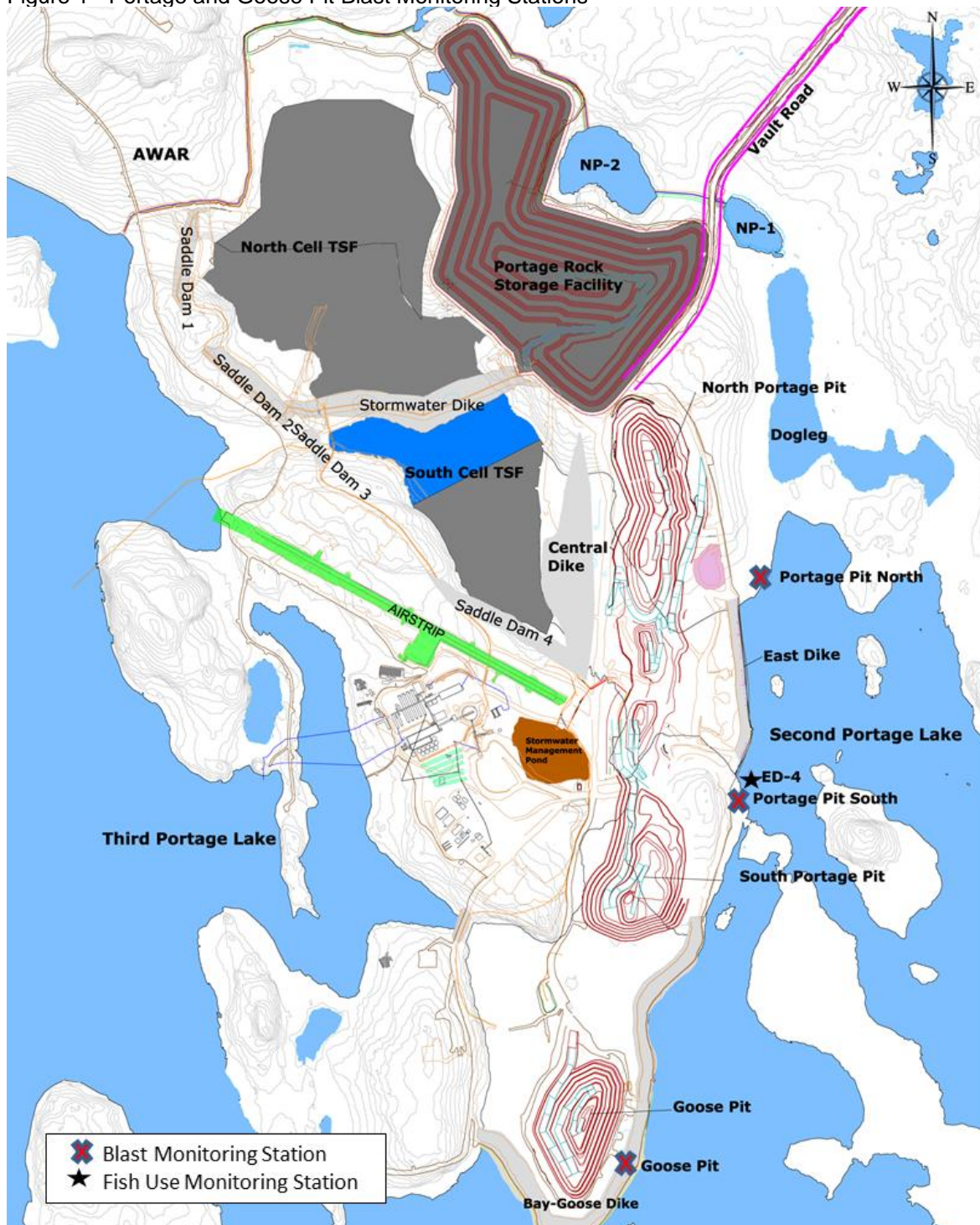
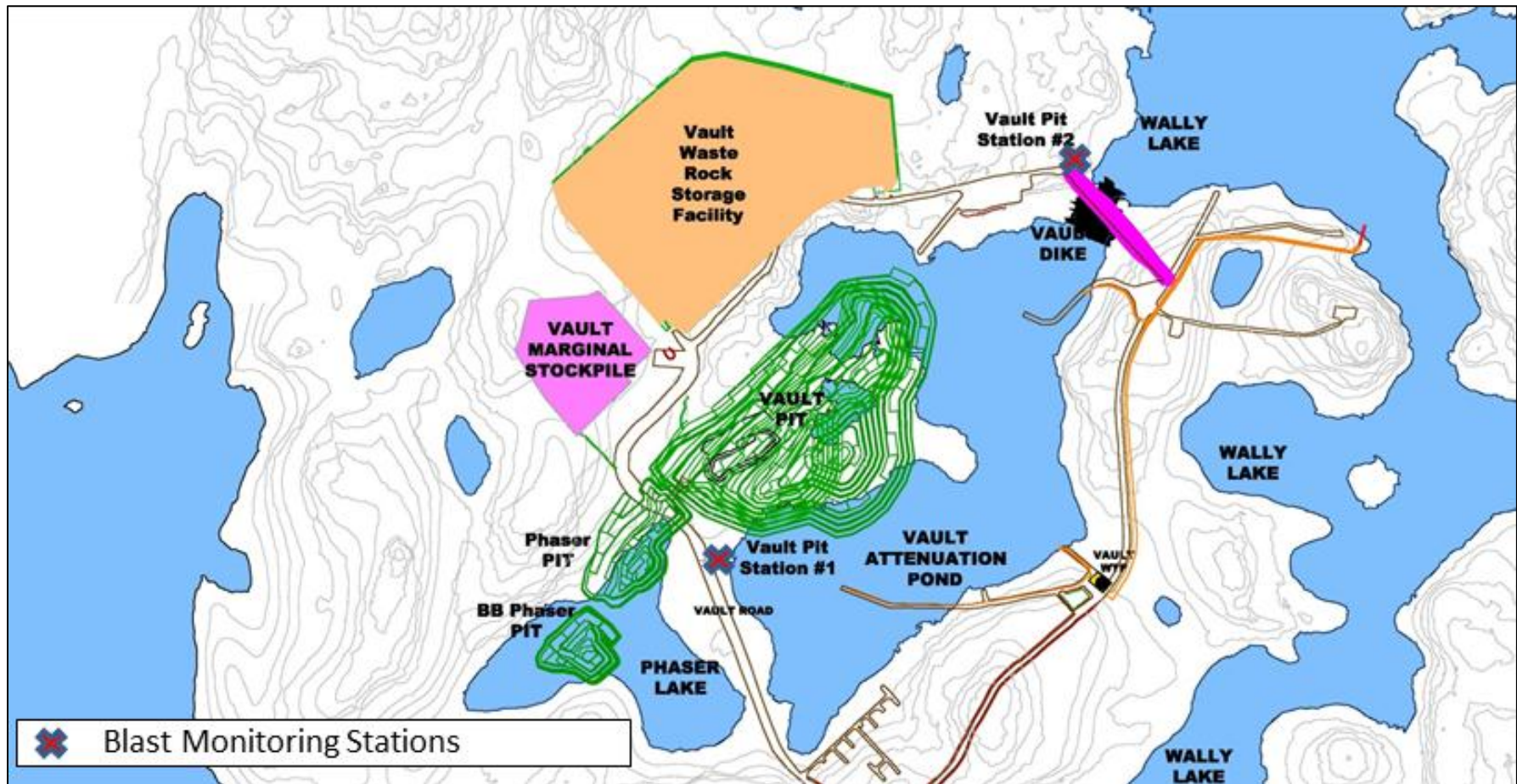




Figure 2 - Vault Pit Blast Monitoring Stations



## 2- Methods

### 2.1- Blast Monitoring

Blasts were monitored using an Instantel Minimate Blaster which is fully compliant with the international Society of Explosives and Engineers performance specifications for blasting seismographs (Instantel, 2005). The Minimate Blaster has three main parts: a monitor, a standard transducer (geophone) and a microphone. The monitor contains the battery and electronic components of the instrument. It also checks the two sensors to ensure they are functioning. The transducer measures ground vibration with a mechanism called a geophone.

This instrument measures transverse, vertical and longitudinal ground vibrations. Transverse ground vibrations agitate particles in a side to side motion. Vertical ground vibrations agitate particles in an up and down motion. Longitudinal ground vibrations agitate particles in a back and forth motion progressing outward from the event site (Instantel, 2005). The Minimate Blaster calculates the PPV for each geophone and calculates the vector sum of the three axes. The final result is the Peak Vector Sum (PVS) and is the resultant particle velocity magnitude of the event:

$$PVS = \sqrt{(T^2 + V^2 + L^2)}$$

Where:

T = particle velocity along the transverse plane

V = particle velocity along the vertical plane

L = particle velocity along the longitudinal plane

The transducer is installed as per the model specifications. All monitoring follows AEM (2010) Blast Monitoring Plan.

### 2.2- Data Analysis

The blast monitoring data was screened to ensure blast PPV and IPC monitoring results corresponded to a single blast event. As previously discussed, in 2015 the blast engineers thoroughly documented blast patterns, sequencing, and detonation results to track the material accurately, optimize blasts and review procedures. As a result, blast monitoring data is collected as a composite of blast patterns and may include multiple blast patterns that could have occurred during the same monitoring event (i.e. a single PPV and IPC value for 3 blast patterns). The data was screened to remove all redundant data points (such as replicate readings).

### 3- Results, Discussion and Conclusions

2015 PPV and IPC blast monitoring results are presented in Table 2. In 2015, 267 blasts were monitored. PPV concentrations exceeded the DFO limit of 13 mm/s on two (2) occasions. Both exceedances occurred during the period of egg incubation which is from August 15 to June 30 for lakes around the Meadowbank mine site. Table 1 outlines exceedances. The number of PPV exceedances has decreased significantly in 2015 compared to 2013 and 2014 which recorded 16 and 8 exceedances, respectively. IPC measurements were all below the DFO limit of 50 kpa. The blast monitoring results are reviewed after each blast and the blast mitigation plan was implemented immediately if the vibrations or the overpressure exceed the guidelines (see appended blast results). This plan includes a retroactive analysis to determine what caused the higher than expected results.

**Table 1. Summary of 2015 Peak Particle Velocity (PPV) exceedances.**

Date	Occurred during period of egg incubation*	Station	Peak Particle Velocity (mm/s)	Peak Sound Pressure (kpa)	Period (s)	Engineering Comments
DFO Limit			13	50		
14-06-2015	X	Portage Pit South	16.5	0.0213	1.129	Long and large blast. Many holes were potentially blasted on the same delay increasing vibrations. Closer to blast monitoring station.
31-12-2015	X	Portage Pit South	14.6	0.00925	0.132	Sinking cut pattern. Mass blast. Pre-share blast. Numerous holes blasted at the same time. Confined blast. This type of blast is rare.

\*The egg incubation period is from August 15 to June 30 for lakes around the Meadowbank mine site.

Shaded grey cells indicate exceedances.

In 2015, the average PPV was 2.38 (CI +/- 0.33) with a maximum of 16.5 mm/s (maximum in 2014 and 2013 were 23.8 and 32.7 mm/s respectively). The average was lower than 2014 (3.93 mm/s) and 2013 (5.39 mm/s) averages. This difference can be explained by the fact that mining ceased at Goose Pit in April 2015. Goose Pit was the closest pit to blast monitoring stations. As there were less blasts occurring in this area, the probability of exceeding the DFO guidelines was reduced. Also, blasting activities at Portage Pit and Goose Pit were conducted deeper this year reducing vibrations felt at the monitoring station. Exceedances recorded in 2015 occurred in Portage Pit E3 – the closest to the blast monitoring station (Table 1). They were triggered by large blast patterns with numerous holes being blasted at the same time. These types of blast are rarely conducted and AEM will attempt to eliminate these in the future. The upper 95% confidence limit for all of the annual data was 7.17 mm/s.

As discussed in the 2011 monitoring report, Wright (1982)<sup>1</sup> determined that peak particle velocity greater than 13 mm/s is potentially damaging to incubating eggs, however Faulkner et al. (2006)<sup>2</sup> found no effects on lake trout eggs

<sup>1</sup> Wright, D.G. 1982. A Discussion Paper on the Effects of Explosives on Fish and Marine Mammals in the Waters of the Northwest Territories. Canadian Technical Report of Fisheries and Aquatic Sciences 1052.

<sup>2</sup> Faulkner, Sean G., Tonn, William, Welz, Marek, Welz, and Schmitt, Douglas. 2006. Effects of Explosives on Incubating Lake Trout Eggs in the Canadian Arctic. North American Journal of Fisheries Management. 26:833-842.

due to blasts at Diavik Mine, NWT with maximum PPVs of 28.5 mm/s (16.5 at Meadowbank in 2015). Faulkner et al. (2006) measured mean PPV at three exposure stations from September to July, 2003-2004 and found a mean range of 5.8 - 6.4 mm/s (2.38 mm/s at Meadowbank in 2015) and reported 80 exceedances (2 at Meadowbank in 2015) of 13 mm/s PPV at these stations with a maximum PPV being double the DFO guideline. They found there were no differences in mortality of lake trout eggs in incubators between exposure sites and reference sites that resulted from blasting at Diavik in 2003-2004. As a result, AEM suggests that additional studies may not be necessary to confirm low PPV at spawning and incubation sites, since results of this study suggest impacts are likely not occurring even if no attenuation of PPV is occurring between blast monitoring sites and spawning habitat.

In 2015, monitoring of habitat compensation features (i.e dike faces) was conducted by AEM in Second Portage Lake. Angling (16h) and underwater camera (28h) techniques were used along the East Dike and the Second Portage Lake reference station to establish fish presence. Fishing effort was approximately equal between Second Portage Lake stations and totaled 18h. In total, 13 lake trout were caught at the station (ED-4) nearest to peak particle velocity exceedances recorded in 2015 (i.e South Portage Pit blast monitoring station). The location of station ED-4 is illustrated on Figure 1. In comparison, 16 lake trout were caught at the Second Portage Lake reference station. Two (2) and three (3) lake trout were captured by underwater camera video at ED-4 and Second Portage Lake Reference Area, respectively. This indicates that fish use of habitat near recorded exceedances is not reduced compared to reference stations. Although the fish use monitoring doesn't coincide with the blast exceedances, it demonstrates no avoidance of the habitat closest to AEM's main operations.

As in the past, based on the monitoring station locations and through comparison to Faulkner et al. (2006), exceedances of 13 mm/s PPV recorded in 2015 were unlikely to impact salmonid incubation sites at the Meadowbank Mine site. This is supported by data collected along the East dike, near South Portage Pit, as part of the HCMP which documented the presence of spawning lake trout, despite blasting occurring nearby.

**Table 2 - 2015 PPV and IPC blast monitoring results**

Date	Station	Blast Pattern	Peak Particulate Velocity (mm/s)	Peak Sound Pressure (kpa)	(sec)
<i>DFO Limit</i>			13	50	
02-01-2015	Vault Pit Station #2	5109711-1	0	0	0
03-01-2015	Goose Pit	4990PS500-4	2.54	0.035	1.578
10-01-2015	Goose Pit	5004506-1	5.55	0.00125	5.717
11-01-2015	Portage Pit South	5074616-1	1.84	0.0155	5.256
11-01-2015	Portage Pit South	5074620-1	1.84	0.0155	5.256
15-01-2015	Vault Pit Station #1	5109719-1	1.09	0.00575	3.613
16-01-2015	Portage Pit South	5074614-1	1.57	0.00525	2.139
19-01-2015	Vault Pit Station #1	5109715-1	0	0	0
21-01-2015	Portage Pit South	5067FM609-1	4.23	0.0188	3.049
26-01-2015	Portage Pit South	5067601-1	2.97	0.00925	3.734
27-01-2015	Portage Pit South	5074622-1	2.38	0.0085	1.658

29-01-2015	Vault Pit Station #2	5109719-2	0	0	0
30-01-2015	Portage Pit South	5067611-1	1.61	0.00075	-0.129
01-02-2015	Portage Pit South	5074612-1	0	0	0
04-02-2015	Vault Pit Station #1	5102702-1	0	0	0
05-02-2015	Portage Pit South	5067605-1	2.17	0.0095	1.957
06-02-2015	Vault Pit Station #1	5102704-1	0	0	0
07-02-2015	Vault Pit Station #2	5109727-1	0	0	0
11-02-2015	Goose Pit	4990PS503-1	2.47	0.00225	1.588
11-02-2015	Vault Pit Station #2	5102706-1	0	0	0
16-02-2015	Goose Pit	4997503-1	8.73	0.0633	0.991
17-02-2015	Vault Pit Station #1	5102708-1	0	0	0
20-02-2015	Portage Pit North	5046300-1	4.01	0.0163	2.026
21-02-2015	Goose Pit	4997501-1	10.1	0.0175	1.551
23-03-2015	Goose Pit	4997505-1	3.81	0.00075	1.213
24-02-2015	Portage Pit South	5067617-1	1.9	0.0423	2.303
25-02-2015	Portage Pit North	5046302-1	2.04	0.0165	4.869
02-03-2015	Portage Pit South	5067603-1	3.42	0.0105	0.743
03-03-2015	Portage Pit North	5046304-1	4.7	0.0103	2.052
04-03-2015	Portage Pit South	5067619-1	6.91	0.0563	4.817
07-03-2015	Portage Pit South	5067613-1	1.42	0.0178	3.945
09-03-2015	Portage Pit South	5046PS600-2	0	0	0
10-03-2015	Portage Pit South	5067621-1	1.67	0.019	5.715
13-03-2015	Portage Pit South	5060602-1	2.98	0.00475	3.412
14-03-2015	Vault Pit Station #1	5088PS714-1	0	0	0
18-03-2015	Vault Pit Station #2	5102712-1	0	0	0
20-03-2015	Portage Pit South	5046PS602-2	8.55	0.0563	2.102
21-03-2015	Portage Pit South	5046PS610-1	3.68	0.0588	1.508
23-03-2015	Portage Pit South	5046PS610-2	5.77	0.151	1.385
24-03-2015	Portage Pit South	5046PS606-2	3.3	0.024	1.688
24-03-2015	Portage Pit South	5060600-1	4.2	0.0148	1.559
25-03-2015	Portage Pit South	5060608-1	5.25	0.0445	1.311
25-03-2015	Vault Pit Station #1	5102710-1	0	0	0
28-03-2015	Portage Pit South	5046PS614-1	1.87	0.156	1.784
30-03-2015	Portage Pit South	5046PS614-2	0	0	0
31-03-2015	Vault Pit Station #2	5102716-1	0	0	0
03-04-2015	Vault Pit Station #2	5123801-1	1.45	0.005	1.46
04-04-2015	Portage Pit South	5046PS616-2	1.84	0.0303	2.787
07-04-2015	Portage Pit South	5046PS618-2	2.69	0.0158	-0.24
09-04-2015	Portage Pit South	5060614-1	2.28	0.008	2.475
09-04-2015	Vault Pit Station #1	5123803-1	1.24	0.0463	5.289
10-04-2015	Vault Pit Station #2	5095701-1	0	0	0
12-04-2015	Goose Pit	4990500-1	10.5	0.0363	1.093
13-04-2015	Vault Pit Station #1	5095703-1	0	0	0
14-04-2015	Vault Pit Station #1	5123805-1	0	0	0
15-04-2015	Vault Pit Station #2	5095705-1	0	0	0



17-04-2015	Portage Pit South	5060616-1	2.07	0.0138	5.819
17-04-2015	Vault Pit Station #1	5095711-1	0	0	0
19-04-2015	Vault Pit Station #1	5095709-1	0	0	0
20-04-2015	Portage Pit South	5123629-1	0	0	0
21-04-2015	Vault Pit Station #1	5123809-1	1.3	0.00075	0.07
23-04-2015	Portage Pit South	5060618-1	1.66	0.0278	0.712
24-04-2015	Goose Pit	5018516-1	12.2	0.0465	1.155
26-04-2015	Vault Pit Station #2	5095721-1	0	0	0
28-04-2015	Portage Pit South	5053603-1	5.08	0.00625	2.028
29-04-2015	Portage Pit South	5053607-1	2.97	0.0135	2.551
02-05-2015	Vault Pit Station #2	5116800-1	1.67	0.0165	4.742
03-05-2015	Vault Pit Station #1	5095713-1	0	0	0
03-05-2015	Portage Pit South	5053601-1	1.89	0.00875	2.607
04-05-2015	Vault Pit Station #2	5116814-1	1.08	0.0215	4.454
10-05-2015	Portage Pit South	5053609-1	5.29	0.00775	1.918
10-05-2015	Vault Pit Station #2	5116802-1	0	0	0
12-05-2015	Vault Pit Station #2	5116804-1	0	0	0
12-05-2015	Portage Pit South	5046PS613-1	1.61	0.00075	0.271
13-05-2015	Portage Pit South	5053605-1	1.49	0.0055	1.619
15-05-2015	Portage Pit South	5053613-1	0	0	0
15-05-2015	Vault Pit Station #2	5116816-1	0	0	0
17-05-2015	Vault Pit Station #1	5130800-1	0	0	0
19-05-2015	Vault Pit Station #1	5095717-1	0	0	0
19-05-2015	Vault Pit Station #1	5095719-1	0	0	0
21-05-2015	Vault Pit Station #1	5116818-1	0	0	0
22-05-2015	Vault Pit Station #1	5135802-1	0	0	0
23-05-2015	Portage Pit South	5053621-1	0	0	0
24-05-2015	Vault Pit Station #1	5116806-1	1.35	0.015	5.067
25-05-2015	Portage Pit South	5053615-1	2.4	0.0145	5.072
29-05-2015	Vault Pit Station #2	5130805-1	2.42	0.00675	4.409
01-06-2015	Portage Pit South	5046600-1	3.8	0.024	2.834
02-06-2015	Vault Pit Station #1	5116808-1	0	0	0
03-06-2015	Portage Pit South	5053POP603-1	3.09	0.0245	1.505
07-06-2015	Portage Pit South	5053617-2	5.07	0.065	1.234
08-06-2015	Vault Pit Station #2	5130808-1	0	0	0
12-06-2015	Vault Pit Station #1	5130818-2	0	0	0
14-06-2015	Portage Pit South	5046602-1	16.5	0.0213	1.129
16-06-2015	Vault Pit Station #1	5130802-2	1.36	0.0153	3.125
17-06-2015	Portage Pit South	5032PS608-1	0	0	0
19-06-2015	Portage Pit South	5046604-1	6.14	0.00825	2.073
19-06-2015	Portage Pit South	5032PS608-2	3.48	0.0273	1.609
20-06-2015	Portage Pit South	5032PS608-3	0	0	0
21-06-2015	Vault Pit Station #2	5088712-1	0	0	0
22-06-2015	Vault Pit Station #1	5109803-1	1.89	0.019	3.664
24-06-2015	Vault Pit Station #2	5088702-1	0	0	0

25-06-2015	Portage Pit South	5039601-1	4.7	0.0158	2.031
27-06-2015	Portage Pit South	5046PS622-2	0	0	0
28-06-2015	Portage Pit South	5046608-1	0	0	0
29-06-2015	Vault Pit Station #2	5088704-1	0	0	0
02-07-2015	Vault Pit Station #1	5046612-1	3.69	0.00775	4.979
03-07-2015	Vault Pit Station #1	5130818-3	0	0	0
04-07-2015	Vault Pit Station #1	5088706-1	0	0	0
05-07-2015	Portage Pit South	5046610-1	1.67	0.00075	0.021
06-07-2015	Vault Pit Station #1	5109PS807-2	4.18	0.0173	1.982
08-07-2015	Vault Pit Station #1	5109PS809-2	3.99	0.015	2.042
08-07-2015	Vault Pit Station #1	5088700-1	4.22	0.00075	-0.004
09-07-2015	Vault Pit Station #1	5109PS809-3	3.7	0.0138	2.005
10-07-2015	Vault Pit Station #1	5109PS809-4	4.69	0.00075	0.139
10-07-2015	Portage Pit South	5025PS603-1	4.66	0.00525	2.062
11-07-2015	Portage Pit South	5046614-1	4.22	0.00075	0.004
12-07-2015	Goose Pit	5025PS603-3	5.75	0.0005	0.001
12-07-2015	Vault Pit Station #1	5116762-1	2.85	0.0145	2.195
13-07-2015	Vault Pit Station #1	5109PS809-6	6.69	0.019	2.224
13-07-2015	Portage Pit South	5025PS605-2	6.03	0.0005	0.262
14-07-2015	Portage Pit South	5025PS605-3	7	0.00075	1.61
14-07-2015	Vault Pit Station #1	5109PS809-7	3.95	0.0533	0.698
15-07-2015	Vault Pit Station #1	5109PS811-2	2.08	0.0005	0.003
15-07-2015	Portage Pit South	5025PS605-4	7.97	0.0375	1.665
15-07-2015	Portage Pit South	5025PS605-5	0	0	0
16-07-2015	Vault Pit Station #1	5109PS811-3	0	0	0
17-07-2015	Portage Pit South	5046616-1	2.58	0.0118	2.37
17-07-2015	Portage Pit South	5025PS605-6	2.39	0.008	1.738
18-07-2015	Vault Pit Station #1	5123813-1	0	0	0
19-07-2015	Vault Pit Station #1	5095723-1	3.83	0.023	4.425
20-07-2015	Portage Pit South	5109PS811-6	0	0	0
20-07-2015	Portage Pit South	5039603-1	4.33	0.0123	1.912
21-07-2015	Vault Pit Station #2	5109PS826-1	0	0	0
24-07-2015	Portage Pit South	5039605-1	7.6	0.0153	1.42
25-07-2015	Vault Pit Station #2	5116820-1	0	0	0
27-07-2015	Vault Pit Station #2	5109PS826-3	0	0	0
28-07-2015	Vault Pit Station #1	5130822-1	0	0	0
29-07-2015	Portage Pit South	5039609-1	5.79	0.00875	5.752
30-07-2015	Vault Pit Station #2	5095723-2	2.87	0.00375	3.47
31-07-2015	Portage Pit South	5039609-2	3.65	0.0445	4.913
01-08-2015	Vault Pit Station #1	5123826-1	4.67	0.0113	2.302
02-08-2015	Portage Pit South	5039PS613-2	0	0	0
04-08-2015	Portage Pit South	5039611-1	3.8	0.0245	3.302
04-08-2015	Portage Pit South	5025PS615-1	0	0	0
05-08-2015	Vault Pit Station #1	5116826-2	2.62	0.0115	1.121
06-08-2015	Portage Pit South	5025PS615-3	2.5	0.121	2.052

07-08-2015	Portage Pit South	5025PS617-2	1.69	0.0628	2.008
10-08-2015	Portage Pit South	5025PS619-1	1.99	0.072	4.467
11-08-2015	Vault Pit Station #1	5102800-1	2.97	0.016	0.119
11-08-2015	Vault Pit Station #1	5109PS826-4	4.83	0.0143	5.134
12-08-2015	Vault Pit Station #1	5109PS826-5	0	0	0
14-08-2015	Vault Pit Station #2	5109PS826-6	2.85	0.0085	6.34
15-08-2015	Portage Pit South	5039617-1	4.91	0.028	3.162
16-08-2015	Vault Pit Station #1	5081701-1	2.05	0.00675	5.901
19-08-2015	Vault Pit Station #2	5116828-1	1.61	0.009	5.901
19-08-2015	Portage Pit South	5039619-1	2.44	0.00775	2.247
20-08-2015	Portage Pit South	5032600-1	7	0.0165	0.544
22-08-2015	Vault Pit Station #1	5130816-1	2.62	0.00675	4.646
25-08-2015	Vault Pit Station #2	5116828-2	1.3	0.00475	2.517
26-08-2015	Portage Pit South	5032602-1	5.73	0.0193	1.473
28-08-2015	Vault Pit Station #2	5081703-1	1.78	0.00832	5.27
29-08-2015	Vault Pit Station #2	5135805-1	1.88	0.00425	5.274
30-08-2015	Portage Pit South	5039POP613-1	5.7	0.015	0.5
31-08-2015	Vault Pit Station #1	5074PS709-1	5.6	0.018	0.22
31-08-2015	Portage Pit South	5032604-1	5.84	0.016	0.656
01-09-2015	Vault Pit Station #2	5116834-1	0	0	0
02-09-2015	Portage Pit South	5032606-1	5.16	0.0115	1.88
03-09-2015	Vault Pit Station #2	5130822-2	0	0	0
04-09-2015	Vault Pit Station #1	5116842-1	3.1	0.0055	0.26
05-09-2015	Vault Pit Station #1	5081707-1	0	0	0
05-09-2015	Portage Pit South	5025PS608-1	0	0	0
06-09-2015	Portage Pit South	5032610-1	3.84	0.00775	1.451
08-09-2015	Vault Pit Station #1	5109PS807-4	12.3	0.035	2.041
09-09-2015	Vault Pit Station #1	5109PS807 -5	7.78	0.028	2.007
10-09-2015	Vault Pit Station #2	5088710-1	6.14	0.0245	4.127
10-09-2015	Vault Pit Station #1	5116840-1	5.74	0.0163	3.345
11-09-2015	Vault Pit Station #1	5109807-1	0	0	0
12-09-2015	Portage Pit South	5032608-1	7.24	0.0218	5.702
13-09-2015	Vault Pit Station #2	5123831-1	5.47	0.0005	0.211
14-09-2015	Vault Pit Station #2	5116844-1	0	0	0
16-09-2015	Portage Pit South	5032612-1	1.99	0.0045	5.069
18-09-2015	Vault Pit Station #2	5109809-1	1.73	0.0153	4.58
19-09-2015	Vault Pit Station #1	5130814-1	0	0	0
22-09-2015	Vault Pit Station #2	5109PS848-1	4.07	0.008	3.381
23-09-2015	Portage Pit South	5032614-1	3.1	0.0108	2.711
24-09-2015	Vault Pit Station #1	5109PS813-1	1.87	0.0168	3.591
25-09-2015	Vault Pit Station #1	5109PS813-2	1.85	0.0283	3.809
26-09-2015	Vault Pit Station #1	5109PS813-3	0	0	0
27-09-2015	Vault Pit Station #1	5109PS813-4	1.47	0.035	3.615
28-09-2015	Vault Pit Station #2	5109811-1	0	0	0

28-09-2015	Vault Pit Station #2	5123848-2	3.25	0.00525	0.844
29-09-2015	Portage Pit South	5032616-1	2.81	0.0205	5.668
01-10-2015	Vault Pit Station #1	5109811-2	1.95	0.0398	3.746
02-10-2015	Vault Pit Station #1	5109PS815-2	0	0	0
02-10-2015	Vault Pit Station #1	5130824-1	2.47	0.00925	4.136
03-10-2015	Portage Pit South	5025601-1	3.22	0.0353	1.432
04-10-2015	Vault Pit Station #1	5109PS815-3	1.89	0.0123	4.015
05-10-2015	Portage Pit South	5011PS603-2	4.03	0.0618	1.387
06-10-2015	Portage Pit South	5025601-2	3.81	0.02	1.573
06-10-2015	Vault Pit Station #2	5116850-1	0	0	0
07-10-2015	Vault Pit Station #2	5109PS815-5	1.71	0.0208	4.253
08-10-2015	Vault Pit Station #1	5109PS819-2	1.71	0.0245	4.385
08-10-2015	Portage Pit South	5025623-1	6.29	0.0198	1.287
10-10-2015	Portage Pit South	5025603-1	7.24	0.0355	2.856
11-10-2015	Vault Pit Station #2	5109PS819-3	0	0	0
12-10-2015	Vault Pit Station #1	5109815-1	2.32	0.00525	4.554
14-10-2015	Vault Pit Station #1	5116854-1	0	0	0
14-10-2015	Portage Pit South	5018PS607-2	6.74	0.0238	0.956
15-10-2015	Portage Pit South	5018PS607-3	0	0	0
16-10-2015	Vault Pit Station #1	5116858-1	1.35	0.0143	3.092
17-10-2015	Portage Pit South	5025607-1	2.88	0.0065	1.521
18-10-2015	Portage Pit North	5046306-1	4.49	0.00675	1.467
19-10-2015	Vault Pit Station #2	5081709-1	0	0	0
21-10-2015	Vault Pit Station #2	5109817-1	1.81	0.004	1.237
21-10-2015	Vault Pit Station #2	5109PS819-5	0	0	0
22-10-2015	Portage Pit South	5025609-1	4.41	0.007	1.869
23-10-2015	Vault Pit Station #1	5109PS821-1	0	0	0
24-10-2015	Vault Pit Station #1	5102854-1	0	0	0
28-10-2015	Portage Pit South	5025611-1	4.72	0.0115	2.125
30-10-2015	Vault Pit Station #1	5109PS821-2	0	0	0
31-10-2015	Vault Pit Station #1	5088PS806-1	0	0	0
01-11-2015	Vault Pit Station #2	5088PS806-2	2.04	0.0325	2.737
02-11-2015	Vault Pit Station #1	5088PS806-3	0	0	0
03-11-2015	Vault Pit Station #1	5102858-1	0	0	0
03-11-2015	Portage Pit South	5025615-1	2.17	0.014	1.909
05-11-2015	Vault Pit Station #1	5088PS808-1	0	0	0
06-11-2015	Portage Pit South	5004PS600-1	4.36	0.0198	1.573
08-11-2015	Vault Pit Station #1	5102806-1	1.18	0.01	4.104
09-11-2015	Vault Pit Station #2	5123851-1	1.98	0.0153	2.452
09-11-2015	Vault Pit Station #2	5088PS808-2	0	0	0
09-11-2015	Portage Pit South	5018600-1	0	0	0
11-11-2015	Portage Pit South	5018602-1	8.92	0.0005	0.138
12-11-2015	Vault Pit Station #1	5116860-1	0	0	0
12-11-2015	Vault Pit Station #2	5088PS808-3	2.96	0.0005	0

14-11-2015	Portage Pit South	5004PS600-2	0	0	0
16-11-2015	Vault Pit Station #2	5088PS814-2	0	0	0
16-11-2015	Vault Pit Station #1	5102860-1	1.59	0.0133	2.844
18-11-2015	Portage Pit South	5018604-1	1.9	0.0215	3.316
19-11-2015	Vault Pit Station #1	5088PS814-3	2.76	0.026	2.257
20-11-2015	Portage Pit South	5018606-1	2.95	0.00975	2.447
21-11-2015	Vault Pit Station #2	5102814-1	1.26	0.004	2.503
22-11-2015	Vault Pit Station #2	5116866-1	0	0	0
23-11-2015	Vault Pit Station #1	5088PS810-1	2.7	0.029	2.32
23-11-2015	Portage Pit South	5018612-1	5.52	0.0095	1.528
25-11-2015	Portage Pit South	5025POP613-1	2.12	0.0518	1.748
27-11-2015	Vault Pit Station #1	5102856-1	0	0	0
30-11-2015	Vault Pit Station #2	5102810-1	1.37	0.00575	5.073
01-12-2015	Portage Pit North	5074SL300-1	5.8	0.104	1.671
03-12-2015	Vault Pit Station #2	5116864-1	0	0	0
04-12-2015	Portage Pit South	5018610-1	0	0	0
06-12-2015	Portage Pit North	5074320-1	1.81	0.0275	0.862
06-12-2015	Portage Pit South	5123651-1	0	0	0
06-12-2015	Vault Pit Station #2	5116870-1	3.12	0.0263	2.922
07-12-2015	Vault Pit Station #2	5074702-1	0	0	0
09-12-2015	Vault Pit Station #1	5095801-1	0	0	0
12-12-2015	Vault Pit Station #1	5102872-1	0	0	0
13-12-2015	Portage Pit South	5123653-1	0	0	0
15-12-2015	Vault Pit Station #1	5102852-1	0	0	0
16-12-2015	Vault Pit Station #2	5095801-3	0	0	0
19-12-2015	Vault Pit Station #2	5095805-1	0	0	0
21-12-2015	Vault Pit Station #1	5095851-1	1.18	0.00575	3.332
22-12-2015	Vault Pit Station #1	5109863-1	1.51	0.0125	3.319
23-12-2015	Portage Pit South	5123655-1	3.3	0.121	1.372
26-12-2015	Vault Pit Station #1	5095807-1	0	0	0
27-12-2015	Portage Pit South	5011601-1	5.62	0.0193	3.129
30-12-2015	Vault Pit Station #1	5102868-1	0	0	0
31-12-2015	Portage Pit South	5011611-1	14.6	0.00925	0.132

Shaded cells indicate exceedances.



**Date/Time** Long at 18:31:53 June 14, 2015  
**Trigger Source** Geo: 1.00 mm/s  
**Range** Geo : 254 mm/s  
**Record Time** 6.0 sec at 4096 sps  
**Job Number:** 1

**Serial Number** BE15259 V 10.60-1.1 Minimate Blaster  
**Battery Level** 6.3 Volts  
**Unit Calibration** January 2, 2014 by Instantel  
**File Name** Q259FW3V.H50

## Notes

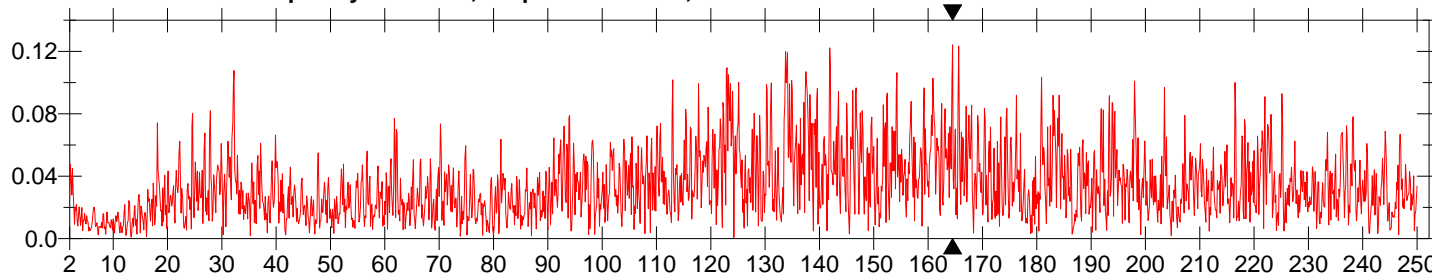
Location:  
 Client:  
 User Name:  
 General:

## Extended Notes

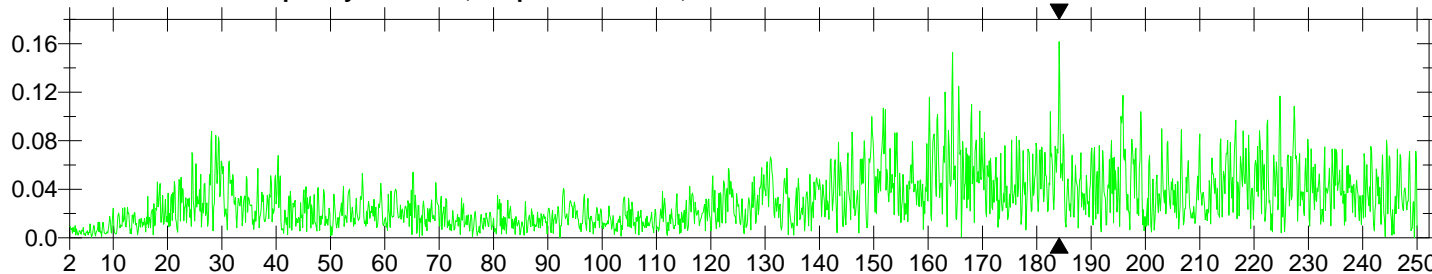
## Post Event Notes

5046602

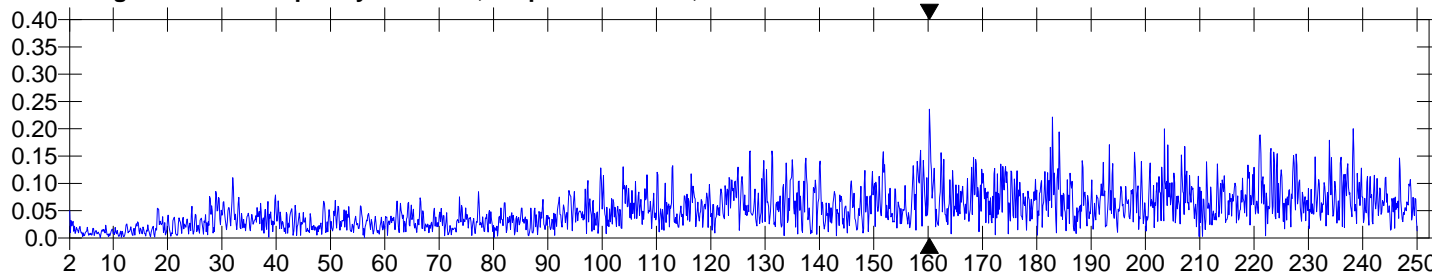
**Tran Dominant Frequency = 165 Hz., Amplitude = 0.124, PPV from Event = 5.84 mm/s**



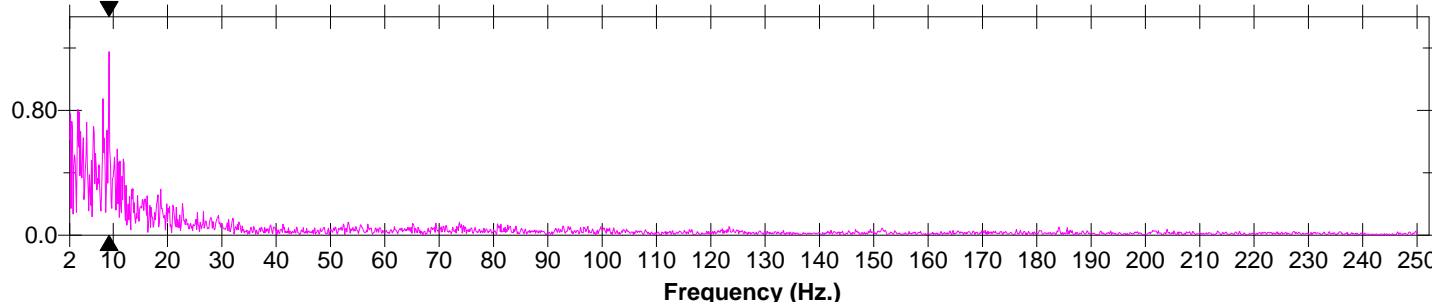
**Vert Dominant Frequency = 184 Hz., Amplitude = 0.162, PPV from Event = 8.25 mm/s**



**Long Dominant Frequency = 160 Hz., Amplitude = 0.236, PPV from Event = 15.2 mm/s**



**MicL Dominant Frequency = 9.25 Hz., Amplitude = 1.18, PSPL From Event = 21.3 pa.(L)**



**Date/Time** Long at 18:31:53 June 14, 2015  
**Trigger Source** Geo: 1.00 mm/s  
**Range** Geo : 254 mm/s  
**Record Time** 6.0 sec at 4096 sps  
**Job Number:** 1

## Notes

Location:  
 Client:  
 User Name:  
 General:

**Serial Number** BE15259 V 10.60-1.1 Minimate Blaster  
**Battery Level** 6.3 Volts  
**Unit Calibration** January 2, 2014 by Instantel  
**File Name** Q259FW3V.H50

## Post Event Notes

5046602

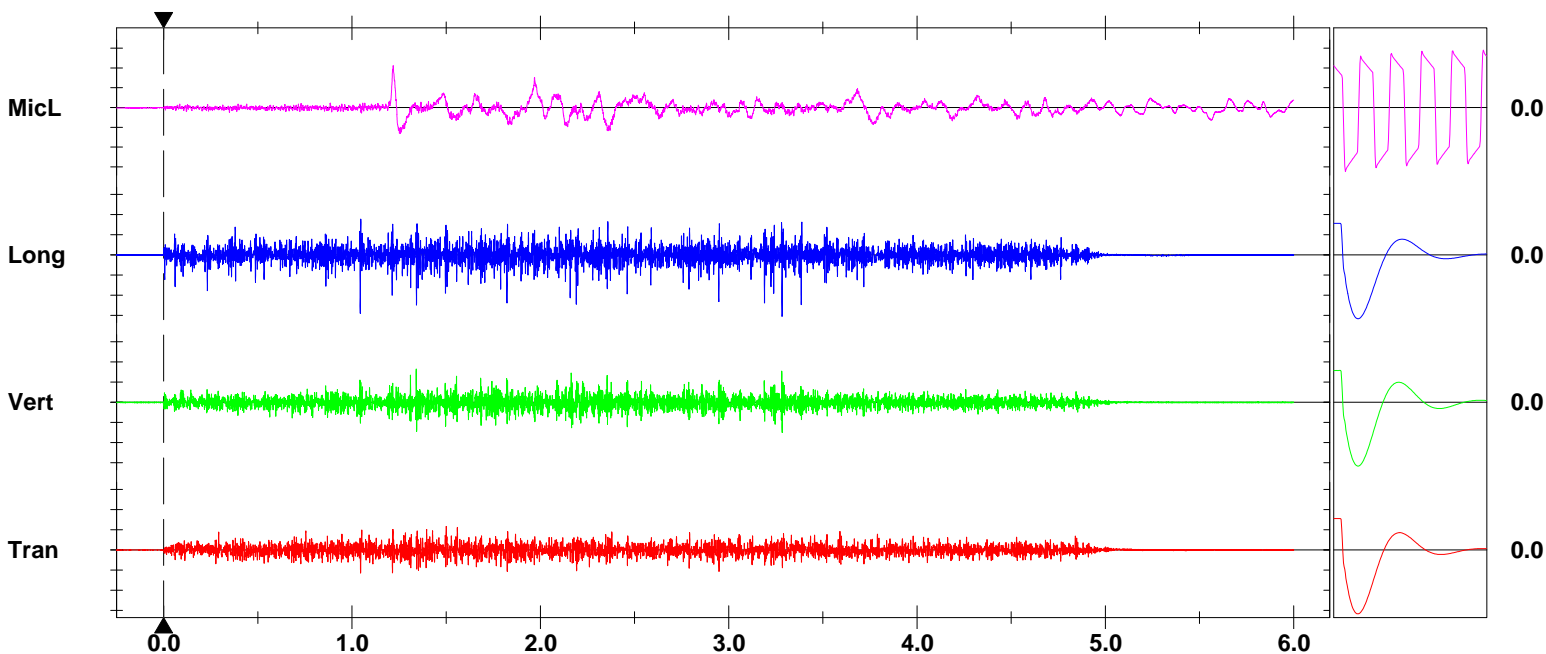
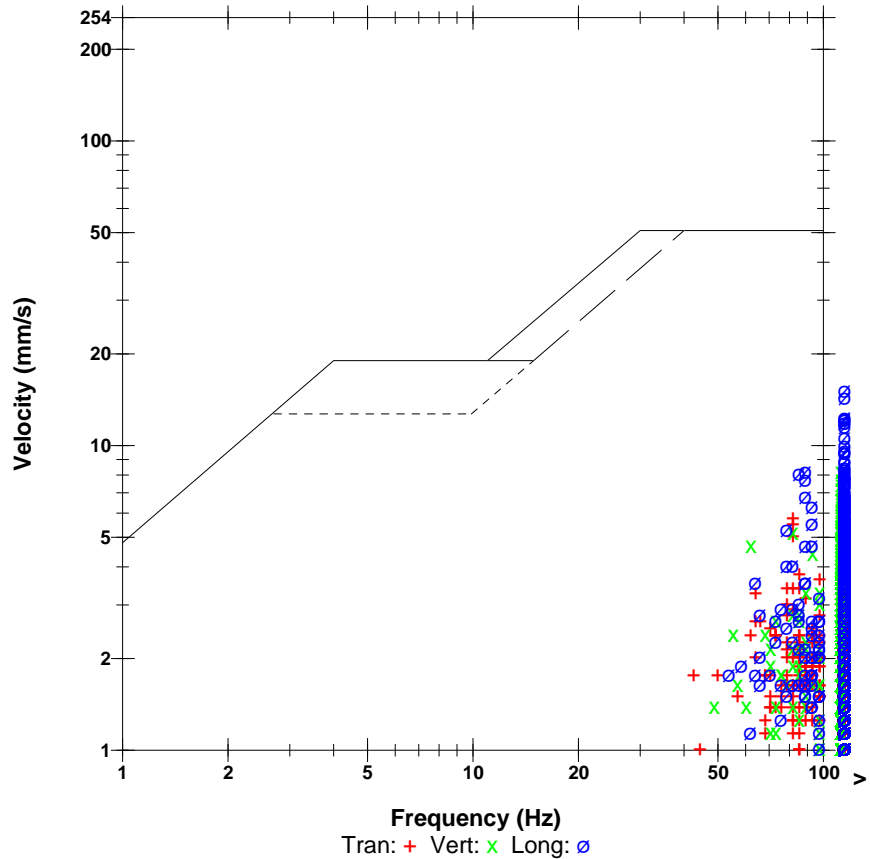
## Extended Notes

**Microphone** Linear Weighting  
**PSPL** 21.3 pa.(L) at 1.219 sec  
**ZC Freq** 11.7 Hz  
**Channel Test** Passed (Freq = 20.1 Hz Amp = 673 mv)

	Tran	Vert	Long	
PPV	5.84	8.25	15.2	mm/s
ZC Freq	82	228	158	Hz
Time (Rel. to Trig)	1.500	1.341	3.283	sec
Peak Acceleration	0.742	1.17	1.54	g
Peak Displacement	0.00933	0.00769	0.0151	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.7	7.2	Hz
Overswing Ratio	3.7	3.2	4.1	

**Peak Vector Sum** 16.5 mm/s at 3.283 sec

## USBM RI8507 And OSMRE



**Date/Time** Vert at 12:49:35 December 31, 2015  
**Trigger Source** Geo: 1.00 mm/s  
**Range** Geo : 254 mm/s  
**Record Time** 5.875 sec (Auto=3Sec) at 4096 sps  
**Job Number:** 1

**Serial Number** BE18421 V 10.72-1.1 Minimate Blaster  
**Battery Level** 6.1 Volts  
**Unit Calibration** May 4, 2015 by Instantel  
**File Name** T421G6DS.YN0

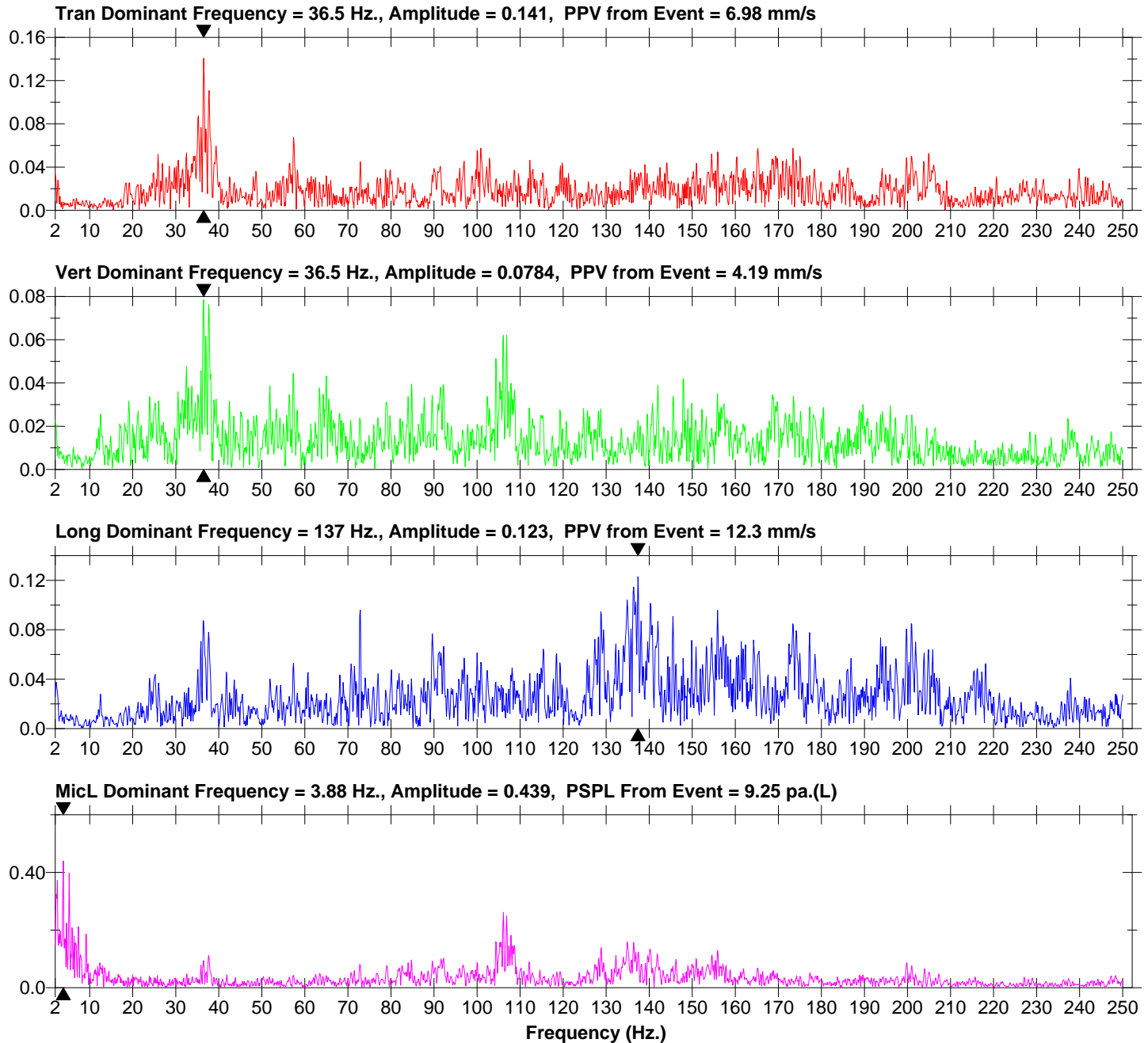
## Notes

**Location:** UNIT 7  
**Client:** AGNICO-EAGLES MINES LTD  
**User Name:** OPERATIONS / DIKES  
**General:** BLAST VIBRATION MONITORING AT DIKE CREST

## MONITORING STATION

## Post Event Notes

5011611 & 5088612



**Date/Time** Vert at 12:49:35 December 31, 2015  
**Trigger Source** Geo: 1.00 mm/s  
**Range** Geo : 254 mm/s  
**Record Time** 5.875 sec (Auto=3Sec) at 4096 sps  
**Job Number:** 1

**Notes**  
 Location: UNIT 7  
 Client: AGNICO-EAGLES MINES LTD  
 User Name: OPERATIONS / DIKES  
 General: BLAST VIBRATION MONITORING AT DIKE CREST

**Serial Number** BE18421 V 10.72-1.1 Minimate Blaster  
**Battery Level** 6.1 Volts  
**Unit Calibration** May 4, 2015 by InstanTel  
**File Name** T421G6DS.YN0

**Post Event Notes**  
 5011611 & 5088612

## MONITORING STATION

**Microphone** Linear Weighting  
**PSPL** 9.25 pa.(L) at 0.132 sec  
**ZC Freq** 137 Hz  
**Channel Test** Passed (Freq = 20.1 Hz Amp = 874 mv)

	Tran	Vert	Long	
PPV	6.98	4.19	12.3	mm/s
ZC Freq	171	64	54	Hz
Time (Rel. to Trig)	0.280	0.279	0.280	sec
Peak Acceleration	0.848	0.636	1.91	g
Peak Displacement	0.0111	0.0111	0.0148	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.5	Hz
Overswing Ratio	4.2	4.2	4.6	

**Peak Vector Sum** 14.6 mm/s at 0.280 sec

## USBM RI8507 And OSMRE

