

BLAST PLAN

PRODUCTION BLAST 9



SCALE: 1"=60 FEET
DATE: 6/20/2017
BIC:

BLASTING CONSULTANT:

• **General Contractor** •

Post Blast As-Built Report

Blast No:	P-9	Cut area:	South Staging Area
Blast Date:	6/20/2017	Blast type:	Production
Day of Week:	Tuesday	Station Limits:	1397+68.3 71.6' L
Blast Time:			

Blaster-in-Charge _____
License No. _____

Drilling Summary	<i>Production</i>	<i>Buffer</i>	<i>Pre-Split</i>
Total # Holes	50		
Hole Diameter (in)	3.5		
Burden (ft)	8		
Spacing (ft)	8		
Hole Depth min (ft)	9.0		
Hole Depth max (ft)	20.0		

Blasting Summary	<i>Production</i>	<i>Buffer</i>	<i>Pre-Split</i>
Stemming min (ft)	8.0		
Stemming max (ft)	18.0		
Min lbs / hole	1.0		
Max lbs / hole	40.0		
Max holes / delay	2		
Max lbs / delay	40.0		
Total holes loaded	40.0		
Powder Factor	0.45		
Total CY	1487		

Product Summary	<i>Qty</i>
Fortel Pro (3" x 36")	652.3 lbs
	0.0 lbs
	lbs
1 lb Cast boosters	40.0 lbs
Total	692.3

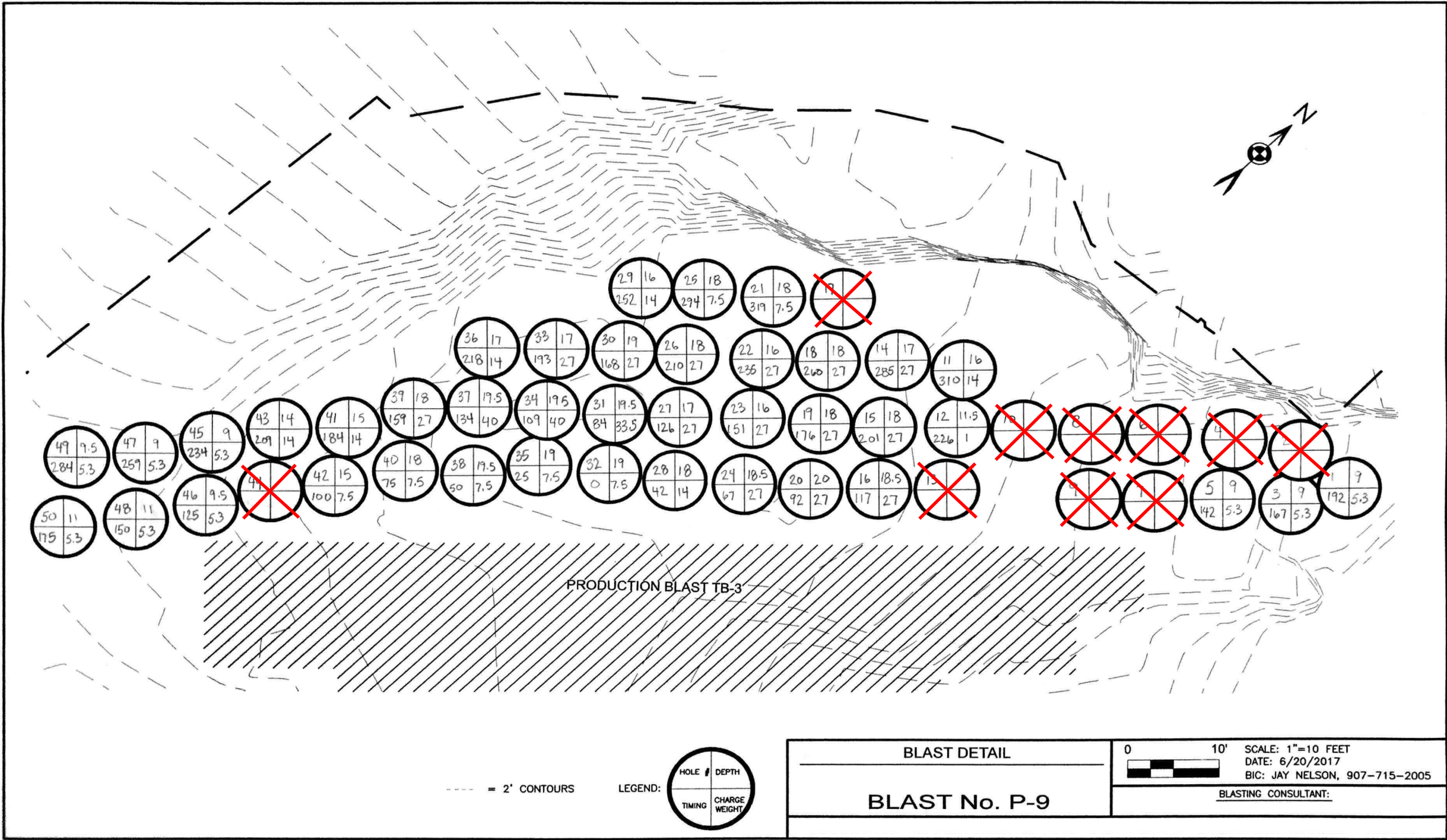
	<i>Qty</i>
Exel dual delay	40
Surface delay	7
Lead-in-line	1
<i>delay periods used:</i>	<i>25ms, 17ms, 42ms, 500ms</i>

Vibration and Air Overpressure Monitoring Summary

<i>Location</i>	<i>S/N</i>	<i>Distance (ft)</i>	<i>Predicted PPV (in/s)</i>	<i>PPV (in/s)</i>	<i>Pk Frequency</i>	<i>Air (dB)</i>
S Abutment	7407	254	1.4	0.08	31	134.0
NW Cable Anchor	7209	184		0.44	38.6	132.8
SW Cable Anchor	7408	212		0.36	24.1	129.6

Additional details provided in attached monitoring report

Notes



49 284 9.5 5.3	47 259 9 5.3	45 234 9 5.3	43 209 14 14	41 184 15 14	39 159 18 27	37 134 19.5 40	34 109 19.5 40	31 84 19.5 33.5	27 126 17 27	23 151 16 27	19 176 18 27	15 201 18 27	12 226 11.5 1	11 17	8 27	6 27	4 27	2 27	5 142 9 5.3	3 167 9 5.3	1 192 9 5.3
50 175 11 5.3	48 150 11 5.3	46 125 9.5 5.3	44 100 14 7.5	42 75 15 7.5	40 75 18 7.5	38 50 19.5 7.5	35 25 19 7.5	32 0 19 7.5	28 42 18 14	24 67 18.5 27	20 92 20 27	16 117 18.5 27	14 15 18.5 27	13 15 18 27	12 15 18 27	11 15 18 27	10 15 18 27	9 15 18 27	8 15 18 27	7 15 18 27	6 15 18 27
284 175 9.5 5.3	259 150 9 5.3	234 125 9 5.3	209 100 14 7.5	184 75 15 7.5	159 75 18 7.5	134 50 19.5 7.5	109 25 19 7.5	84 0 19 7.5	126 42 17 14	151 67 16 27	176 92 18 27	201 117 18 27	226 15 11.5 1	17 15 18 27	8 15 18 27	6 15 18 27	4 15 18 27	2 15 18 27	15 142 11.5 1	14 167 11.5 1	13 192 11.5 1
292 152 16 14	274 125 18 7.5	21 319 18 7.5	17 15 18 27	36 218 17 14	33 193 17 27	30 168 19 27	26 210 18 27	22 235 16 27	18 260 18 27	14 285 17 27	11 310 16 14	10 15 18 27	9 15 18 27	8 15 18 27	7 15 18 27	6 15 18 27	5 15 18 27	4 15 18 27	3 15 18 27	2 15 18 27	1 15 18 27
29 252 16 14	25 274 18 7.5	21 319 18 7.5	17 15 18 27	36 218 17 14	33 193 17 27	30 168 19 27	26 210 18 27	22 235 16 27	18 260 18 27	14 285 17 27	11 310 16 14	10 15 18 27	9 15 18 27	8 15 18 27	7 15 18 27	6 15 18 27	5 15 18 27	4 15 18 27	3 15 18 27	2 15 18 27	1 15 18 27

• General Contractor •

Drilling & Loading Details

Blast No: P-9

Blast Date: 6/20/2017

Day of Week: Tuesday

Blast Time: 0:00

Cut area: South Staging Area

Blast type: Production

Station Limits: 1397+68.3 71.6' L

Burden:	8.0
Spacing:	8.0

Hole #	Hole Type	Over-burden depth (ft)	Hole Depth (ft)	Subdrill (ft)	Hole Angle	Water	Booster	Delay	Product Type	# Sticks/Hole	Charge length	Pounds Loaded (lbs)	Stemming (ft)	Cubic yards/hole	Powder Factor/ Hole (lbs/cy)
1	Production	0	9		0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.0	21.3	0.25
2	Production	0													
3	Production	0	9		0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.0	21.3	0.25
4	Production	0													
5	Production	0	9		0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.0	21.3	0.25
6	Production	0													
7	Production	0													
8	Production	0													
9	Production	0													
10	Production	0													
11	Production	0	16		0	0	1	1	Fortel Plus 3-in	1	3	14.0	13.0	37.9	0.37
12	Production	0	11.5		0	0	1	1	Fortel Plus 3-in	0	0.333	1.0	11.2	27.3	0.04
13	Production	0													
14	Production	0	17		0	0	1	1	Fortel Plus 3-in	2	6	27.0	11.0	40.3	0.67
15	Production	0	18		0	0	1	1	Fortel Plus 3-in	2	6	27.0	12.0	42.7	0.63
16	Production	0	18.5		0	0	1	1	Fortel Plus 3-in	2	6	27.0	12.5	43.9	0.62
17	Production	0													
18	Production	0	18		0	0	1	1	Fortel Plus 3-in	2	6	27.0	12.0	42.7	0.63
19	Production	0	18		0	0	1	1	Fortel Plus 3-in	2	6	27.0	12.0	42.7	0.63
20	Production	0	20		0	0	1	1	Fortel Plus 3-in	2	6	27.0	14.0	47.4	0.57
21	Production	0	18		0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	16.5	42.7	0.18
22	Production	0	16		0	0	1	1	Fortel Plus 3-in	2	6	27.0	10.0	37.9	0.71
23	Production	0	16		0	0	1	1	Fortel Plus 3-in	2	6	27.0	10.0	37.9	0.71
24	Production	0	18.5	14			1	1	Fortel Plus 3-in	2	6	27.0	12.5	43.9	0.62
25	Production	0	18		0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	16.5	42.7	0.18
26	Production	0	18		0	0	1	1	Fortel Plus 3-in	2	6	27.0	12.0	42.7	0.63
27	Production	0	17		0	0	1	1	Fortel Plus 3-in	2	6	27.0	11.0	40.3	0.67
28	Production	0	18		0	0	1	1	Fortel Plus 3-in	1	3	14.0	15.0	42.7	0.33
29	Production	0	16		0	0	1	1	Fortel Plus 3-in	1	3	14.0	13.0	37.9	0.37
30	Production	0	19		0	0	1	1	Fortel Plus 3-in	2	6	27.0	13.0	45.0	0.60
31	Production	0	19.5		0	0	1	1	Fortel Plus 3-in	2.5	7.5	33.5	12.0	46.2	0.72
32	Production	0	19		0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	17.5	45.0	0.17
33	Production	0	17		0	0	1	1	Fortel Plus 3-in	2	6	27.0	11.0	40.3	0.67
34	Production	0	19.5		0	0	1	1	Fortel Plus 3-in	3	9	40.0	10.5	46.2	0.87
35	Production	0	19.5		0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	18.0	46.2	0.16
36	Production	0	16		0	0	1	1	Fortel Plus 3-in	1	3	14.0	13.0	37.9	0.37
37	Production	0	19.5		0	0	1	1	Fortel Plus 3-in	3	9	40.0	10.5	46.2	0.87
38	Production	0	19.5		0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	18.0	46.2	0.16
39	Production	0	18		0	0	1	1	Fortel Plus 3-in	2	6	27.0	12.0	42.7	0.63
40	Production	0	18		0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	16.5	42.7	0.18

41	Production	0	15	0	0	1	1	Fortel Plus 3-in	1	3	14.0	12.0	35.6	0.39
42	Production	0	15	0	0	1	1	Fortel Plus 3-in	0.5	1.5	7.5	13.5	35.6	0.21
43	Production	0	14	0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	13.0	33.2	0.16
44	Production	0												
45	Production	0	9	0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.0	21.3	0.25
46	Production	0	9.5	0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.5	22.5	0.24
47	Production	0	9.5	0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.5	22.5	0.24
48	Production	0	11	0	1	1	1	Fortel Plus 3-in	0.333	1	5.3	10.0	26.1	0.20
49	Production	0	9.5	0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	8.5	22.5	0.24
50	Production	0	11	0	0	1	1	Fortel Plus 3-in	0.333	1	5.3	10.0	26.1	0.20

DRILL LOG

Blast No: P-9 **Start date/time:** 6/19/2017 **Burden:** 8 **Borehole ft:** 778
Driller: R. Johnson **Stop date/time:** 6/20/2017 **Spacing:** 8 **Est. CY:** 1844

Hole #	Hole Depth	Subdrill	Angle	Comments (voids, seams, zones of soft rock, mud pockets, change in drill effort, etc.)	Hole #	Hole Depth	Subdrill	Angle	Comments (voids, seams, zones of soft rock, mud pockets, change in drill effort, etc.)
1	9			Competent rock	33	17.5			Competent rock
2	9			Fractured rock	34	19			Competent rock
3	9			Competent rock	35	19			Competent rock
4	10			Fractured rock	36	18			Competent rock
5	10			Competent rock	37	19			Competent rock
6	12			Competent rock	38	19			Competent rock
7	12			Fractured rock, lost hole	39	19			Competent rock
8	13			Fractured rock, lost hole	40	19			Competent rock
9	13			Fractured rock, lost hole	41	19			Competent rock
10	15			Fractured rock, lost hole	42	18			Competent rock
11	15			Competent rock	43	18			Competent rock
12	16			Soft 6 to 12'	44	15			Fractured rock, lost hole
13	17			Competent rock	45	15			5' overburden
14	17			Competent rock	46	13			Competent rock
15	17			Soft 5 to 15'	47	10			2-4' overburden
16	17			Competent rock	48	10			2-4' overburden
17	18.5			Competent rock	49	10			2-4' overburden
18	16.5			Soft overburden	50	10			2-4' overburden
19	16.5			Competent rock	51				
20	20			Competent rock	52				
21	18			Competent rock	53				
22	17.5			Competent rock	54				
23	16.5			Competent rock	55				
24	19			Competent rock	56				
25	10			Competent rock	57				
26	17.5			Competent rock	58				
27	18			Competent rock	59				
28	19			Competent rock	60				
29	17			Competent rock	61				
30	17.5			Competent rock	62				
31	19			Competent rock	63				
32	19			Competent rock	64				

BLAST MONITORING REPORT

Project:

Submitted to:

Description of work: Blast Vibration and Overpressure Monitoring Report

Blast Information

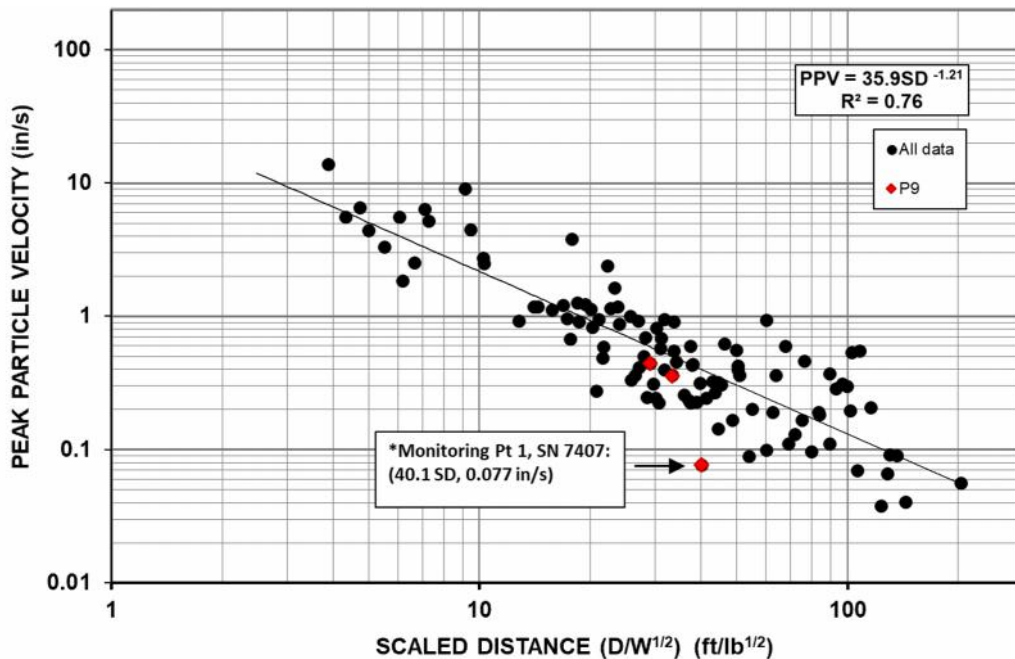
Blast No.	P9
Blast Date	June 20, 2017
Blast Time	16:14
Blast Location	South Staging Area
Max lbs/delay	40.0

Seismograph Settings

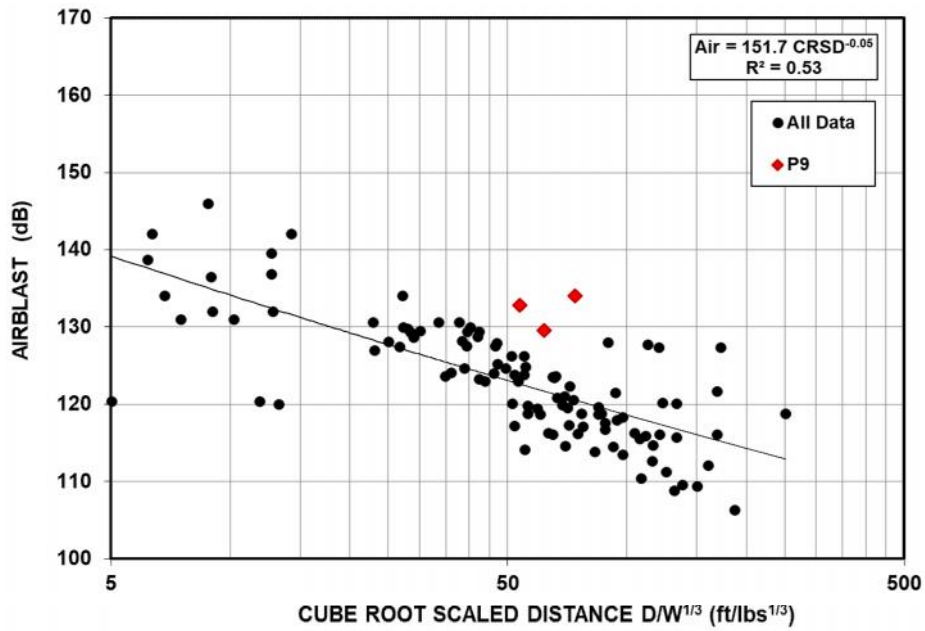
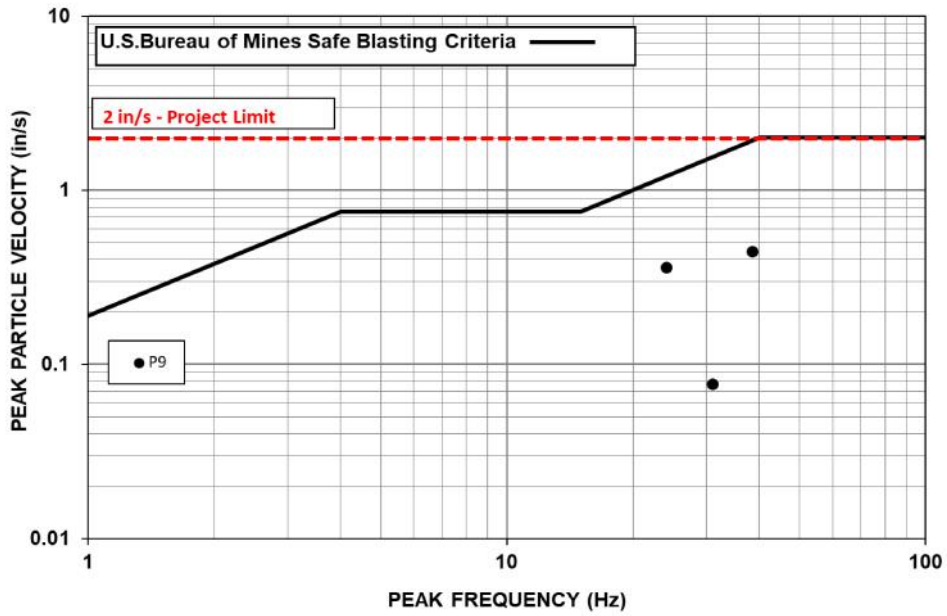
Mode	Continuous
Sample Rate	4,096 S/s
Seismic Trigger	0.03 in/s
Air Trigger	128 dB
Record Length	4 sec

Table of Results

No.	Measurement Location	Unit S/N	Ground Material/ Geophone Coupling	Dist to Blast	Scaled Distance	Max PPV	Peak Frequency	FFT	Peak Airblast
				(ft)	(ft/lb ^{1/2})	(in/sec)	(Hz)	(Hz)	(db)
P9	S Abutment	7407	Concrete / Bracket	254	40.1	0.077	31.0	19.5	134
	NW Cable Anchor	7209	Soil / Buried	184	29.1	0.443	38.6	32.4	132.8
	SW Cable Anchor	7408	Soil / Buried	212	33.4	0.358	24.1	21.0	129.6



* Monitoring Pt 1 (SN 7407) removed from best line and attenuation model



Findings

All measured vibrations and air overpressures were below project specified limits. All measured amplitudes of vibrations and air overpressures were within expected ranges. The resulting attenuation model will be used to predict future vibrations and refined with each blast.