APPENDIX 11-C

APPENDIX 11-C

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Sample Blast Reports

BHP Minerals
COAL BLASTING REPORT

Job: 51DX7B-C1

Date: 06/24/2005	Pit and Seam: Dixon / 7B	Strip: 51	Blaster: Toledo, Victor
Time: 01:24PM	Station: 181+00 to 174+00		License:
Shift: Day	Material: Coal		
Crew Size: 7	Total Manhours: 36	Holes/Manhour: 17	Signature: Victor Toledo

DESIGN INFORMATION

Burden:	14	Hole Diameter: 8.00	Total Holes:	610	Drill: SE-3132
Spacing:	14	Stem Height: 3.00	Total Rows:	10	
Average Depth:	5	Stem Material: Hole Cuttings	Holes/Row:	61	

EXPLOSIVES TYPE	POUNDS
ANFO WESCO	7,758
Total Weight of Explosives	7,758

BOOSTERS	WT	QTY	POUNDS
LP-8-2 Trojan	0.50	604	302
Total Boosters		604	302

TOTALS	
Total Explosives Weight	8,060
Powder Factor (lbs/ton)	0.33
Number Holes Loaded	604
Average Pounds / Hole	13
Estimated Tons (Factor .0405)	24,210

ACCESSORIES		
Category	Description	Quantity
Detonating Cord	ZAP Ensign Bickford	8
EB InHole Delays	EBMS #4 Ensign Bickford	1
EB Surface Delays	MS-009 Ensign Bickford	30
EB Surface Delays	MS-042 Ensign Bickford	18

OTHER

Initiation Type
ZAP Ensign Bickford

Legal Weight & Distance
Max. Charge per 8ms Interval: 256
No. Holes per 8ms Interval: 16
Scaled Distance: 65
Minimum Distance: 1,040

Nearest Structure
Name: M. Yazzie
Type: Dwelling
Distance: 10,110
Direction: WNW

Weather
Sky Conditions: Clear
Temperature: 90
Wind Speed: 5
Wind Direction: E

Blasting Mats: No

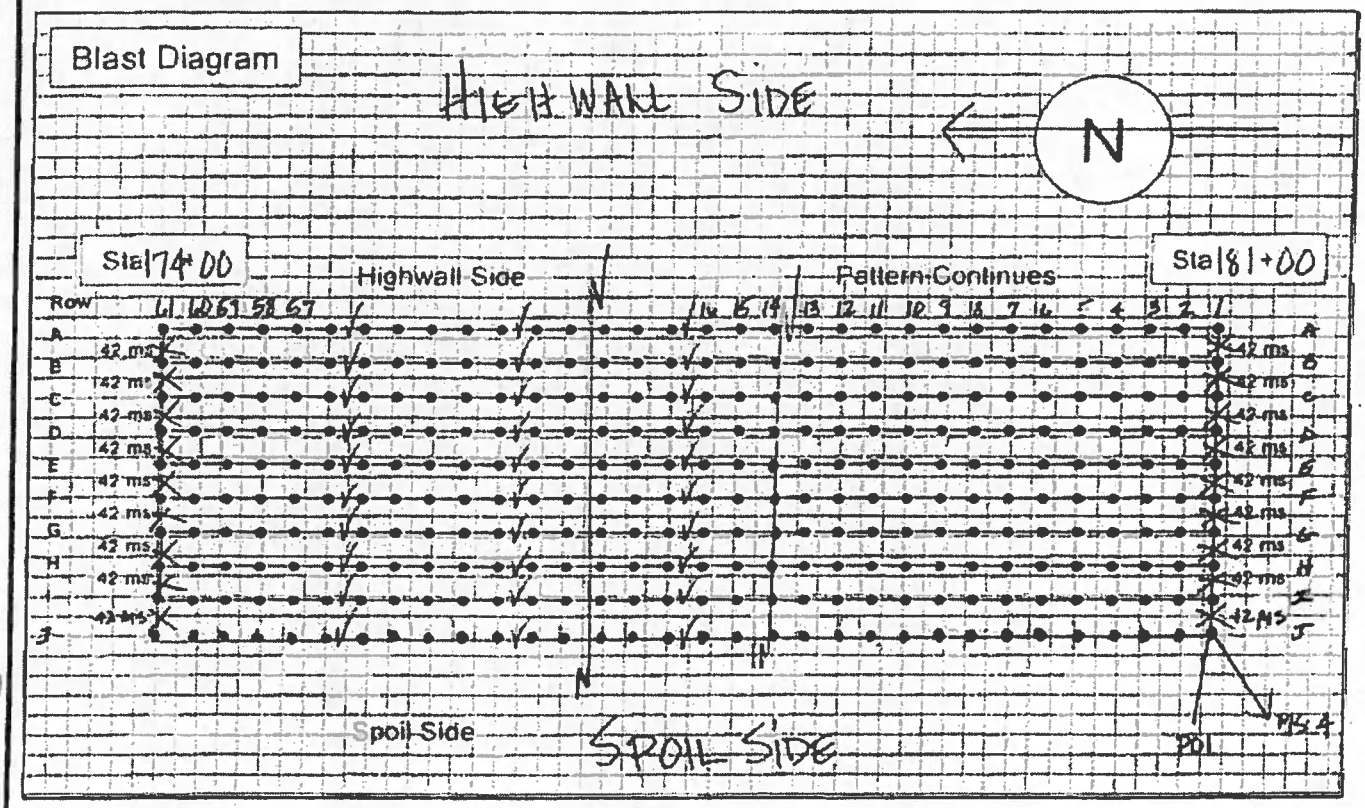
Reasons for unscheduled shot (if applicable) / Other Comments:

6 LOSE HOLE
NO IN HOLE DELAY

COAL BLASTING REPORT

Job 51DX7B-C1 Date 6-24-05

Blast Diagram



Seismograph Information: Not monitored

Comments:

X - MS-42 WERE USED ON BOTH END OF BLOCK.

√ - MS-9 WERE USED IN BETWEEN ROW 3 TIMES.

→ - MS-4 LEADLINE.

NOTE 16 HOLE INTERVAL
NO IN-HOLE DELAY.
6 LOSE HOLE

10 rows

Job Data	
Date:	
5-24-05	
JOB NUMBER	
COAL 1	
Block:	
A	
From Station:	
181+00	
To Station:	
173+00	

Hole No	Blasthole Data A	B	C	Rows D	E	F	G	H	I	J	K	L
1												
2												
3												
4												
5												
6												
7												
8												
9												
10	5	5	5	5	4	4	5	4	5	5		
11	5	5	5	5	5	4	5	4	5	4		
12	5	5	5	5	5	5	5	4	5	4		
13	5	5	5	5	5	5	4	5	5	4		
14	5	5	5	5	5	4	5	5	4	4		
15	5	5	5	5	5	5	5	5	5	5		
16	5	5	5	5	4	5	5	5	5	5		
17	5	5	4	5	4	5	5	5	5	5		
18	5	5	4	5	4	5	5	5	5	5		
19	5	5	5	5	5	5	5	5	5	5		
20	5	5	5	5	5	5	5	5	5	5		
21	4	5	5	5	5	5	5	5	5	5		
22	5	5	5	5	5	5	5	5	5	5		
23	5	5	5	5	5	5	5	5	5	5		
24	5	5	5	5	5	5	5	5	5	5		
25	5	5	4	4	4	5	5	5	5	5		
26	5	5	5	5	5	5	5	5	5	5		
27	6	5	5	5	5	5	5	5	5	5		
28	4	5	5	5	4	4	5	5	5	5		
29	4	5	5	5	5	5	5	5	5	5		
30	6	5	4	4	4	5	5	5	5	5		
31	4	4	4	5	4	4	5	5	5	5		
32	5	5	5	5	4	4	4	5	5	5		
33	6	5	0	5	5	5	5	5	5	5		
34	5	5	4	4	4	5	4	5	5	5		
35	6	5	5	5	5	5	5	5	5	5		
36	4	5	5	5	5	5	5	5	5	4		
37	5	4	5	5	5	5	5	6	4	5		
38	5	5	5	5	5	0	0	6	5	5		
39	4	5	4	5	5	5	5	6	5	5		
40	5	4	4	5	5	5	5	5	4	4		
41	6	5	5	5	5	5	5	5	5	6		
42	6	5	5	5	5	5	5	5	5	5		
43	5	5	5	5	5	5	5	5	5	5		
44	6	5	4	4	4	5	5	5	4	4		
45	5	5	5	5	5	5	5	5	5	5		
46	6	5	5	5	5	5	5	5	5	5		
47	4	4	5	4	4	5	5	5	5	5		
48	6	5	5	5	5	5	5	6	5	5		
49	5	5	6	5	5	5	5	5	5	5		
50	5	5	6	5	5	5	5	5	5	5		

51	6	5	5	5	6	6	5	5	4	5
52	5	5	6	6	6	6	5	4	5	5
53	6	6	6	5	4	6	5	5	5	5
54	5	5	6	6	6	5	4	4	6	5
55	6	6	6	5	5	5	4	4	4	5
56	6	5	5	5	5	6	5	4	4	5
57	5	5	5	6	6	6	5	5	6	5
58	4	5	6	6	6	6	5	5	6	5
59	6	6	6	5	5	6	6	6	6	5
60	5	5	6	6	6	5	5	4	5	5
61	6	6	6	5	5	5	5	5	6	4
62	6	6	6	6	5	5	5	6	6	4
63	5	6	6	6	6	5	5	4	6	4
64	6	6	6	5	4	6	5	4	6	5
65	6	5	4	5	4	6	5	4	6	5
66	5	5	6	6	5	6	5	4	5	4
67	6	6	6	6	6	5	4	4	5	4
68	5	5	6	6	6	6	5	5	6	5
69	6	5	4	5	5	6	5	4	4	4
70	6	6	6	5	4	5	0	0	0	0
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102										

06/24/2005

BHP Minerals

Mix Truck Load Sheet

Job: COAL-1 Block: A

Row	Hole	Stm	Bottom Formula	Bottom Chg	Top Formula	Top Chg
A	010	3.2	ANFO WESCO	13		
A	011	3.2	ANFO WESCO	13		
A	012	3.2	ANFO WESCO	13		
A	013	3.2	ANFO WESCO	13		
A	014	3.2	ANFO WESCO	13		
A	015	3.2	ANFO WESCO	13		
A	016	3.2	ANFO WESCO	13		
A	017	3.2	ANFO WESCO	13		
A	018	3.2	ANFO WESCO	13		
A	019	3.2	ANFO WESCO	13		
A	020	3.2	ANFO WESCO	13		
A	021	2.6	ANFO WESCO	10		
A	022	3.2	ANFO WESCO	13		
A	023	3.2	ANFO WESCO	13		
A	024	3.2	ANFO WESCO	13		
A	025	3.2	ANFO WESCO	13		
A	026	3.2	ANFO WESCO	13		
A	027	3.9	ANFO WESCO	15		
A	028	2.6	ANFO WESCO	10		
A	029	2.6	ANFO WESCO	10		
A	030	3.9	ANFO WESCO	15		
A	031	2.6	ANFO WESCO	10		
A	032	3.2	ANFO WESCO	13		
A	033	3.9	ANFO WESCO	15		
	034	3.2	ANFO WESCO	13		
	035	3.9	ANFO WESCO	15		
A	036	2.6	ANFO WESCO	10		
A	037	3.2	ANFO WESCO	13		
A	038	3.2	ANFO WESCO	13		
A	039	2.6	ANFO WESCO	10		
A	040	3.2	ANFO WESCO	13		
A	041	3.9	ANFO WESCO	15		
A	042	3.9	ANFO WESCO	15		
A	043	3.2	ANFO WESCO	13		
A	044	3.9	ANFO WESCO	15		
A	045	3.2	ANFO WESCO	13		
A	046	3.9	ANFO WESCO	15		
A	047	2.6	ANFO WESCO	10		
A	048	3.9	ANFO WESCO	15		
A	049	3.2	ANFO WESCO	13		
A	050	3.2	ANFO WESCO	13		
A	051	3.9	ANFO WESCO	15		
A	052	3.2	ANFO WESCO	13		
A	053	3.9	ANFO WESCO	15		
A	054	3.2	ANFO WESCO	13		
A	055	3.9	ANFO WESCO	15		
A	056	3.9	ANFO WESCO	15		
A	057	3.2	ANFO WESCO	13		
A	058	2.6	ANFO WESCO	10		
	059	3.9	ANFO WESCO	15		
	060	3.2	ANFO WESCO	13		
A	061	3.9	ANFO WESCO	15		
A	062	3.9	ANFO WESCO	15		
A	063	3.2	ANFO WESCO	13		
A	064	3.9	ANFO WESCO	15		
A	065	3.9	ANFO WESCO	15		
A	066	3.2	ANFO WESCO	13		
A	067	3.9	ANFO WESCO	15		
A	068	3.2	ANFO WESCO	13		
A	069	3.9	ANFO WESCO	15		
A	070	3.9	ANFO WESCO	15		
B	010	3.2	ANFO WESCO	13		
B	011	3.2	ANFO WESCO	13		
B	012	3.2	ANFO WESCO	13		
B	013	3.2	ANFO WESCO	13		
B	014	3.2	ANFO WESCO	13		
B	015	3.2	ANFO WESCO	13		
B	016	3.2	ANFO WESCO	13		
B	017	3.2	ANFO WESCO	13		
B	018	3.2	ANFO WESCO	13		
B	019	3.2	ANFO WESCO	13		
B	020	3.2	ANFO WESCO	13		
B	021	3.2	ANFO WESCO	13		
B	022	3.2	ANFO WESCO	13		
B	023	3.2	ANFO WESCO	13		
B	024	3.2	ANFO WESCO	13		
B	025	3.2	ANFO WESCO	13		
B	026	3.2	ANFO WESCO	13		
B	027	3.2	ANFO WESCO	13		
B	028	3.2	ANFO WESCO	13		
B	029	3.2	ANFO WESCO	13		
B	030	3.2	ANFO WESCO	13		
B	031	2.6	ANFO WESCO	10		
B	032	3.2	ANFO WESCO	13		
B	033	3.2	ANFO WESCO	13		
B	034	3.2	ANFO WESCO	13		
B	035	3.2	ANFO WESCO	13		
B	036	3.2	ANFO WESCO	13		
B	037	2.6	ANFO WESCO	10		
B	038	3.2	ANFO WESCO	13		
B	039	3.2	ANFO WESCO	13		
B	040	2.6	ANFO WESCO	10		
B	041	3.2	ANFO WESCO	13		
B	042	3.2	ANFO WESCO	13		
B	043	3.2	ANFO WESCO	13		
B	044	3.2	ANFO WESCO	13		
B	045	3.2	ANFO WESCO	13		
B	046	3.2	ANFO WESCO	13		
B	047	2.6	ANFO WESCO	10		
B	048	3.2	ANFO WESCO	13		
B	049	3.2	ANFO WESCO	13		
B	050	3.2	ANFO WESCO	13		
B	051	3.2	ANFO WESCO	13		
B	052	3.2	ANFO WESCO	13		

BHP Minerals

Mix Truck Load Sheet

Job: COAL-1 Block: A

Row	Hole	Stm	Bottom Formula	Bottom Chg	Top Formula	Top Chg
	053	3.9	ANFO WESCO	15		
B	054	3.2	ANFO WESCO	13		
B	055	3.9	ANFO WESCO	15		
B	056	3.2	ANFO WESCO	13		
B	057	3.2	ANFO WESCO	13		
B	058	3.2	ANFO WESCO	13		
B	059	3.9	ANFO WESCO	15		
B	060	3.2	ANFO WESCO	13		
B	061	3.9	ANFO WESCO	15		
B	062	3.9	ANFO WESCO	15		
B	063	3.9	ANFO WESCO	15		
B	064	3.9	ANFO WESCO	15		
B	065	3.2	ANFO WESCO	13		
B	066	3.2	ANFO WESCO	13		
B	067	3.9	ANFO WESCO	15		
B	068	3.2	ANFO WESCO	13		
B	069	3.2	ANFO WESCO	13		
B	070	3.9	ANFO WESCO	15		
C	010	3.2	ANFO WESCO	13		
C	011	3.2	ANFO WESCO	13		
C	012	3.2	ANFO WESCO	13		
C	013	3.2	ANFO WESCO	13		
C	014	3.2	ANFO WESCO	13		
C	015	3.2	ANFO WESCO	13		
	016	3.2	ANFO WESCO	13		
	017	2.6	ANFO WESCO	10		
C	018	2.6	ANFO WESCO	10		
C	019	3.2	ANFO WESCO	13		
C	020	3.2	ANFO WESCO	13		
C	021	3.2	ANFO WESCO	13		
C	022	3.2	ANFO WESCO	13		
C	023	3.2	ANFO WESCO	13		
C	024	3.2	ANFO WESCO	13		
C	025	2.6	ANFO WESCO	10		
C	026	3.2	ANFO WESCO	13		
C	027	3.2	ANFO WESCO	13		
C	028	3.2	ANFO WESCO	13		
C	029	3.2	ANFO WESCO	13		
C	030	2.6	ANFO WESCO	10		
C	031	2.6	ANFO WESCO	10		
C	032	3.2	ANFO WESCO	13		
C	033	0.0	Lost			
C	034	2.6	ANFO WESCO	10		
C	035	3.2	ANFO WESCO	13		
C	036	3.2	ANFO WESCO	13		
C	037	3.2	ANFO WESCO	13		
C	038	3.2	ANFO WESCO	13		
C	039	2.6	ANFO WESCO	10		
C	040	2.6	ANFO WESCO	10		
	041	3.2	ANFO WESCO	13		
	042	3.2	ANFO WESCO	13		
C	043	3.2	ANFO WESCO	13		

Row	Hole	Stm	Bottom Formula	Bottom Chg	Top Formula	Top Chg
C	044	2.6	ANFO WESCO	10		
C	045	3.2	ANFO WESCO	13		
C	046	3.2	ANFO WESCO	13		
C	047	3.2	ANFO WESCO	13		
C	048	3.2	ANFO WESCO	13		
C	049	3.9	ANFO WESCO	15		
C	050	3.9	ANFO WESCO	15		
C	051	3.2	ANFO WESCO	13		
C	052	3.9	ANFO WESCO	15		
C	053	3.9	ANFO WESCO	15		
C	054	3.9	ANFO WESCO	15		
C	055	3.9	ANFO WESCO	15		
C	056	3.2	ANFO WESCO	13		
C	057	3.2	ANFO WESCO	13		
C	058	3.9	ANFO WESCO	15		
C	059	3.9	ANFO WESCO	15		
C	060	3.9	ANFO WESCO	15		
C	061	3.9	ANFO WESCO	15		
C	062	3.9	ANFO WESCO	15		
C	063	3.9	ANFO WESCO	15		
C	064	3.9	ANFO WESCO	15		
C	065	2.6	ANFO WESCO	10		
C	066	3.9	ANFO WESCO	15		
C	067	3.9	ANFO WESCO	15		
C	068	3.9	ANFO WESCO	15		
C	069	2.6	ANFO WESCO	10		
C	070	3.9	ANFO WESCO	15		
D	010	3.2	ANFO WESCO	13		
D	011	3.2	ANFO WESCO	13		
D	012	3.2	ANFO WESCO	13		
D	013	3.2	ANFO WESCO	13		
D	014	3.2	ANFO WESCO	13		
D	015	3.2	ANFO WESCO	13		
D	016	3.2	ANFO WESCO	13		
D	017	3.2	ANFO WESCO	13		
D	018	3.2	ANFO WESCO	13		
D	019	3.2	ANFO WESCO	13		
D	020	3.2	ANFO WESCO	13		
D	021	3.2	ANFO WESCO	13		
D	022	3.2	ANFO WESCO	13		
D	023	3.2	ANFO WESCO	13		
D	024	3.2	ANFO WESCO	13		
D	025	2.6	ANFO WESCO	10		
D	026	3.2	ANFO WESCO	13		
D	027	3.2	ANFO WESCO	13		
D	028	3.2	ANFO WESCO	13		
D	029	3.2	ANFO WESCO	13		
D	030	2.6	ANFO WESCO	10		
D	031	3.2	ANFO WESCO	13		
D	032	3.2	ANFO WESCO	13		
D	033	3.2	ANFO WESCO	13		
D	034	2.6	ANFO WESCO	10		

BHP Minerals

Mix Truck Load Sheet

Job: COAL-1 Block: A

Row	Hole	Stm	Bottom Formula	Bottom Chg	Top Formula	Top Chg
D	035	3.2	ANFO WESCO	13		
D	036	3.2	ANFO WESCO	13		
D	037	3.2	ANFO WESCO	13		
D	038	3.2	ANFO WESCO	13		
D	039	3.2	ANFO WESCO	13		
D	040	3.2	ANFO WESCO	13		
D	041	3.2	ANFO WESCO	13		
D	042	3.2	ANFO WESCO	13		
D	043	3.2	ANFO WESCO	13		
D	044	2.6	ANFO WESCO	10		
D	045	3.2	ANFO WESCO	13		
D	046	3.2	ANFO WESCO	13		
D	047	2.6	ANFO WESCO	10		
D	048	3.2	ANFO WESCO	13		
D	049	3.2	ANFO WESCO	13		
D	050	3.2	ANFO WESCO	13		
D	051	3.2	ANFO WESCO	13		
D	052	3.9	ANFO WESCO	15		
D	053	3.2	ANFO WESCO	13		
D	054	3.9	ANFO WESCO	15		
D	055	3.2	ANFO WESCO	13		
D	056	3.2	ANFO WESCO	13		
D	057	3.9	ANFO WESCO	15		
D	058	3.9	ANFO WESCO	15		
D	059	3.2	ANFO WESCO	13		
D	060	3.9	ANFO WESCO	15		
D	061	3.2	ANFO WESCO	13		
D	062	3.9	ANFO WESCO	15		
D	063	3.9	ANFO WESCO	15		
D	064	3.2	ANFO WESCO	13		
D	065	3.2	ANFO WESCO	13		
D	066	3.9	ANFO WESCO	15		
D	067	3.9	ANFO WESCO	15		
D	068	3.9	ANFO WESCO	15		
D	069	3.2	ANFO WESCO	13		
D	070	3.2	ANFO WESCO	13		
E	010	2.6	ANFO WESCO	10		
E	011	3.2	ANFO WESCO	13		
E	012	3.2	ANFO WESCO	13		
E	013	3.2	ANFO WESCO	13		
E	014	3.2	ANFO WESCO	13		
E	015	3.2	ANFO WESCO	13		
E	016	2.6	ANFO WESCO	10		
E	017	2.6	ANFO WESCO	10		
E	018	2.6	ANFO WESCO	10		
E	019	3.2	ANFO WESCO	13		
E	020	3.2	ANFO WESCO	13		
E	021	3.2	ANFO WESCO	13		
E	022	3.2	ANFO WESCO	13		
E	023	3.2	ANFO WESCO	13		
E	024	3.2	ANFO WESCO	13		
E	025	2.6	ANFO WESCO	10		
E	026	3.2	ANFO WESCO	13		
E	027	3.2	ANFO WESCO	13		
E	028	2.6	ANFO WESCO	10		
E	029	3.2	ANFO WESCO	13		
E	030	2.6	ANFO WESCO	10		
E	031	2.6	ANFO WESCO	10		
E	032	2.6	ANFO WESCO	10		
E	033	3.2	ANFO WESCO	13		
E	034	2.6	ANFO WESCO	10		
E	035	3.2	ANFO WESCO	13		
E	036	3.2	ANFO WESCO	13		
E	037	3.2	ANFO WESCO	13		
E	038	3.2	ANFO WESCO	13		
E	039	3.2	ANFO WESCO	13		
E	040	3.2	ANFO WESCO	13		
E	041	3.2	ANFO WESCO	13		
E	042	3.2	ANFO WESCO	13		
E	043	3.2	ANFO WESCO	13		
E	044	2.6	ANFO WESCO	10		
E	045	3.2	ANFO WESCO	13		
E	046	3.2	ANFO WESCO	13		
E	047	2.6	ANFO WESCO	10		
E	048	3.2	ANFO WESCO	13		
E	049	3.2	ANFO WESCO	13		
E	050	3.2	ANFO WESCO	13		
E	051	3.9	ANFO WESCO	15		
E	052	3.9	ANFO WESCO	15		
E	053	2.6	ANFO WESCO	10		
E	054	3.9	ANFO WESCO	15		
E	055	3.2	ANFO WESCO	13		
E	056	3.2	ANFO WESCO	13		
E	057	3.9	ANFO WESCO	15		
E	058	3.9	ANFO WESCO	15		
E	059	3.2	ANFO WESCO	13		
E	060	3.9	ANFO WESCO	15		
E	061	3.2	ANFO WESCO	13		
E	062	3.2	ANFO WESCO	13		
E	063	3.9	ANFO WESCO	15		
E	064	2.6	ANFO WESCO	10		
E	065	2.6	ANFO WESCO	10		
E	066	3.2	ANFO WESCO	13		
E	067	3.9	ANFO WESCO	15		
E	068	3.9	ANFO WESCO	15		
E	069	3.2	ANFO WESCO	13		
E	070	2.6	ANFO WESCO	10		
F	010	2.6	ANFO WESCO	10		
F	011	2.6	ANFO WESCO	10		
F	012	3.2	ANFO WESCO	13		
F	013	3.2	ANFO WESCO	13		
F	014	2.6	ANFO WESCO	10		
F	015	3.2	ANFO WESCO	13		
F	016	3.2	ANFO WESCO	13		

BHP Minerals

Mix Truck Load Sheet

Job: COAL-1 Block: A

Row	Hole	Stm	Bottom Formula	Bottom Chg	Top Formula	Top Chg
	017	3.2	ANFO WESCO	13		
F	018	3.2	ANFO WESCO	13		
F	019	3.2	ANFO WESCO	13		
F	020	3.2	ANFO WESCO	13		
F	021	3.2	ANFO WESCO	13		
F	022	3.2	ANFO WESCO	13		
F	023	3.2	ANFO WESCO	13		
F	024	3.2	ANFO WESCO	13		
F	025	3.2	ANFO WESCO	13		
F	026	3.2	ANFO WESCO	13		
F	027	3.2	ANFO WESCO	13		
F	028	2.6	ANFO WESCO	10		
F	029	3.2	ANFO WESCO	13		
F	030	3.2	ANFO WESCO	13		
F	031	2.6	ANFO WESCO	10		
F	032	2.6	ANFO WESCO	10		
F	033	3.2	ANFO WESCO	13		
F	034	3.2	ANFO WESCO	13		
F	035	3.2	ANFO WESCO	13		
F	036	3.2	ANFO WESCO	13		
F	037	3.2	ANFO WESCO	13		
F	038	0.0	Lost			
F	039	3.2	ANFO WESCO	13		
F	040	3.2	ANFO WESCO	13		
	041	3.2	ANFO WESCO	13		
	042	3.2	ANFO WESCO	13		
F	043	3.2	ANFO WESCO	13		
F	044	3.2	ANFO WESCO	13		
F	045	3.2	ANFO WESCO	13		
F	046	3.2	ANFO WESCO	13		
F	047	3.2	ANFO WESCO	13		
F	048	3.2	ANFO WESCO	13		
F	049	3.2	ANFO WESCO	13		
F	050	3.2	ANFO WESCO	13		
F	051	3.9	ANFO WESCO	15		
F	052	3.9	ANFO WESCO	15		
F	053	3.9	ANFO WESCO	15		
F	054	3.2	ANFO WESCO	13		
F	055	3.2	ANFO WESCO	13		
F	056	3.9	ANFO WESCO	15		
F	057	3.9	ANFO WESCO	15		
F	058	3.9	ANFO WESCO	15		
F	059	3.9	ANFO WESCO	15		
F	060	3.2	ANFO WESCO	13		
F	061	3.2	ANFO WESCO	13		
F	062	3.2	ANFO WESCO	13		
F	063	3.2	ANFO WESCO	13		
F	064	3.9	ANFO WESCO	15		
F	065	3.9	ANFO WESCO	15		
	066	3.9	ANFO WESCO	15		
	067	3.2	ANFO WESCO	13		
F	068	3.9	ANFO WESCO	15		

Row	Hole	Stm	Bottom Formula	Bottom Chg	Top Formula	Top Chg
F	069	3.9	ANFO WESCO	15		
F	070	3.2	ANFO WESCO	13		
G	010	3.2	ANFO WESCO	13		
G	011	3.2	ANFO WESCO	13		
G	012	3.2	ANFO WESCO	13		
G	013	2.6	ANFO WESCO	10		
G	014	3.2	ANFO WESCO	13		
G	015	3.2	ANFO WESCO	13		
G	016	3.2	ANFO WESCO	13		
G	017	3.2	ANFO WESCO	13		
G	018	3.2	ANFO WESCO	13		
G	019	3.2	ANFO WESCO	13		
G	020	3.2	ANFO WESCO	13		
G	021	3.2	ANFO WESCO	13		
G	022	3.2	ANFO WESCO	13		
G	023	3.2	ANFO WESCO	13		
G	024	3.2	ANFO WESCO	13		
G	025	3.2	ANFO WESCO	13		
G	026	3.2	ANFO WESCO	13		
G	027	3.2	ANFO WESCO	13		
G	028	3.2	ANFO WESCO	13		
G	029	3.2	ANFO WESCO	13		
G	030	3.2	ANFO WESCO	13		
G	031	3.2	ANFO WESCO	13		
G	032	2.6	ANFO WESCO	10		
G	033	3.2	ANFO WESCO	13		
G	034	2.6	ANFO WESCO	10		
G	035	3.2	ANFO WESCO	13		
G	036	3.2	ANFO WESCO	13		
G	037	3.2	ANFO WESCO	13		
G	038	0.0	Lost			
G	039	3.2	ANFO WESCO	13		
G	040	3.2	ANFO WESCO	13		
G	041	3.2	ANFO WESCO	13		
G	042	3.2	ANFO WESCO	13		
G	043	3.2	ANFO WESCO	13		
G	044	3.2	ANFO WESCO	13		
G	045	3.2	ANFO WESCO	13		
G	046	3.2	ANFO WESCO	13		
G	047	3.2	ANFO WESCO	13		
G	048	3.2	ANFO WESCO	13		
G	049	3.2	ANFO WESCO	13		
G	050	3.2	ANFO WESCO	13		
G	051	3.2	ANFO WESCO	13		
G	052	3.2	ANFO WESCO	13		
G	053	3.2	ANFO WESCO	13		
G	054	2.6	ANFO WESCO	10		
G	055	2.6	ANFO WESCO	10		
G	056	3.2	ANFO WESCO	13		
G	057	3.2	ANFO WESCO	13		
G	058	3.2	ANFO WESCO	13		
G	059	3.9	ANFO WESCO	15		

BHP Minerals

Mix Truck Load Sheet

Job: COAL-1 Block: A

			Bottom		Top	
Row	Hole	Stm	Formula	Chg	Formula	Chg
G	060	3.2	ANFO WESCO	13		
G	061	3.2	ANFO WESCO	13		
G	062	3.2	ANFO WESCO	13		
G	063	3.2	ANFO WESCO	13		
G	064	3.2	ANFO WESCO	13		
G	065	3.2	ANFO WESCO	13		
G	066	3.2	ANFO WESCO	13		
G	067	2.6	ANFO WESCO	10		
G	068	3.2	ANFO WESCO	13		
G	069	3.2	ANFO WESCO	13		
G	070	0.0	Lost			
H	010	2.6	ANFO WESCO	10		
H	011	2.6	ANFO WESCO	10		
H	012	2.6	ANFO WESCO	10		
H	013	3.2	ANFO WESCO	13		
H	014	3.2	ANFO WESCO	13		
H	015	3.2	ANFO WESCO	13		
H	016	3.2	ANFO WESCO	13		
H	017	3.2	ANFO WESCO	13		
H	018	3.2	ANFO WESCO	13		
H	019	3.2	ANFO WESCO	13		
H	020	3.2	ANFO WESCO	13		
H	021	3.2	ANFO WESCO	13		
H	022	3.2	ANFO WESCO	13		
H	023	3.2	ANFO WESCO	13		
H	024	3.2	ANFO WESCO	13		
H	025	3.2	ANFO WESCO	13		
H	026	3.2	ANFO WESCO	13		
H	027	3.2	ANFO WESCO	13		
H	028	3.2	ANFO WESCO	13		
H	029	3.2	ANFO WESCO	13		
H	030	3.2	ANFO WESCO	13		
H	031	3.2	ANFO WESCO	13		
H	032	3.2	ANFO WESCO	13		
H	033	3.2	ANFO WESCO	13		
H	034	3.2	ANFO WESCO	13		
H	035	3.2	ANFO WESCO	13		
H	036	3.2	ANFO WESCO	13		
H	037	3.9	ANFO WESCO	15		
H	038	3.9	ANFO WESCO	15		
H	039	3.9	ANFO WESCO	15		
H	040	3.2	ANFO WESCO	13		
H	041	3.2	ANFO WESCO	13		
H	042	3.2	ANFO WESCO	13		
H	043	3.2	ANFO WESCO	13		
H	044	3.2	ANFO WESCO	13		
H	045	3.2	ANFO WESCO	13		
H	046	3.2	ANFO WESCO	13		
H	047	3.2	ANFO WESCO	13		
H	048	3.9	ANFO WESCO	15		
H	049	3.2	ANFO WESCO	13		
H	050	3.2	ANFO WESCO	13		

			Bottom		Top	
Row	Hole	Stm	Formula	Chg	Formula	Chg
H	051	3.2	ANFO WESCO	13		
H	052	2.6	ANFO WESCO	10		
H	053	3.2	ANFO WESCO	13		
H	054	2.6	ANFO WESCO	10		
H	055	2.6	ANFO WESCO	10		
H	056	2.6	ANFO WESCO	10		
H	057	3.2	ANFO WESCO	13		
H	058	3.2	ANFO WESCO	13		
H	059	3.9	ANFO WESCO	15		
H	060	2.6	ANFO WESCO	10		
H	061	3.2	ANFO WESCO	13		
H	062	3.9	ANFO WESCO	15		
H	063	2.6	ANFO WESCO	10		
H	064	2.6	ANFO WESCO	10		
H	065	2.6	ANFO WESCO	10		
H	066	2.6	ANFO WESCO	10		
H	067	2.6	ANFO WESCO	10		
H	068	3.2	ANFO WESCO	13		
H	069	2.6	ANFO WESCO	10		
H	070	0.0	Lost			
I	010	3.2	ANFO WESCO	13		
I	011	3.2	ANFO WESCO	13		
I	012	3.2	ANFO WESCO	13		
I	013	3.2	ANFO WESCO	13		
I	014	2.6	ANFO WESCO	10		
I	015	3.2	ANFO WESCO	13		
I	016	3.2	ANFO WESCO	13		
I	017	3.2	ANFO WESCO	13		
I	018	3.2	ANFO WESCO	13		
I	019	3.2	ANFO WESCO	13		
I	020	3.2	ANFO WESCO	13		
I	021	3.2	ANFO WESCO	13		
I	022	3.2	ANFO WESCO	13		
I	023	3.2	ANFO WESCO	13		
I	024	3.2	ANFO WESCO	13		
I	025	3.2	ANFO WESCO	13		
I	026	3.2	ANFO WESCO	13		
I	027	3.2	ANFO WESCO	13		
I	028	3.2	ANFO WESCO	13		
I	029	3.2	ANFO WESCO	13		
I	030	3.2	ANFO WESCO	13		
I	031	3.2	ANFO WESCO	13		
I	032	3.2	ANFO WESCO	13		
I	033	3.2	ANFO WESCO	13		
I	034	3.2	ANFO WESCO	13		
I	035	3.2	ANFO WESCO	13		
I	036	3.2	ANFO WESCO	13		
I	037	2.6	ANFO WESCO	10		
I	038	3.2	ANFO WESCO	13		
I	039	3.2	ANFO WESCO	13		
I	040	2.6	ANFO WESCO	10		
I	041	3.2	ANFO WESCO	13		

BHP Minerals

Mix Truck Load Sheet

Job: COAL-1 Block: A

			Bottom		Top	
w	Hole	Stm	Formula	Chg	Formula	Chg
I	042	3.2	ANFO WESCO	13		
I	043	3.2	ANFO WESCO	13		
I	044	2.6	ANFO WESCO	10		
I	045	3.2	ANFO WESCO	13		
I	046	3.2	ANFO WESCO	13		
I	047	3.2	ANFO WESCO	13		
I	048	3.2	ANFO WESCO	13		
I	049	3.2	ANFO WESCO	13		
I	050	3.2	ANFO WESCO	13		
I	051	2.6	ANFO WESCO	10		
I	052	3.2	ANFO WESCO	13		
I	053	3.2	ANFO WESCO	13		
I	054	3.9	ANFO WESCO	15		
I	055	2.6	ANFO WESCO	10		
I	056	2.6	ANFO WESCO	10		
I	057	3.9	ANFO WESCO	15		
I	058	3.9	ANFO WESCO	15		
I	059	3.9	ANFO WESCO	15		
I	060	3.2	ANFO WESCO	13		
I	061	3.9	ANFO WESCO	15		
I	062	3.9	ANFO WESCO	15		
I	063	3.9	ANFO WESCO	15		
I	064	3.9	ANFO WESCO	15		
I	065	3.9	ANFO WESCO	15		
I	066	3.2	ANFO WESCO	13		
I	067	3.2	ANFO WESCO	13		
I	068	3.9	ANFO WESCO	15		
I	069	2.6	ANFO WESCO	10		
I	070	0.0	Lost			
J	010	3.2	ANFO WESCO	13		
J	011	2.6	ANFO WESCO	10		
J	012	2.6	ANFO WESCO	10		
J	013	2.6	ANFO WESCO	10		
J	014	2.6	ANFO WESCO	10		
J	015	3.2	ANFO WESCO	13		
J	016	3.2	ANFO WESCO	13		
J	017	3.2	ANFO WESCO	13		
J	018	3.2	ANFO WESCO	13		
J	019	3.2	ANFO WESCO	13		
J	020	3.2	ANFO WESCO	13		
J	021	3.2	ANFO WESCO	13		
J	022	3.2	ANFO WESCO	13		
J	023	3.2	ANFO WESCO	13		
J	024	3.2	ANFO WESCO	13		
J	025	3.2	ANFO WESCO	13		
J	026	3.2	ANFO WESCO	13		
J	027	3.2	ANFO WESCO	13		
J	028	3.2	ANFO WESCO	13		
J	029	3.2	ANFO WESCO	13		
	030	3.2	ANFO WESCO	13		
J	031	3.2	ANFO WESCO	13		
J	032	3.2	ANFO WESCO	13		

			Bottom		Top	
Row	Hole	Stm	Formula	Chg	Formula	Chg
J	033	3.2	ANFO WESCO	13		
J	034	3.2	ANFO WESCO	13		
J	035	3.2	ANFO WESCO	13		
J	036	2.6	ANFO WESCO	10		
J	037	3.2	ANFO WESCO	13		
J	038	3.2	ANFO WESCO	13		
J	039	3.2	ANFO WESCO	13		
J	040	2.6	ANFO WESCO	10		
J	041	3.9	ANFO WESCO	15		
J	042	3.2	ANFO WESCO	13		
J	043	3.2	ANFO WESCO	13		
J	044	2.6	ANFO WESCO	10		
J	045	3.2	ANFO WESCO	13		
J	046	3.2	ANFO WESCO	13		
J	047	3.2	ANFO WESCO	13		
J	048	3.2	ANFO WESCO	13		
J	049	3.2	ANFO WESCO	13		
J	050	3.2	ANFO WESCO	13		
J	051	3.2	ANFO WESCO	13		
J	052	3.2	ANFO WESCO	13		
J	053	3.2	ANFO WESCO	13		
J	054	3.2	ANFO WESCO	13		
J	055	3.2	ANFO WESCO	13		
J	056	3.2	ANFO WESCO	13		
J	057	3.2	ANFO WESCO	13		
J	058	3.2	ANFO WESCO	13		
J	059	3.2	ANFO WESCO	13		
J	060	3.2	ANFO WESCO	13		
J	061	2.6	ANFO WESCO	10		
J	062	2.6	ANFO WESCO	10		
J	063	2.6	ANFO WESCO	10		
J	064	3.2	ANFO WESCO	13		
J	065	3.2	ANFO WESCO	13		
J	066	2.6	ANFO WESCO	10		
J	067	2.6	ANFO WESCO	10		
J	068	3.2	ANFO WESCO	13		
J	069	2.6	ANFO WESCO	10		
J	070	0.0	Lost			

BHP Minerals

Mix Truck Load Sheet Totals

Job: COAL-1 Block: A

Formula Name	Total Pounds
ANFO WESCO	7,758

BHP Minerals
BLASTING REPORT

Job: 67NB6B-5

Date: 07/28/2004 | Pit and Seam: North Barber / 6B | Strip: 67 | Blaster: Chadby, Salerno
Time: 09:29AM | Station: 42+50 to 70+00 | License
Shift: Day | Material: PitFloor
Crew Size: 4 | Total Manhours: 16 | Holes/Manhour: 8.94 | Signature:

ITEM	BLOCK A	BLOCK B	BLOCK C	BLOCK D	TOTAL
Hole Diameter	10.63				
Burden	26				
Spacing	34				
Total Depth	3148				
Average Depth	22				
Total Holes	143				143
Volume Blasted	103,002				103,002
Stemming Height	11.7				
#1 Deck					
#2 Deck					
Stemming Material	Hole Cuttings				
EXPLOSIVES TYPE	**POUNDS**	**POUNDS**	**POUNDS**	**POUNDS**	**TOTAL POUNDS**
26% Emul WESCO	60,288				60,288
Total Weight of Explosives	60,288				60,288

BOOSTERS	WT	QTY	POUNDS	QTY	POUNDS	QTY	POUNDS	QTY	POUNDS	QTY	POUNDS
P-32 Booster	2.00	140	280							140	280
Total Boosters		140	280							140	280

TOTALS					
Total Explosives Weight	60,568				60,568
Powder Factor (lbs/bcy)	0.59				0.59
Number Holes Loaded	140				140
Average Pounds / Hole	432				432

OTHER

Initiation Type
ZAP Ensign Bickford

Legal Weight & Distance
Max. Chg / 8ms Interval: 7,425 Scaled Distance: 65
No. Holes / 8ms Interval: 15 Min. Distance: 5,601

Blasting Mats: No

Nearest Structure
Name: J. Lowe Distance: 11,798
Type: Dwelling Direction: SSW

Weather
Sky Conditions: Cloudy Wind Speed: 5
Temperature: 74 Wind Direction: N

Reasons for unscheduled shot (if applicable) / Other Comments
3 HOLES LOST NOT PRIMED.

BHP Minerals
BLASTING REPORT

Job: 67NB6B-5

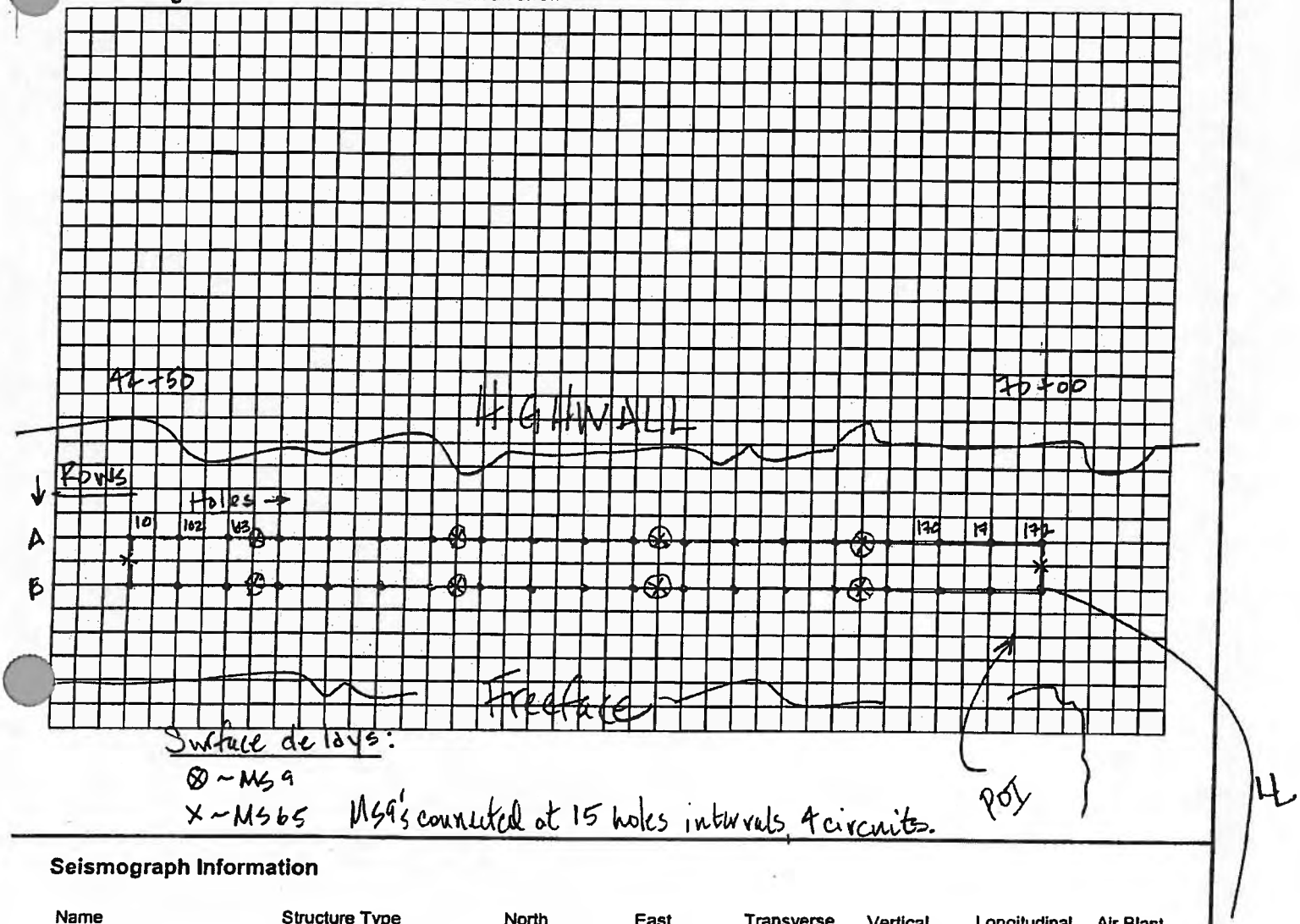
Category	Description	Quantity
Detonating Cord	ZAP Ensign Bickford	6
EB InHole Delays	EBMS #4 Ensign Bickford	1
EB Surface Delays	MS-009 Ensign Bickford	8
EB Surface Delays	MS-065 Ensign Bickford	2

BHP Minerals
BLASTING REPORT

Job: 67NB6B-5

N

Blast Diagram Indicate North with an arrow



Surface delays:
⊗ ~ MS 9
X ~ MS 65 MS9's connected at 15 holes intervals, 4 circuits.

Seismograph Information

Name	Structure Type	North	East	Transverse	Vertical	Longitudinal	Air Blast (dB)
				PPV(ips) / Freq(Hz)			
Not Monitored							

7/28/2004

Page: 3 of 6

BHP Minerals
BLASTING REPORT

Job: 67NB6B-5

Block	Row	Number	Position	Depth	Status	Stem Ht	Charge Type	Charge Wt.
A	A	101	Bottom	0	Lost			
	A	102	Bottom	23	Dry	12	26% Emul WESCO	441
	A	103	Bottom	22	Dry	11	26% Emul WESCO	420
	A	104	Bottom	22	Dry	11	26% Emul WESCO	420
	A	105	Bottom	22	Dry	11	26% Emul WESCO	420
	A	106	Bottom	22	Dry	11	26% Emul WESCO	420
	A	107	Bottom	22	Dry	11	26% Emul WESCO	420
	A	108	Bottom	23	Dry	12	26% Emul WESCO	441
	A	109	Bottom	23	Dry	12	26% Emul WESCO	441
	A	110	Bottom	22	Dry	11	26% Emul WESCO	420
	A	111	Bottom	22	Dry	11	26% Emul WESCO	420
	A	112	Bottom	22	Dry	11	26% Emul WESCO	420
	A	113	Bottom	22	Dry	11	26% Emul WESCO	420
	A	114	Bottom	23	Dry	12	26% Emul WESCO	441
	A	115	Bottom	23	Dry	12	26% Emul WESCO	441
	A	116	Bottom	22	Dry	11	26% Emul WESCO	420
	A	117	Bottom	22	Dry	11	26% Emul WESCO	420
	A	118	Bottom	22	Dry	11	26% Emul WESCO	420
	A	119	Bottom	22	Dry	11	26% Emul WESCO	420
	A	120	Bottom	23	Dry	12	26% Emul WESCO	441
	A	121	Bottom	23	Dry	12	26% Emul WESCO	441
	A	122	Bottom	23	Dry	12	26% Emul WESCO	441
	A	123	Bottom	23	Dry	12	26% Emul WESCO	441
	A	124	Bottom	23	Dry	12	26% Emul WESCO	441
	A	125	Bottom	23	Dry	12	26% Emul WESCO	441
	A	126	Bottom	23	Dry	12	26% Emul WESCO	441
	A	127	Bottom	22	Dry	11	26% Emul WESCO	420
	A	128	Bottom	22	Dry	11	26% Emul WESCO	420
	A	129	Bottom	23	Dry	12	26% Emul WESCO	441
	A	130	Bottom	22	Dry	11	26% Emul WESCO	420
	A	131	Bottom	23	Dry	12	26% Emul WESCO	441
	A	132	Bottom	23	Dry	12	26% Emul WESCO	441
	A	133	Bottom	23	Dry	12	26% Emul WESCO	441
	A	134	Bottom	24	Dry	12	26% Emul WESCO	462
	A	135	Bottom	22	Dry	11	26% Emul WESCO	420
	A	136	Bottom	23	Dry	12	26% Emul WESCO	441
	A	137	Bottom	23	Dry	12	26% Emul WESCO	441
	A	138	Bottom	24	Dry	12	26% Emul WESCO	462
	A	139	Bottom	24	Dry	12	26% Emul WESCO	462
	A	140	Bottom	23	Dry	12	26% Emul WESCO	441
	A	141	Bottom	23	Dry	12	26% Emul WESCO	441
	A	142	Bottom	23	Dry	12	26% Emul WESCO	441
	A	143	Bottom	23	Dry	12	26% Emul WESCO	441
	A	144	Bottom	24	Dry	12	26% Emul WESCO	462
	A	145	Bottom	24	Dry	12	26% Emul WESCO	462
	A	146	Bottom	24	Dry	12	26% Emul WESCO	462
	A	147	Bottom	25	Dry	13	26% Emul WESCO	495
	A	148	Bottom	23	Dry	12	26% Emul WESCO	441
	A	149	Bottom	25	Dry	13	26% Emul WESCO	495
	A	150	Bottom	25	Dry	13	26% Emul WESCO	495
	A	151	Bottom	22	Dry	11	26% Emul WESCO	420
	A	152	Bottom	22	Dry	11	26% Emul WESCO	420
	A	153	Bottom	22	Dry	11	26% Emul WESCO	420
	A	154	Bottom	22	Dry	11	26% Emul WESCO	420

BHP Minerals
BLASTING REPORT

ob: 67NB6B-5

Block	Row	Number	Position	Depth	Status	Stem Ht	Charge Type	Charge Wt.
A	A	155	Bottom	22	Dry	11	26% Emul WESCO	420
	A	156	Bottom	22	Dry	11	26% Emul WESCO	420
	A	157	Bottom	22	Dry	11	26% Emul WESCO	420
	A	158	Bottom	22	Dry	11	26% Emul WESCO	420
	A	159	Bottom	22	Dry	11	26% Emul WESCO	420
	A	160	Bottom	23	Dry	12	26% Emul WESCO	441
	A	161	Bottom	22	Dry	11	26% Emul WESCO	420
	A	162	Bottom	22	Dry	11	26% Emul WESCO	420
	A	163	Bottom	22	Dry	11	26% Emul WESCO	420
	A	164	Bottom	22	Dry	11	26% Emul WESCO	420
	A	165	Bottom	20	Dry	10	26% Emul WESCO	378
	A	166	Bottom	22	Dry	11	26% Emul WESCO	420
	A	167	Bottom	23	Dry	12	26% Emul WESCO	441
	A	168	Bottom	22	Dry	11	26% Emul WESCO	420
	A	169	Bottom	22	Dry	11	26% Emul WESCO	420
	A	170	Bottom	22	Dry	11	26% Emul WESCO	420
	A	171	Bottom	22	Dry	11	26% Emul WESCO	420
	A	172	Bottom	23	Dry	12	26% Emul WESCO	441
	B	101	Bottom	0	Lost			
	B	102	Bottom	0	Lost			
	B	103	Bottom	22	Dry	11	26% Emul WESCO	420
	B	104	Bottom	21	Dry	11	26% Emul WESCO	399
	B	105	Bottom	21	Dry	11	26% Emul WESCO	399
	B	106	Bottom	22	Dry	11	26% Emul WESCO	420
	B	107	Bottom	22	Dry	11	26% Emul WESCO	420
	B	108	Bottom	22	Dry	11	26% Emul WESCO	420
	B	109	Bottom	23	Dry	12	26% Emul WESCO	441
	B	110	Bottom	21	Dry	11	26% Emul WESCO	399
	B	111	Bottom	22	Dry	11	26% Emul WESCO	420
	B	112	Bottom	22	Dry	11	26% Emul WESCO	420
	B	113	Bottom	22	Dry	11	26% Emul WESCO	420
	B	114	Bottom	22	Dry	11	26% Emul WESCO	420
	B	115	Bottom	22	Dry	11	26% Emul WESCO	420
	B	116	Bottom	23	Dry	12	26% Emul WESCO	441
	B	117	Bottom	22	Dry	11	26% Emul WESCO	420
	B	118	Bottom	22	Dry	11	26% Emul WESCO	420
	B	119	Bottom	22	Dry	11	26% Emul WESCO	420
	B	120	Bottom	22	Dry	11	26% Emul WESCO	420
	B	121	Bottom	24	Dry	12	26% Emul WESCO	462
	B	122	Bottom	23	Dry	12	26% Emul WESCO	441
	B	123	Bottom	19	Dry	10	26% Emul WESCO	357
	B	124	Bottom	22	Dry	11	26% Emul WESCO	420
	B	125	Bottom	18	Dry	9	26% Emul WESCO	336
	B	126	Bottom	22	Dry	11	26% Emul WESCO	420
	B	127	Bottom	23	Dry	12	26% Emul WESCO	441
	B	128	Bottom	23	Dry	12	26% Emul WESCO	441
	B	129	Bottom	23	Dry	12	26% Emul WESCO	441
	B	130	Bottom	22	Dry	11	26% Emul WESCO	420
	B	131	Bottom	23	Dry	12	26% Emul WESCO	441
	B	132	Bottom	22	Dry	11	26% Emul WESCO	420
	B	133	Bottom	22	Dry	11	26% Emul WESCO	420
	B	134	Bottom	22	Dry	11	26% Emul WESCO	420
	B	135	Bottom	22	Dry	11	26% Emul WESCO	420
	B	136	Bottom	23	Dry	12	26% Emul WESCO	441

BHP Minerals
BLASTING REPORT

Job: 67NB6B-5

Block	Row	Number	Position	Depth	Status	Stem Ht	Charge Type	Charge Wt.
A	B	137	Bottom	23	Dry	12	26% Emul WESCO	441
	B	138	Bottom	23	Dry	12	26% Emul WESCO	441
	B	139	Bottom	24	Dry	12	26% Emul WESCO	462
	B	140	Bottom	24	Dry	12	26% Emul WESCO	462
	B	141	Bottom	24	Dry	12	26% Emul WESCO	462
	B	142	Bottom	25	Dry	13	26% Emul WESCO	495
	B	143	Bottom	24	Dry	12	26% Emul WESCO	462
	B	144	Bottom	23	Dry	12	26% Emul WESCO	441
	B	145	Bottom	24	Dry	12	26% Emul WESCO	462
	B	146	Bottom	22	Dry	11	26% Emul WESCO	420
	B	147	Bottom	22	Dry	11	26% Emul WESCO	420
	B	148	Bottom	25	Dry	13	26% Emul WESCO	495
	B	149	Bottom	23	Dry	12	26% Emul WESCO	441
	B	150	Bottom	24	Dry	12	26% Emul WESCO	462
	B	151	Bottom	22	Dry	11	26% Emul WESCO	420
	B	152	Bottom	22	Dry	11	26% Emul WESCO	420
	B	153	Bottom	22	Dry	11	26% Emul WESCO	420
	B	154	Bottom	22	Dry	11	26% Emul WESCO	420
	B	155	Bottom	22	Dry	11	26% Emul WESCO	420
	B	156	Bottom	22	Dry	11	26% Emul WESCO	420
	B	157	Bottom	22	Dry	11	26% Emul WESCO	420
	B	158	Bottom	21	Dry	11	26% Emul WESCO	399
	B	159	Bottom	23	Dry	12	26% Emul WESCO	441
	B	160	Bottom	23	Dry	12	26% Emul WESCO	441
	B	161	Bottom	22	Dry	11	26% Emul WESCO	420
	B	162	Bottom	22	Dry	11	26% Emul WESCO	420
	B	163	Bottom	22	Dry	11	26% Emul WESCO	420
	B	164	Bottom	22	Dry	11	26% Emul WESCO	420
	B	165	Bottom	19	Dry	10	26% Emul WESCO	357
	B	166	Bottom	22	Dry	11	26% Emul WESCO	420
	B	167	Bottom	23	Dry	12	26% Emul WESCO	441
	B	168	Bottom	23	Dry	12	26% Emul WESCO	441
	B	169	Bottom	22	Dry	11	26% Emul WESCO	420
	B	170	Bottom	21	Dry	11	26% Emul WESCO	399
	B	171	Bottom	24	Dry	12	26% Emul WESCO	462
Totals for		143		3,148		12		60,288
Totals for Job		143		3,148				60,288

SCALE DISTANCE FACTOR APPROVALS

23-D-1

Xerox Copy to
C. Ellefson
B. Kantz
S. Gregan
J. Francois
Then File

XC: [redacted]
Garth W.

United States Department of the Interior
OFFICE OF SURFACE MINING
Reclamation and Enforcement
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

MAY 9 1985

Mr. R. C. Diederich
Mine Manager, Navajo Mine
Utah International Inc.
P.O. Box 155
Fruitland, New Mexico 87416

Dear Mr. Diederich,

The purpose of this letter is to approve the proposed blasting plan submitted on May 9, 1985 for blasting adjacent to the Texas-New Mexico Pipeline Company's Petroleum Pipeline that is within your permit boundary. My staff has performed a technical evaluation of the "Seismic Study in the Bighan Pit Area" which included a regression analysis of the seismic data contained in the report. This analysis confirmed that blasting with a scaling factor of 13 would keep the peak particle velocity at the petroleum pipeline below the recommended 5 inch per second limit.

If you have any questions concerning this matter please feel free to contact me or Keith Kirk of my staff who was responsible for the technical evaluation of this material.

Sincerely,

Allen D. Klein
Administrator

cc: Robert Hagen
Ed Kelly

UTAH INTERNATIONAL INC.
NAVAJO MINE
POST OFFICE BOX 155 • FRUITLAND, NEW MEXICO 87416
(505) 598-5561

May 09, 1985

Mr. Allen D. Klein, Administrator
Western Technical Center
Office of Surface Mining
Brooks Towers
1020 15th Street
Denver, CO 80202

Dear Mr. Klein:

Utah International Inc., Navajo Mine, is requesting approval of a modififed scaled distance factor Ds=13 to be used when blasting in the vicinity of the Texas-New Mexico Pipeline and the Public Service Company of New Mexico Powerlines (see map) as per CFR 30 Section 816.67 (d)(3)(ii).

In support of this request we are submitting the attached "Seismic Study in the Bighan Pit Area". A scaled distance factor Ds=10 is the result when the 59 seismic data points are analyzed according to the 95 confidence level criteria. We are requesting approval of a scaled distance factor Ds=13 because it includes the maximum positive deviation and will insure that the peak particle velocity is not exceeded.

Sincerely,

R.C. Diederich
Mine Manager
Navajo Mine

plb

White Industrial Seismology, Inc.
2431 RANGELINE SUITE A-B
P.O. BOX 1256
JOPLIN, MO 64802-1256
PH. (417) 624-0164

April 27, 1985

Utah International, Inc.
Navajo Mine
P. O. Box 155
Fruitland, New Mexico 87416

Attention: Mr. George Gilfillan, Mine Engineer

Dear Mr. Gilfillan:

You have requested that we suggest an upper limit for your blast vibration effects. This limit is to be directed toward safety for large power transmission lines and a buried pipeline in the vicinity of the Big Han area of the Navajo Mine of Utah International, Inc.

A search of literature reveals that blast tests imposing over 100 inches per second peak particle velocity on buried pipelines have been carried out without any damage being sustained by the lines. My own experience has been that buried pipelines can withstand much higher ground vibration levels than those that are considered dangerous for residental structures. On several occasions, I have witnessed mine blasting being conducted within very short distances of petroleum products lines with no occurrence of blasting damage being noted.

Large power transmission lines mounted on poles or towers are designed to sustain severe wind loading. Mining directly adjacent to power lines gives rise to more concern for protecting blasters from electric shock than from possible damage to the lines by blasting.

The ability of these two facilities to withstand severe vibration loading should be self evident. However, as a matter of prudence, we feel that an upper limit of five inches per second peak particle velocity would be a reasonable limit for either of these two structures. Five inches per second peak particle velocity is sufficient enough to provide a wide margin of safety for either structure but liberal enough that you should be able to devise an economically feasible blasting program to meet this limit.

We refer you to the following literature in support of this blast vibration level as a limit:

1. Glasstone, S. and P. J. Dolan, Eds., The Effects of Nuclear Weapons, United States Department of Defense and the United States Department of Energy, 1977.

2. Langefors, U. and B. Kihlstrom, The Modern Technique of Rock Blasting, John H. Wiley and Sons, New York, 1973.

3. Wada, M., "Behavior of Submarine Steel Pipelines Subjected to Shock Pressure of Underwater Blasting. 3. Analysis of Experimental Results and Discussion," Journal of the Industrial Explosives Society, Japan, Vol. 41, 1980, pp. 106 - 23. Translated from Japanese to English by P. R. Kanada, for the USBM, Amerind Publishing Company, Pvt. Ltd., New Delhi, 1983.

4. Westine, P. S., E. D. Esparza and A. B. Wenzel, Analysis and Testing of Pipe Response to Buried Explosive Detonations, Southwest Research Institute, San Antonio, 1978.

Please do not hesitate to call if we can be of further help.

Very truly yours,

WHITE INDUSTRIAL SEISMOLOGY, INC.

David S. Bowling, C.P.G.S.
Consulting Geophysicist

DSB/tj

White Industrial Seismology, Inc.
2431 RANGELINE SUITE A-B
P.O. BOX 1256
JOPLIN, MO 64802-1256
PH. (417) 624-0164

April 27, 1985

SUBJECT: Measurements of Blast Effects
Utah International, Inc.
Navajo Mine
April 3 and 4, 1985

TO: Utah International, Inc.
Navajo Mine
P. O. Box 155
Fruitland, New Mexico 87416

Attention: Mr. George Gilfillan

AUTHORITY AND PURPOSE

On April 3 and 4, 1985, at the request of Mr. George Gilfillan, personnel from White Industrial Seismology, Inc. visited the Coal Mining operation of Utah International, Inc.'s Navajo Mine, located near Farmington, New Mexico. The purpose of this visit was to secure measurements of earthborne and airborne effects produced by blasting at this operation. It was the further purpose of this study to relate these measurements to a suggested ground vibration limit of 5.0 inches per second with regard to underground pipelines and overhead power lines.

INSTRUMENTATION

Ten full waveform seismographs were provided by White to measure the seismic and acoustic effects produced by the blasts fired on these dates. The sensing elements of each of these instruments consists of a triaxial seismometer and a condenser microphone. These sensing elements simultaneously measure three components of ground motion, two horizontal and one vertical, plus the airblast effects. The measured signals are amplified and recorded on magnetic tape by a four track recording system. The magnetic tape becomes a time history of the ground vibration and airblast effects produced at the recording point. These tapes may be transcribed to visual seismograms, or they may be analyzed directly by a computer for peak amplitude, frequency content, or other parameters of interest.

In addition to their hard copy tape storage, each seismograph is also provided with a direct reading meter by which the peak particle velocity amplitude of ground vibration may be read directly at the time of a test. These meters are designed with peak holding capability eliminating the necessity for an immediate observation at shot moment.

Instrumentation - Continued

The instruments used during this study consisted of White Seismo Sentinel Units, Models ST-4; Seismo Tape III units, Models SM-4; and Seismo Tape I and II units, Models BT-4. All of the instruments provided were manufactured by Dallas Instruments, Inc. The Dallas Instruments seismographs have been tested for accuracy and response characteristics by the United States Bureau of Mines. These tests are noted in the USBM's reports of investigation, RI 8506, "Measurements of Blast Induced Ground Vibration and Seismograph Calibration," and RI 8508, "Airblast Instrumentation and Measurement Techniques for Surface Mine Blasting."

Manufacturer's instrument specifications for these seismographs are presented as Appendix I.

SHOT DATA

Six blasts were fired to produce the data for this study. The blasts ranged from a single hole to two multi-hole shots. Five were loaded and fired on April 3, 1985. The sixth shot, which was the largest in terms of number of holes and total pounds, was fired April 4, 1985. Pertinent details of each shot were provided by Utah International, Inc. Copies of the shot reports are included in Appendix II.

INSTRUMENT POSITIONS

Instrument positions were predetermined from topographic maps provided by the mine. These positions were staked and surveyed by the mine surveyors.

The recording site selections were made to cover three different directions. Two of the directions were at approximate right angles to each other. The third was along an azimuth between the quadrant formed by the two perpindicular lines.

Instrument positions along each azimuth were staggered so that all would provide measurements at points of increasing distance from each blast. The shot to instrument distances for the entire study ranged from 194 feet to 2167 feet.

The ground surface lying east of the blast area was primarily a sand. In order to assure a similar couple at all stations, a hole of 12 to 15 inches deep was dug at each station. The seismic sensors were spiked to the earth in the bottom of each hole by means of a three inch spike attached to the bottom of the case. The holes were then filled and tamped solid.

A sketch map has been prepared showing the locations of the blasts and the instruments. This is included in Appendix II.

MEASUREMENTS

Peak particle velocity amplitude measurements with peak airblast overpressure measurements are listed in the summaries of blast details and vibration measurements. These are found in Appendix III. Each of the magnetic tape recordings obtained during this study has been computer analyzed for peak amplitudes and frequency. Fifty-nine computer plotted and analyzed seismograms are included with this report as Appendix IV.

There was one instrument station that did not obtain a measurement for Shot #6. This occurred at Station C2. The unit placed at this station was equipped with both airblast and ground vibration triggering capability. The wind became quite strong on April 4, which caused excessive triggering of the instrument. Both the hard copy tape recording and the memory storage capacity were exceeded and the shot measurements were lost.

An intermittent malfunction occurred on the vertical channel in the instrument placed at Station A3. This malfunction occurred on Shots #2, #3 and #4. The data recorded on Shots #1, #5 and #6 appear to be accurate. As a consequence of this malfunction, this instrument, ID 141, has been submitted to the manufacturer for repair and validation of the radial and transverse measurements for Shots #2, #3 and #4. We believe these measurements to be accurate. The manufacturers statement will be submitted when received. Use of the measurement on the radial channel for these three shots should not introduce significant error to this study.

GENERAL TECHNICAL DISCUSSION

The peak particle velocity of ground motion which may be produced at a given point within the general vicinity of a blasting operation is heavily dependent on both the quantity of explosives fired at a single instant in time and the distance between the shot and the point of interest. Other factors such as the quality of explosives, placement of blast holes and lateral changes in the lithology may also affect the peak velocity amplitude. However, quantity of explosives and distance between the shot and a point of interest are the primary controlling factors of particle velocity amplitude.

When a shot is fired in an operation, the earth and rock surrounding this shot, that is not fractured by the blast, behaves as an elastic carrier to disperse the residual energy. As the ground vibration wave is transmitted away from the shot site, the volume of earth that is affected becomes a hemisphere of rapidly increasing radius. The quantity of energy that was originally released as a seismic pulse is accordingly dispersed in the increasingly greater volume contained within this hemisphere.

Typically, the lateral distance from a confined hole in a shot at which rock fracturing ceases is approximately 30 - 35 hole diameters. From the instant of formation, the amplitude of the seismic pulse decreases rapidly

General Technical Discussion - Continued

with increasing distance as it travels away from the source. The peak particle velocity amplitude which is representative of the energy levels contained within this pulse or wave train is essentially dispersed within ten burden distances from a shot, although perceptible ground vibrations may persist for several thousand feet. The dispersal of seismic energy resulting from these test shots is amply illustrated by Figures I and II in Appendix V.

Both the USBM and other researchers have shown that peak ground vibration amplitudes and peak airblast overpressures decrease exponentially with distance from the shot. The peak particle velocity amplitudes produced by a blast may be estimated by an equation of the form $V = I(D)^S$, where V = particle velocity amplitude, D = blast to instrument distance, S = the slope or rate of amplitude decrease with distance and I is a constant of proportionality equal to the peak particle velocity at unit distance. This standard propagation equation, which applies to a single blast, will also apply to other shots in a blasting operation, when an equalizing or scaling factor is applied.

A site specific equation can be developed for a particular mine site. Such equations are useful for estimating the probable peak particle velocity for a particular set of blasting conditions. Such an equation is dependent upon the determination of site specific constants S and I. The scaling factor for use in determining these two site specific constants is generally referred to as a scaled distance and has been designated D_s by the USBM as a standard symbol which has become extensively used throughout the industry. Mathematically it is $D_s = D/W^{1/2}$ where D_s = scaled distance, D = radial distance from a shot to a recording point, and W = the maximum charge weight of explosives fired at a single instant. The USBM requires a minimum delay time of eight milliseconds between elements of a multi-delay element blast. By securing extensive measurements of variable charge weights at varying distances and by substituting D_s values for D in the standard equation, values for the slope S and intercept I can be determined graphically. By substituting D_s for D in the standard equation, a site specific equation now becomes $V = I(D_s)^S$ where values for I and S have been determined by the above procedure.

The airblast overpressure obeys a similar propagation law. However, overpressure is greatly affected by wind, temperature and other rapidly changing factors in the atmosphere. It is also affected by terrain conditions which absorb or reflect the acoustic pulse. Overpressure obeys a cube root scaling law. The other parameters stated above are the same. In establishing an airblast propagation equation $D_s = D/W^{1/3}$.

DATA ANALYSIS AND DISCUSSION

The data obtained and our analyses of these fifty-nine seismic measurements have been presented in charts and graphs included in Appendix V. In Figure I, of Appendix V, the peak measurements obtained from Shots #1, #2

Data Analysis and Discussion - Continued

#3 and #4 are plotted in rectangular coordinates with PPV amplitude as a function of distance. It is evident that the PPV amplitude levels of Shots #2 and #3 increased approximately proportional to the increase in charge weights. Shot #4 did not show an increase in overall amplitude above that of Shot #3, except in the direction of Line B. The overall amplitude of Shot #4 appears to be slightly lower than Shot #3. We are inclined to believe that a possible low order detonation occurred on one or more holes in Shot #4.

In Figure II, we have plotted the measurements from Shots #1, #3, #5 and #6 as a function of distance. It is evident from this graph that the delay patterns used are sufficient to assure the peak particle velocity is primarily a function of the maximum load per delay.

In Figure III, we have plotted the PPV measurements as a function of scaled distance in accordance with the standard equation. The site specific equation has been determined and is shown in this graph. You will note the scaled distance associated with five inches per second PPV along the mean trend line is five. The maximum positive deviation however falls at a D_s value of 13.0. If we take a 95% confidence factor including the point from A4 Shot #6, it will intersect the 5.0 inches per second PPV level at $D_s = 10$.

It appears that adherence to a scaled distance of 13.0 for blast load design will provide a virtual certainty that the peak particle velocity of 5.0 inches per second will not be produced on either the power lines or the pipelines.

There are some salient points that should be made. First, the maximum deviation line is caused by the single measurement produced at Station A4, 2167 feet from the closest part of Shot #6. An examination of this seismogram reveals the peak amplitude occurred well into the wave train produced by this very long duration blast. We believe this to be due to an additive effect uniquely related to the extra long duration of the single hole delay pattern of Shot #6. The measurement at Station A3 is also higher than would normally be expected at these distances which tends to confirm a surge or an additive effect. Regardless of the cause, the distance is so great and the measurement so low that we do not see this point as significant in developing a number for reasonable control at close range.

A second point to be made is that a peak particle velocity in excess of 5.0 inches per second was only measured at distances less than 400 feet.

A third point to be made is that, based on this study, the power lines that supply your machines, must have at one time or another sustained ground vibrations well in excess of 5.0 inches per second. In March 1985, David Bowling observed a Navajo Mine blast similar to those fired on the 3rd and 4th of April. Based on the data obtained from our April study, we believe this

Data Analysis and Discussion - Continued

blast would have imposed a PPV level of 5.0 inches per second or more on your power line since the blast was located within 200 feet of it.

A fourth point to be made about this Figure III is that only three points fall above a line intersecting 5.0 inches per second at a D_s value of 8. These consist of the measurement from Shot #1, Station A1 and Shot #6, Stations A3 and A4.

CONCLUSIONS AND RECOMMENDATIONS

Based on this study, it is our conclusion that adherence to a scaled distance of 10 or greater when designing shots proximal to either the power lines or pipelines will assure a PPV less than 5.0 inches per second. It is possible that aderence to a D_s of 8 would provide a reasonable assurance that the upside limit of 5.0 inches per second would not be exceeded.

The most rational approach would be to secure a portable seismograph, with a direct reading meter or printout to set up on either the power lines or the pipelines for each shot and design your shots to assure no measurement reaches or exceeds 5.0 inches per second. We believe this approach would maximize your coal extraction with the minimum modification of your blasting technique.

The following items are attached as appendices and complete this report:

Appendix I	Instrument Specifications
Appendix II	Copies of Blasters Logs and Sketch Map
Appendix III	6 Summary of Blast Measurement Tables
Appendix IV	59 Computer Drawn and Analyzed Seismograms
Appendix V	Figures I, II and III

Respectfully submitted,

WHITE INDUSTRIAL SEISMOLOGY, INC.

Randall M. Wheeler

Randall M. Wheeler
Manager of Technical Services

David S. Bowling

David S. Bowling, C.P.G.S.
Consulting Geophysicist

RMW/DSB/tj

BLAST REPORTING PRACTICES AT NAVAJO MINE

General Shot Planning and Design

Shot planning and design at the Navajo Mine consists of the steps outlined below, and is based on attaining maximum shot performance while insuring complete compliance with all pertinent regulations.

Evaluation of blast area based on:

- Material Type
- Material Thickness
- Proximity to lease lines, etc.
- Distance to nearest structure (Preliminary estimate of maximum legal charge per 8 ms period).

This leads to selection of initiation system used.

- Instantaneous blasting is done with surface delays in most non-critical partings.
- And in-hole delay system is used in cast shots or critical partings.

If an in-hole delay is to be used, a timing analysis is done. Timing is fine tuned to insure that the maximum number of holes firing in any 8 ms period is within compliance and to provide maximum shot performance.

The drill pattern design is then done based on either the burdens determined through the timing analysis or on a 'typical' burden for a given parting depth. Drill pattern dimensions are then evaluated on the basis of the resultant energy factor and stem heights, to insure acceptable shot performance and control.

Once the initial timing and drill dimensions are determined, a load sheet (Exhibit 1) is developed. This sheet shows the following:

- Hole Depth.
- Pounds of each explosive type to be loaded in a hole of given depth.
- Resultant Powder Factor.
- Legal Holes per Delay. This is based on input for shot coordinates and coordinates for the nearest structure (Exhibit 2). This design information for coordinates is taken from a scaled distance spreadsheet (Exhibit 3) that is developed for each strip. This scaled distance sheet is generated by taking survey information for coal line coordinates by station, and then calculating the distance to the structures proximate to each pit.
- Design Stem Height.
- Resultant Energy Factor.
- Relative Confinement Factor. In all 'critical shots', this factor must exceed 1.4 to be acceptable. Design parameters will be changed as necessary to reach this level.

After the load sheet is generated, the appropriate range of hole depths will be checked to insure that the legal holes per delay does not come within a factor of two holes per delay to the design holes per delay. (i.e. if the legal holes per delay is 9 and the design calls for 7 holes per 8 ms period, the design will be reevaluated to see if a larger safety factor between the legal and design numbers can be reached).

If shot requirements dictate that the design is not able to be 'backed off to a level that insures a sufficient safety margin, BNCC will monitor the shot and attach the seismograph report to the Blast Report.

Once the design is complete a package consisting of a copy of the drill plan, all load sheets, and a scaled distance sheet is forwarded to the Blast Foremen for their field use.

bhpbilliton

BHP Navajo Coal Company

Memorandum

Date 20 March 2009

To Gene Hay, OSM Mining Engineer

CC Greg Perkins, Production Coordinator
Kent Applegate, Environmental Coordinator
Shawn Goeckner, Chief Engineer
Bill Jenkins, General Blasting Foreman
Valdez Nez, Assistant Production Superintendent-Stripping
Steve Hough; Production Superintendent

From Desiree Smiley, Drill and Blast Engineer

Detail Procedures for Airblast and Flyrock Control When Cast Blasting

The cast blasting procedures currently followed are intended to adequately mitigate the loss of confinement typically occuring through the face or stemming column (the path of least resistance). The design parameters are:

- Minimum of 19 feet of face burden when drilling 10.625" holes
- Using the minimum stemming lengths of 17 ft when loading with ANFO and 19 ft when loading with HANFO for 10.625" blast holes
- Bobbing the holes when loading cast to ensure proper stem height. If overloading occurs, dilution of explosive product to adjust to proper stem height
- Pre-blast face burden profiling can be used to determine proper collar location of the blast holes

Current Procedures for Airblast and Flyrock Control When Blasting Thin Seams (overburden and Interburden)

- When blasting parting greater than 20 ft OR outside of the 1,000 ft zone
    - 10.625" drill holes are used
    - All parting less than 5 ft is ripped
    - All wet holes are stemmed with crushed rock

- A minimum of 50% of hole depth is used for stemming length
- Drilling parameters for 10.625" drill holes are variable due to the rock type and depth. A range of burden and spacing given below encompasses the variations of the drill pattern designs
  - Burden (ft) = (20 to 40) * 10.625"/12
  - Spacing (ft) = (1 to 1.8) * Burden

- When blasting within 1,000 ft of the lease line or stream buffer zone and parting is under 20 feet
  - 6.75" drill holes are used with a tighter pattern
  - All holes are stemmed with crushed rock
  - A minimum of 50% of hole depth is used for stemming length
  - All parting less than 5 ft is ripped
  - Drilling parameters for 6.75" drill holes are variable due to the rock type and depth. A range of burden and spacing given below encompasses the variations of the drill pattern designs
    - Burden (ft) = (20 to 40) * 6.75"/12
    - Spacing (ft) = (1 to 1.8) * Burden

Current Procedures for Airblast and Flyrock Control When Blasting Thin Seams (coal)

- 5" drill holes are used with a 14' x 14' pattern
- All coal under 5 ft is ripped
- A minimum of 65% of hole depth is used for stemming length

Future Procedures for Airblast and Flyrock Control When Cast Blasting

The future procedures will be the same as above with the following additions and enhancements:

- All cast shots will have pre-blast face burden profiling to determine the proper collar location of the blast holes
- All wet holes will be stemmed with crushed rock
- If high wall issues have occurred after drilling is complete, holes near the face will only be toe loaded
- Loading blast holes from the back of the shot first (future high wall side) and moving across the pit to the front of the shot (current high wall side) in case the current highwall face changes before shot is made
- When adverse geologic conditions are present, the area with issues will be loaded as close to the shot time as practical

Future Procedures for Airblast and Flyrock Control When Blasting Thin Seams (overburden and interburden)

Due to the current procedures successfully controlling the amount of flyrock and airblast, there is no change required.

Future Procedures for Airblast and Flyrock Control When Blasting Thin Seams (coal)

Due to the current procedures successfully controlling the amount of flyrock and airblast, there is no change required.

PIT	S. BARBER	STA 145+00 —> STA 169+00			[redacted]
SEAM	8A				
STRIP	60	60S88A-8			
HOLE DIAMETER	9.875		20 % EMUL	TOP MODE	[redacted]
DRILL BURDEN	27.0 (avg)		20 % EMUL	TOE MODE	[redacted]
DRILL SPACING	30.0			STANDOFF	0.0
DIST. TO STRUCTUR	5.190	J. Lewis STA 169+00, SAE OF SHOT		BACKFILL	[redacted]

Use ZAP and LP-48s

[redacted] Surface Delay [redacted] Holes/8 ms Delay

HOLE DEPTH	BACKFILL	COLUMN LOAD	TOP LOAD	TOTAL P.F.	TOTAL POUNDS	HOLES / DELAY	[redacted]	EN Factor avg 930	RC Factor Ce 1.17
						Max Burden	18.0		
5.0	1.0	58	0	0.39	58	272.5	2.5	91	0.301
6.0	1.0	78	0	0.43	78	204.3	3.0	102	0.332
7.0	1.0	97	0	0.46	97	163.5	3.5	109	0.363
8.0	1.0	117	0	0.49	117	136.2	4.0	114	0.394
9.0	1.0	136	0	0.50	136	116.8	4.5	119	0.426
10.0	1.0	155	0	0.52	155	102.2	5.0	122	0.457
11.0	1.0	175	0	0.53	175	90.8	5.5	125	0.488
12.0	1.0	194	0	0.54	194	81.7	6.0	127	0.520
13.0	1.0	214	0	0.55	214	74.3	6.5	129	0.551
14.0	1.0	233	0	0.55	233	68.1	7.0	131	0.582
15.0	1.0	253	0	0.56	253	62.9	7.5	132	0.613
16.0	1.0	272	0	0.57	272	58.4	8.0	133	0.645
17.0	1.0	291	0	0.57	291	54.5	8.5	135	0.676
18.0	1.0	311	0	0.58	311	51.1	9.0	136	0.707
19.0	1.0	330	0	0.58	330	48.1	9.5	136	0.739
20.0	1.0	350	0	0.58	350	45.4	10.0	137	0.770
21.0	1.0	369	0	0.59	369	43.0	10.5	138	0.801
22.0	1.0	388	0	0.59	388	40.9	11.0	139	0.832
23.0	1.0	408	0	0.59	408	38.9	11.5	139	0.864
24.0	1.0	427	0	0.59	427	37.2	12.0	140	0.895
25.0	1.0	447	0	0.60	447	35.5	12.5	140	0.926
26.0	1.0	466	0	0.60	466	34.1	13.0	141	0.958
27.0	1.0	486	0	0.60	486	32.7	13.5	141	0.989
28.0	1.0	505	0	0.60	505	31.4	14.0	142	1.020
29.0	1.0	524	0	0.60	524	30.3	14.5	142	1.051
30.0	1.0	544	0	0.60	544	29.2	15.0	142	1.083
31.0	1.0	563	0	0.61	563	28.2	15.5	143	1.114
32.0	1.0	583	0	0.61	583	27.2	16.0	143	1.145
33.0	1.0	602	0	0.61	602	26.4	16.5	143	1.177
34.0	1.0	622	0	0.61	622	25.5	17.0	144	1.208
35.0	1.0	641	0	0.61	641	24.8	17.5	144	1.239
36.0	1.0	660	0	0.61	660	24.0	18.0	144	1.270
37.0	1.0	699	0	0.63	699	22.7	18.0	148	1.270
38.0	1.0	738	0	0.65	738	21.5	18.0	152	1.270
39.0	1.0	777	0	0.66	777	20.4	18.0	156	1.270
40.0	1.0	816	0	0.68	816	19.5	18.0	160	1.270
41.0	1.0	855	0	0.69	855	18.6	18.0	164	1.270
42.0	1.0	894	0	0.71	894	17.8	18.0	167	1.270
43.0	1.0	932	0	0.72	932	17.0	18.0	170	1.270
44.0	1.0	971	0	0.74	971	16.3	18.0	173	1.270
45.0	1.0	1010	0	0.75	1,010	15.7	18.0	176	1.270
46.0	1.0	1049	0	0.76	1,049	15.1	18.0	179	1.270
[redacted]								182	1.270
48.0	1.0	1127	0	0.78	1,127	14.1	18.0	184	1.270
49.0	1.0	1166	0	0.79	1,166	13.6	18.0	187	1.270
50.0	1.0	1204	0	0.80	1,204	13.2	18.0	189	1.270
51.0	1.0	1243	0	0.81	1,243	12.8	18.0	191	1.270
52.0	1.0	1282	0	0.82	1,282	12.4	18.0	194	1.270
53.0	1.0	1321	0	0.83	1,321	12.0	18.0	196	1.270
54.0	1.0	1360	0	0.84	1,360	11.7	18.0	198	1.270
55.0	1.0	1399	0	0.85	1,399	11.4	18.0	200	1.270
56.0	1.0	1437	0	0.86	1,437	11.0	18.0	202	1.270
57.0	1.0	1476	0	0.86	1,476	10.8	18.0	203	1.270
58.0	1.0	1515	0	0.87	1,515	10.5	18.0	205	1.270
59.0	1.0	1554	0	0.88	1,554	10.2	18.0	207	1.270
60.0	1.0	1593	0	0.88	1,593	10.0	18.0	208	1.270
61.0	1.0	1632	0	0.89	1,632	9.7	18.0	210	1.270
62.0	1.0	1670	0	0.90	1,670	9.5	18.0	212	1.270
63.0	1.0	1709	0	0.90	1,709	9.3	18.0	213	1.270
64.0	1.0	1748	0	0.91	1,748	9.1	18.0	214	1.270
65.0	1.0	1787	0	0.92	1,787	8.9	18.0	216	1.270
66.0	1.0	1826	0	0.92	1,826	8.7	18.0	217	1.270
67.0	1.0	1865	0	0.93	1,865	8.5	18.0	218	1.270
68.0	1.0	1904	0	0.93	1,904	8.3	18.0	220	1.270
69.0	1.0	1942	0	0.94	1,942	8.2	18.0	221	1.270
70.0	1.0	1981	0	0.94	1,981	8.0	18.0	222	1.270
71.0	1.0	2020	0	0.95	2,020	7.9	18.0	223	1.270
72.0	1.0	2059	0	0.95	2,059	7.7	18.0	224	1.270
73.0	1.0	2098	0	0.96	2,098	7.6	18.0	226	1.270
74.0	1.0	2137	0	0.96	2,137	7.4	18.0	227	1.270
75.0	1.0	2176	0	0.97	2,176	7.3	18.0	228	1.270
76.0	1.0	2214	0	0.97	2,214	7.2	18.0	229	1.270
77.0	1.0	2253	0	0.98	2,253	7.0	18.0	230	1.270
78.0	1.0	2292	0	0.98	2,292	6.9	18.0	231	1.270
79.0	1.0	2331	0	0.98	2,331	6.8	18.0	232	1.270
80.0	1.0	2370	0	0.99	2,370	6.7	18.0	233	1.270
81.0	1.0	2409	0	0.99	2,409	6.6	18.0	233	1.270
82.0	1.0	2447	0	0.99	2,447	6.5	18.0	234	1.270
83.0	1.0	2486	0	1.00	2,486	6.4	18.0	235	1.270
84.0	1.0	2525	0	1.00	2,525	6.3	18.0	236	1.270
85.0	1.0	2564	0	1.01	2,564	6.2	18.0	237	1.270

2/11/97 9:14 AM

cbn

EXHIBIT 1

DISTANCE TO BUILDING			
LOCATION	NORTHING	EASTING	DISTANCE
C. Dixon	[redacted]		
STA 101+00	2,016,400	302,870	7,060
	2,847	6,461	N&E
M. Yazzie	[redacted]		
STA 152+00	2,011,300	302,870	9,984
	1,783	(9,823)	N&W

Nearest:	C. Dixon
STA:	STA 101+00
Dir:	N&E

Legal Weight: 11,799 pounds

Resident	Northing	Easting
E Yazzie	2,066,240	313,395
J. Allen	2,064,299	312,151
D. Harris	2,058,691	326,525
Qstar-Pt3	2,054,765	315,640
Qstar-Pt5	2,053,538	321,606
Qstar-Pt4	2,053,301	320,481
H. Barber	2,052,300	305,675
Qstar-Pt1	2,051,701	309,494
Qstar-Pt2	2,051,435	312,152
A. Mason	2,040,620	322,409
John Mason	2,039,591	321,431
P. While	2,034,347	286,250
AIII	2,033,820	300,603
A. Barber	2,028,053	305,911
J. Lowe	2,026,622	302,417
J. Mason 1	2,022,171	310,570
J. Mason 2	2,020,959	310,302
K. Joe	2,020,555	308,939
K. Dobey	2,019,750	294,800
C. Dixon	2,019,247	309,331
M. Yazzie	2,013,083	293,047
A. Gilmore 2	2,003,500	296,500
R. Mason	2,022,434	309,701

EXHIBIT 2

S. Barber Pit Scaled Distances : Step # 60

STATIONS	Relative Direction from Pit: N of Pit	S of Pit	NW of Pit	SE of Pit	E of Pit	SB COAL LINE N	E
	Distance To:						
	4CPL	K. Dobey	H. Barber	J. Lone	AIII		
79+0	10,599	20,050	13,865	11,999	5,751	2,036,928	303,905
80+0	10,694	20,786	13,946	11,999	5,648	2,032,478	303,818
81+0	10,790	20,704	14,027	11,979	5,570	2,028,628	303,732
82+0	10,886	20,622	14,069	11,921	5,480	2,030,379	303,645
83+0	10,991	20,540	14,133	11,782	5,391	2,030,329	303,558
84+0	11,077	20,458	14,193	11,705	5,302	2,030,279	303,471
85+0	11,173	20,376	14,256	11,648	5,213	2,030,229	303,385
86+0	11,269	20,294	14,319	11,591	5,125	2,030,180	303,298
87+0	11,345	20,213	14,383	11,535	5,038	2,030,130	303,211
88+0	11,461	20,132	14,447	11,480	4,950	2,030,080	303,124
89+0	11,557	20,051	14,511	11,425	4,864	2,030,030	303,038
90+0	11,653	19,970	14,576	11,371	4,777	2,029,980	302,951
91+0	11,749	19,889	14,642	11,319	4,692	2,029,931	302,864
92+0	11,845	19,808	14,707	11,265	4,606	2,029,881	302,777
93+0	11,942	19,728	14,773	11,213	4,522	2,029,831	302,691
94+0	12,038	19,648	14,840	11,161	4,438	2,029,781	302,604
95+0	12,135	19,568	14,907	11,110	4,355	2,029,732	302,517
96+0	12,231	19,488	14,974	11,060	4,272	2,029,682	302,431
97+0	12,328	19,408	15,041	11,010	4,191	2,029,632	302,344
98+0	12,424	19,329	15,109	10,961	4,110	2,029,582	302,257
99+0	12,521	19,249	15,178	10,913	4,030	2,029,533	302,170
100+0	12,618	19,170	15,248	10,866	3,951	2,029,483	302,084
101+0	12,715	19,091	15,315	10,819	3,873	2,029,433	301,997
102+0	12,812	19,017	15,385	10,773	3,795	2,029,383	301,910
103+0	12,908	18,934	15,454	10,728	3,719	2,029,333	301,823
104+0	13,005	18,856	15,524	10,683	3,644	2,029,284	301,737
105+0	13,102	18,778	15,593	10,640	3,571	2,029,234	301,650
106+0	13,199	18,700	15,665	10,597	3,498	2,029,184	301,563
107+0	13,296	18,622	15,736	10,554	3,428	2,029,134	301,476
108+0	13,394	18,545	15,807	10,513	3,358	2,029,083	301,390
109+0	13,491	18,468	15,879	10,472	3,290	2,029,033	301,303
110+0	13,588	18,391	15,951	10,432	3,224	2,028,985	301,216
111+0	13,685	18,314	16,023	10,393	3,159	2,028,935	301,130
112+0	13,880	18,161	16,168	10,318	3,036	2,028,836	300,956
114+0	13,977	18,085	16,241	10,281	2,978	2,028,786	300,869
115+0	14,075	18,009	16,315	10,245	2,922	2,028,736	300,783
117+0	14,042	18,019	16,308	10,251	2,919	2,028,738	300,853
118+0	14,142	17,928	16,396	10,170	2,843	2,028,687	300,764
119+0	14,242	17,837	16,486	10,110	2,766	2,028,585	300,695
120+0	14,342	17,746	16,575	10,051	2,692	2,028,513	300,626
121+0	14,441	17,655	16,666	9,992	2,620	2,028,440	300,558
122+0	14,541	17,564	16,756	9,934	2,550	2,028,367	300,489
123+0	14,641	17,473	16,846	9,877	2,481	2,028,293	300,420
124+0	14,741	17,382	16,936	9,820	2,415	2,028,222	300,351
125+0	14,841	17,292	17,027	9,764	2,352	2,028,150	300,282
126+0	14,941	17,201	17,118	9,709	2,291	2,028,077	300,213
127+0	15,041	17,111	17,208	9,654	2,232	2,028,005	300,144
128+0	15,140	17,020	17,299	9,600	2,177	2,027,932	300,075
129+0	15,240	16,930	17,390	9,547	2,123	2,027,860	300,006
130+0	15,340	16,840	17,481	9,495	2,077	2,027,787	299,938
131+0	15,440	16,750	17,572	9,443	2,032	2,027,715	299,869
132+0	15,540	16,660	17,663	9,392	1,991	2,027,643	299,800
133+0	15,640	16,570	17,755	9,342	1,955	2,027,570	299,731
134+0	15,739	16,481	17,846	9,293	1,923	2,027,497	299,662
135+0	15,839	16,391	17,938	9,245	1,896	2,027,425	299,593
136+0	15,939	16,302	18,029	9,197	1,874	2,027,352	299,524
137+0	16,039	16,213	18,121	9,150	1,857	2,027,280	299,455
138+0	16,139	16,123	18,213	9,105	1,845	2,027,207	299,386
139+0	16,239	16,034	18,305	9,060	1,839	2,027,135	299,317
140+0	16,339	15,946	18,397	9,015	1,838	2,027,063	299,249
141+0	16,439	15,857	18,489	8,972	1,842	2,026,990	299,180
142+0	16,538	15,768	18,581	8,930	1,852	2,026,917	299,111
143+0	16,638	15,680	18,673	8,889	1,867	2,026,845	299,042
144+0	16,738	15,591	18,765	8,848	1,888	2,026,772	298,973
145+0	16,838	15,503	18,858	8,809	1,913	2,026,700	298,904
146+0	16,938	15,415	18,950	8,770	1,943	2,026,627	298,835
147+0	17,038	15,327	19,042	8,733	1,978	2,026,555	298,766
148+0	17,138	15,239	19,135	8,696	2,017	2,026,482	298,697
149+0	17,238	15,152	19,228	8,661	2,061	2,026,410	298,629
150+0	17,337	15,064	19,320	8,626	2,108	2,026,338	298,560
151+0	17,437	14,977	19,413	8,593	2,159	2,026,265	298,491
152+0	17,537	14,890	19,506	8,560	2,213	2,026,193	298,422
153+0	17,637	14,803	19,599	8,529	2,270	2,026,120	298,353
154+0	17,737	14,716	19,692	8,498	2,330	2,026,048	298,284
155+0	17,837	14,629	19,785	8,469	2,393	2,025,975	298,215
156+0	17,937	14,543	19,878	8,441	2,458	2,025,903	298,146
157+0	18,037	14,457	19,971	8,414	2,526	2,025,830	298,077
158+0	18,137	14,370	20,065	8,388	2,595	2,025,758	298,009
159+0	18,237	14,285	20,158	8,363	2,667	2,025,685	297,940
160+0	18,336	14,199	20,251	8,339	2,740	2,025,613	297,871
161+0	18,436	14,113	20,345	8,316	2,815	2,025,540	297,802
162+0	18,536	14,028	20,438	8,295	2,892	2,025,468	297,733
163+0	18,636	13,943	20,532	8,275	2,969	2,025,395	297,664
164+0	18,736	13,858	20,626	8,256	3,049	2,025,323	297,595
165+0	18,836	13,773	20,719	8,237	3,129	2,025,250	297,526
166+0	18,936	13,688	20,813	8,221	3,210	2,025,178	297,457
167+0	19,036	13,604	20,907	8,205	3,293	2,025,105	297,388
168+0	19,136	13,520	21,001	8,190	3,376	2,025,033	297,320

Shot Monitoring and Reporting

Shot Monitoring

BNCC monitors all shots that meet the following criteria:

- All Cast Shots.
- All blasts that exceed the scale distance requirement.
- Shots utilizing new designs or products.

BNCC will also monitor shots for our own analysis on a regular basis. Any shots that are monitored for compliance purposes will have the seismograph tape attached to the Blast Report.

BNCC uses a White - Mini Seis II seismograph for the monitoring activities.

Blast Reporting

Included in this appendix are examples of Coal and Overburden Blast Reports. These reports were generated using BlastMan Pro software. The reports contain the following information:

Page 1

- Shot Date, Time, Location, Material Type, and the Name of Blaster of Record.
- Summary of Pattern Dimensions, Average Hole Depth, Number of Holes, Volume Shot, and Average Stem Height.
- Summary of Bulk Explosives Used.
- Summary of Primers Used.
- Compliance information including Nearest Structure, Distance to Structure, Scaled Distance Factor, Actual Holes per 8ms Period, Maximum Charge per 8ms Period, and Calculated Legal Minimum Distance to Structure.

It should be noted that when calculating the maximum charge per 8ms period, the BlastMan Pro software will go to the load information for the block and pull the maximum load that exists in any one hole in the block. Maximum charge per 8 ms period for coal shots also uses the maximum load in any one hole located within the block. This maximum hole load is then multiplied by the number of holes per 8 ms delay that is input by the blaster to determine the reported maximum charge per 8 ms period. BNCC believes that this is an extremely conservative approach to determining and reporting compliance values for ground vibration. In conjunction with the safety factor incorporated into the design, BNCC believes that it would be exceedingly unlikely for Navajo Mine to be out of compliance on any of these shots.

Page 2

- For Overburden/Parting Shots - Summary of Blasting Accessories Used
- For Coal Shots - Blast Diagram and Seismograph Information (if monitored)

Page 3

- For Overburden/Parting Shots - Blast Diagram and Seismograph Information (if monitored).
- For Coal Shots – Blast hole data sheet(s)

Page 4 - End

- Hole Loading Information by Block/Row/Hole. Type and amount of explosive used in each hole is shown. This portion of the blast report also indicates wet or dry holes and lost holes.

The only area of appreciable difference between design loads and actual loads will be in deep overburden holes such as on cast shots. In these areas, BNCC loads more to a design stem height than to a design load. Generally, the actual loads in casts will exceed the design by about 200 pounds per hole (about 5%).

Actual Hole Locations

Due to the magnitude of our operations, surveying and reporting each individual hole location becomes impractical. Instead, Navajo Mine surveys and reports the four corners of the shot block (for accuracy) and uses these coordinate sets to determine scaled distance for reporting purposes. A shot block is determined by load sheet changes or by drill pattern changes and a blast may contain multiple blocks. Since shot block coordinates are known, the user will then be able to calculate coordinates for subsequent hole locations, since pattern dimensions are reported.

Actual Hole Loads

Blasts with varying hole weights will be reported with actual load per hole in the pattern. Navajo Mine will continue to report the worst case (maximum potential explosives detonated in 8 ms) on blast reports for calculation of scaled distances. Blasts with holes that are loaded with the same amount of explosive will be reported using this hole load weight for the entire blast pattern.

Navajo Mine uses *"worst-case-maximum-weight"* to determine maximum weight per eight (8) millisecond delay period. After the maximum weight of the pattern(s) is determined, that weight is used to calculate allowable weight/8ms and the minimum shot distance (ft) from protected structures. The worst case-maximum-weight is a conservative scenario in which it is assumed that every blast hole in the pattern was loaded with that weight. Pattern corners are surveyed for actual distance determination to the nearest protected structure(s). Thus from each pattern corner, scaled distance calculations are made to the nearest structure(s) using the "worst-case-maximum-weight" previously determined. Depending upon the number of surrounding protected structures, numerous repetitive calculations are performed at each pattern corner to determine the legal shot weight and distance to the nearest protected structure.

Blast Diagrams

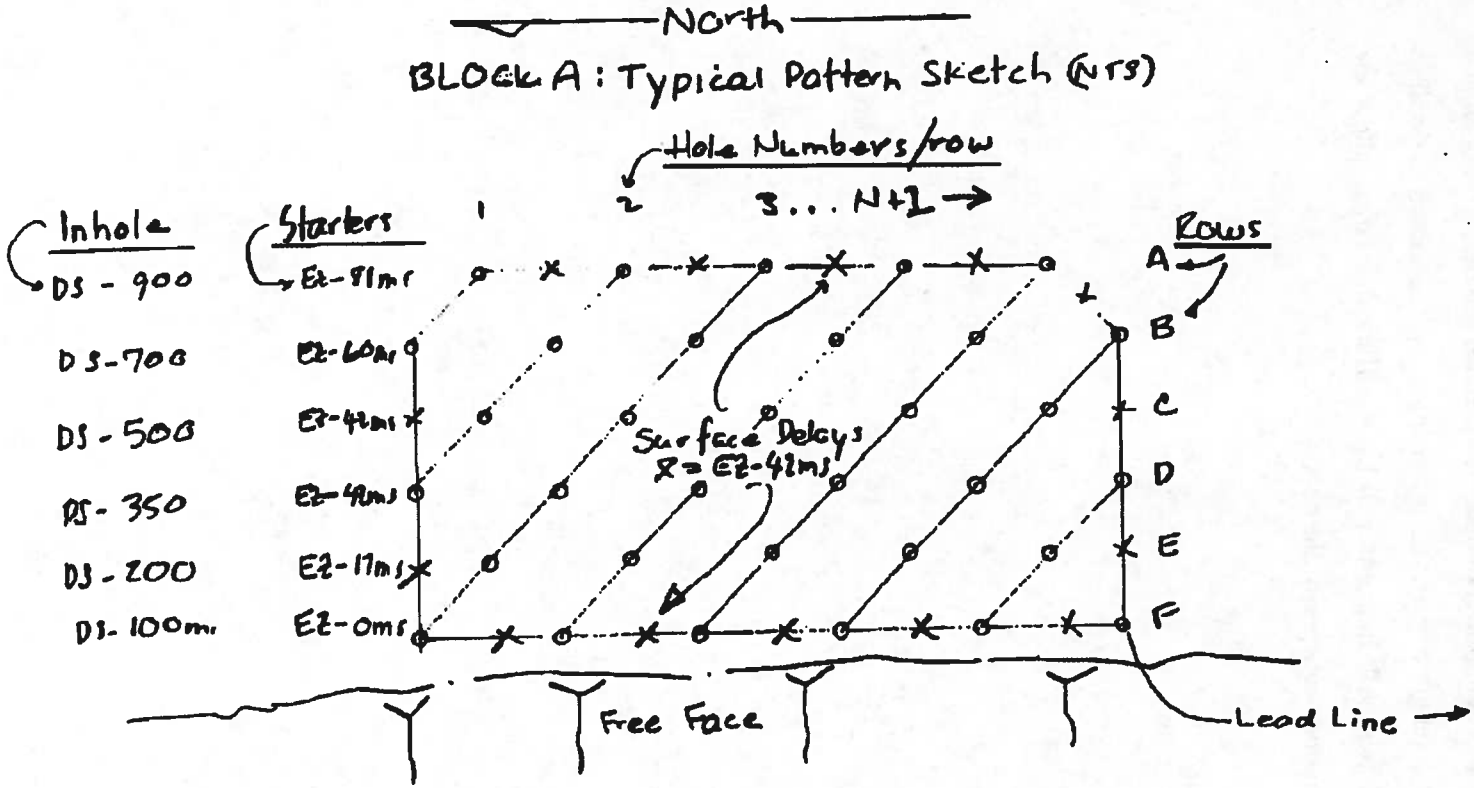
With the exception of large, complex blocks such as those found on cast shots, Navajo Mine will provide a blast diagram for the following shot types:

- Overburden/Parting shots using In-Hole Delays System (Exhibit 5)
- Overburden/Parting shots using Detonating Cord/Surface Connectors (Exhibit 6)
- Coal Shots tied in Row-by-Row (Exhibit 7)
- Coal Shots tied in en Echelon (Exhibit 8)

Navajo Mine will also provide a note on the diagram when electronic detonators are used as a form of initiation. In all of these typical diagrams, the following information will be explicitly defined in the drawing:

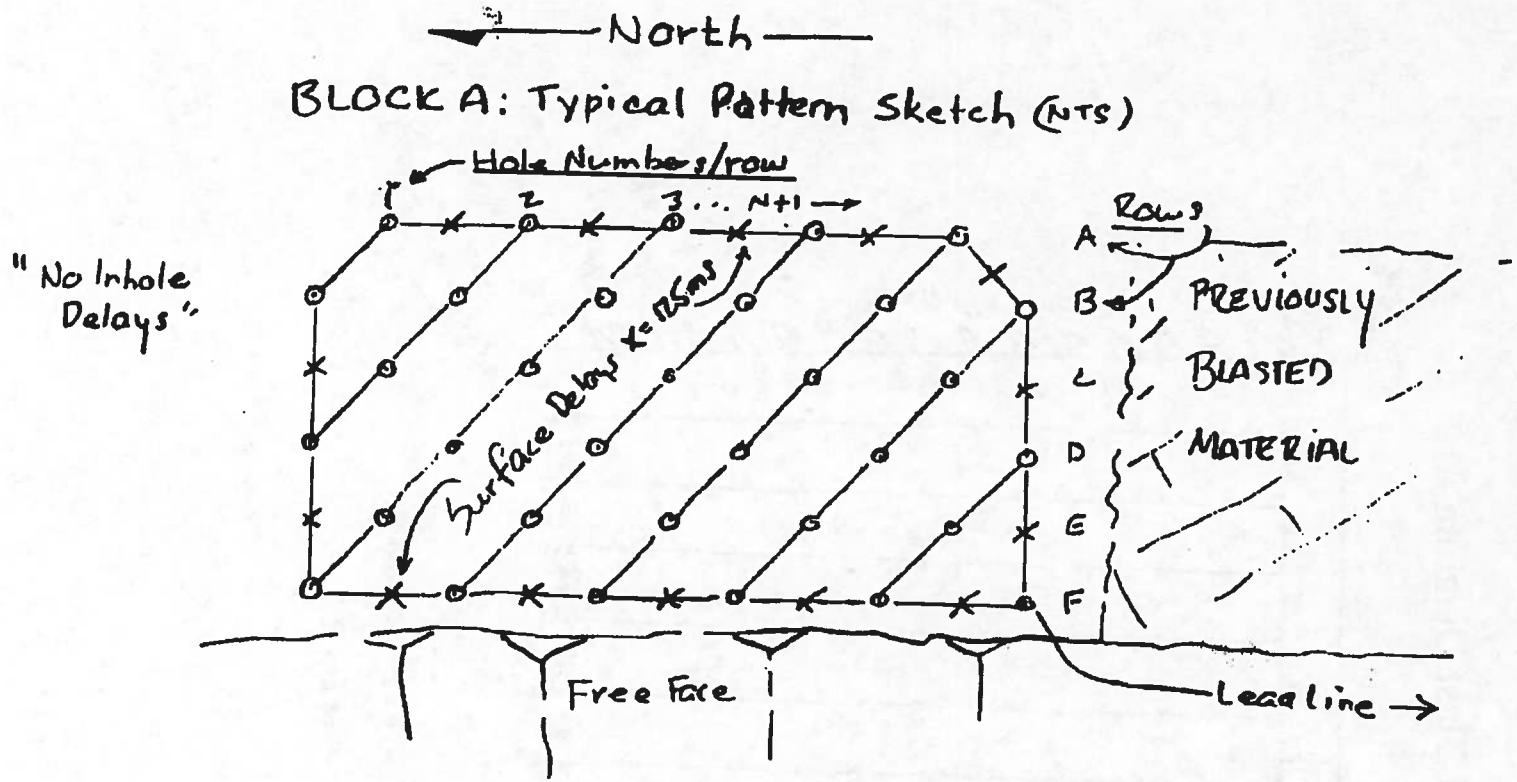
- North Arrow.
- Row Letter.
- Hole Number – diagram will not show the total holes in a row, but a number sufficient to determine the initiation sequence.
- Relative Hole Locations – diagram will show terminal ends of the shot pattern to include lead-in and termination. General or repetitive data for the body of the shot will be excluded.
- Relative locations of Free Face, Highwall, Empty Pit, etc.
- Location and period of all surface delays. Top-of-hole delays will be specified in tabular format above or alongside the drawing. Generally, all holes in a row will have the same top-of-hole delay period. Circuit delays will be shown symbolically on the drawing then detailed in a legend below the diagram.
- Period of In-Hole delays. Again provided in tabular format. Generally, all holes in a row will have the same in-hole delay period.
- Type of material bounding the shot. (i.e. Prime, Previously Shot).

In areas where conditions require the addition of more holes than planned (double drilling around failures, added row of holes for a short length of pit), this information will be shown in detail in addition to the diagrams currently drawn. All diagrams will have sufficient detail to allow the user to accurately reconstruct the initiation sequence of the shot.



In – Hole Delay System

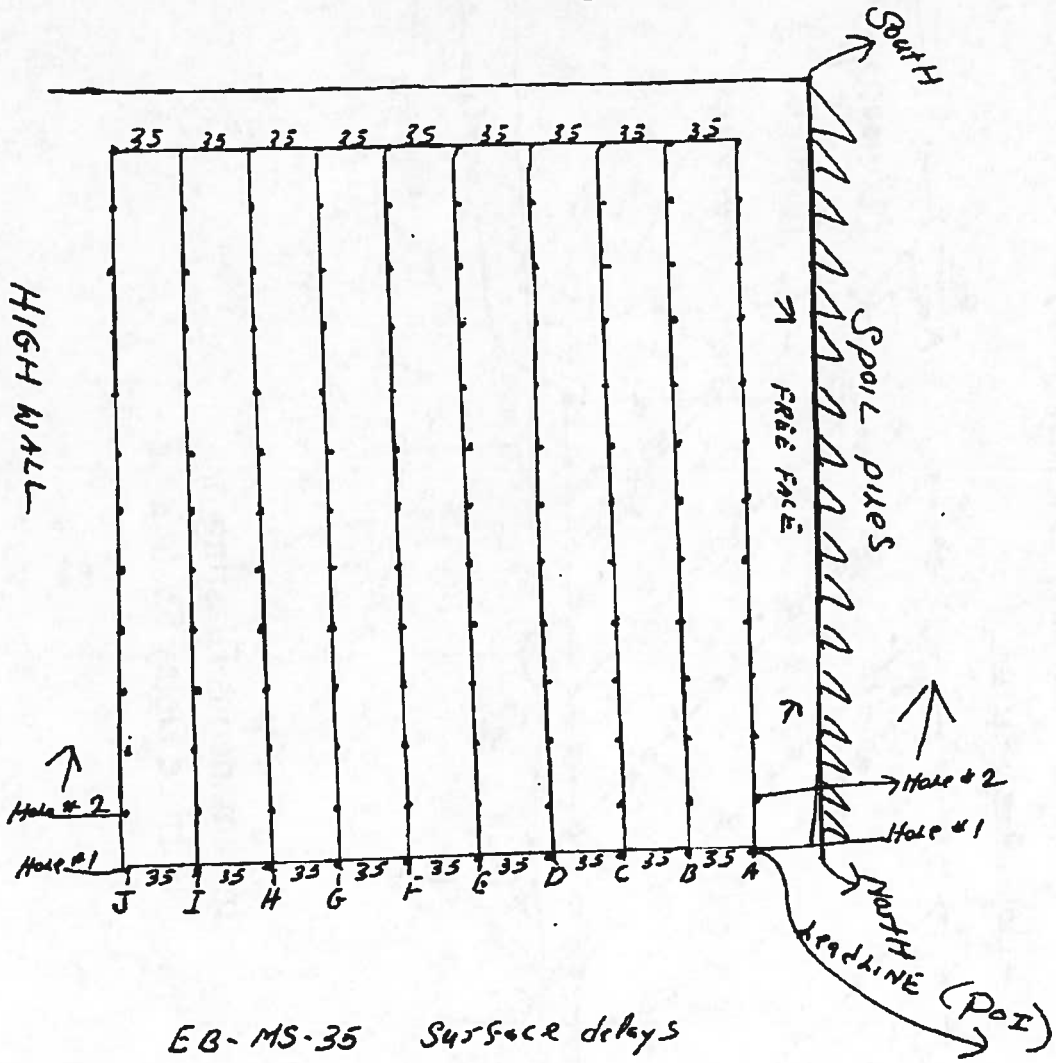
EXHIBIT 5



Instantaneous Blasting or
Surface Delay System

EXHIBIT 6

Coal Blast Diagram #1



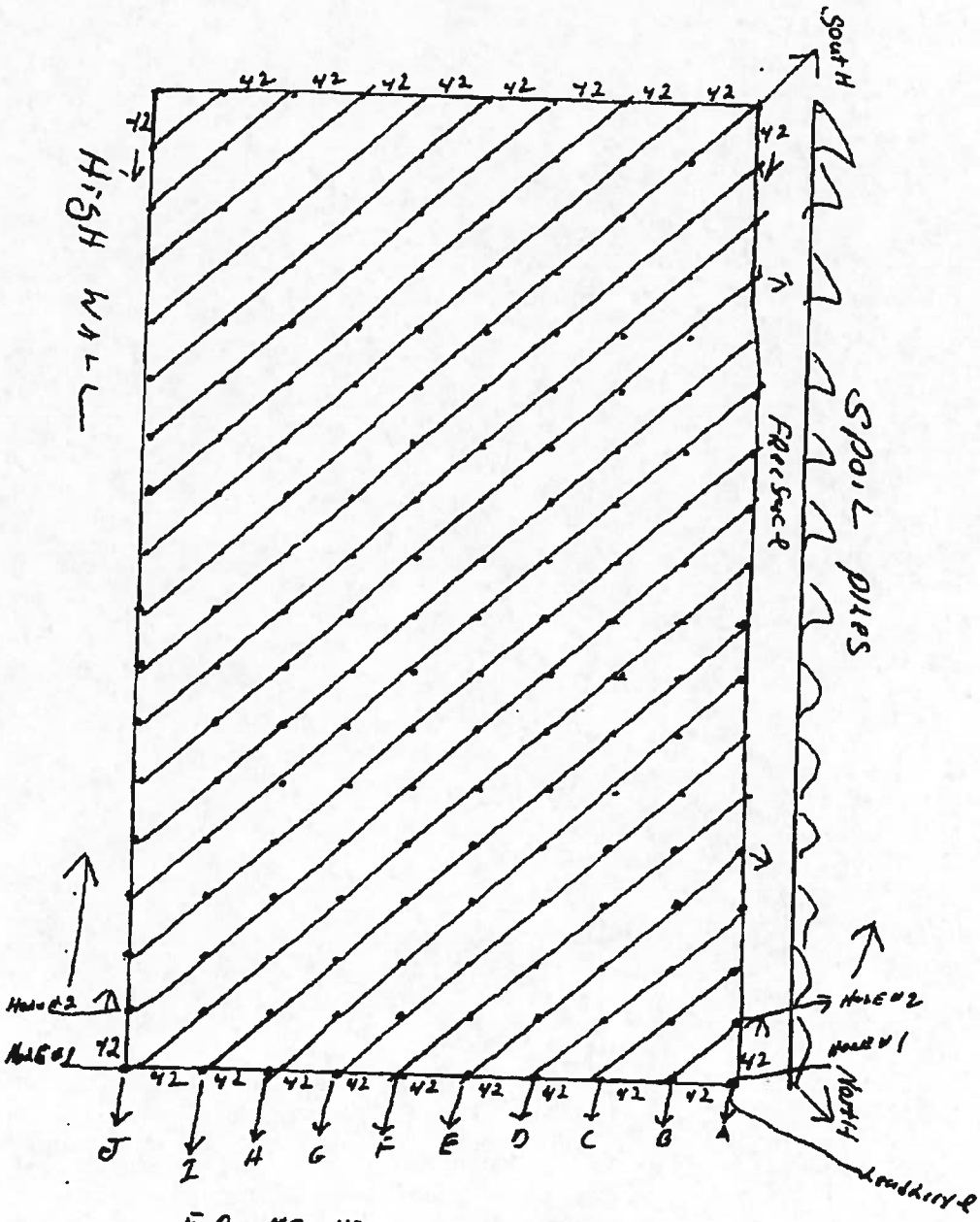
EB-MS-35 Surface delays

Row A on Free face

NORTH

EXHIBIT 7

Coal Blast Diagram #2



EB-MS-42 Surface delays
Row "A" on FREE face

NORTH

EXHIBIT 8